GOLDER
MEMBER OF WSP

REPORT

2021 Annual Inspection

Coal Creek Station – Upstream Raise 92 CCR Surface Impoundment

Submitted to:

Great River Energy

2875 Third Street SW
Underwood, North Dakota 58576

Submitted by:

Golder Associates USA Inc.
7245 W Alaska Drive, Suite 200, Lakewood, Colorado, USA 80226

+1 303 980-0540

21451024-20-R-0

January 2022

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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 USA Inc. (Golder), a Member of WSP, for Great River Energy (GRE) to satisfy the 2021 annual inspection requirements for CCR surface impoundments under 40 CFR Part 257.83.

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 Upstream Raise 92 at CCS performed August 31, 2021.

From January 2021 to April 2021, bottom ash and additional fill material from Southeast 16 were hauled to Upstream Raise 92 in order to fill Upstream Raise 92 to its final capacity limits. As of April 2021, Upstream Raise 92 was no longer receiving material and Golder completed a notice for intent of closure on June 4, 2021 (Golder 2021).

2.0 REVIEW OF EXISTING INFORMATION

2.1 Geological Conditions

Upstream Raise 92 is generally constructed over a glacial till layer consisting of sandy and silty-clay soils. The glacial till varies in thickness from 20 feet to several hundred feet near CCS. Silty-sand and sand lenses and discontinuous coal seams 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 Facility Location and Operation

Upstream Raise 92 (Figure 2) is located in Section 16, Township 145N, Range 82W and covers approximately 110 acres. The facility was used as a combined dewatering and storage facility for CCRs including fly ash, bottom ash, and flue gas desulfurization (FGD) material. Bottom ash, economizer ash, and fly ash were hauled to the facility. FGD material and hydraulic conveyance water were historically conveyed to Upstream Raise 92 through a high-density polyethylene (HDPE) pipe from the plant to the northwest corner of the facility. Sluiced FGD material placement in Upstream Raise 92 ceased in December 2020 and GRE began placing CCR and non-CCR waste across the top of Upstream Raise 92 to achieve design closure grades.

Upstream Raise 92 is approximately 300 feet south of Lower Samuelson Slough and 100 feet north of the rail lines. Upstream Raise 91 is adjacent to the west end of the facility and the plant dry CCR landfill (Southeast 16) is adjacent to the east side of the facility.

2.3 Site History and Liner Systems

Upstream Raise 92 was constructed within the boundaries of the historic South and East Ash Ponds, which are legacy facilities for managing CCR at CCS. The South and East Ash Pond CCR and process water containment areas were made by constructing clay core dikes around the perimeter of each area and relying on in situ low-permeability soil to act as a soil liner across the floor. The South Ash Pond was put into operation in 1979 and the East Ash Pond was put into operation in 1981. The South and East Ash Ponds were operated intermittently throughout the 1980s.

In the early 1990s, the South Ash Pond was closed by removal of CCRs. A portion of the remaining clay core dikes of the South Ash Pond were salvaged, and additional soil embankments were constructed to outline the footprint of the west half of Upstream Raise 92 and the adjacent Upstream Raise 91. A new composite liner was completed over the west half of Upstream Raise 92 in 1989, consisting of an upper component of HDPE geomembrane having a thickness of 40 mils (0.040 inches) and a lower component consisting of a compacted soil layer at least two feet thick with a hydraulic conductivity less than 1×10^{-7} centimeters per second (cm/sec).

In 1989, the East Ash Pond was reclassified as a solid waste disposal area and CCRs were excavated and placed into the location historically occupied by the west side of the East Ash Pond. These CCRs placed in the west side of the East Ash Pond were regraded and became the base for the east half of Upstream Raise 92. A new composite liner was completed over the east half of Upstream Raise 92 between 2005 and 2008 (over the historically placed CCR), consisting of an upper component of 60-mil linear low-density polyethylene (LLDPE) geomembrane and a lower component consisting of a compacted soil layer at least one foot thick with a hydraulic conductivity less than 1×10^{-7} cm/sec.

An additional 7 acres of composite liner were installed in the area between Upstream Raise 91 and the Upstream Raise 92 in 2016. The liner completes a continuous composite-lined area between Upstream Raise 91 and Upstream Raise 92. The composite liner system installed in 2016 consists of (from bottom to top) geosynthetic clay liner (GCL) and 60-mil HDPE liner.

Appendix A contains additional information regarding the design of Upstream Raise 92.

2.4 Site Geometry

The design crest of the original soil perimeter berms surrounding Upstream Raise 92 are between approximate elevation (El.) 1,900 feet (ft) and El. 1,920 ft. This berm surrounding the facility has a gravel surfaced roadway supporting both light passenger vehicles and heavy construction equipment, such as Caterpillar 777 haul trucks. Based on existing topography, soil perimeter berm downstream slopes generally have three horizontal units to one vertical unit (3:1) or 2.5:1 slopes down to perimeter drainage ditches between approximate El. 1,880 ft and El. 1,900 ft. The soil perimeter berm upstream slopes have an approximate 3:1 slope from the soil perimeter berm crest to the base of the facility between El. 1,892 ft and El. 1,910 ft.

An expansion berm on the east half of the facility built with soil and CCRs extends from the original soil perimeter berms to El. 1,950 ft at 3.5:1 to 4:1 slopes. The entire facility is designed with 4:1 final CCR slopes from the perimeter berms to El. 1,974 ft, 15% final CCR grades between El. 1,974 ft and El. 1,998 ft, and a 5% crown to achieve a final CCR elevation at approximate El. 2,018 ft (Figure 3).

2.5 Changes in Geometry

No significant changes to geometry were noted other than the continued placement of CCRs to the design grades. GRE placed a significant amount of material between December 2020 and April 10, 2021, but were not able to place all the material required to develop the crown as part of the revised closure design. CCR and non-CCR waste was placed from El. 1,995 ft to El. 2,000 ft to promote consolidation and stabilization of FGD material prior to final cover placement.

2.6 Storage Capacity and Volumes

Based on a comparison between the approximate grades as of the fall of 2021 and the final permitted grades of Upstream Raise 92, the facility has a remaining CCR capacity of approximately 200,000 cubic yards (CY). The approximate total CCR capacity of Upstream Raise 92 is 12,920,000 CY. Therefore, the amount of CCR contained in the facility at the time of the inspection is estimated to be approximately 12,720,000 CY.

2.7 Impounded Water

Historically, the depth of impounded water in Upstream Raise 92 varied with time as more CCRs were deposited and as operational variables change (such as gravity drainage pipe elevations). Since hydraulically placed FGD material ceased being placed in Upstream Raise 92 at the end of 2020, only minimal amounts of water have been impounded in the center of the facility. At the time of the inspection, no impounded water was present in Upstream Raise 92.

2.8 Permits

Upstream Raise 92 is currently permitted with the North Dakota Department of Environmental Quality (NDDEQ) 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, 2012).

2.9 Summary of Previous Inspection

The most recent annual professional engineer inspection of Upstream Raise 92 was performed by Golder in the fall of 2020 (Golder 2021) and a summary of the observations of that inspection are as follows:

- Generally good vegetation and site maintenance.
- No signs of significant or unexpected seepage, settlement, or cracking of the berm downstream slopes.
- Recent improvements to the perimeter berm crests are functioning properly and directing contact water as designed.
- Cracks in the bottom ash and fly ash CCR crests and CCR downstream slopes were noted and were attributed to consolidation of interior FGD materials. These cracks were expected to continue during CCR and non-CCR waste placed as part of the crown and cover.
- Minor erosion of the fly ash “shell” (CCR downstream slopes [no cover]) within the lined footprint of the facility) and accumulation of sediment in perimeter contact water channels.
- Several animal burrows (up to 6 inches in diameter), but none that were anticipated to cause areas of structural weakness.

- Portions of the final cover seeded in 2020 have poor native grass vegetative growth. Other areas of the CCR downstream slope with final cover constructed previously show fair/good native grass vegetative growth.

2.10 Summary of 2021 Weekly Inspections

Routine weekly inspections of Upstream Raise 92 facility were performed throughout 2021 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 settlement or cracking of the berm downstream slopes.
- Fugitive dust is actively controlled using a water truck (as required).
- Woody vegetation (small saplings) surrounding the facility were cut as required.

3.0 2021 ANNUAL INSPECTION

On August 31, 2021, Todd Stong and Craig Schuettpelz of Golder performed a visual inspection of Upstream Raise 92 per United States Environmental Protection Agency (USEPA) Regulation 40 CFR Part 257.83(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 2021 annual inspection.

3.1 Hydraulic Structures

As of December 2020, Upstream Raise 92 no longer receives hydraulically conveyed CCR materials. The outflows from Upstream Raise 92 consist of culverts and seepage piping that transfer CCR conveyance water and stormwater from the facility to the adjacent Upstream Raise 91. The culvert connecting the drainage ditch on the northwest side of Upstream Raise 92 to Upstream Raise 91 was in good condition and protected by concrete rubble, although smaller diameter HDPE piping has partially blocked the inlet to the culvert. The seepage piping connecting Upstream Raise 92 to Upstream Raise 91 is buried and was not visible during the inspection.

The outflow systems appear to be in good condition with no sign of settlement, cracking, or corrosion.

3.2 Perimeter Berm

3.2.1 Berm Upstream Slope

The berm upstream slopes are mostly covered by CCR deposition and/or final cover. A small amount of the berm upstream slope from El. 1,917 ft to 1,920 ft was visible on the north side of the facility. The observed slope appeared to match the design slopes of 3:1 and are being protected from erosion with a cemented fly ash layer. The berm upstream slopes appeared to be in good condition.

3.2.2 Berm Crest

The berm crest along the north side of Upstream Raise 92 is used for both light vehicle and heavy construction equipment traffic. The berm crest road on the south side of Upstream Raise 92 experiences little heavy traffic and is mostly exposed to light vehicle traffic (e.g., cars, pickups). The berm crest on the west side of Upstream Raise 92 was not visible as Upstream Raise 92 is connected with Upstream Raise 91 via a geomembrane liner covered with protective cover CCR material. The crest of the original perimeter soil berm on the north and south

sides of the facility (El. 1,900 ft to El. 1,920 ft) is a gravel surfaced road that appeared to be in good condition with minor rutting. The roads were well-compacted and the north side experiences frequent heavy traffic. A safety and contact water containment berm was recently constructed on the north side of the berm crest and appears to contain and direct runoff from the haul road toward the Upstream Raise 92 perimeter contact water channel. In addition, the haul road grades in this area were also improved to route contact water from the access ramp on the north side of Upstream Raise 92 CCR downstream slope toward the Upstream Raise 92 perimeter contact water channel. The visual inspections did not reveal signs of cracking, erosion, or settlement.

3.2.3 Berm Downstream Slope

The berm downstream slopes of Upstream Raise 92 below the original and expansion berms are heavily vegetated with native grasses. Occasional animal burrows up to approximately 6 inches in diameter were observed on the north and south berm downstream slopes. There is no noticeable significant erosion, cracks, or scarps on these grassy slopes, and they appear to be in good condition.

3.3 Toe

The toe of the slopes on the north and south sides of Upstream Raise 92 are mostly covered with tall grass. A few small animal burrows were noted during the inspection, but there were no noticeable signs of seepage, cracks, or settlement.

The surface water drainage at the toe of the slope on the south side of Upstream Raise 92 had some marshy vegetation and standing water. The presence of some standing water in this surface water drainage ditch was noted due to the low average slope of this ditch and the fact that it is near typical groundwater levels. Side slopes of this drainage ditch are also relatively steep near the toe but did not show signs of movement. The toe may require maintenance in the future to limit erosion.

3.4 CCR Placement

3.4.1 CCR Upstream Slope

The CCR upstream slope is defined as the slope that toes out into the raise pool or historic FGD deposition area. The CCR upstream slope of Upstream Raise 92 is constantly changing as additional CCR materials are deposited. Therefore, the CCR upstream slopes are temporary and dependent on the angle of repose of the bottom ash material. The vertical distance from the top of the bottom ash CCR upstream slope to the FGD material mixture was approximately 5 feet at the time of inspection. The CCR upstream slopes appear to be in good condition with no signs of structural weakness.

3.4.2 CCR Crest

The CCR crest along the top of the facility is constructed mainly of bottom ash or other mixed waste materials placed between December 2020 and April 2021. The CCR crest is bordered on the outsides of the facility by a fly ash “shell” primarily for erosion protection and as a trafficking surface. The CCR crest of the facility is in good condition and is continually worked and compacted with heavy equipment.

3.4.3 CCR Downstream Slope (No Cover)

The area above the original and expansion berm downstream slopes surrounding the west and east sides, and a portion of the north and south sides of Upstream Raise 92 had an exposed fly ash “shell” at the time of the inspections (CCR downstream slope). The fly ash CCR downstream slope is in good condition and there was no noticeable seepage, or sloughing during the inspections; however, there were cracks noted on the surface of the

CCR downstream (described herein) as well as some minor erosion of the fly ash shell. The eroded fly ash is collected within the lined footprint in a perimeter ditch and must be periodically cleaned out as required.

Cracks noted on the surface of the CCR downstream slopes (most prevalent between El. 1,974 ft and 1,998 ft) were between approximately 1 and 12 inches wide, up to 2 feet deep, and up to several hundred feet long. The cracks are expected and can be attributed to consolidation of FGD material on the interior of the facility and the relatively rigid bottom ash and fly ash exterior of the facility. These cracks are continually observed and evaluated by on-site operations personnel for changes to the shape, offset, or length of the features, and the installed instrumentation (inclinometers and piezometers) provides additional information regarding the performance of the facility with respect to the design.

3.4.4 CCR Downstream Slope (with Cover)

Portions of CCR downstream slopes on the north side of Upstream Raise 92 have temporary cover. These areas were well vegetated with grass and weeds but had experienced some minor erosion. The 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 south CCR downstream slope of Upstream Raise 92 has established final cover on the side slopes to El. 1,998 ft with terraces approximately every 20 vertical feet and downchute drainage channels along the side slopes. Final cover seeded less than two years ago has fair to poor vegetation mostly consisting of weeds. These areas should continue to be monitored and should be reseeded to promote growth of native grass species, as required. Other areas of the CCR downstream slope with final cover show good native grass vegetative growth. Wormwood growth was noted on the final cover in addition to the native grass. Wormwood is a noxious woody weed that should be mitigated when growing on final or temporary cover slopes. Occasional small burrows up to 6 inches in diameter were also noted on the north slopes that are constructed with temporary cover. There is no noticeable significant erosion, scarps, or settlement on CCR downstream slopes with cover, and they appear to be in good condition.

3.5 Instrumentation

Water levels in Upstream Raise 92 are monitored monthly using 16 piezometers located within the placed CCR slopes of the facility. Two new piezometers were installed in September 2021 to monitor water levels in the middle of Upstream Raise 92. In addition, two inclinometers were installed in the CCR slopes of the facility to monitor slope movements associated with ongoing consolidation of FGD material in the facility. The plan view location of each piezometer and inclinometer is shown in Figure 4.

Piezometer measurements for the past year are included in Appendix D-1. Piezometers PZ-1 through PZ-12 were constructed near the perimeter bottom ash seepage piping and have historically fluctuated by less than approximately 3 feet as the facility height has increased. Piezometers PZ-13S and PZ-14 (D and S) were constructed along the side slopes of the facility and show greater variability since installation as they are nearer to the FGD material pool in the center of the facility. Piezometers PZ-20 and PZ-21 were just recently installed in the crown area of Upstream Raise 92 with placement of CCR and non-CCR waste between December 2020 and April 2021. These piezometers measure the water level in the center of Upstream Raise 92 as the facility dewaters and progresses toward closure.

Inclinometer measurements have been taken since 2014 and are shown in Appendix D-2. Inclinometer measurements show a general trend that supports the consolidation of the FGD material in the middle of the

facility. Consolidation of thicker zones of FGD material in the middle of the facility is greater than consolidation of FGD material zones near the perimeter. Therefore, the inclinometers show a trend of the rigid fly ash and bottom ash material settling toward the center of the facility. Inclinometers appear to show that movement is slowing as most of the loading within the facility moves inward, further from the inclinometers.

3.6 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 Upstream Raise 92 were observed during the site inspection in August 2021.

4.0 SUMMARY AND CONCLUSIONS

An annual visual inspection was performed for Upstream Raise 92 at Coal Creek Station on August 31, 2021. 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 structural deficiencies such as settlement, or unexpected cracking during visual observations of Upstream Raise 92. Overall, the facility appeared to be in good condition at the time of the visual evaluation.

In addition to annual inspections by the Professional Engineer (PE), trained and qualified site personnel continue to perform the required weekly facility inspections to look for signs of potential structural weaknesses. Instrumentation (inclinometers and piezometers) will be monitored regularly to ensure proper operation of the equipment and to evaluate the overall structural stability of the facility.

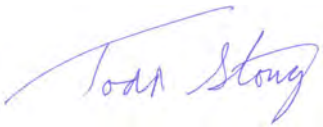
Minor maintenance items that may need to be continually addressed include monitoring the size and shape of cracks in CCR downstream slopes and the CCR crest of the facility, repairing large animal burrows as they appear, monitoring erosion and vegetative success of areas near recently placed articulated concrete block mats and the surface water channel along the south toe of the facility, clean-out of collected material in the perimeter channels and maintaining gravity and culvert piping between Upstream Raise 91 and Upstream Raise 92, reseeding of CCR downstream slopes with final cover, and removal of any woody vegetation growing on the berm downstream slopes. In addition, the outflow piping should be monitored regularly to ensure proper conveyance of water from the facility.

Signature Page

Golder Associates USA Inc.

Madeline Sova
Staff Engineer

Craig Schuettpelz, PE
Senior Engineer



Todd Stong, PE
Practice Leader

MRS/CSS/TS/rm

https://golderassociates.sharepoint.com/sites/140044/project files/6 deliverables/21451024/reports/20-r-ur92_2021_annual_report/20-r-0/21451024-20-r-0-upstream_raise_92_2021_annual_inspection_28jan22.docx

5.0 REFERENCES

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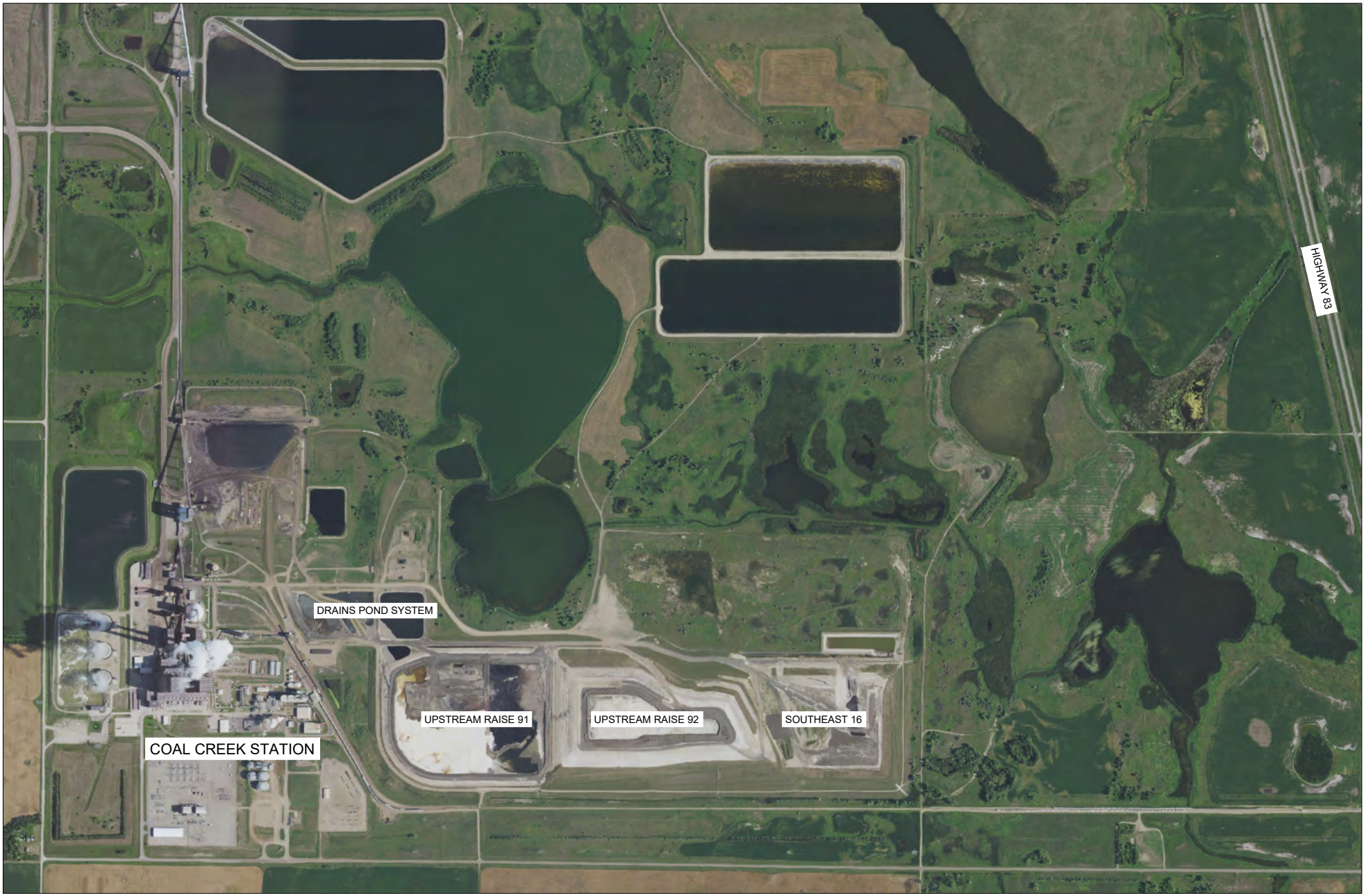
GRE (Great River Energy – Coal Creek Station). 2003. Permit Modification Document, Permit No. SP-033. Original Permit Modification submitted September 30, 2003. Revised Permit Modification submitted to NDDH on July 8, 2004.

GRE. 2012. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated December 12, 2012.

Figures



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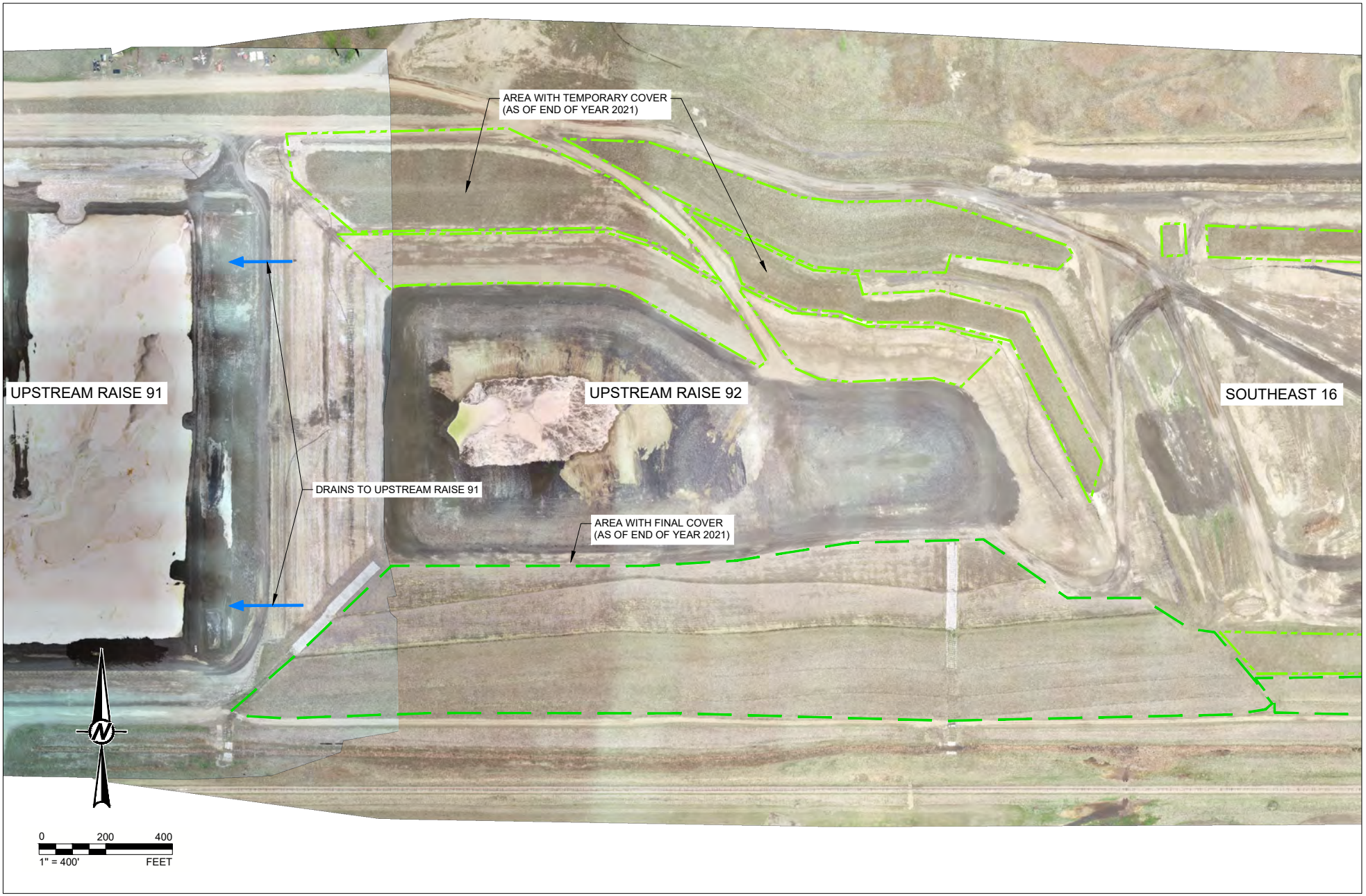
NOTE(S)

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURE AERIAL IMAGERY PROGRAM, TAKEN IN 2020.

GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
SITE OVERVIEW

FIGURE 1



REFERENCE(S)

1. AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN MAY 2021.

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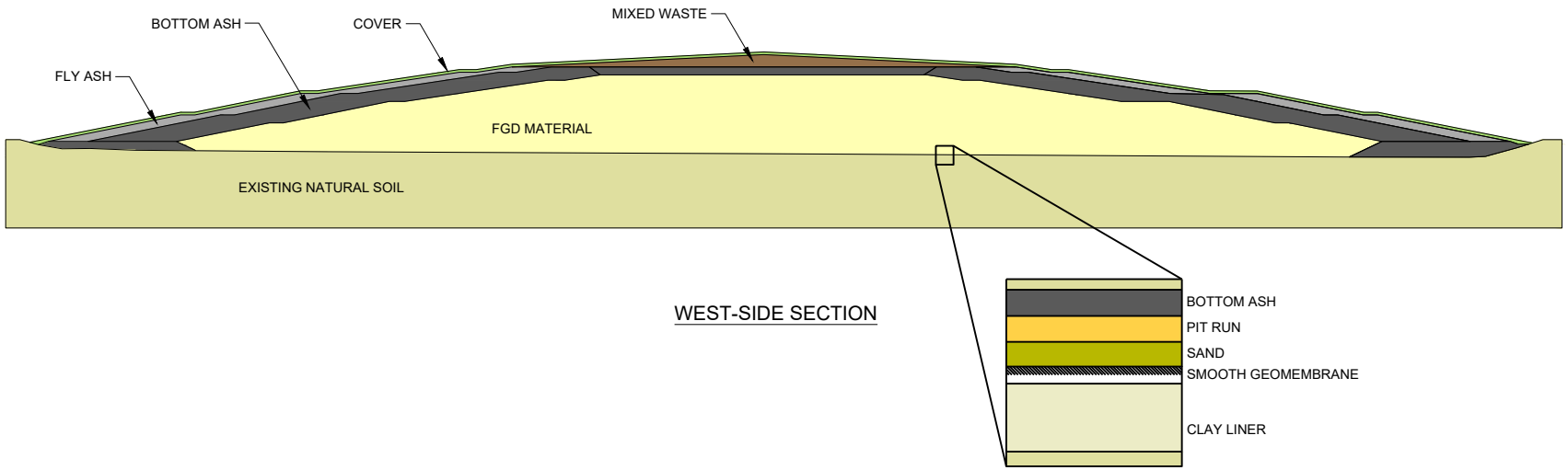
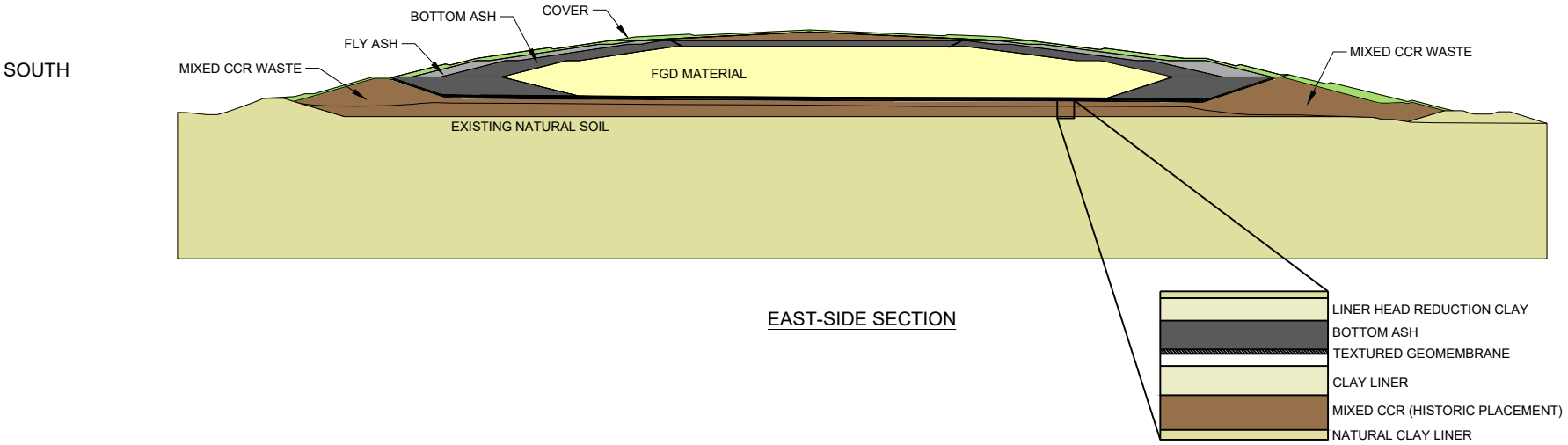
GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - SITE OVERVIEW

FIGURE 2



WEST-SIDE SECTION



EAST-SIDE SECTION

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GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - CROSS SECTIONS

FIGURE 3

Path: \\golder.gds\complexdata\office\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\21451024\21451024\2021 Annual Inspections\ | File Name: Fig4 - UR92 Instrumentation Overview.dwg

REFERENCE(S)

1. AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN MAY 2021.

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GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 INSTRUMENTATION OVERVIEW

FIGURE 4

APPENDIX A

Selected Construction Drawings and Permit Drawings

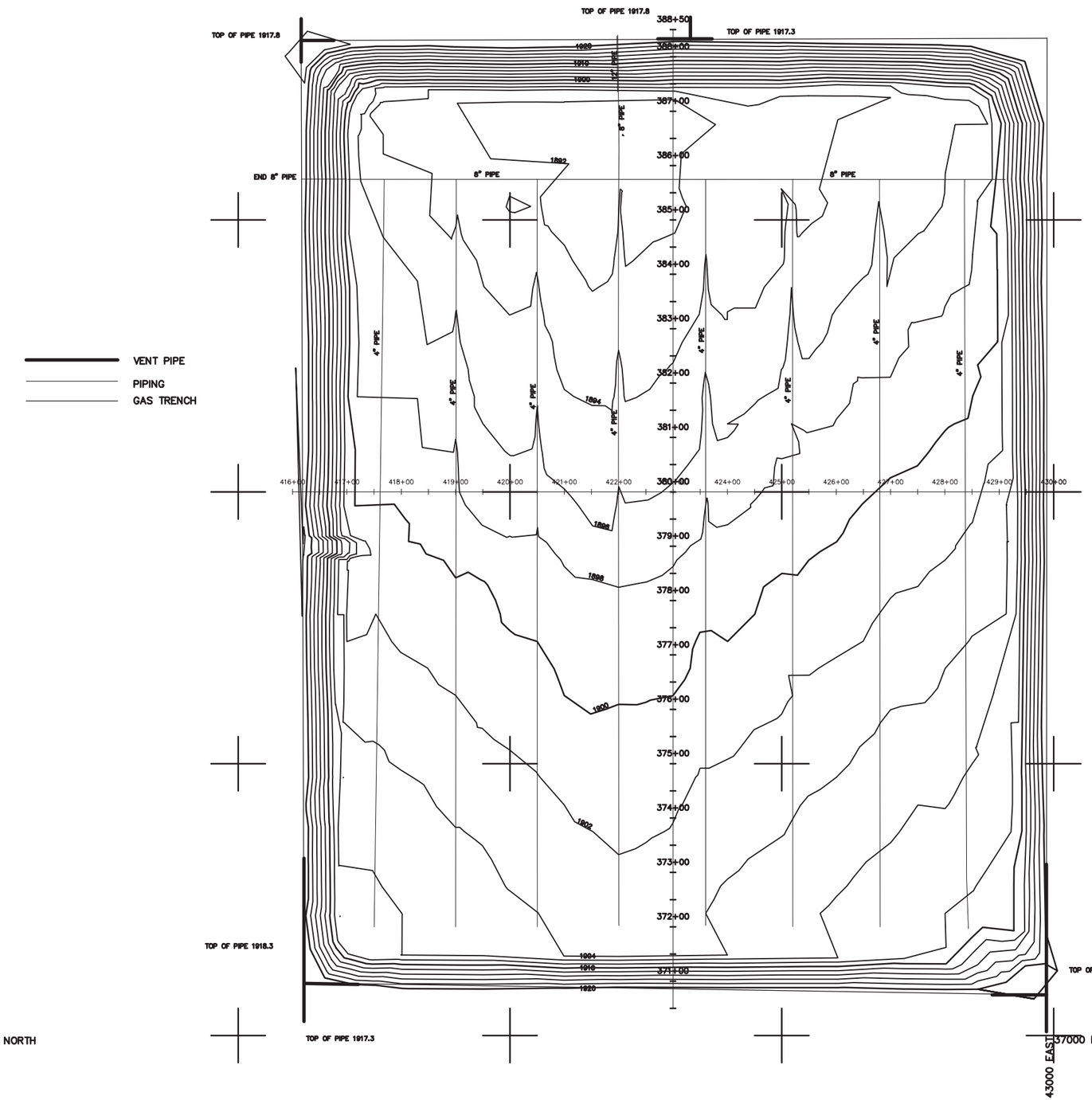
COAL CREEK STATION

EAST HALF SOUTH ASH POND

FINISHED GRADES

AND PIPING

UNDERWOOD, NORTH DAKOTA



VENT PIPE
PIPING
GAS TRENCH

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

THIS DRAWING PREPARED JANUARY 26, 1990
FROM INFORMATION COMPLETED ON DECEMBER 20, 1989

NOTES
1. SITE LOCATION SW 1/4 SECTION 16 T. 145 N., R. 82 W., McLEAN COUNTY, NORTH DAKOTA.
2. TOPOGRAPHY IS BASED ON AN ACTUAL SURVEY OF THE GROUNDS.
3. ELEVATIONS ARE BASED ON SEA LEVEL DATUM.
4. HORIZONTAL DATUM IS BASED ON NORTH DAKOTA STATE PLANE COORDINATES SYSTEM AS FOLLOWS:
   SITE GRID NORTH = NORTH STATE PLANE COORDINATES MINUS 1000,000.
   SITE GRID EAST = EAST STATE PLANE COORDINATES MINUS 1,800,000.

SURVEYOR'S CERTIFICATE

I, LARRY J. SMITH, A REGISTERED LAND SURVEYOR IN THE STATE OF NORTH DAKOTA, HEREBY CERTIFY THAT THE ANNEXED PLAT IS A TRUE COPY OF THE NOTES OF SURVEY COMPLETED ON DECEMBER 20, 1989 AND IS A TRUE REPRESENTATION OF THE AS-BUILT CONDITION.

LARRY J. SMITH
NORTH DAKOTA REGISTRATION
NO. 2363

CIVIL ENGINEERING LAND PLANNING LAND SURVEYING
SWENSON, HAGEN & CO. P.C.
CONSULTING ENGINEERS
P.O. BOX 1135, 909 BASIN AVENUE
BISMARCK, NORTH DAKOTA 58502
701-223-2800

CADD PROJ CODE:		PRF NAME:					
DRAWN BY:		DATE:					
SURVEYED BY:		DATE:					
SURVEY DATA:							

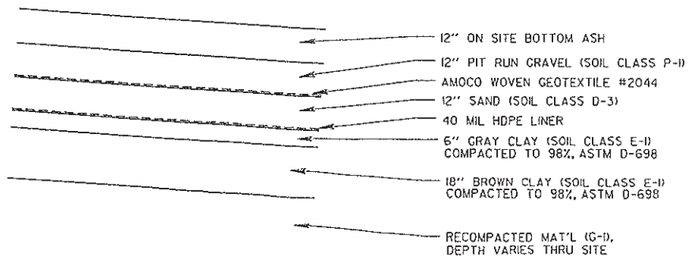
NO	BY	DATE	NO	BY	DATE
1			1		
2			2		
3			3		

Foth & Van Dyke

SCALE

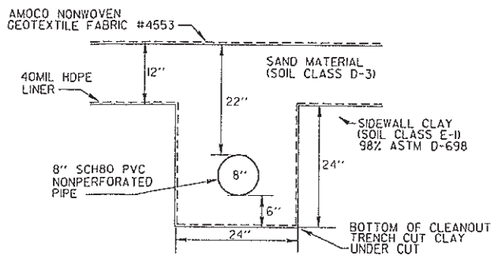
SCOPE ID.

DRAWING NO.

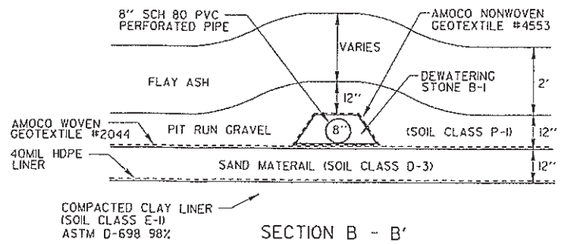


1/11 TYPICAL FLEXIBLE MEMBRANE LINER (FML) DETAIL

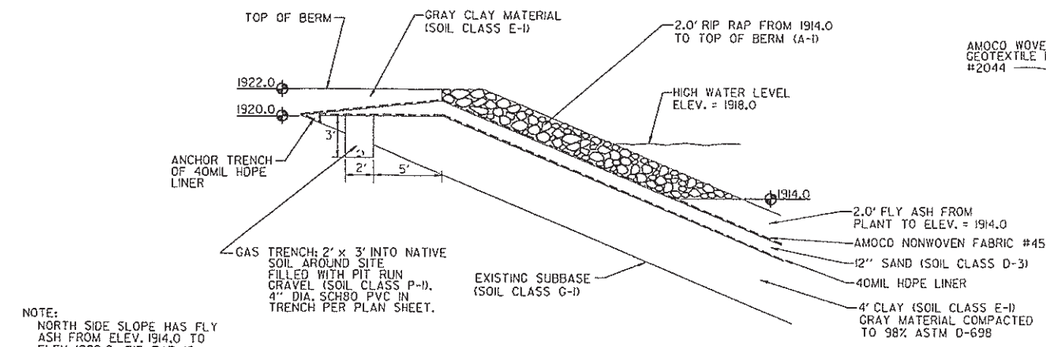
NOT TO SCALE



SECTION A - A'



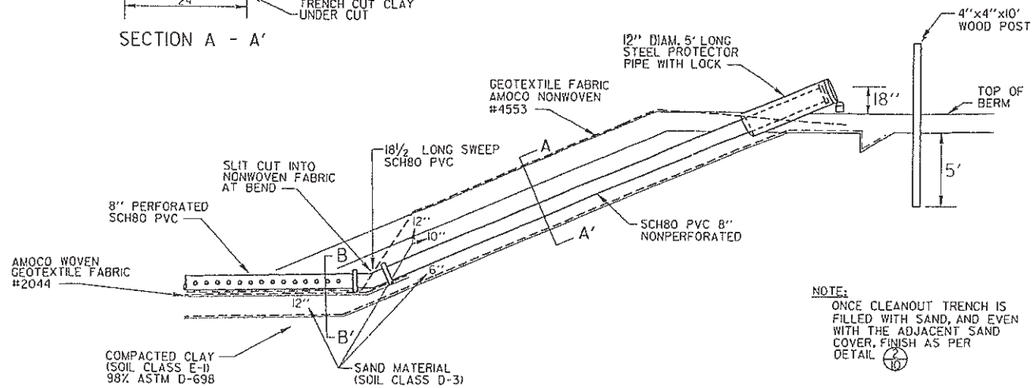
SECTION B - B'



NOTE:
NORTH SIDE SLOPE HAS FLY ASH FROM ELEV. 1914.0 TO ELEV. 1922.0. RIP RAP IS REPLACED WITH FLYASH.

2/11 TYPICAL SIDE WALL DETAIL OF SOUTH, EAST AND WEST SLOPES

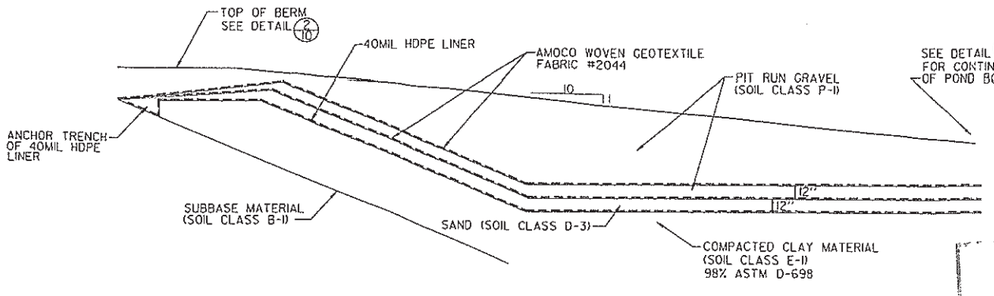
NOT TO SCALE



NOTE:
ONCE CLEANOUT TRENCH IS FILLED WITH SAND, AND EVEN WITH THE ADJACENT SAND COVER, FINISH AS PER DETAIL 6/10

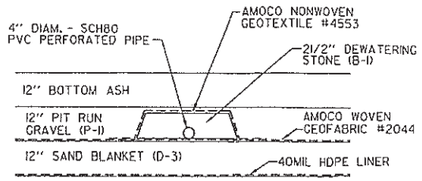
4/11 TYPICAL CLEAN-OUT RISERS EAST AND WEST SLOPES

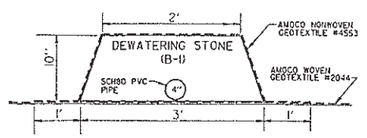
NOT TO SCALE



3/11 PERMANENT HEAVY EQUIPMENT ENTRANCE RAMP DETAIL (SOUTHEAST CORNER OF POND)

NOT TO SCALE





TYPICAL DEWATERING STONE DETAIL

5/11 TYPICAL DEWATERING AND HEADER TRENCH DETAIL WITH DETAIL OF THE BEDDING AROUND THE PERFORATED PIPE

NOT TO SCALE

CADD PROJ CODE: SCOO | PRF NAME: SCOODET
DRAWN BY: DP | DATE: 1/25/90
SURVEYED BY: LS | DATE: 9/8/89
SURVEY DATA:

RECORD DRAWINGS OF COMPLETED CONSTRUCTION BASED ON CONTRACTORS AND/OR OWNERS RECORDS DURING CONSTRUCTION.
BY [illegible] DATE 2-6-90

REVISIONS / REMARKS

NO.	BY	DATE
1		
2		
3		

APPROVED BY: [illegible] DATE: 2-6-90
REVIEWED BY: [illegible] DATE: 2-6-90
PREPARED BY: [illegible] DATE: 2-6-90

Foth & Van Dyke

COOPERATIVE POWER
EDEN PRAIRIE, MINN.
AND
UNITED POWER
ELK RIVER, MINN.

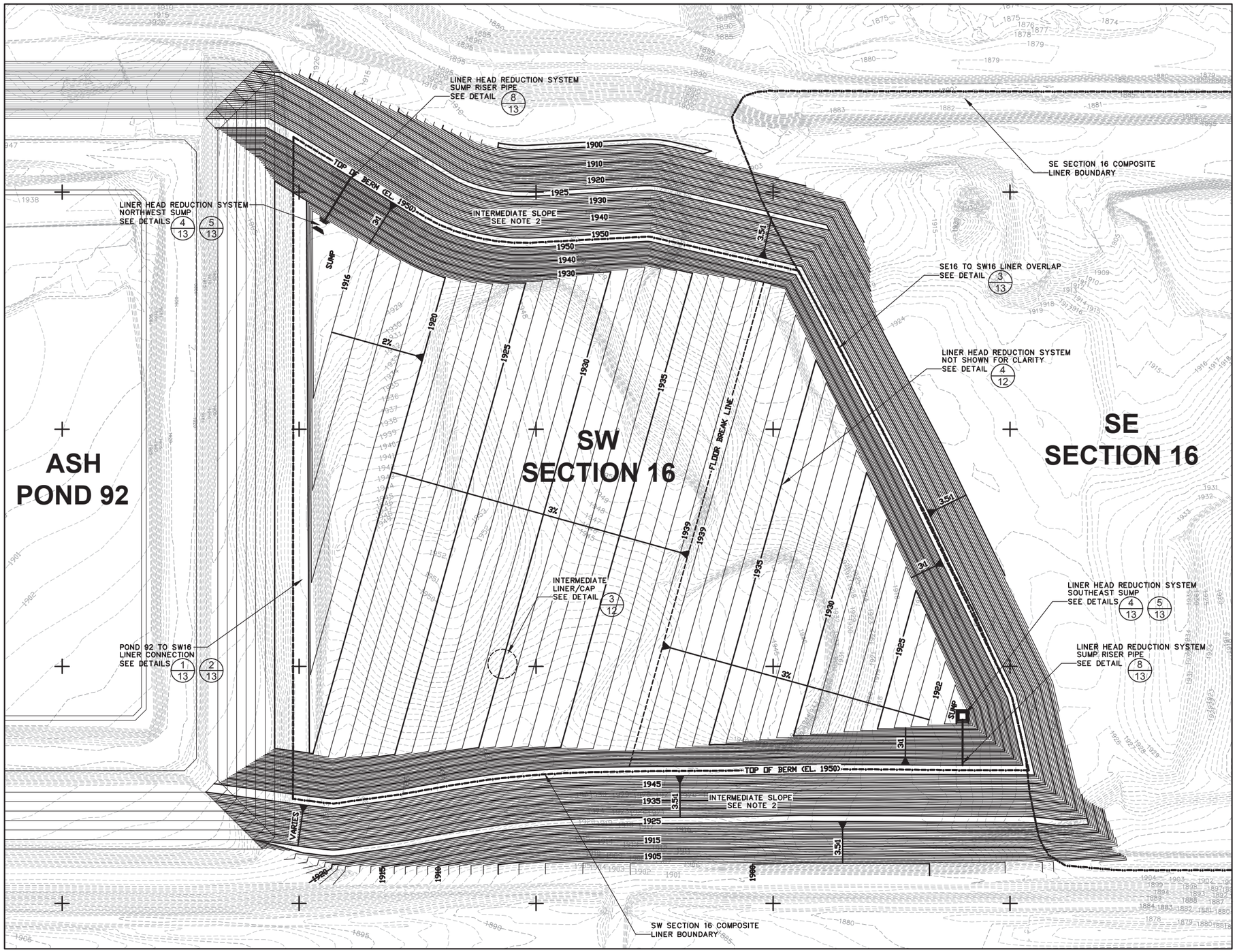
DOCUMENTATION DRAWINGS
COAL CREEK STATION
EAST HALF OF SOUTH ASH POND

DETAILS

SCALE NOT TO SCALE

SCOPE ID 89C16

DRAWING NO. 11



LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCES)
- PREVIOUS PHASE PROPOSED TOPOGRAPHY
- PROPOSED CONSTRUCTION TOPOGRAPHY
- SW SECTION 16 COMPOSITE LINER BOUNDARY
- SE SECTION 16 COMPOSITE LINER BOUNDARY

NOTES

1. SW SECTION 16 GRADES REPRESENT TOP OF CLAY LINER/SOIL DIKE.
2. SW SECTION 16 CONTAINMENT DIKE SLOPES ARE INTERMEDIATE SLOPES AT 3.5H:1V. FINAL CLOSURE SLOPES WILL BE GRADED TO 4H:1V.

REGULATORY DESIGN BASIS

1. CONTROL OF RUN-ON AND RUN-OFF DURING OPERATIONS FROM A TWENTY-FIVE-YEAR, TWENTY-FOUR-HOUR STORM EVENT (3.75"), PER SUBDIVISION A OF SUBSECTION 3 OF NDAC SECTION 33-20-04.1-09.
2. OPERATE THE UPSTREAM RAISE (SURFACE IMPOUNDMENT) TO HAVE A FREEBOARD OF AT LEAST TWO FEET, PER SUBDIVISION D OF SUBSECTION 2 OF NDAC SECTION 33-20-08.1-01.
3. MINIMIZE EROSION OF FINAL COVER, PER SUBDIVISION B3 OF SUBSECTION 4 OF NDAC SECTION 33-20-04.1-09.
4. MAXIMUM FINAL SLOPES NOT LESS THAN THREE PERCENT, NOR MORE THAN TWENTY-FIVE PERCENT, PER SUBDIVISION B3 OF SUBSECTION 4 OF NDAC SECTION 33-20-04.1-09.
5. EVALUATE SLOPES STEEPER THAN FIFTEEN PERCENT TO ENSURE STABILITY, PER SUBDIVISION B3 OF SUBSECTION 4 OF NDAC SECTION 33-20-04.1-09.
6. CONTROL OF SURFACE WATER DRAINAGE FROM FINAL SLOPES, PER SUBDIVISIONS B2-B4 OF SUBSECTION 4 OF NDAC SECTION 33-20-04.1-09.
7. COMPOSITE LINER, PER SUBDIVISION B OF SUBSECTION 2 OF NDAC SECTION 33-20-08.1-01.
8. APPROPRIATE ENGINEERED FINAL COVER DESIGN, PER NDAC SECTION 33-20-07.1-02.
9. ALL OTHER APPLICABLE RULES FROM NDCC CHAPTER 23-29 AND NDAC ARTICLE 33-20.

REFERENCES

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY PROVIDED BY GREAT RIVER ENERGY. PERFORMED BY INTERSTATE ENGINEERING AND KADRMAS, LEE & JACKSON BETWEEN 1996 AND 2003.
3. ELEVATIONS BASED ON MEAN SEA LEVEL DATUM, CONTOUR INTERVAL IS ONE FOOT.
4. HORIZONTAL DATUM BASED ON NORTH DAKOTA STATE PLANE COORDINATE SYSTEM AS FOLLOWS:

   SITE GRID N = N STATE PLANE COORDINATE MINUS 100,000
   SITE GRID E = E STATE PLANE COORDINATE MINUS 1,800,000

5. ALL PROPERTY SHOWN ON THIS MAP IS OPERATED BY GREAT RIVER ENERGY.

ENGINEER'S STAMP

REFERENCE DRAWINGS

NO.	REVISION DESCRIPTION (THIS DRAWING IS NOT APPROVED UNLESS LAST REVISION IS HAND WRITTEN)	DATE	BY	CHKD	AP'VD
C	ISSUED FOR DRAFT REVISED PERMIT MODIFICATION	07/09/04			
B	ISSUED FOR PERMIT MODIFICATION	09/24/03	TJS	RRJ	RRJ
A	ISSUED FOR CLIENT REVIEW	06/04/03	TJS	–	RRJ

PRINT ISSUE RECORD

DATE	
FOR	
REVISED	
CLIENT	
FIELD	

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

TITLE
PHASE 2: SW SECTION 16 INTERMEDIATE LINER/CAP

Golder Associates
Denver, Colorado

PROJECT No.	023-2411		FILE No.	0232411A020	
DESIGN	TJS	05/01/03	SCALE	AS SHOWN	REV. C
CADD	TJS	05/01/03	5		
CHECK	RRJ	06/02/03			
REVIEW	RRJ	06/02/03			

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Layout Name: Layout2
Last Plot: Sep 27, 2010 15:28
Machine: NOT SET
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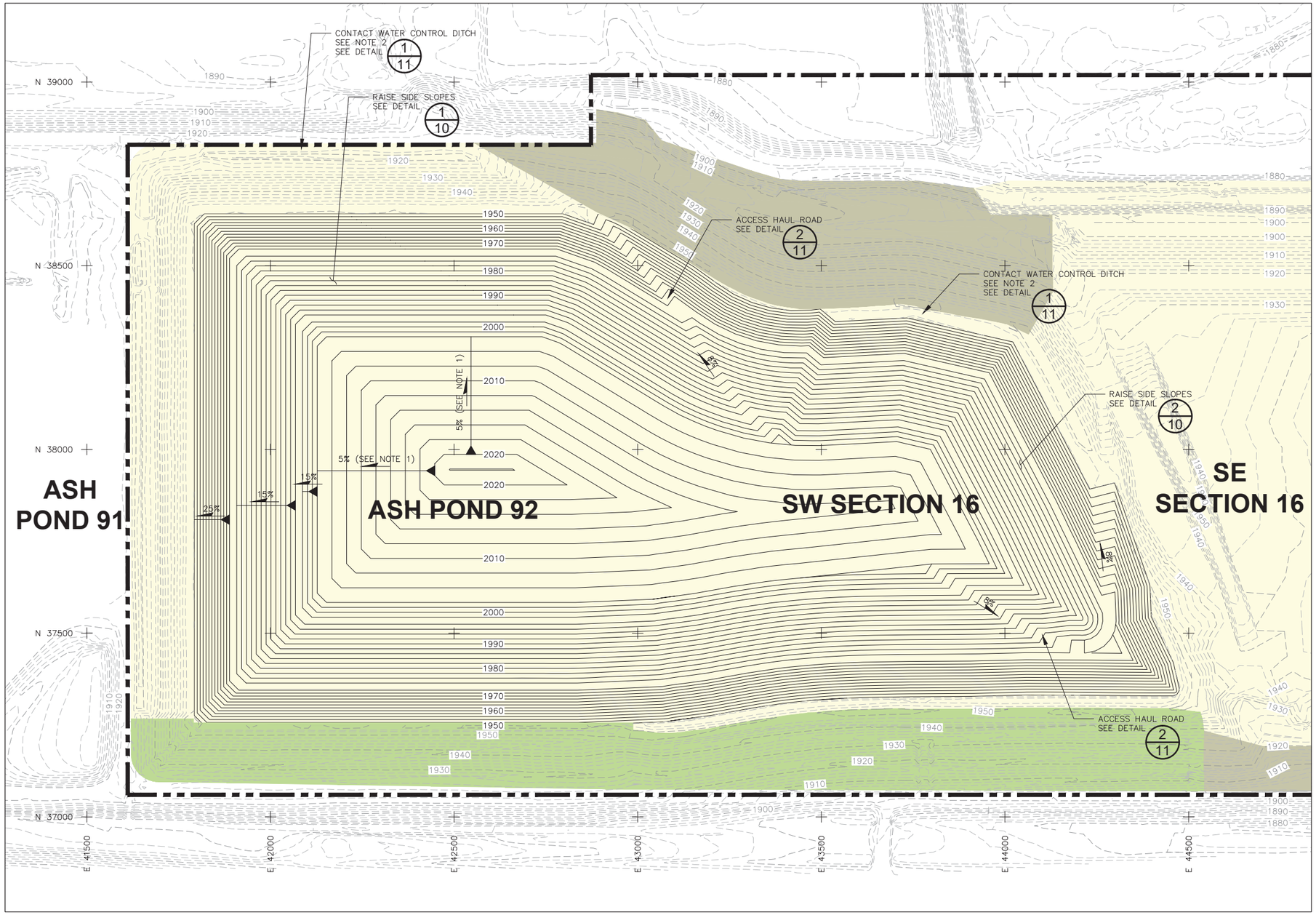
Last Saved: Aug 02, 2004 09:50
By: CSchuettpelz



LEGEND

- EXISTING GROUND TOPOGRAPHY (1880)
- PROPOSED TOP OF CCP TOPOGRAPHY (1980)
- AREA OF ACTIVE CCP PLACEMENT
- TEMPORARY COVER PLACED
- FINAL COVER PLACED
- PERMITTED LIMIT OF CCP PLACEMENT

NOTES

1. CCP GRADES OF THE CROWN OF THE FACILITY ARE SHOWN AT 5%, BUT MAY BE CONSTRUCTED BETWEEN 3% AND 5%.
2. CONTACT WATER IS COLLECTED IN THE DITCH AROUND ASH POND 92 AND SW SECTION 16. WATER IS DIRECTED THROUGH CULVERTS TO ASH POND 91 OR DOWNWARD INTO THE UPSTREAM RAISE.

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.

150 0 150
SCALE FEET

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

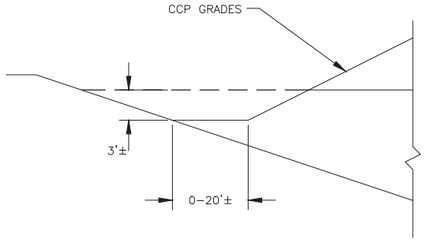
TITLE
PHASES 3 AND 4: ASH POND 92 & SW SECTION 16 RAISE VERTICAL EXPANSION

Golder Associates

GREAT RIVER ENERGY

FILE No. 11381519A006
PROJECT No. 113-81519

5



1/11 CONTACT WATER CONTROL DITCH
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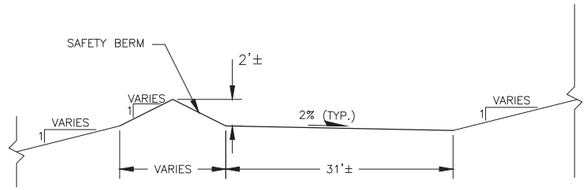
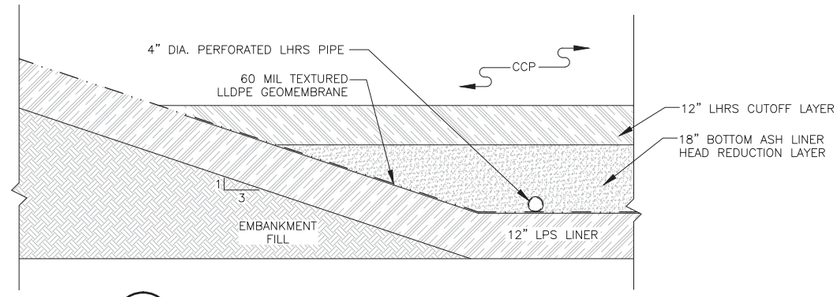
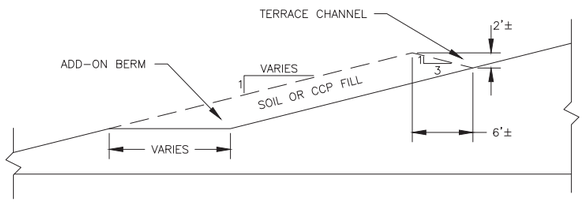


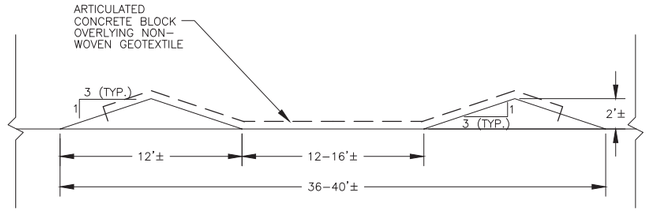
2/11 ACCESS HAUL ROAD
NOT TO SCALE



3/11 SW 16 INTERMEDIATE LINER/CAP AND LHRS DETAIL
NOT TO SCALE



4/11 TERRACE CHANNEL DETAIL
NOT TO SCALE



5/11 TYPICAL DOWN-CHUTE CHANNEL
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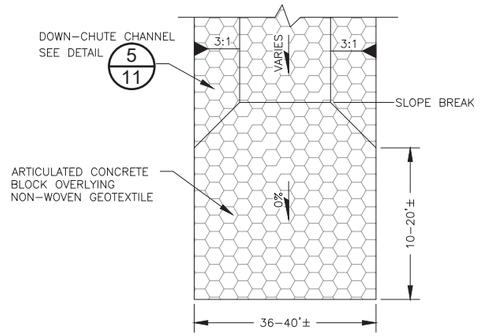

6/11 HYDRAULIC JUMP BASIN
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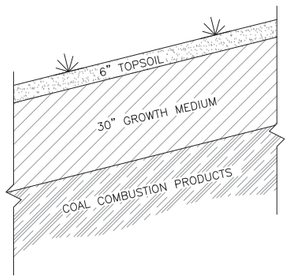
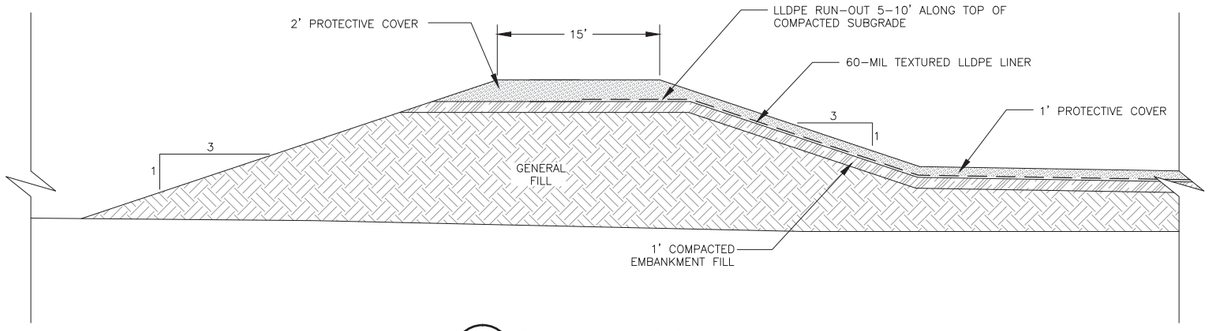


7/11 FINAL COVER DETAIL
NOT TO SCALE



8/11 SUMP EXTENSION DETAIL
NOT TO SCALE

ENGINEER'S STAMP

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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

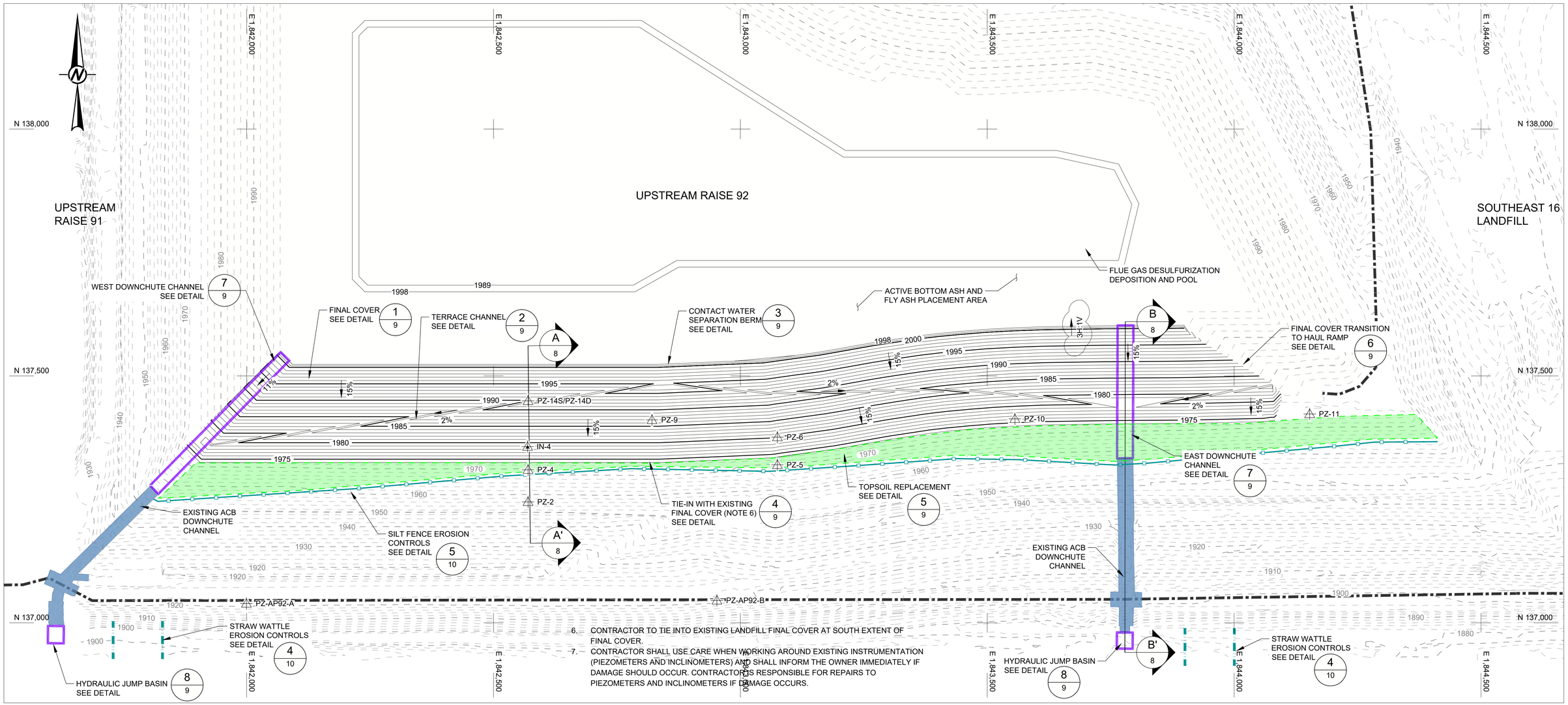
TITLE
DETAIL SHEET 2

Golder Associates

GREAT RIVER ENERGY

FILE No. 11381519A012
PROJECT No. 113–81519

11



LEGEND

- 1890 — EXISTING TOPOGRAPHY (SEE REFERENCE 2)
- 1980 — TOP OF FINAL COVER GRADES (SEE NOTE 1)
- PIEZOMETER (SEE NOTE 7)
- INCLINOMETER (SEE NOTE 7)
- POTENTIAL ACCESS/HAUL ROUTE
- EXISTING ACB DOWNCHUTE CHANNEL
- ACB DOWNCHUTE CHANNEL AND HYDRAULIC JUMP BASIN (SEE NOTE 5)
- SILT FENCE EROSION CONTROLS
- STRAW WATTLE EROSION CONTROLS
- TOPSOIL REPLACEMENT (SEE NOTE 2)

NOTE(S)

1. BOLD TOPOGRAPHIC LINES SHOWN REPRESENT APPROXIMATE TOP OF FINAL COVER.
2. CONTRACTOR TO REMOVE AND REPLACE TOP 4-INCHES OF CCR IMPACTED TOPSOIL. REMOVED TOPSOIL TO BE DISPOSED OF IN THE SE16 LANDFILL.
3. GROWTH MEDIUM SHALL BE PLACED IN MAXIMUM 18-INCH LOOSE LIFTS SUCH THAT THE FINAL IN-SITU DRY DENSITY IS BETWEEN 80 AND 95 PERCENT THE MAXIMUM DRY DENSITY AS DETERMINED BY STANDARD PROCTOR COMPACTION TESTING, WITH AN AVERAGE DRY DENSITY OF ALL IN-SITU TESTS LESS THAN OR EQUAL TO 92 PERCENT OF THE MAXIMUM DRY DENSITY. AREAS FOUND TO BE COMPACTED TO GREATER THAN 95 PERCENT MAXIMUM DRY DENSITY SHALL BE LOOSENED BY DISCING, RAKING WITH A GRADER, OR ALTERNATIVE METHOD AS APPROVED BY THE OWNER'S REPRESENTATIVE.
4. TOPSOIL SHALL BE PLACED IN A SINGLE 8-INCH LOOSE LIFT AND PREPARED FOR SEED AND MULCH USING METHODS CONSISTENT WITH THE SPECIFICATIONS.
5. ACB MATS SHALL BE PLACED IN ACCORDANCE TO THE MANUFACTURER'S SPECIFICATIONS OR AS DIRECTED BY OWNER'S REPRESENTATIVE. FINE GRADING ASSOCIATED WITH THE DOWNCHUTE CHANNELS AND HYDRAULIC JUMP BASINS IS NOT SHOWN FOR CLARITY. CONTRACTOR SHALL CONSTRUCT CHANNELS IN ACCORDANCE WITH THE DETAILS INCLUDED AS A PART OF THIS DRAWING SET.
6. CONTRACTOR TO TIE INTO EXISTING LANDFILL FINAL COVER AT SOUTH EXTENT OF FINAL COVER.
7. CONTRACTOR SHALL USE CARE WHEN WORKING AROUND EXISTING INSTRUMENTATION (PIEZOMETERS AND INCLINOMETERS) AND SHALL INFORM THE OWNER IMMEDIATELY IF DAMAGE SHOULD OCCUR. CONTRACTOR IS RESPONSIBLE FOR REPAIRS TO PIEZOMETERS AND INCLINOMETERS IF DAMAGE OCCURS.

REFERENCE(S)

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. COORDINATES ARE BASED ON PLANT GRID SYSTEM.
3. EXISTING TOPOGRAPHY IS A COMPILATION OF SURVEY SURFACES CONDUCTED BETWEEN 2013 AND 2018.
4. EXISTING TOPOGRAPHY CONTOUR INTERVAL IS 2 FEET.
5. TOP OF FINAL COVER GRADES CONTOUR INTERVAL IS 1 FOOT.

0 100 200
1" = 100' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-09-16	ISSUED FOR CONSTRUCTION	KAC	AGD	CCS	TJS
C	2020-08-06	ISSUED FOR BID	KAC	KAC	CCS	TJS
B	2020-07-31	REVISED ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS
A	2020-07-23	ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 9/16/2020 — NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA 58576

CONSULTANT
GOLDER
GOLDER ASSOCIATES, INC.
7245 W ALASKA DR., STE 200
LAKEWOOD, COLORADO 80226
USA
[+1](303)-980-0540
www.golder.com

PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

TITLE
TOP OF FINAL COVER

PROJECT NO. 20141272 | REV. 0 | 5 of 10 | DRAWING 5

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

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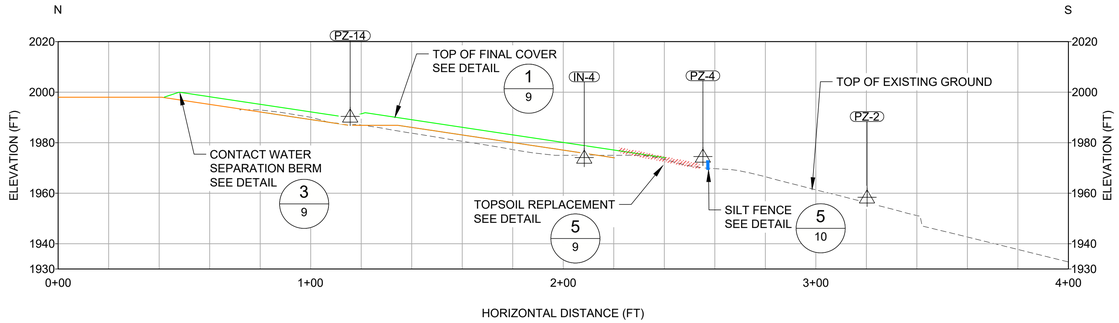
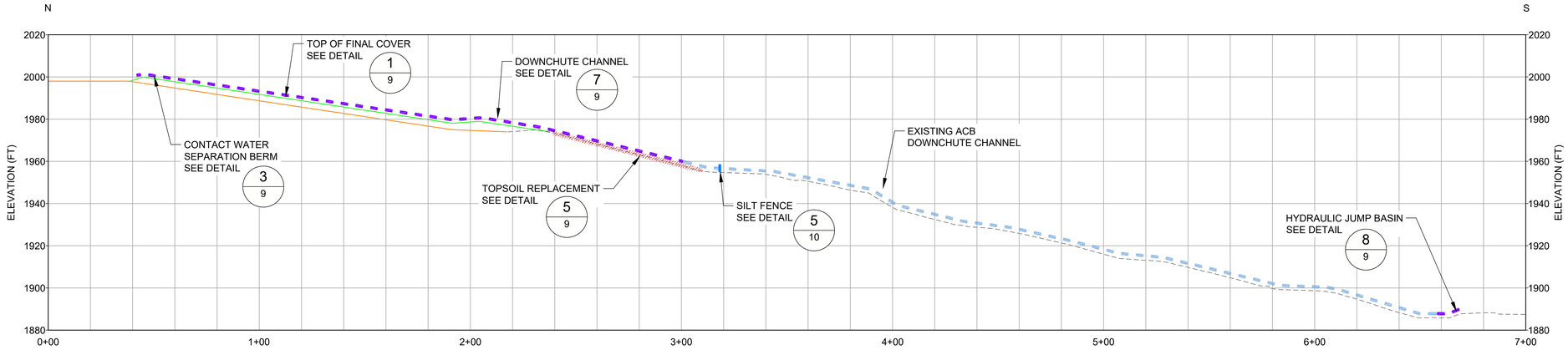


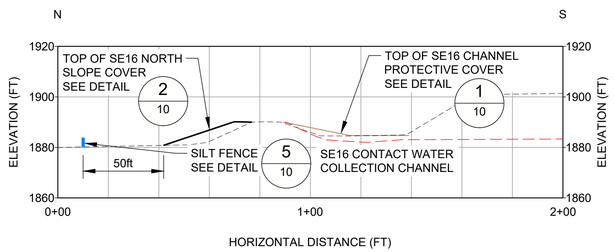
SCALE 1:30 / VERT. SCALE 1:1 — A/8 — PARTIAL FINAL COVER CROSS SECTION

LEGEND

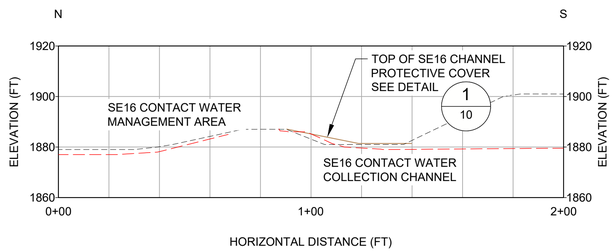
- EXISTING GROUND
- TOP OF FINAL COVER
- TOP OF ADD-ON BERM (DONE BY OTHERS)
- TOP OF PROTECTIVE SOIL COVER
- TOP OF PROTECTIVE BOTTOM ASH COVER
- TOP OF GEOMEMBRANE LINER
- EXISTING ARTICULATED CONCRETE BLOCK
- PROPOSED ARTICULATED CONCRETE BLOCK
- TOPSOIL REPLACEMENT EXTENTS



SCALE 1:30 / VERT. SCALE 1:1 — B/8 — PARTIAL FINAL COVER AND DOWNCHUTE CROSS SECTION



SCALE 1:30 / VERT. SCALE 1:1 — C/8 — SE16 NORTH SLOPE SOIL COVER SECTION



SCALE 1:30 / VERT. SCALE 1:1 — D/8 — SE16 CWC PROTECTIVE COVER SECTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-09-16	ISSUED FOR CONSTRUCTION	KAC	AGD	CCS	TJS
C	2020-08-06	ISSUED FOR BID	KAC	KAC	CCS	TJS
B	2020-07-31	REVISED ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS
A	2020-07-23	ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 9/16/2020 — NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA 58576

CONSULTANT
GOLDER
GOLDER ASSOCIATES, INC.
7245 W ALASKA DR., STE 200
LAKEWOOD, COLORADO 80226
USA
[+1](303)-980-0540
www.golder.com

PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

TITLE
SECTIONS

PROJECT NO. 20141272 | REV. 0 | 8 of 10 | DRAWING 8

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

0 1in

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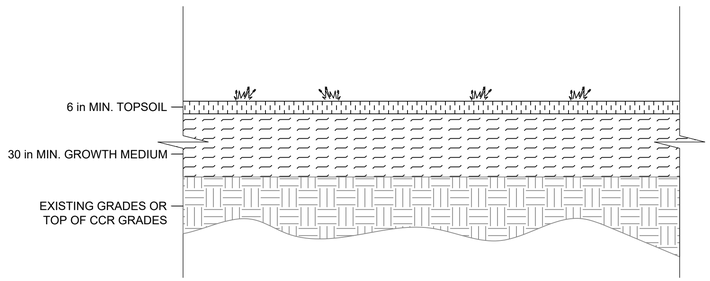
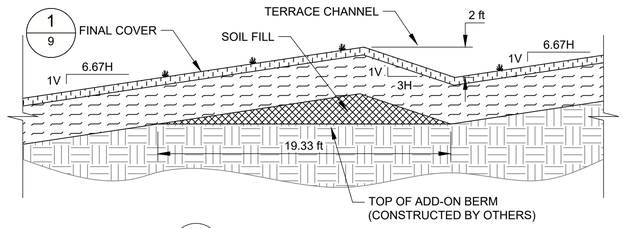
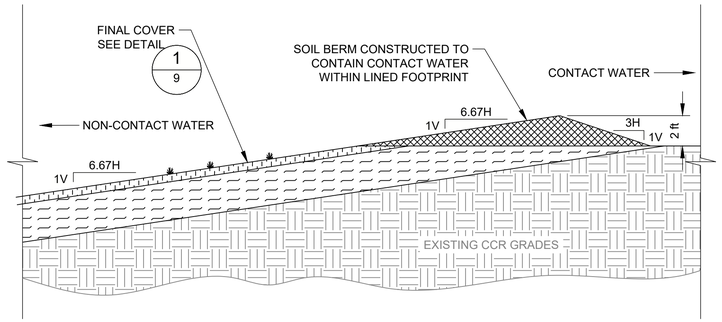


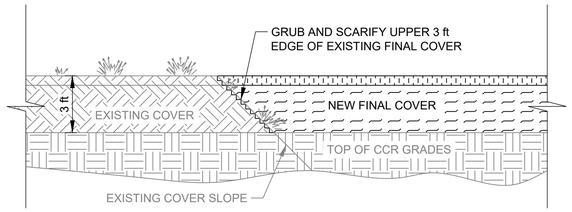
SCALE N.T.S. 1/9 FINAL COVER DETAIL



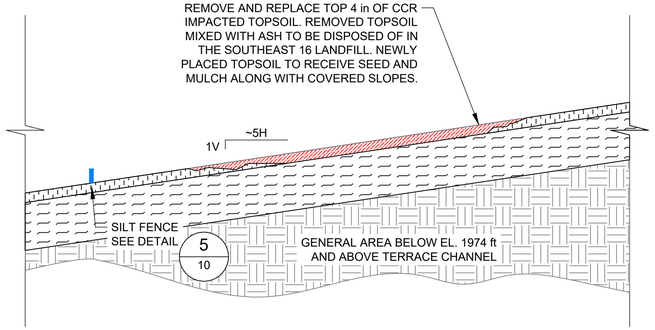
SCALE N.T.S. 2/9 TERRACE CHANNEL DETAIL



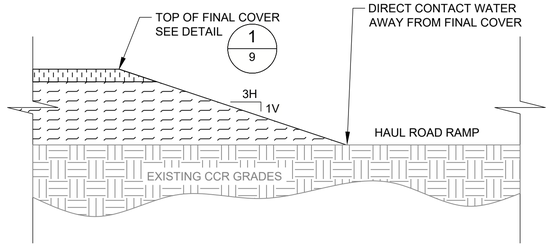
SCALE N.T.S. 3/9 CONTACT WATER SEPARATION BERM DETAIL



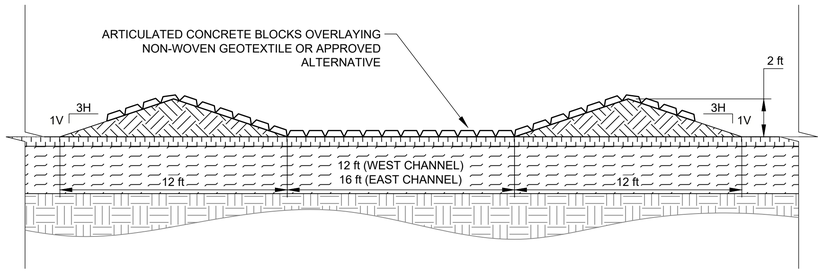
SCALE N.T.S. 4/9 TYING IN TO EXISTING COVER DETAIL



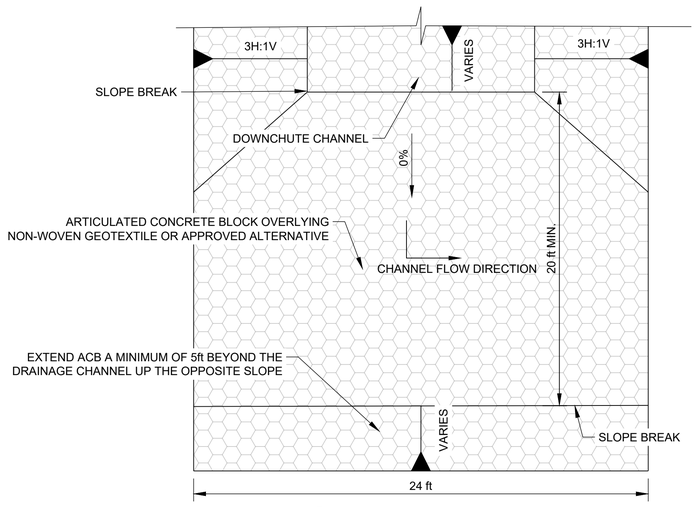
SCALE N.T.S. 5/9 TOPSOIL REPLACEMENT DETAIL



SCALE N.T.S 6/9 FINAL COVER TRANSITION TO HAUL RAMP DETAIL



SCALE N.T.S. 7/9 DOWNCHUTE CHANNEL DETAIL



SCALE N.T.S. 8/9 HYDRAULIC JUMP BASIN DETAIL

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-09-16	ISSUED FOR CONSTRUCTION	KAC	AGD	CCS	TJS
C	2020-08-06	ISSUED FOR BID	KAC	KAC	CCS	TJS
B	2020-07-31	REVISED ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS
A	2020-07-23	ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 9/16/2020
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA 58576

CONSULTANT
GOLDER ASSOCIATES, INC.
7245 W ALASKA DR., STE 200
LAKEWOOD, COLORADO 80226
USA
[+1](303)-980-0540
www.golder.com

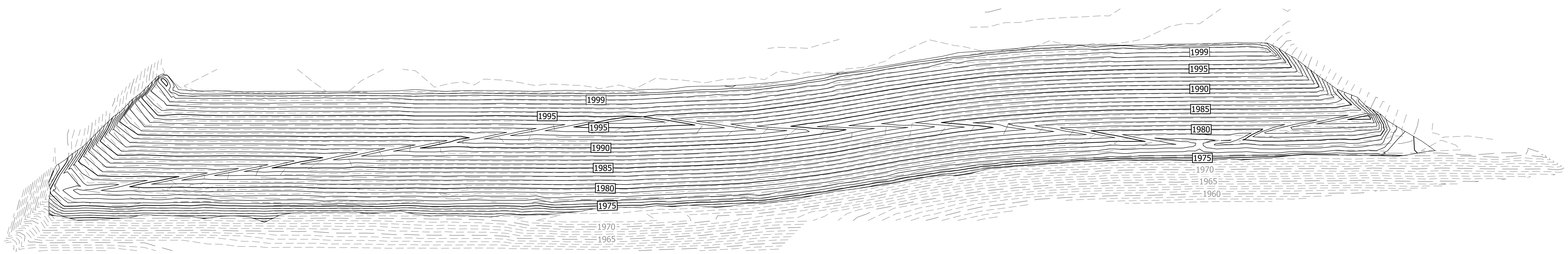
PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

TITLE
DETAILS 1

PROJECT NO. 20141272 | REV. 0 | 9 of 10 | DRAWING 9

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

0 100' 200'
SCALE: 1" = 100'



QUANTITIES	
ITEM	QUANTITY
GROWTH MEDIUM	39,631 CY

#	DATE	DESCRIPTION	BY

UPSTREAM RAISE 92
GROWTH MEDIUM AS-BUILT

NORTHERN IMPROVEMENT CO.
2020 PARTIAL FINAL COVER UPSTREAM RAISE 92
GREAT RIVER ENERGY, COAL CREEK STATION

Bartlett & West
3456 E CENTURY AVENUE - BISMARCK ND 58503
PHONE 701.258.1110 - FAX 701.258.1111
www.bartlettwest.com

REGISTERED PROFESSIONAL LAND SURVEYOR
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

DESIGNED BY:	ARV
DRAWN BY:	ARV
APPROVED BY:	KM
DESIGN PROJ:	18594.014
CONST PROJ:	18594.014
SCALE:	AS NOTED
DATE:	DEC. 2020
DRAWING NO:	C03
SHEET NO:	3 of 6

Last edit on: 12/16/2020 3:22 PM by: ARV01064 Drawing Name: F:\Proj\18000\18594\18594.014\AutoCad\Plan Set\18594.014 UR92 GM VERIFICATION.dwg Layout Name: GM Verification Plotted By: ARV01064 Plotted on: 12/16/2020 4:36:39 PM

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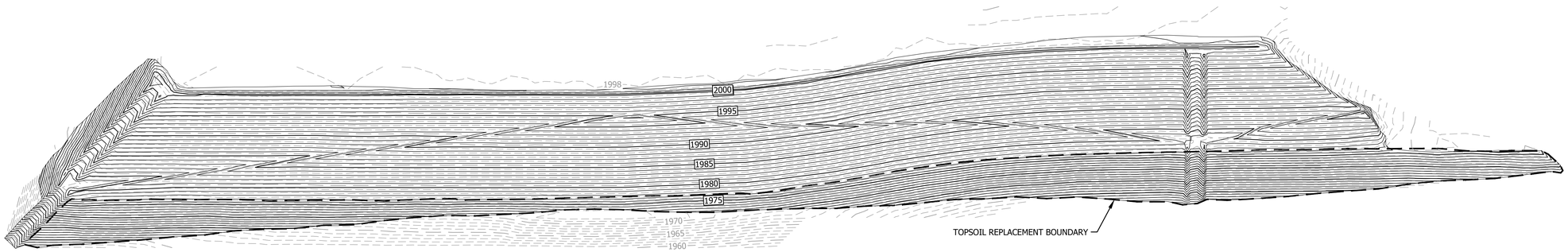

BARTLETT & WEST, INC. CERTIFIES THAT THE FINAL COVER OF GROWTH MEDIUM AND TOPSOIL THICKNESS MEET THE REQUIRED MINIMUM 36" COVER, AS STATED IN THE PROJECT SPECIFICATIONS

QUANTITIES	
ITEM	QUANTITY
TOPSOIL	9,658 CY
TOPSOIL REPLACEMENT	2,527 CY

#	DATE	DESCRIPTION	BY

Bartlett & West
3456 E CENTURY AVENUE - BISMARCK ND 58503
PHONE 701.258.1110 - FAX 701.258.1111
www.bartlettwest.com

UPSTREAM RAISE 92
TOPSOIL AS-BUILT

NORTHERN IMPROVEMENT CO.
2020 PARTIAL FINAL COVER UPSTREAM RAISE 92
GREAT RIVER ENERGY, COAL CREEK STATION

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

DESIGNED BY:	ARV
DRAWN BY:	ARV
APPROVED BY:	KM
DESIGN PROJ:	18594.014
CONST PROJ:	18594.014
SCALE:	AS NOTED
DATE:	DEC. 2020
DRAWING NO:	C04
SHEET NO:	4 of 6

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BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

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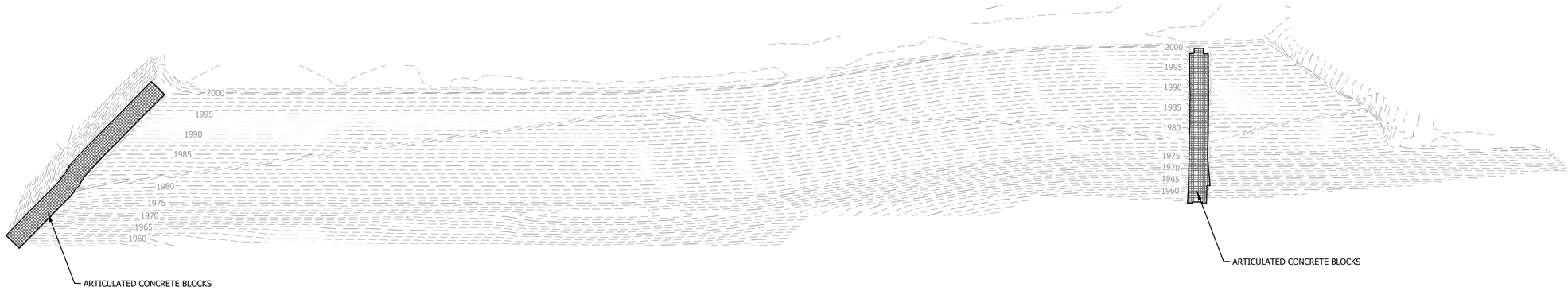

QUANTITIES	
ITEM	QUANTITY
ARTICULATED CONCRETE BLOCKS	18,679 SF

#	DATE	DESCRIPTION	BY

Bartlett&West
3456 E CENTURY AVENUE - BISMARCK ND 58503
PHONE 701.258.1110 - FAX 701.258.1111
www.bartlettwest.com

ARTICULATED CONCRETE BLOCKS

NORTHERN IMPROVEMENT CO.
2020 PARTIAL FINAL COVER UPSTREAM RAISE 92
GREAT RIVER ENERGY, COAL CREEK STATION

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

DESIGNED BY:	ARV
DRAWN BY:	ARV
APPROVED BY:	KM
DESIGN PROJ:	18594.014
CONST PROJ:	18594.014
SCALE:	AS NOTED
DATE:	DEC. 2020
DRAWING NO:	C05
SHEET NO:	5 of 6

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APPENDIX B

Visual Observations Checklist

INSPECTION CHECKLIST

Facility Name: Upstream Raise 92
Owner and Address: Great River Energy – Coal Creek Station
Purpose of Facility: CCR Containment
Legal: Sections 16 & 17 **Township:**145N **Range:** 82W
County: McLean
Inspected By: Craig Schuettpelz and Todd Stong **Inspection Date:** August 31, 2021
Weather: 83ºF, mostly sunny, windy

ITEM	Y	N	N/A	REMARKS
1. Water levels				
a. High water mark			X	El: N/A
b. Current water level			X	El: N/A
2. Inflow structure (*Flue gas desulfurization piping)- FGD deposition ceased December 2020*				
a. Settlement			X	
b. Cracking			X	
c. Corrosion			X	
d. Obstacles in inlet			X	
e. Riprap/erosion control			X	
3. Outflow structure (*Drains to Upstream Raise 91)*				
a. Settlement		X		
b. Cracking		X		
c. Corrosion		X		
d. Obstacles in outlet		X		HDPE piping placed temporarily in north culvert to UR91
e. Riprap/erosion control			X	
4. CCR placement areas				
a. CCR upstream slope erosion		X		
b. CCR upstream slope cracks/settlement		X		
c. CCR crest exposed to heavy traffic	X			CAT 777
d. CCR crest damage from vehicles/machinery		X		
e. CCR crest cracks/settlement	X			Minor cracks noted as part of placement of CCR and non-CCR material in cap/crown
f. CCR downstream slope erosion	X			Minor erosion of fly ash slopes
g. Downstream slope seepage/sloughs/cracks/settlement	X			Cracks noted, mostly near the El. 1974 ft bench
5. Covered downstream slopes				
a. Downstream Slope erosion	X			Minor erosion of temporary cover
b. Downstream Slope rodent burrows	X			Small animal burrows in the temporary cover
c. Downstream Slope vegetation	X			Weedy vegetation of south final covered slope between El. 1,974 ft and El. 1,998 ft benches
d. Downstream Slope seepage/sloughs/cracks/settlement	X			Cracks due to settlement of fly ash over FGD material at and above El. 1,974 ft
6. Perimeter berm				
a. Upstream Slope erosion (exposed liner)		X		
b. Upstream Slope rodent burrows		X		
c. Upstream Slope vegetation		X		
d. Upstream Slope cracks/settlement		X		
e. Upstream Slope riprap/other erosion protection	X			Fly ash protective cover
f. Crest exposed to heavy traffic	X			North side haul road (CAT 777)
g. Crest damage from vehicles/machinery		X		
h. Crest comparable to design width	X			
i. Crest rodent burrows		X		
j. Downstream Slope erosion		X		
k. Downstream Slope rodent burrows	X			Small animal burrows
l. Downstream Slope vegetation	X			Healthy grass and reeds
m. Downstream Slope seepage/sloughing/cracks/settlement		X		
7. Toe				
a. Vegetation	X			Healthy grass and reeds
b. Rodent burrows	X			Small animal burrows
c. Seepage/sloughs/cracks/settlement		X		
d. Drainage conditions		X		Drainage conditions OK

General Remarks: Cracking of fly ash within the facility was noted and should be expected due to ongoing settlement of the FGD material. Recent cover (placed in 2020) consists mostly of weedy vegetation rather than native grasses. Minor maintenance includes addressing small burrows, maintaining fly ash protective cover, maintaining outflow piping and the perimeter ditch, and addressing vegetative success of the cover and erosion as observed.

Name of Engineer (Engineer Firm):
Craig Schuettpelz, PE (Golder Associates USA Inc.)
Date: 08/31/2021
Signature:

APPENDIX C

Photographs

Path: \\golder.gds\complexdata\office\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\21451024\21451024\2021 Annual Inspections\ | File Name: 2021 Annual Inspection - Photolog - UR92.dwg

LEGEND

1 PHOTOGRAPH ID AND LOCATION

NOTE(S)

1. AERIAL IMAGE FROM GREAT RIVER ENERGY, TAKEN IN 2021.

GOLDER
MEMBER OF WSP

GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - PHOTOGRAPH LOCATIONS

FIGURE 1

Upstream Raise 92

Photograph 1 (Southwest perimeter downchute)
Downchute in good condition and well vegetated. (IMGP7939.JPG)

Photograph 2 (West CCR downstream slope)
Minor fly ash erosion. (IMGP7940.JPG)

Upstream Raise 92

Photograph 3 (West CCR downstream slope)
Crack in fly ash CCR downstream slope below El. 1,974 ft bench (4-6 inches wide inside offset a little lower than outside). (IMGP7941.JPG)

Photograph 4 (West CCR downstream slope)
Minor erosion of fly ash slope above El. 1,974 ft bench. (IMGP7945.JPG)

Upstream Raise 92

Photograph 5 (North CCR downstream slope (temporary cover))
Minor fly ash erosion onto temporary cover. (IMGP7949.JPG)

Photograph 6 (North CCR downstream slope (temporary cover))
Temporary cover, well vegetated. (IMGP7950.JPG)

Upstream Raise 92

Photograph 7 (North CCR downstream slope (temporary cover) and perimeter berm upstream slope)
Perimeter ditch and culvert to UR91, good condition. (IMGP7951.JPG)

Photograph 8 (North perimeter berm crest and downstream slope)
North haul road safety berm, good condition with weedy vegetation. (IMGP7953.JPG)

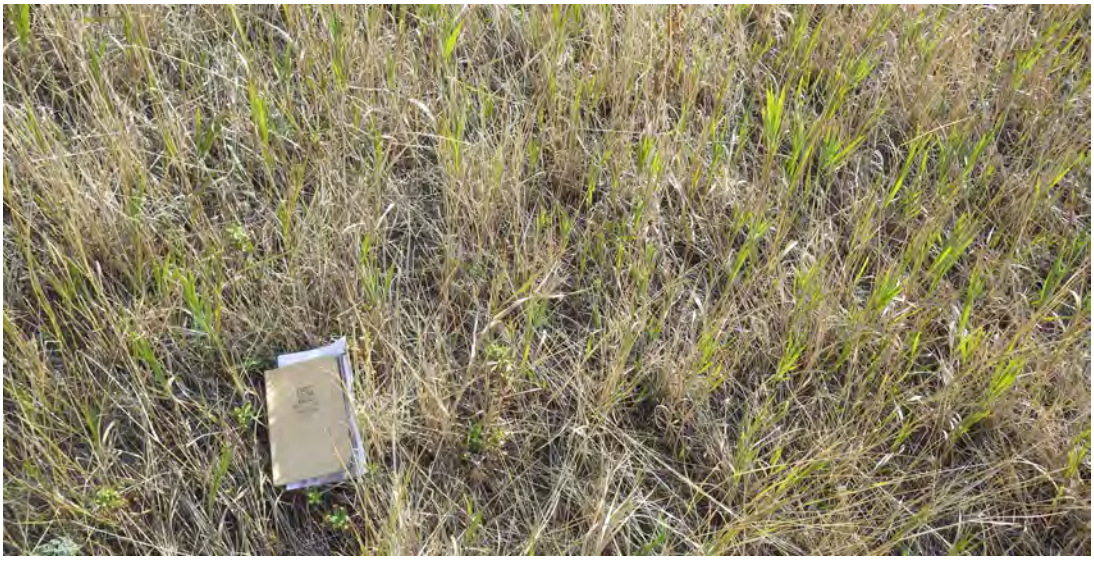
Upstream Raise 92

Photograph 9 (North perimeter berm downstream slope)
Small animal burrow (typical). (IMGP7954.JPG)

Photograph 10 (North perimeter berm downstream slope)
Good grass vegetation on outer berm. (IMGP7957.JPG)

Upstream Raise 92

Photograph 11 (North haul ramp)
Recent erosion repairs on inside of ramp (fly ash erosion), Upstream Raise 92 signage. (IMGP7960.JPG)



Photograph 12 (North CCR downstream slope (temporary cover))
Temporary cover in good condition. (IMGP7961.JPG)

Upstream Raise 92

Photograph 13 (North CCR downstream slope (temporary cover))
Temporary cover in fair condition. (IMGP7962.JPG)

Photograph 14 (North CCR downstream slope (temporary cover))
Erosion of temporary cover, 1-2 feet deep. (IMGP7966.JPG)

Upstream Raise 92

Photograph 15 (North CCR downstream slope (temporary cover))
North contact water ditch and perimeter berm. (IMGP7971.JPG)

Photograph 16 (North perimeter berm downstream slope)
Mossy area on north perimeter berm slope (slope is shaded most of the year) (IMGP7974.JPG)

Upstream Raise 92

Photograph 17 (North CCR downstream slope)
El. 1,974 ft bench and fly ash slopes above, minimal erosion. (IMGP7976.JPG)

Photograph 18 (North CCR downstream slope (temporary cover))
Small animal burrow in temporary cover. (IMGP7978.JPG)

Upstream Raise 92

Photograph 19 (East CCR downstream slope)
Concrete rubble erosion protection in good condition at bottom of east haul ramp. (IMGP7982.JPG)

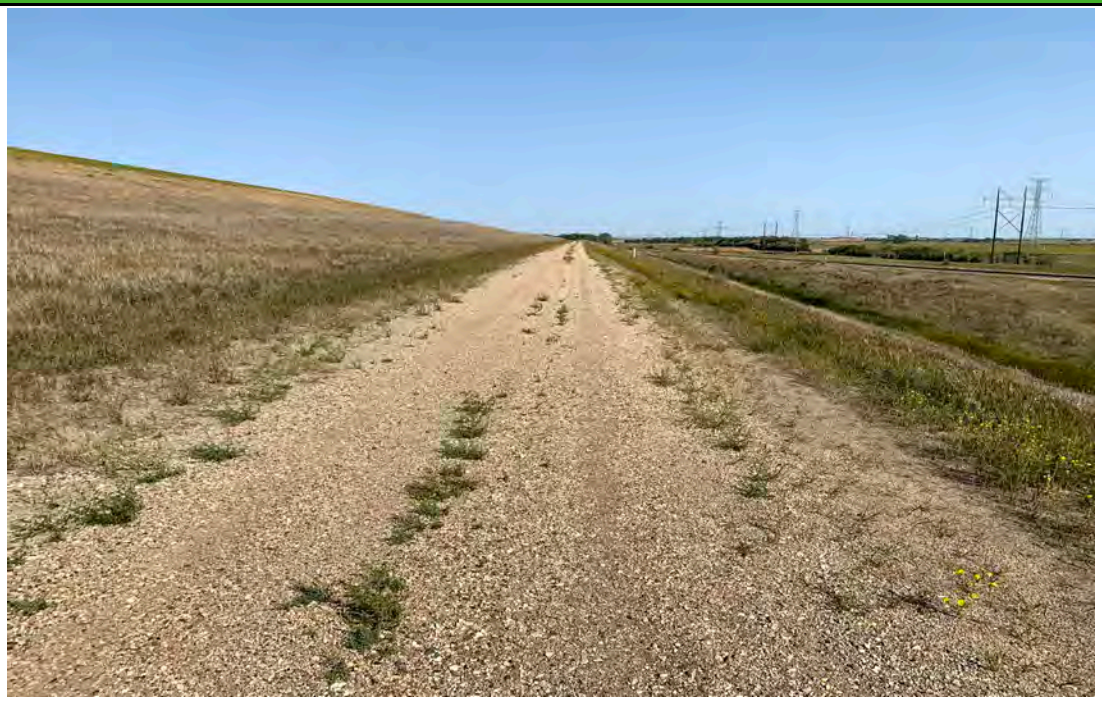
Photograph 20 (CCR upstream slopes)
Remaining exposed FGD material and placement of crown CCR material. (IMGP7984.JPG)

Upstream Raise 92

Photograph 21 (Southwest downchute and hydraulic jump basin)
Articulated concrete block in good condition. (IMGP2823.JPG)

Photograph 22 (South perimeter berm downstream slope)
Perimeter berm downstream slope and toe, good condition and well vegetated. (IMGP2824.JPG)

Upstream Raise 92



Photograph 23 (South perimeter berm crest)
Perimeter berm gravel road. (IMGP2825.JPG)

Photograph 24 (South CCR downstream slope (final cover))
Predominately weeds in final cover placed in 2020 (El. 1,974 ft to El. 1,998 ft). (IMGP2827.JPG)

Upstream Raise 92

Photograph 25 (CCR upstream slopes)
Remaining exposed FGD material and placement of crown CCR material. (IMGP2832.JPG)

Photograph 26 (South CCR downstream slope (final cover))
Standpipe piezometer marked by cone and weedy final cover placed in 2020. (IMGP2833.JPG)

Upstream Raise 92

Photograph 27 (South CCR downstream slope (final cover))
Terrace channel and final cover, well vegetated and in good condition. (IMGP2834.JPG)

Photograph 28 (South CCR downstream slope)
CCR and non-CCR waste placed as part of crown/cap above El. 1,998 ft. (IMGP2836.JPG)

Upstream Raise 92

Photograph 29 (South CCR downstream slope (final cover))
Southeast downchute channel, good condition. (IMGP2838.JPG)

Photograph 30 (South CCR downstream slope)
Silt fence downgradient of final cover installed in 2020, fair condition. (IMGP2840.JPG)

Upstream Raise 92

Photograph 31 (South perimeter berm crest)
Downchute crossing the perimeter gravel access road. (IMGP2842.JPG)

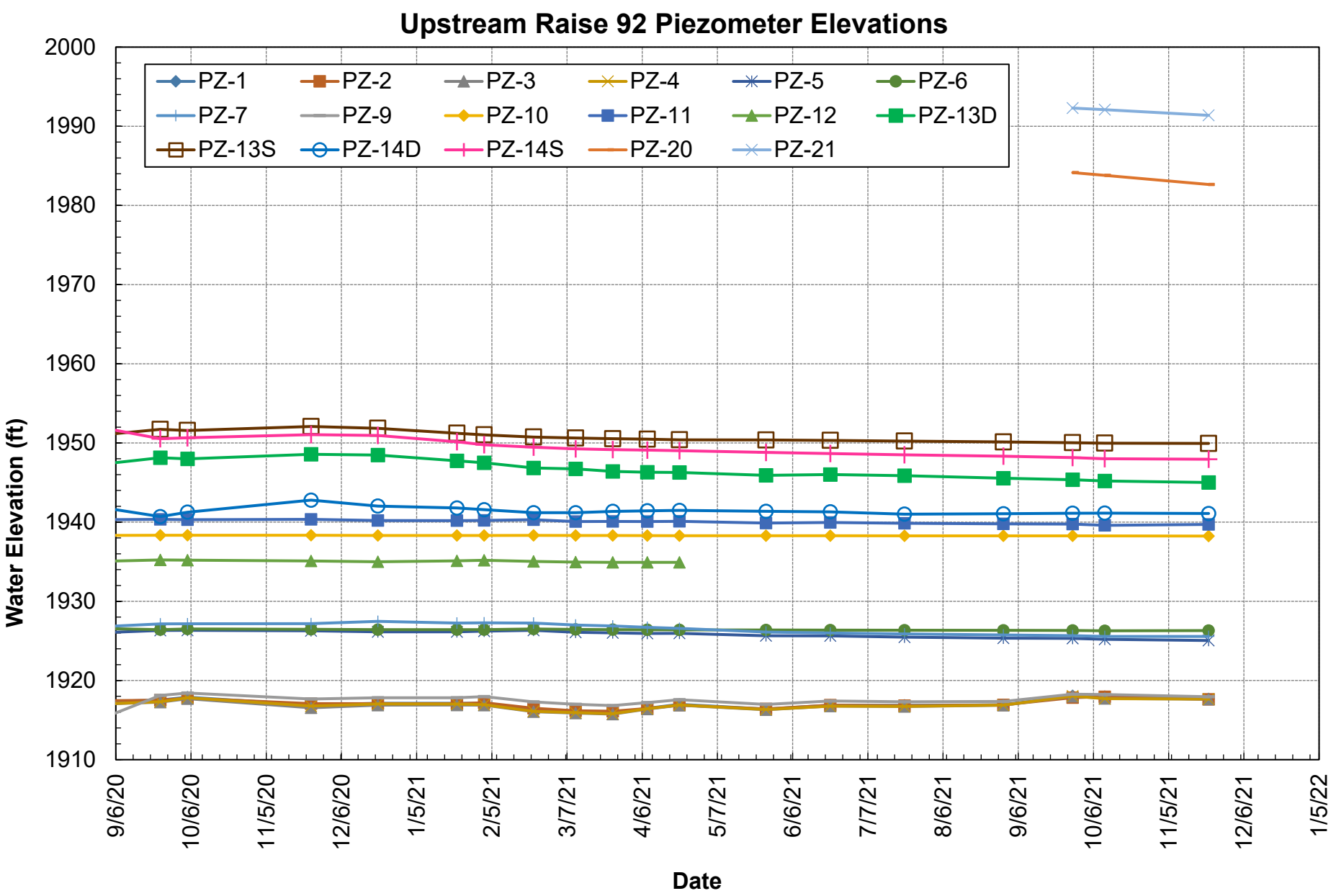
Photograph 32 (South CCR downstream slope (final cover))
Sump riser and cleanout piping. (IMGP2843.JPG)

APPENDIX D

Instrumentation Results

APPENDIX D-1

Piezometer Information

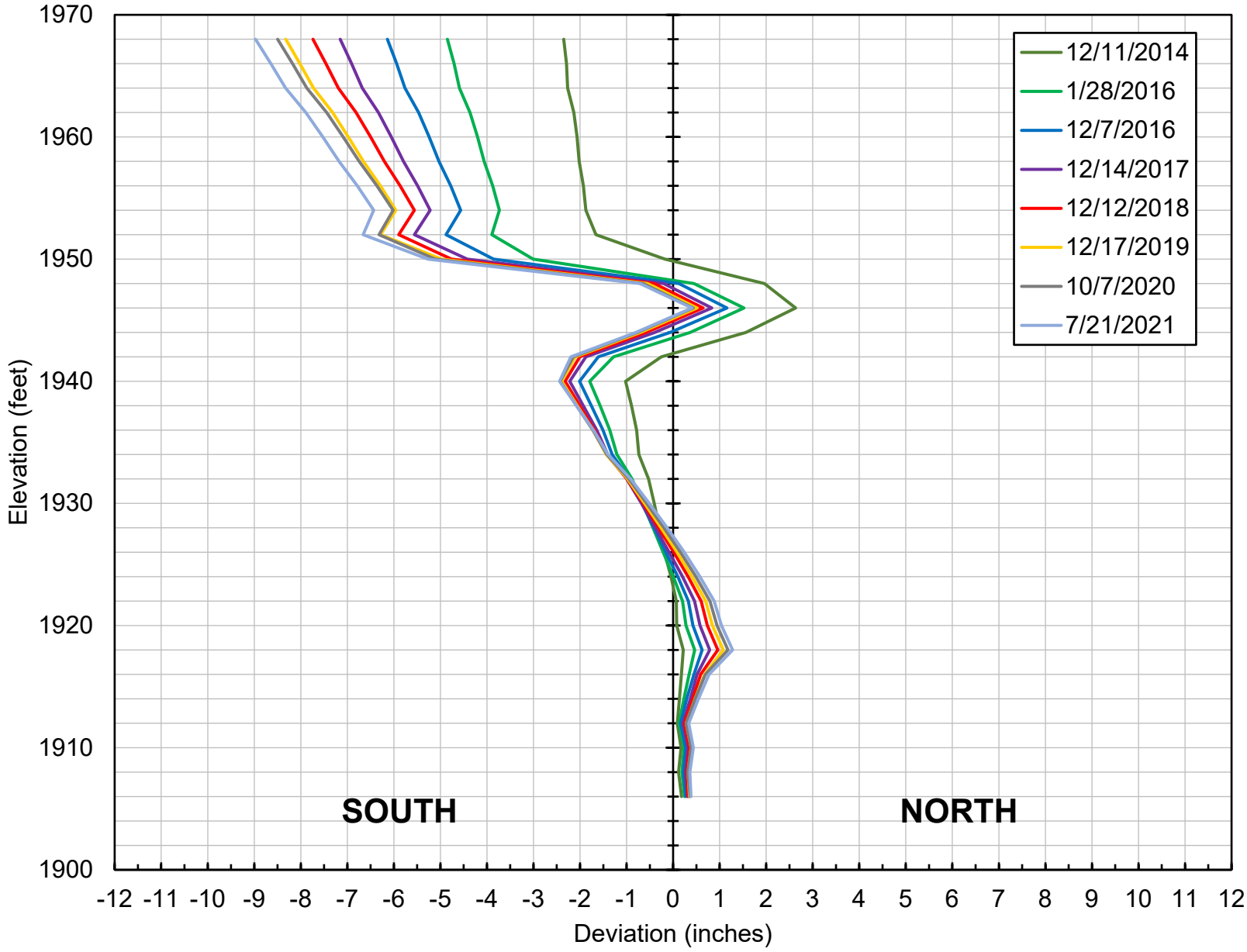

Upstream Raise 92 Piezometer Elevations
PZ-1
PZ-2
PZ-3
PZ-4
PZ-5
PZ-6
PZ-7
PZ-9
PZ-10
PZ-11
PZ-12
PZ-13D
PZ-13S
PZ-14D
PZ-14S
PZ-20
PZ-21
Water Elevation (ft)
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
9/6/20
10/6/20
11/5/20
12/6/20
1/5/21
2/5/21
3/7/21
4/6/21
5/7/21
6/6/21
7/7/21
8/6/21
9/6/21
10/6/21
11/5/21
12/6/21
1/5/22
Date

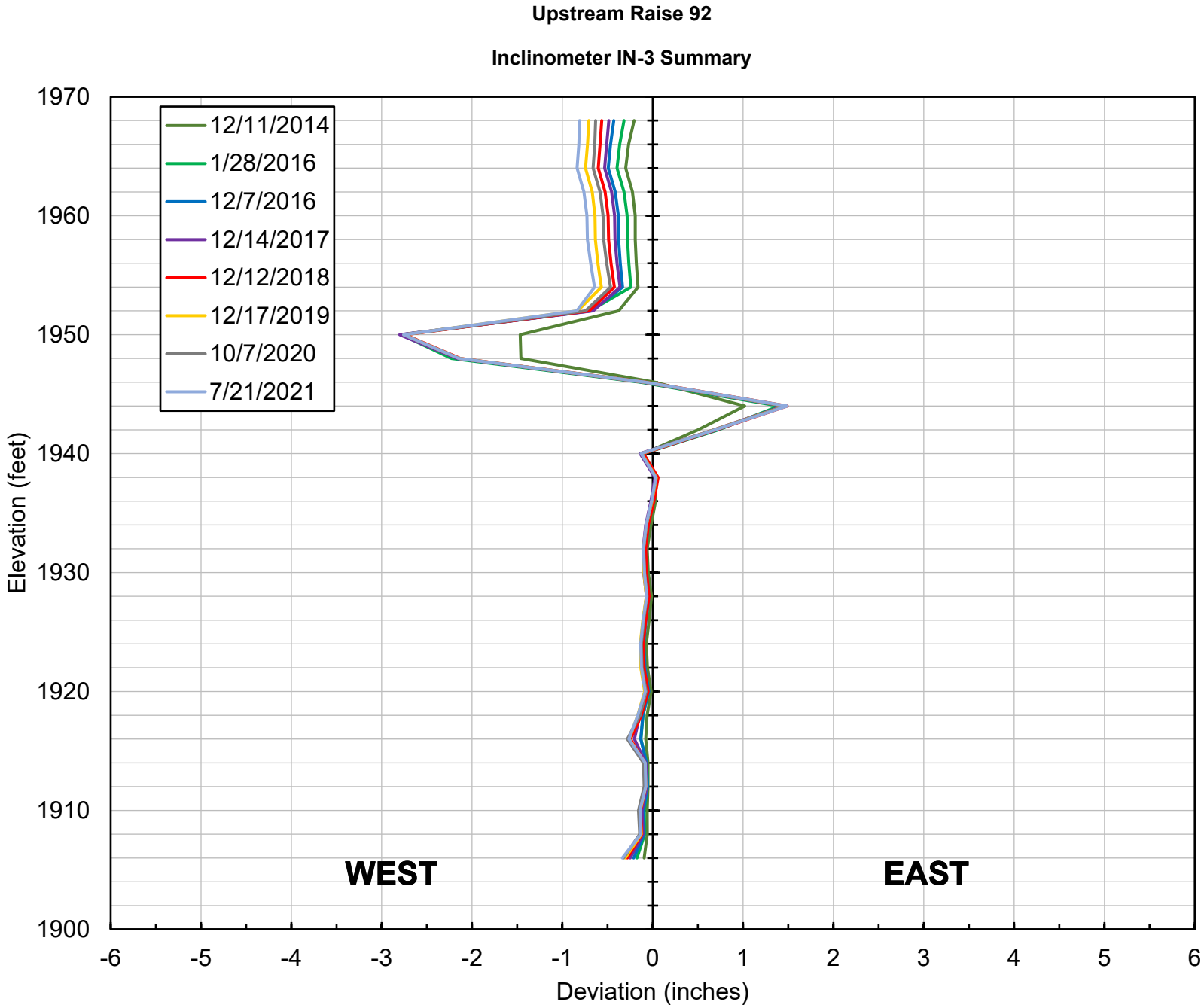
APPENDIX D-2

Inclinometer Information

Upstream Raise 92

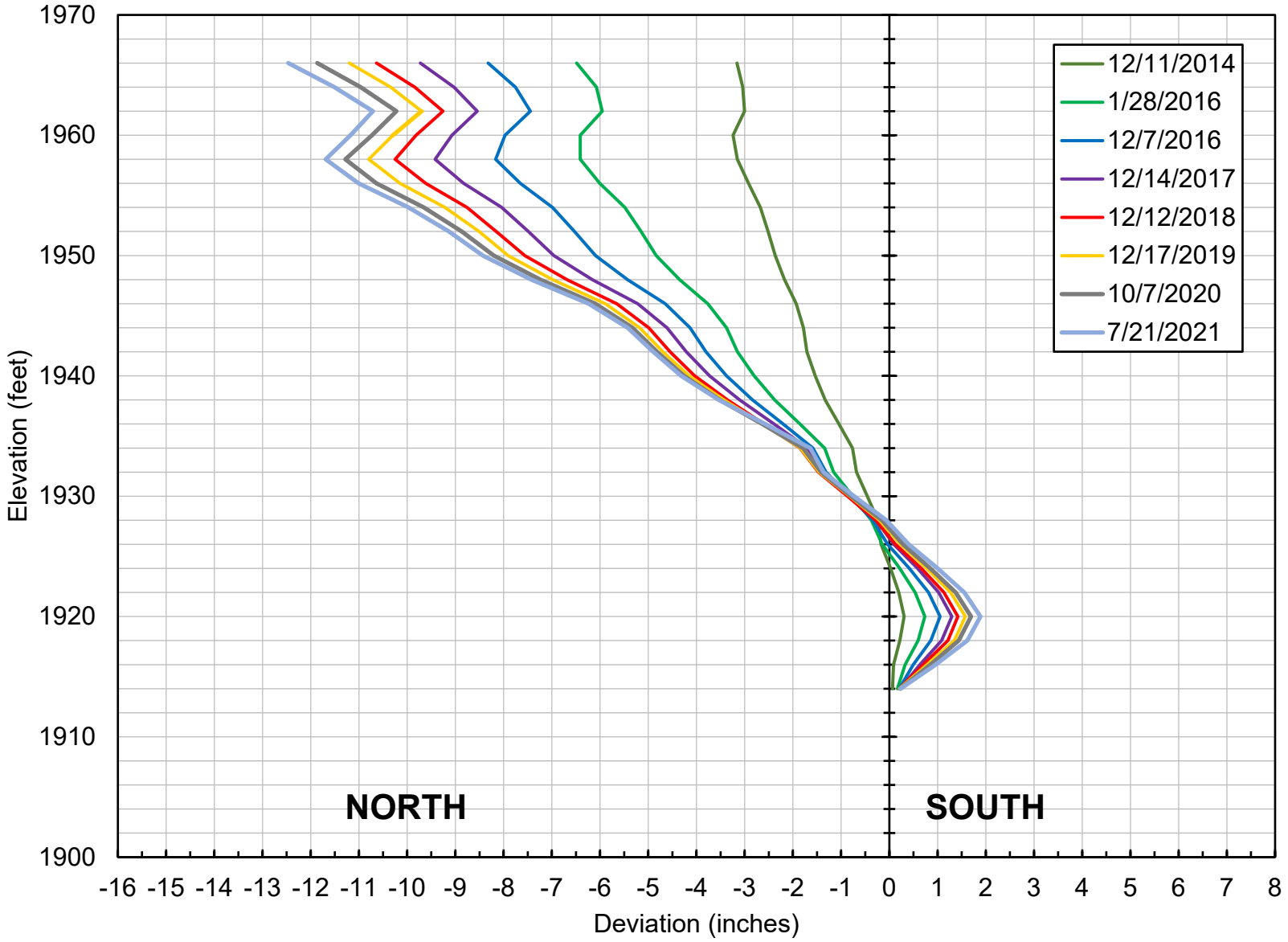
Inclinometer IN-3 Summary




Upstream Raise 92
Inclinometer IN-3 Summary
12/11/2014
1/28/2016
12/7/2016
12/14/2017
12/12/2018
12/17/2019
10/7/2020
7/21/2021
Elevation (feet)
1970
1960
1950
1940
1930
1920
1910
1900
WEST
EAST
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
Deviation (inches)

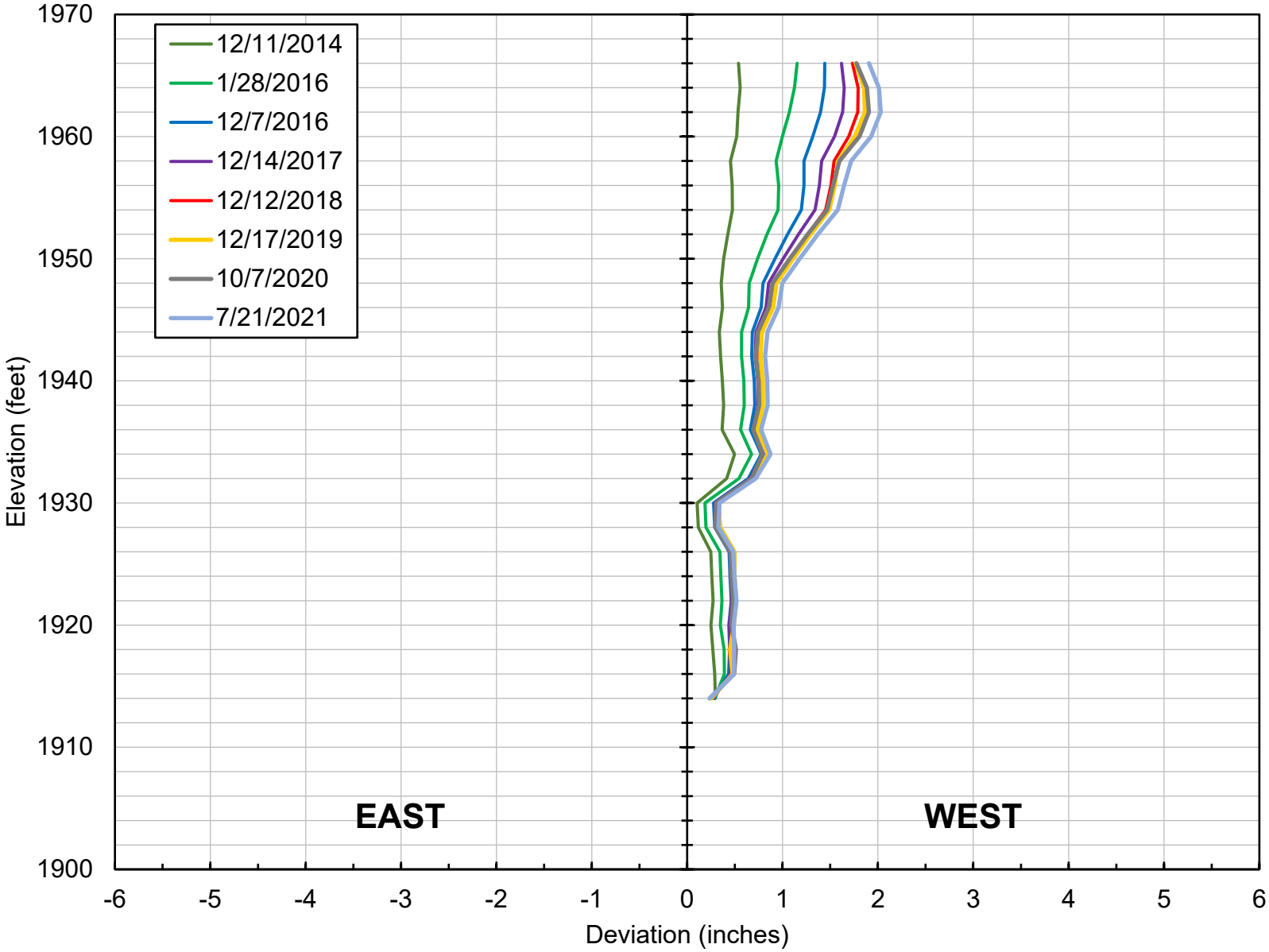
Upstream Raise 92

Inclinometer IN-4 Summary



Upstream Raise 92

Inclinometer IN-4 Summary



golder.com