REPORT

Annual Inspection

Coal Creek Station - Upstream Raise 92 CCR Surface Impoundment

Submitted to:

Great River Energy
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Submitted by:

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19136224

January 2021

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1.0 INTRODUCTION

As part of 40 CFR Part 257 of the Subtitle D solid waste provisions under the Resource Conservation and Recovery Act (RCRA), utilities are required to complete annual inspections for surface impoundments and landfills containing Coal Combustion Residuals (CCR). This report has been prepared by Golder Associates Inc. (Golder) for Great River Energy (GRE) to satisfy the annual inspection requirements for CCR surface impoundments under 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 October 7, 2020.

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 is 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 are hauled to the facility. FGD material and hydraulic conveyance water enter Upstream Raise 92 through a high-density polyethylene (HDPE) pipe from the plant to the northwest corner of the facility. The pipe runs above ground from the northwest corner of the facility to the final discharge location. The on-grade HDPE pipe is periodically moved to different areas of Upstream Raise 92 to achieve an even distribution of FGD material. The facility is dewatered using gravity-driven drainage pipes that extend from the west side of Upstream Raise 92 to the east side of Upstream Raise 91. 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 $1x10^{-7}$ 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 cm/sec.

An additional 7 acres of composite liner was 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 at approximate elevations between 1900 feet above mean sea level (amsl) and 1920 feet amsl. 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 with elevations between approximately 1880 feet amsl and 1900 feet amsl. 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 1892 feet amsl and 1910 feet amsl.

An expansion berm on the east half of the facility built with soil and CCRs extends from the original soil perimeter berms to an elevation of 1950 feet amsl at 3.5:1 to 4:1 slopes. The entire facility is designed with 4:1 final CCR slopes from the perimeter berms to elevation 1974 feet amsl, 15 percent final CCR grades between elevations 1974 feet amsl and 1998 feet amsl, and a 5 percent crown to achieve a final CCR elevation of approximately 2018 feet amsl (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. Between January and December of 2020, the bottom ash/fly ash has increased in elevation from approximately 1995 feet amsl to 1998 feet amsl and the FGD material has increased in elevation from approximately 1988 feet amsl to 1995 feet amsl.

2.6 Storage Capacity and Volumes

Based on a comparison between the approximate grades as of the fall of 2020 and the final permitted grades of Upstream Raise 92, the facility has a remaining CCR capacity of approximately 400,000 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 12,520,000 CY.

2.7 Impounded Water

The depth of impounded water in Upstream Raise 92 varies with time as more CCRs are deposited and as operational variables change (such as gravity drainage pipe elevations). At the time of the inspection, the depth of impounded water at Upstream Raise 92 varied from zero feet on the east side of the facility (FGD material deposition location) to approximately two feet on the west side of the facility. It is estimated that approximately 4,300,000 gallons (13.3 acre-feet) of water was impounded at the time of inspection.

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, GRE 2012).

2.9 Summary of 2020 Weekly Inspections

Routine weekly inspections of Upstream Raise 92 facility were performed throughout 2020 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).

2.10 Summary of Previous Inspection

The most recent annual professional engineer inspection of Upstream Raise 92 was performed by Golder in the fall of 2019 (Golder 2020) 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, although the surface water drainage at the toe along the south side of Upstream Raise 92 had some standing water and marshy vegetation due to recent grading activities.
- A small seep was noted on the south perimeter berm downstream slope after large precipitation events in the fall of 2019. The seep was observed to dissipate later in 2019 and was not observed in 2020.
- 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 placement of CCRs.

- 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 six inches in diameter), but none that were anticipated to cause areas of structural weakness.
- Portions of the final cover seeded in the past four years have fair native grass vegetative growth. Other areas of the CCR downstream slope with final cover constructed more than four years ago show good native grass vegetative growth.

3.0 2020 ANNUAL INSPECTION

On October 7, 2020, Addison Darr, Brendan Purcell, and Craig Schuettpelz of Golder performed a visual inspection of Upstream Raise 92 per 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 2020 annual inspection.

3.1 Hydraulic Structures

Upstream Raise 92 has an inflow pipe for depositing FGD material. The on-grade HDPE pipe is 8 inches in diameter and is periodically moved to different areas of Upstream Raise 92 (or Upstream Raise 91) to achieve an even distribution of FGD material in the facilities.

The outflows from Upstream Raise 92 consist of a series of gravity drainage pipes and culverts that transfer CCR conveyance water from the facility to the adjacent Upstream Raise 91. At the time of the inspection, gravity drainage pipes appeared to be in good condition and were located above the impounded water within Upstream Raise 92 in preparation for drainage to start at a specified level. The culvert connecting the drainage ditch on the northwest side of Upstream Raise 92 to Upstream Raise 91 was in good condition and the inlet to the culvert was recently armored with concrete rubble to protect the culvert inlet from damage.

The inflow and 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 elevation 1917 to 1920 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 (cars, pickups, etc.). The berm crest on the west side of Upstream Raise 92 was not visible since Upstream Raise 92 is connected with Upstream Raise 91 via a geomembrane liner. The crest of the original perimeter soil berm on the north and south sides of the facility (elevation 1900 feet amsl to 1920 feet amsl) 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. Articulated concrete block was recently placed prior to the inspection in two locations and disturbed areas were noted adjacent to the articulated concrete block. These areas were seeded after completion of construction and will be monitored for erosion and vegetative success. There is no noticeable significant erosion, cracks, or scarps on these grassy slopes, and they appear to be in good condition. The seep noted and described as a part of the 2019 annual visual inspection was not noted to exist in 2020.

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 need to be regraded and reseeded in the future to limit erosion. As noted above, areas of sparse vegetation where articulated concrete block was placed will be monitored for erosion and vegetative success.

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. The CCR upstream slope of Upstream Raise 92 is constantly changing as bottom ash and FGD material 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 water/FGD material mixture is approximately 3 to 5 feet in most locations. 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. 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. Bottom ash on 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 below) 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 elevations 1974 feet amsl and 1998 feet amsl) were between approximately 1 and 12 inches wide, up to several 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 onsite 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 an elevation of 1974 feet amsl with terraces approximately every 20 vertical feet and downchute drainage channels along the side slopes. Final cover seeded in the past four years has fair to good native grass vegetative growth. These areas should continue to be monitored and should be re-seeded to promote growth of native grass species, as required. Other areas of the CCR downstream slope with final cover constructed more than four years ago 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 six inches in diameter were also noted on final covered slopes. Minor cracks were noted near the top of final covered slopes at elevation 1974 feet amsl (contact water separation berm) on the south side of the facility. There is no noticeable significant erosion, scarps, or settlement on these grassy slopes and they appear to be in good condition.

3.5 Instrumentation

Water levels in Upstream Raise 92 are monitored monthly using 14 piezometers located within the placed CCR slopes of the facility. 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. As noted in the 2019 annual inspection report, PZ-13D is no longer monitored because of damage.

Inclinometer measurements taken since 2014 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 October 2020.

4.0 SUMMARY AND CONCLUSIONS

An annual visual inspection was performed for Upstream Raise 92 at Coal Creek Station on October 7, 2020. 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.

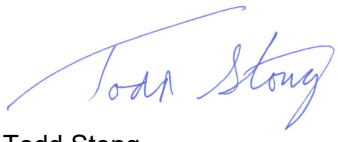
In addition to annual inspections by the Professional Engineer, trained and qualified site personnel continue to perform the required weekly facility inspections to look for signs of potential structural weaknesses. Instrumentation (inclinometers and piezometers) will be monitored regularly to ensure 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, re-seeding of CCR downstream slopes with final cover, and removal of any woody vegetation growing on the berm downstream slopes. In addition, the inflow and outflow piping should be monitored regularly to ensure proper conveyance of water to and from the facility.

Golder Associates Inc.

Kevin Cernik
Staff Engineer

Craig Schuettpelz
Senior Engineer



Todd Stong
Associate and Senior Consultant

KAC/CCS/mp

https://golderassociates.sharepoint.com/sites/120551/project files/6 deliverables/19136224/reports/fnl_annual_inspection_ccs_ur92_ccr_si_27jan21 - copy/report/19136224-rpt-fnl-ur92_ccs_ccr_surface_impoundment_27jan21.docx

5.0 REFERENCES

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Golder Associates Inc. (Golder). 2020. Annual Inspection Report – Coal Creek Station – Upstream Raise 92 CCR Surface Impoundment, January 2020.

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.

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

Figures

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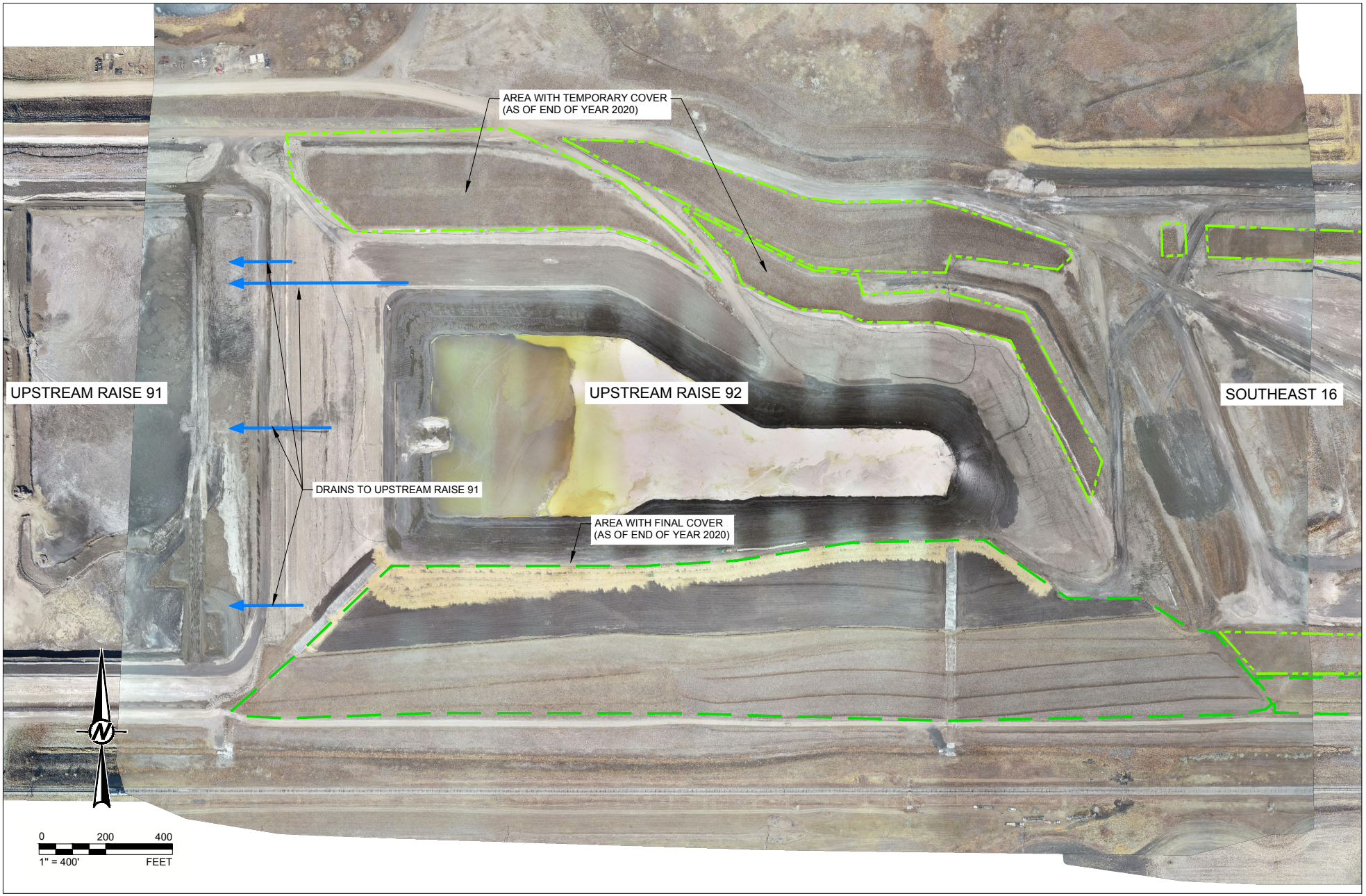
NOTE(S)

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

GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
SITE OVERVIEW

FIGURE 1

Path: \\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\19136224\2020 Annual Inspections\ | File Name: Fig2 - UR92 Site Overview.dwg



REFERENCE(S)

1. AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN NOVEMBER 2020.

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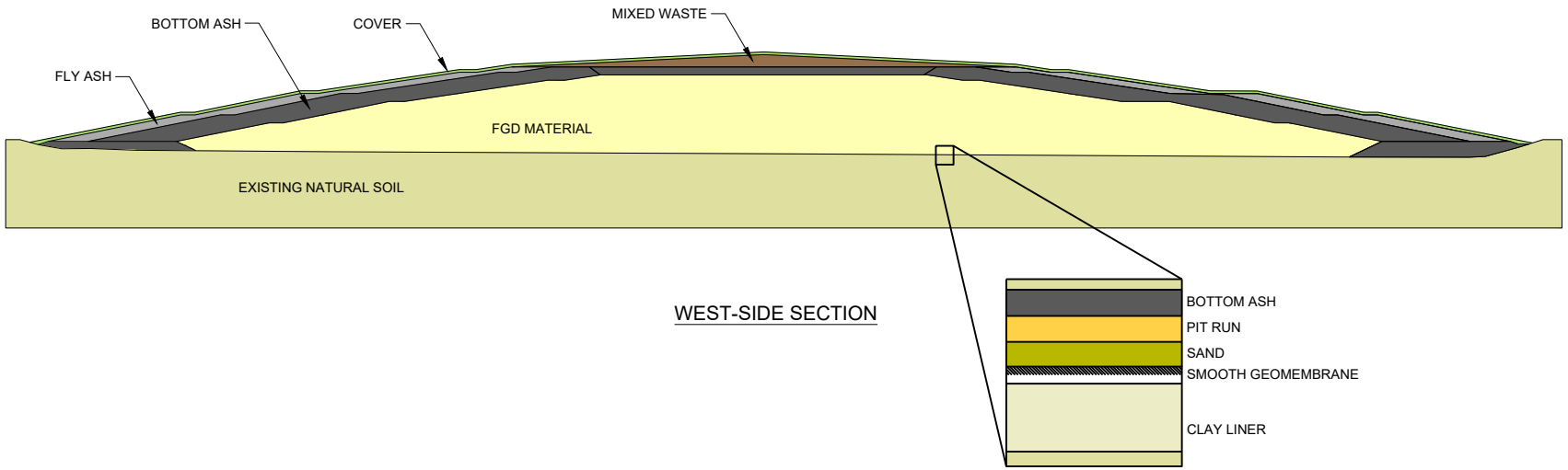
GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - SITE OVERVIEW

FIGURE 2

SOUTH

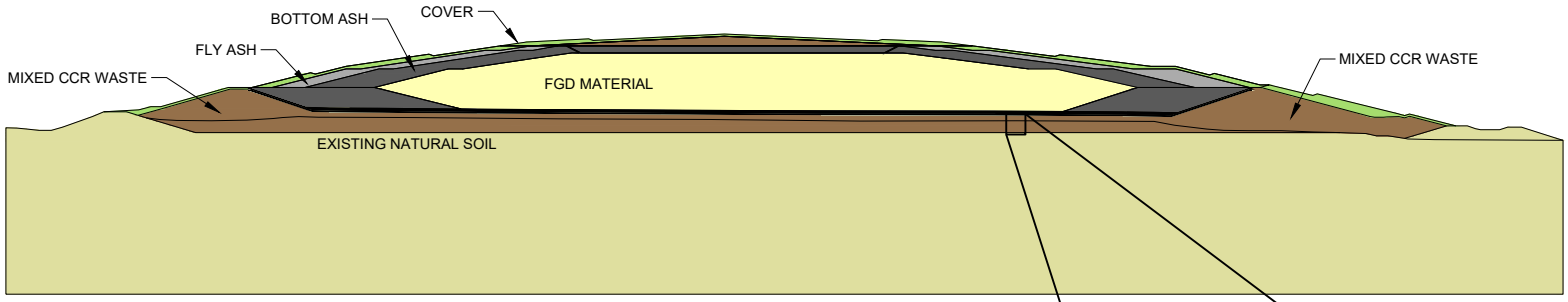
NORTH



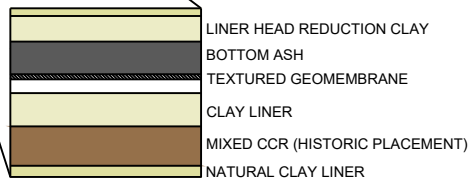
WEST-SIDE SECTION

SOUTH

NORTH



EAST-SIDE SECTION



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GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - CROSS SECTIONS

FIGURE 3

Path: \\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\19136224\2020 Annual Inspections\ | File Name: Fig4 - UR92 Instrumentation Overview.dwg

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GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 INSTRUMENTATION OVERVIEW

FIGURE 4

APPENDIX A

Selected Construction Drawings and Permit Drawings

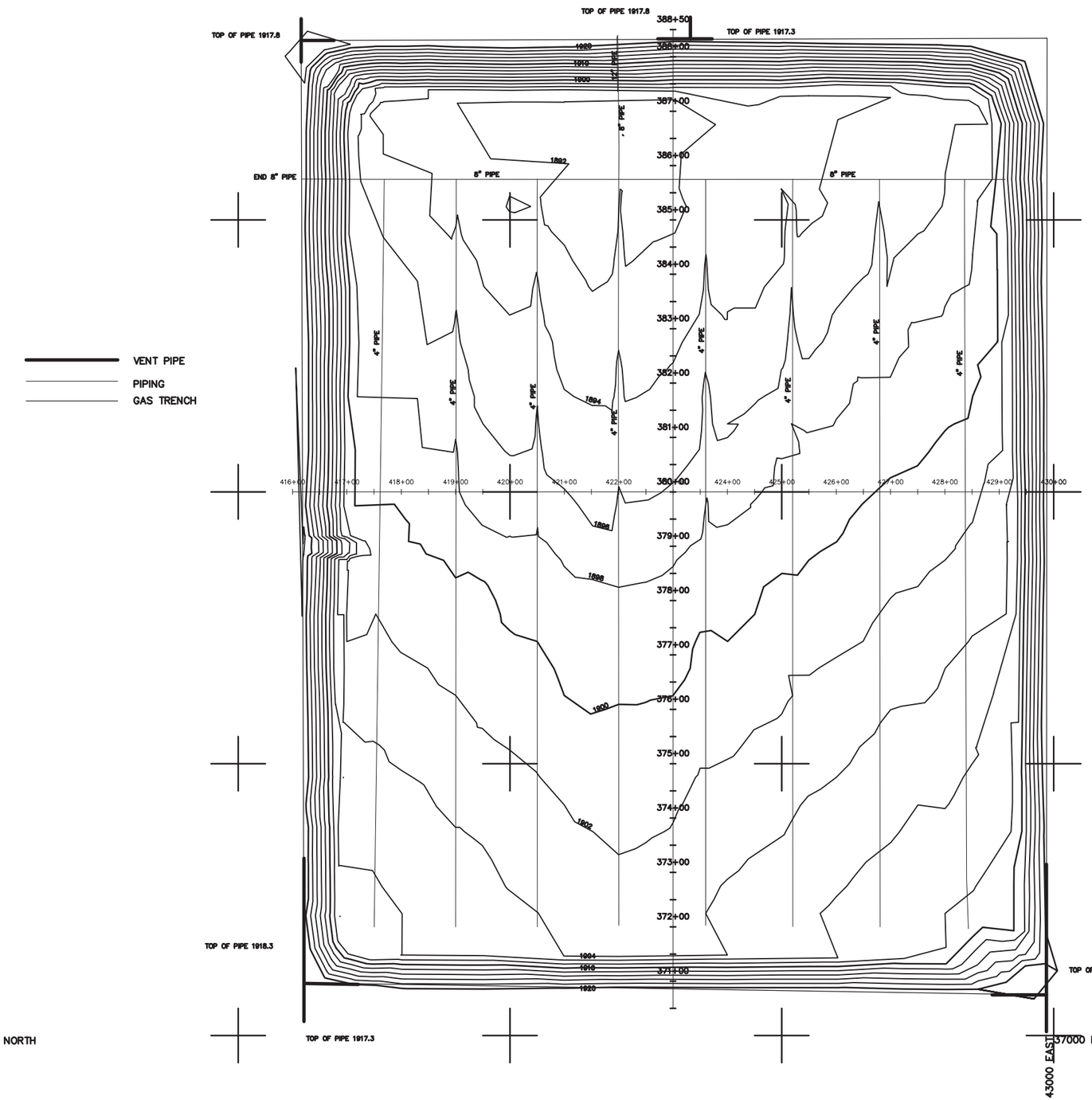
COAL CREEK STATION

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
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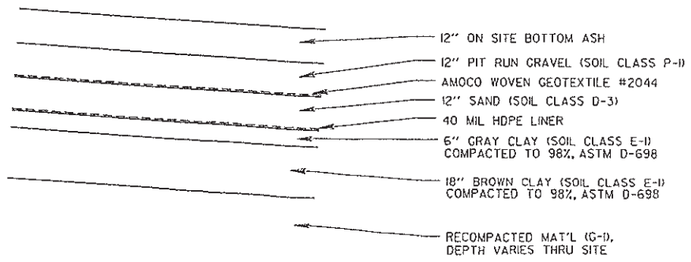
2			2		
3			3		

Foth & Van Dyke

SCALE

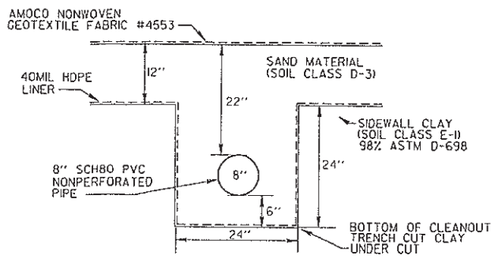
SCOPE ID.

DRAWING NO.

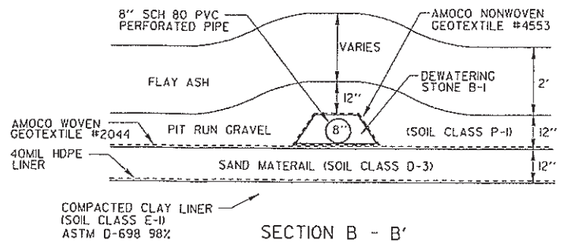


1/11 TYPICAL FLEXIBLE MEMBRANE LINER (FML) DETAIL

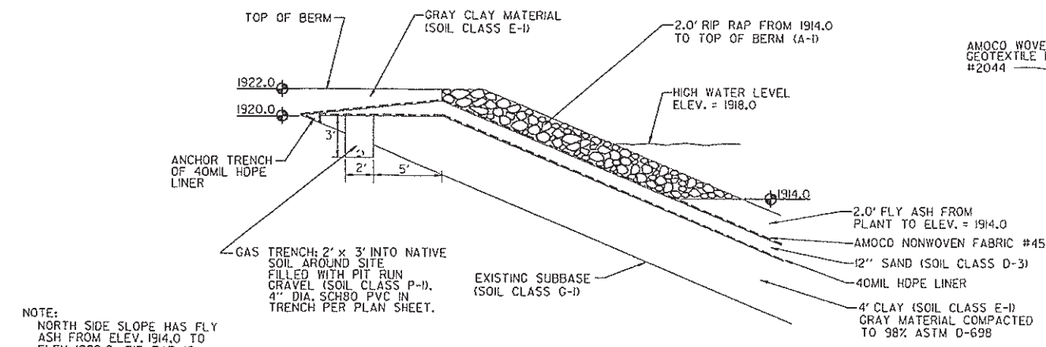
NOT TO SCALE



SECTION A - A'



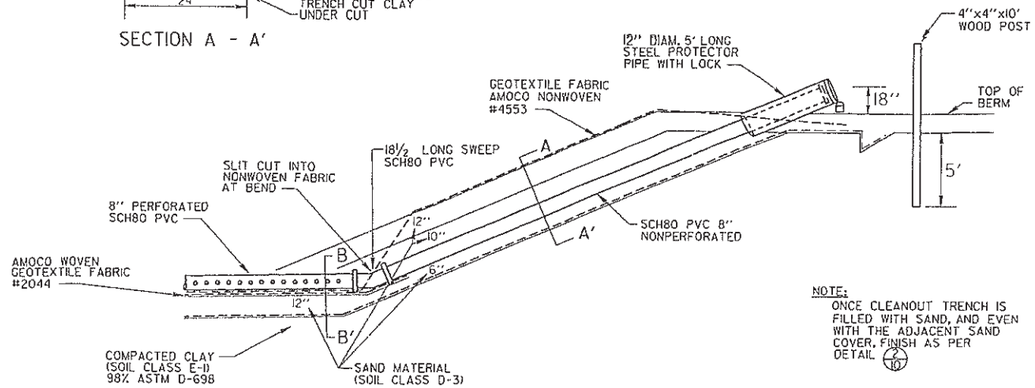
SECTION B - B'



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

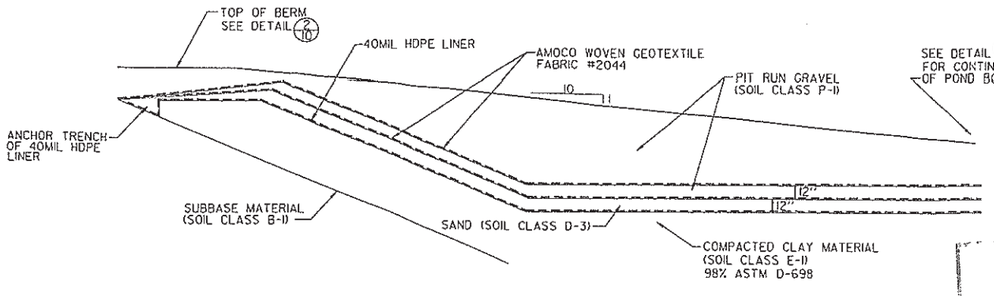
NOT TO SCALE



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

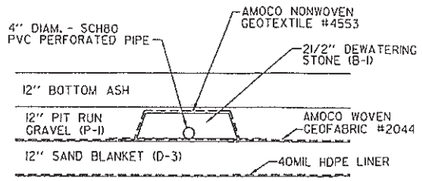
4/11 TYPICAL CLEAN-OUT RISERS EAST AND WEST SLOPES

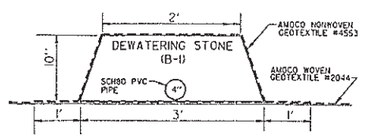
NOT TO SCALE



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.

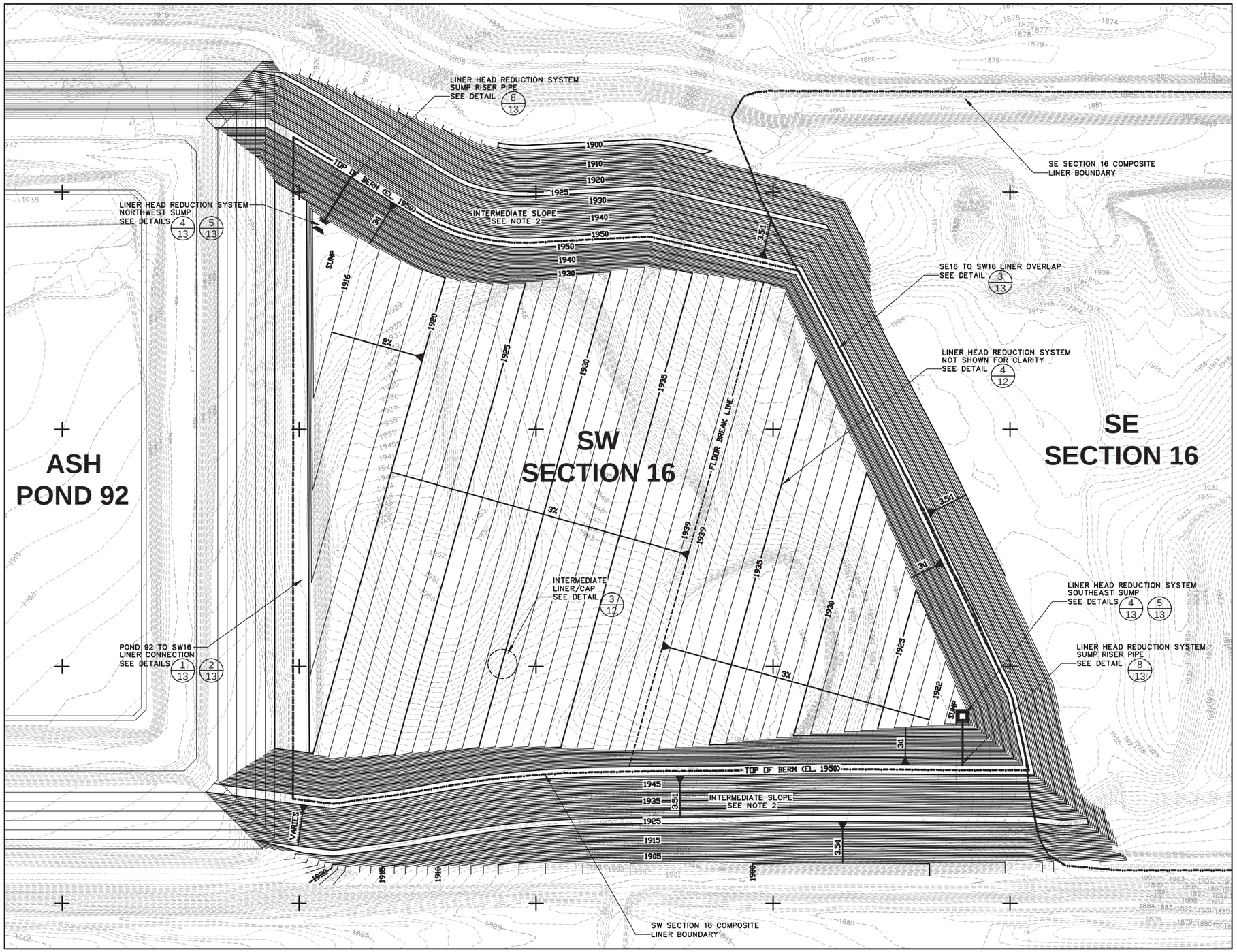
DOCUMENTATION DRAWINGS
COAL CREEK STATION
EAST HALF OF SOUTH ASH POND

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.

100 0 100
1" = 100 FEET

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

TITLE
PHASE 2: SW SECTION 16 INTERMEDIATE LINER/CAP

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	

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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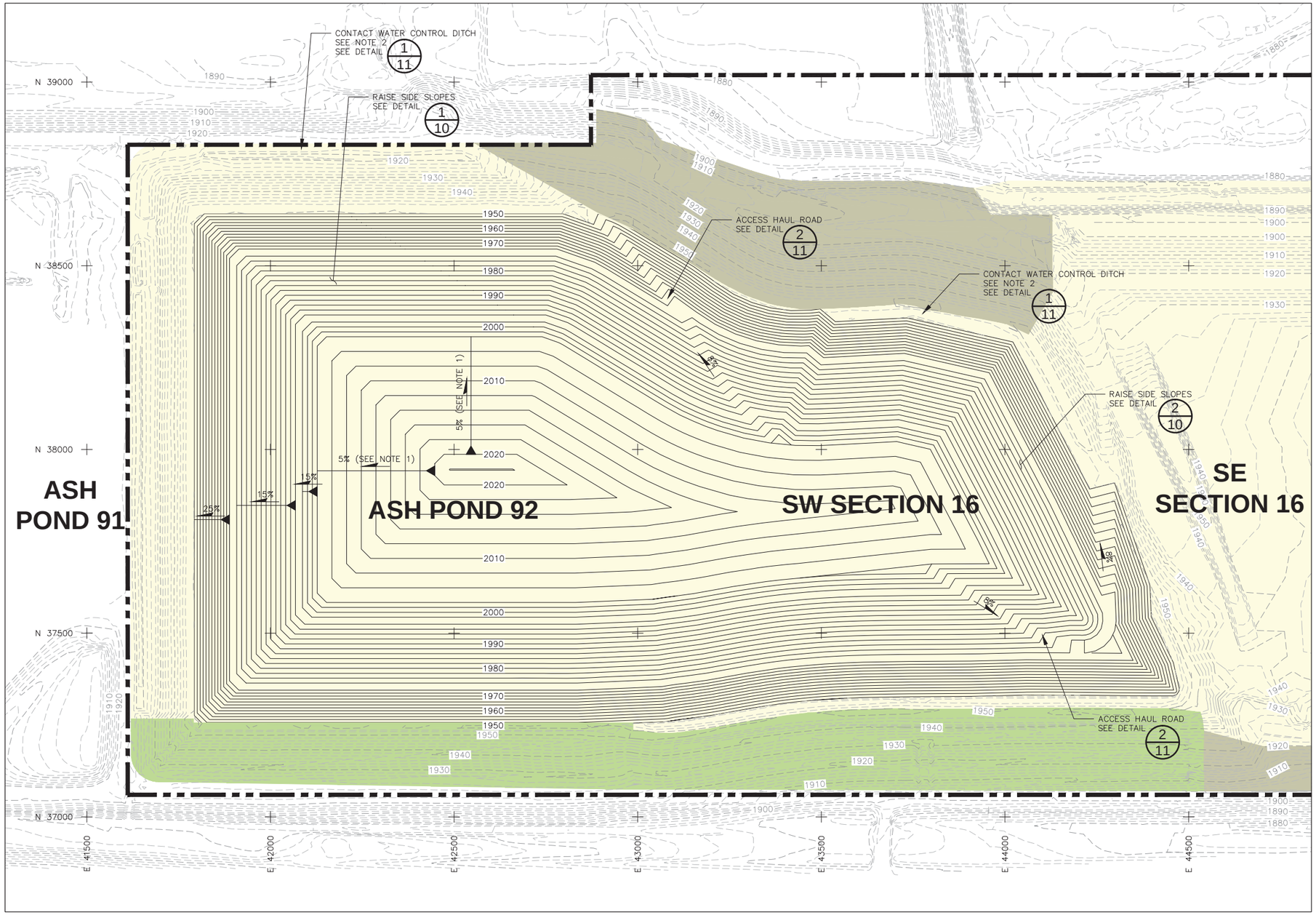
Layout Name: A1 02 2004 09:58
Last Plot: Sep 27, 2010 15:28
Machine: NOT SET
By: Cschuettpelz
References\0232411A020.dwg
By: Cschuettpelz



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
7						
6						
5						
4						
3						
2						
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

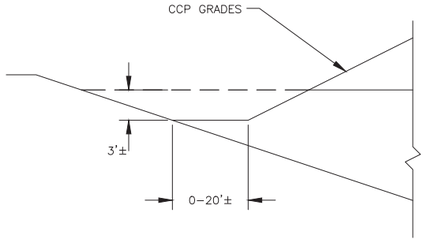
TITLE
PHASES 3 AND 4: ASH POND 92 & SW SECTION 16 RAISE VERTICAL EXPANSION

Golder Associates

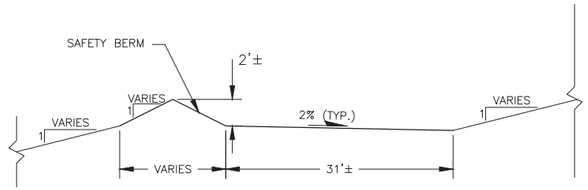
GREAT RIVER ENERGY

FILE No. 11381519A006
PROJECT No. 113-81519

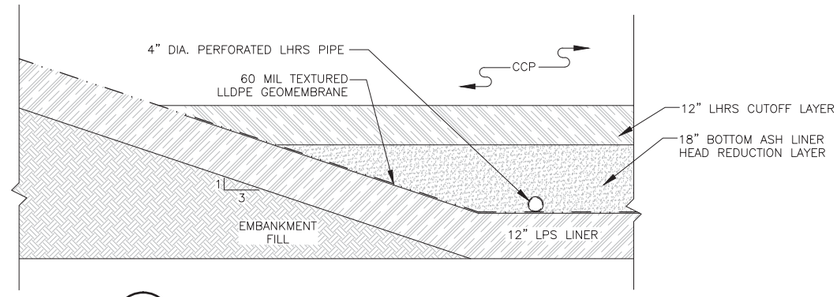
5



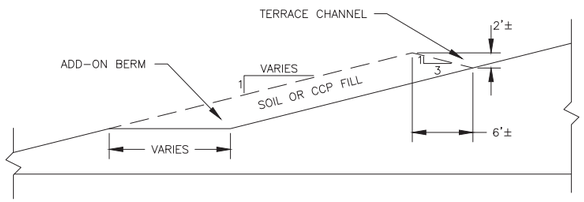
1/11 CONTACT WATER CONTROL DITCH
NOT TO SCALE



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
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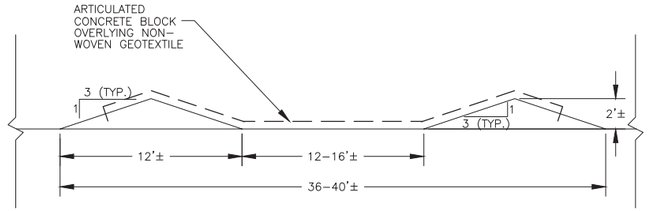
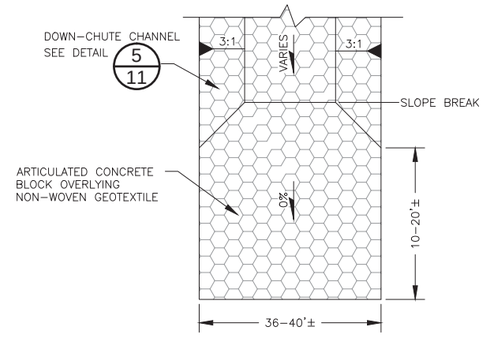
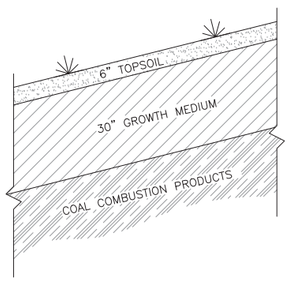


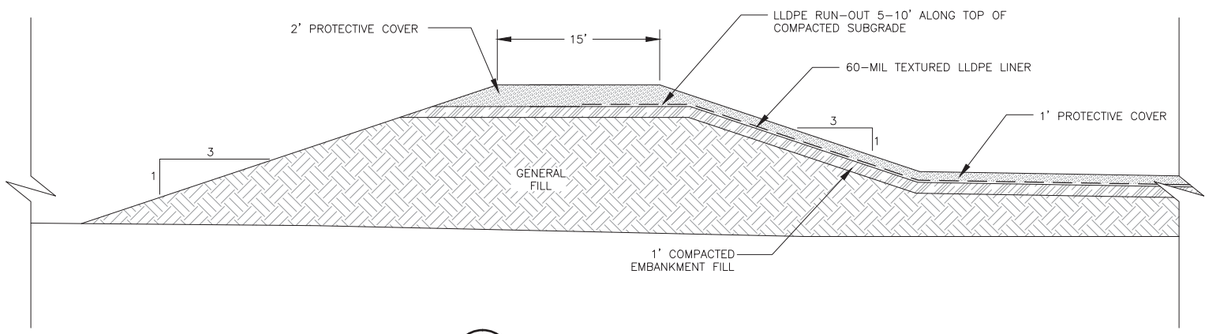
5/11 TYPICAL DOWN-CHUTE CHANNEL
NOT TO SCALE



6/11 HYDRAULIC JUMP BASIN
NOT TO SCALE



7/11 FINAL COVER DETAIL
NOT TO SCALE



8/11 SUMP EXTENSION DETAIL
NOT TO SCALE

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

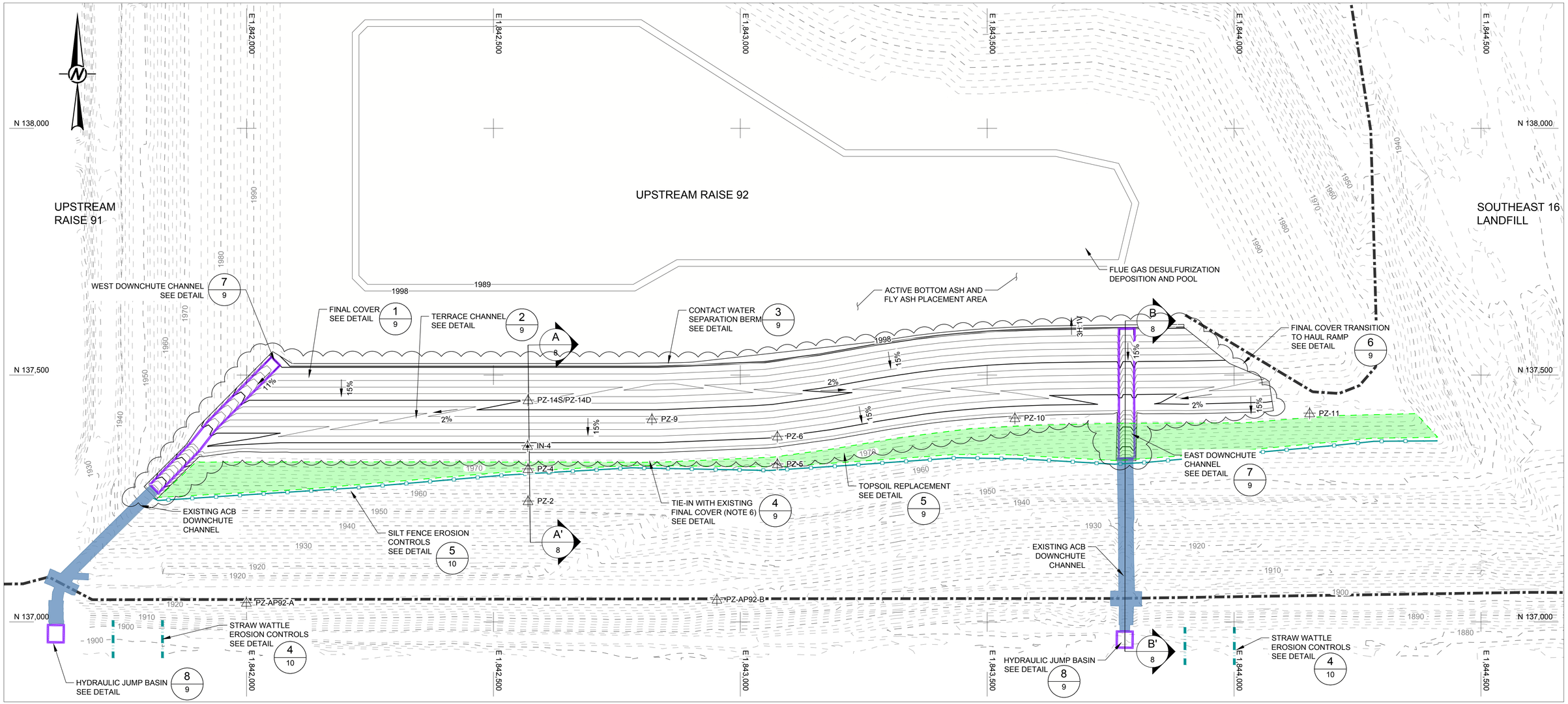
TITLE
DETAIL SHEET 2

Golder Associates

GREAT RIVER ENERGY

FILE No. 11381519A012
PROJECT No. 113–81519

11



LEGEND

- EXISTING TOPOGRAPHY (SEE REFERENCE 2)
- 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
1	2020-10-29	REVISED ISSUED FOR CONSTRUCTION	KAC	KAC	CCS	TJS
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 10/29/2020
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
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PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

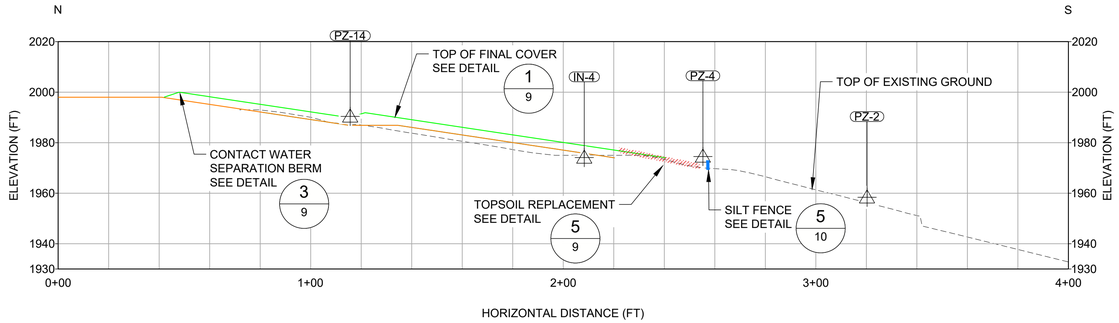
TITLE
TOP OF FINAL COVER

PROJECT NO. 20141272 | REV. 1 | 5 of 10 | DRAWING 5

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

0 1 in

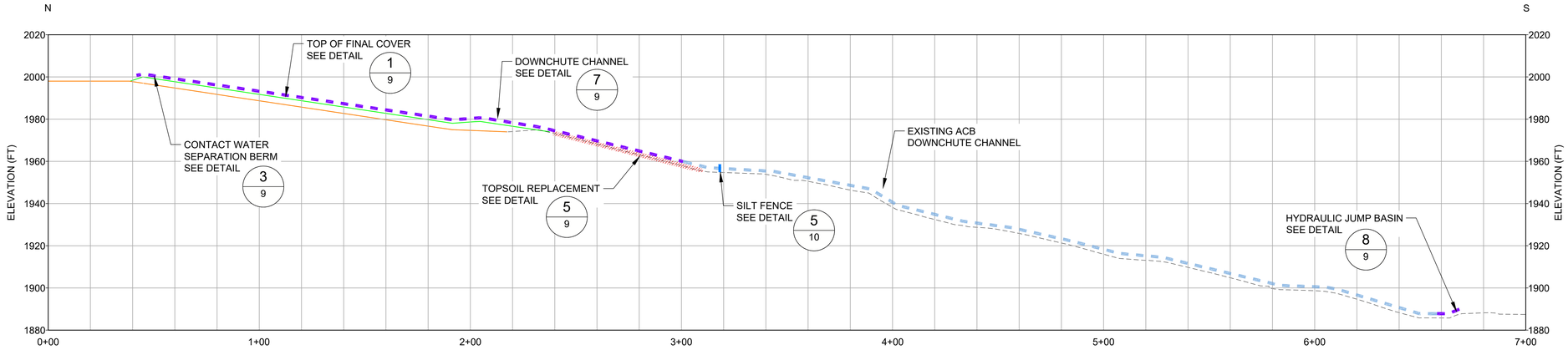
Path: \\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\09_PROJECTS\20141272\02_PRODUCTION\DWG\FIG\ | File Name: 20141272-4.dwg | Last Edited By: kcornik Date: 2021-01-21 Time:11:40:38 AM | Printed By: KCornik Date: 2021-01-21 Time:12:43:23 PM



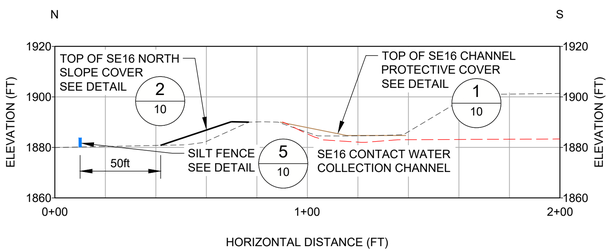
SCALE 1:30 / VERT. SCALE 1:1 — A 8 — PARTIAL FINAL COVER CROSS SECTION

LEGEND

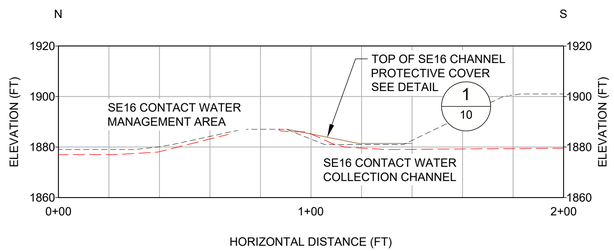
- EXISTING GROUND
- TOP OF FINAL COVER
- TOP OF ADD-ON BERM (DONE BY OTHERS)
- TOP OF PROTECTIVE SOIL COVER
- TOP OF PROTECTIVE BOTTOM ASH COVER
- TOP OF GEOMEMBRANE LINER
- EXISTING ARTICULATED CONCRETE BLOCK
- PROPOSED ARTICULATED CONCRETE BLOCK
- TOPSOIL REPLACEMENT EXTENTS



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
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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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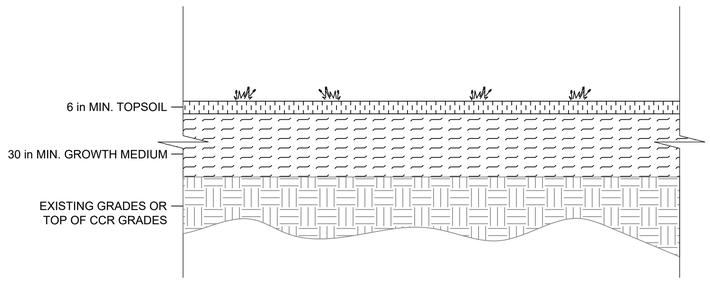
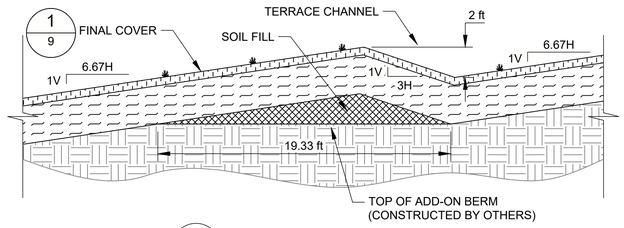
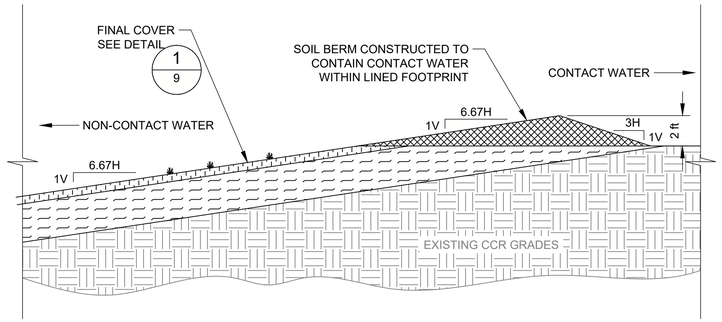


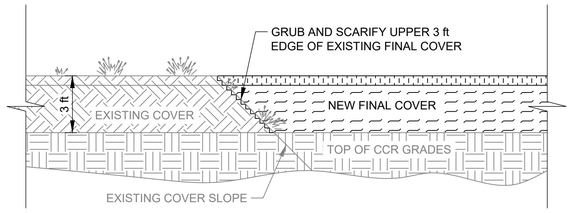
SCALE N.T.S. 1/9 FINAL COVER DETAIL



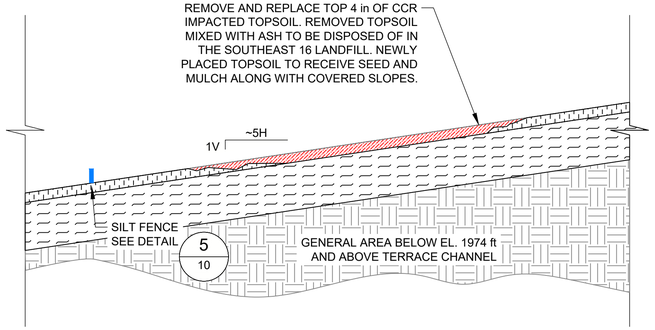
SCALE N.T.S. 2/9 TERRACE CHANNEL DETAIL



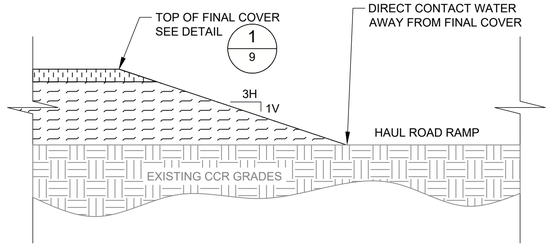
SCALE N.T.S. 3/9 CONTACT WATER SEPARATION BERM DETAIL



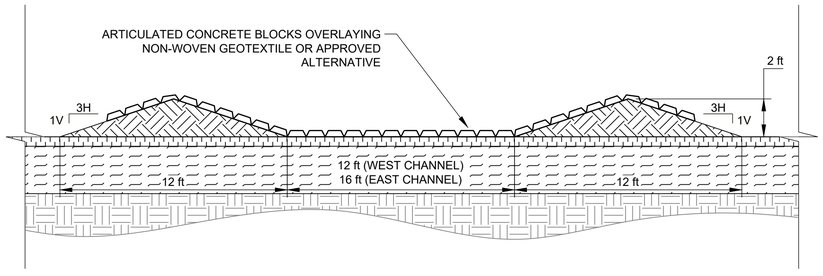
SCALE N.T.S. 4/9 TYING IN TO EXISTING COVER DETAIL



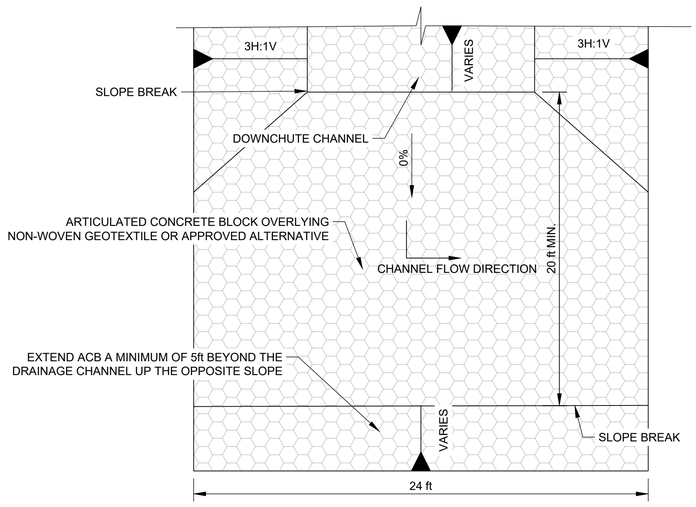
SCALE N.T.S. 5/9 TOPSOIL REPLACEMENT DETAIL



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

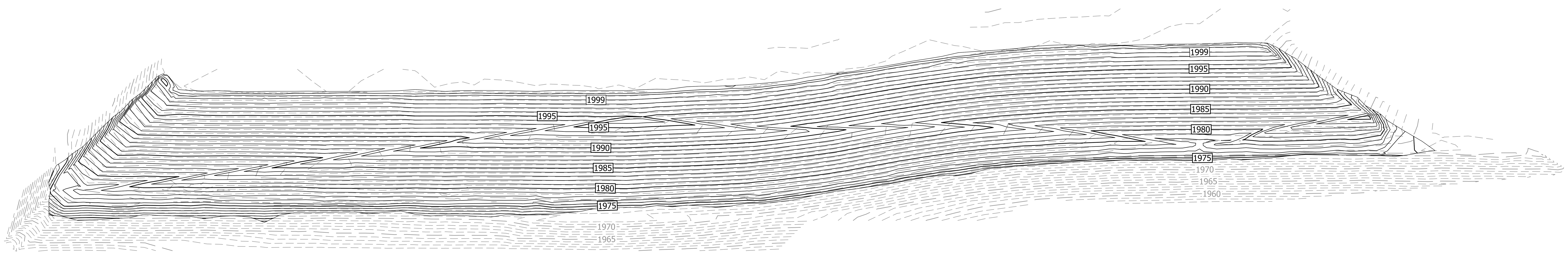
PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

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'



#	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
GROWTH MEDIUM AS-BUILT

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

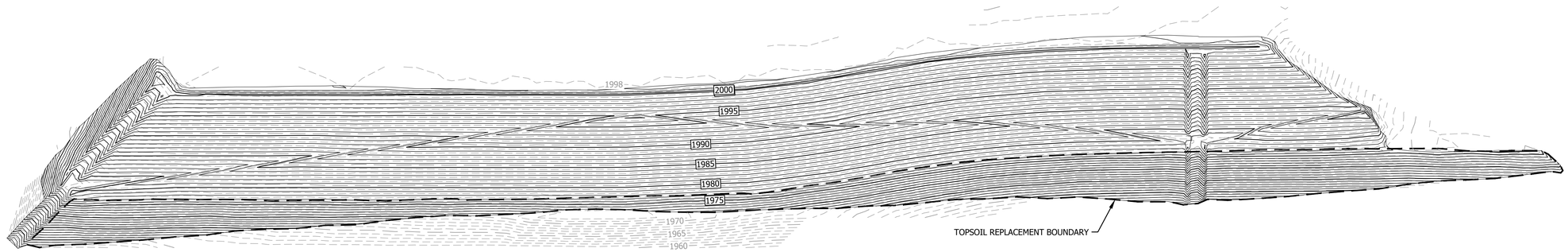
REGISTERED PROFESSIONAL LAND SURVEYOR
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

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

QUANTITIES	
ITEM	QUANTITY
GROWTH MEDIUM	39,631 CY

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

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



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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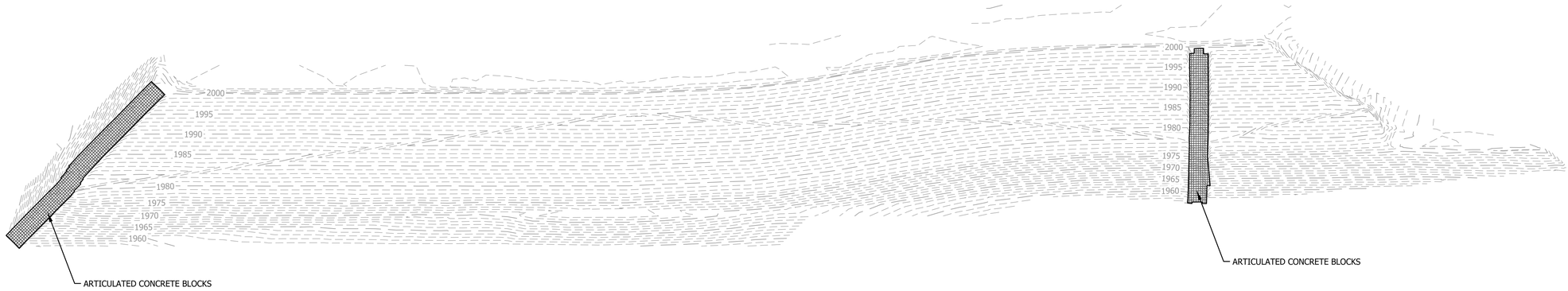
SCALE: 1" = 100'



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 Observation 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, Brendan Purcell, Addison Darr **Inspection Date:** October 7, 2020

Weather: 50-65ºF, 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			Elevation: 1995 feet
2. Inflow structure (*Flue gas desulfurization piping)*				
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		
e. Riprap/erosion control			X	
4. CCR placement areas				
a. CCR upstream slope erosion	X			Minor erosion adjacent to east haul route
b. CCR upstream slope cracks/settlement		X		
c. CCR crest exposed to heavy traffic	X			CAT 777, final cover construction equipment
d. CCR crest damage from vehicles/machinery		X		
e. CCR crest cracks/settlement	X			Settlement of fly ash over FGD material
f. CCR downstream slope erosion	X			Minor fly ash erosion on the west, north, and east slope
g. Downstream slope seepage/sloughs/cracks/settlement	X			Settlement and cracking of fly ash over FGD material
5. Covered downstream slopes				
a. Downstream Slope erosion		X		
b. Downstream Slope rodent burrows	X			South and north side up to 6-inch diameter
c. Downstream Slope vegetation	X			Bare spots/trampled areas; less vegetation above el. 1950 ft and on temporary cover; healthy vegetation below el. 1950 ft; minor woody vegetation present on final cover slopes
d. Downstream Slope seepage/sloughs/cracks/settlement	X			Cracks due to settlement of fly ash over FGD material at and above el. 1974 ft; no cracks noted below el. 1974 ft on covered downstream slopes
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 in perimeter ditches
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 rodent burrows along the south slope
l. Downstream Slope vegetation	X			Healthy grass and reeds, some sparse vegetation near toe of slope where it is over steepened due to regrading of the south drainage channel
m. Downstream Slope seepage/sloughing/cracks/settlement	X			Some irregular slope geometry near recently constructed downchutes/hydraulic jump basins
7. Toe				
a. Vegetation	X			Healthy grass and reeds
b. Rodent burrows	X			Small burrows on south side
c. Seepage/sloughs/cracks/settlement		X		
d. Drainage conditions		X		

General Remarks: Cracking of fly ash within the facility was noted and should be expected due to settlement of the FGD material. Additionally, the recently constructed downchute channel and hydraulic jump basin on the south side of UR92 has an irregular slope. Minor maintenance includes addressing small burrows, maintaining fly ash protective cover, maintaining inflow and outflow piping, and addressing vegetative success of the cover and erosion as observed.

Name of Engineer (Engineer Firm):
Craig Schuettpelz, PE (Golder Associates, Inc.)
Date: 10/07/2020
Signature:

APPENDIX C

Photographs

Path: \\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\19136224\2020 Annual Inspections\ | File Name: 2020 Annual Inspection - Photolog - UR92.dwg

LEGEND

1 PHOTOGRAPH ID AND LOCATION

NOTE(S)

1. AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN IN 2020.

GOLDER

GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 92 - PHOTOGRAPH LOCATIONS

FIGURE 1

Upstream Raise 92

Photograph 1 (South CCR Downstream Slope (covered))
Animal burrows and sparse vegetation on downstream slope. (IMG_DSCF1743.JPG)

Photograph 2 (South perimeter berm downstream slope and south ditch)
Downchute channel and recently constructed hydraulic jump basin in good condition.
(IMG_DSCF1747.JPG)

Upstream Raise 92

Photograph 3 (West CCR downstream slope (road))
Road between UR91 and UR92. (IMG_DSCF1751.JPG)

Photograph 4 (West CCR downstream slope (no cover))
Minor fly ash erosion near elevation 1998 feet on west downstream slope.
(IMG_DSCF1754.JPG)

Upstream Raise 92

Photograph 5 (West CCR downstream slope (no cover))
Approximately 6-inch wide crack in fly ash within the bench at elevation 1974 feet.
(IMG_DSCF1757.JPG)

Photograph 6 (East CCR upstream slope (no cover))
Gravity drain piping inlet to Upstream Raise 91. (IMG_DSCF1767.JPG)

Upstream Raise 92

Photograph 7 (West CCR downstream slope)
Minor erosion of fly ash in southwest corner between elevations 1950 feet and 1974 feet. (IMG_DSCF1762.JPG)

Photograph 8 (North CCR downstream slope)
Erosion of fly ash below elevation 1998 feet. (IMG_DSCF1771.JPG)

Upstream Raise 92

Photograph 9 (North CCR downstream slope)
Perimeter contact water channel and culvert to Upstream Raise 91. (IMG_BP15.JPG)

Photograph 10 (North CCR downstream slope (no cover))
Cracking and erosion of fly ash around piezometers. (IMG_DSCF1774.JPG)

Upstream Raise 92

Photograph 11 (South CCR upstream slope)
Panoramic of Upstream Raise 92 CCR upstream slope and FGD pool. (IMG_DSCF1787-1789.JPG)

Photograph 12 (East CCR downstream (no cover))
Minor erosion of fly ash. (IMG_DSCF1783.JPG)

Upstream Raise 92

Photograph 13 (East CCR downstream slope (no cover))
Minor fly ash erosion on the east slope above the haul road. (IMG_DP1.JPG)

Photograph 14 (North CCR downstream slope (no cover))
Contact water channel with sparse vegetation. (IMG_DP14.JPG)

Upstream Raise 92

Photograph 15 (South CCR downstream slope (final cover))
Well-vegetated final cover terrace channel. (IMG_4638.JPG)

Photograph 16 (North CCR downstream slope (temporary cover))
Temporary vegetative cover on north slope, fair to good grass coverage.
(IMG_AD13P.JPG)

Upstream Raise 92

Photograph 17 (North CCR downstream slope (no cover/temporary cover))
Temporary cover and contact water contaminant channel. (IMG_AD14P.JPG)

Photograph 18 (East CCR upstream slope (road))
Erosion on the corner of the main east/west haul route to the southeast corner of Upstream Raise 92. (IMG_AD15P.JPG)

Upstream Raise 92

Photograph 19 (East side FGD pool)
Hydraulic deposition of FGD material on east side of Upstream Raise 92.
(IMG_DSCF1782.JPG)

Photograph 20 (South perimeter berm downstream slope)
Animal burrow. (IMG_AD11P.JPG)

Upstream Raise 92

Photograph 21 (South perimeter berm downstream slope)
Well-vegetated (grass) perimeter berm downstream slope. (IMG_AD16.JPG)

Photograph 22 (North perimeter berm downstream slope)
Well-vegetated (grass) perimeter berm downstream slope and toe. (IMG_AD20P.JPG)

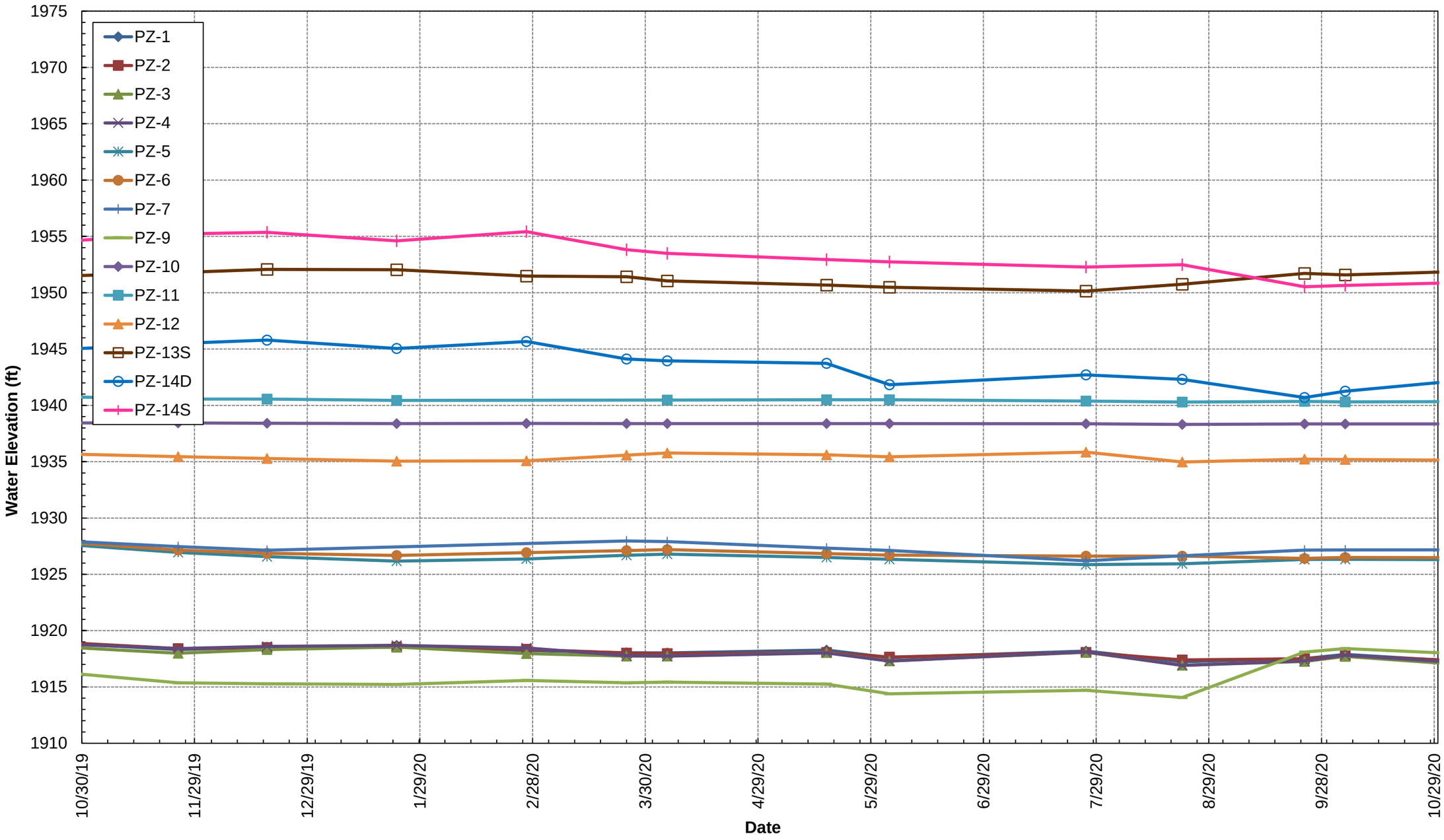
APPENDIX D

Instrumentation Results

APPENDIX D-1

Piezometer Information

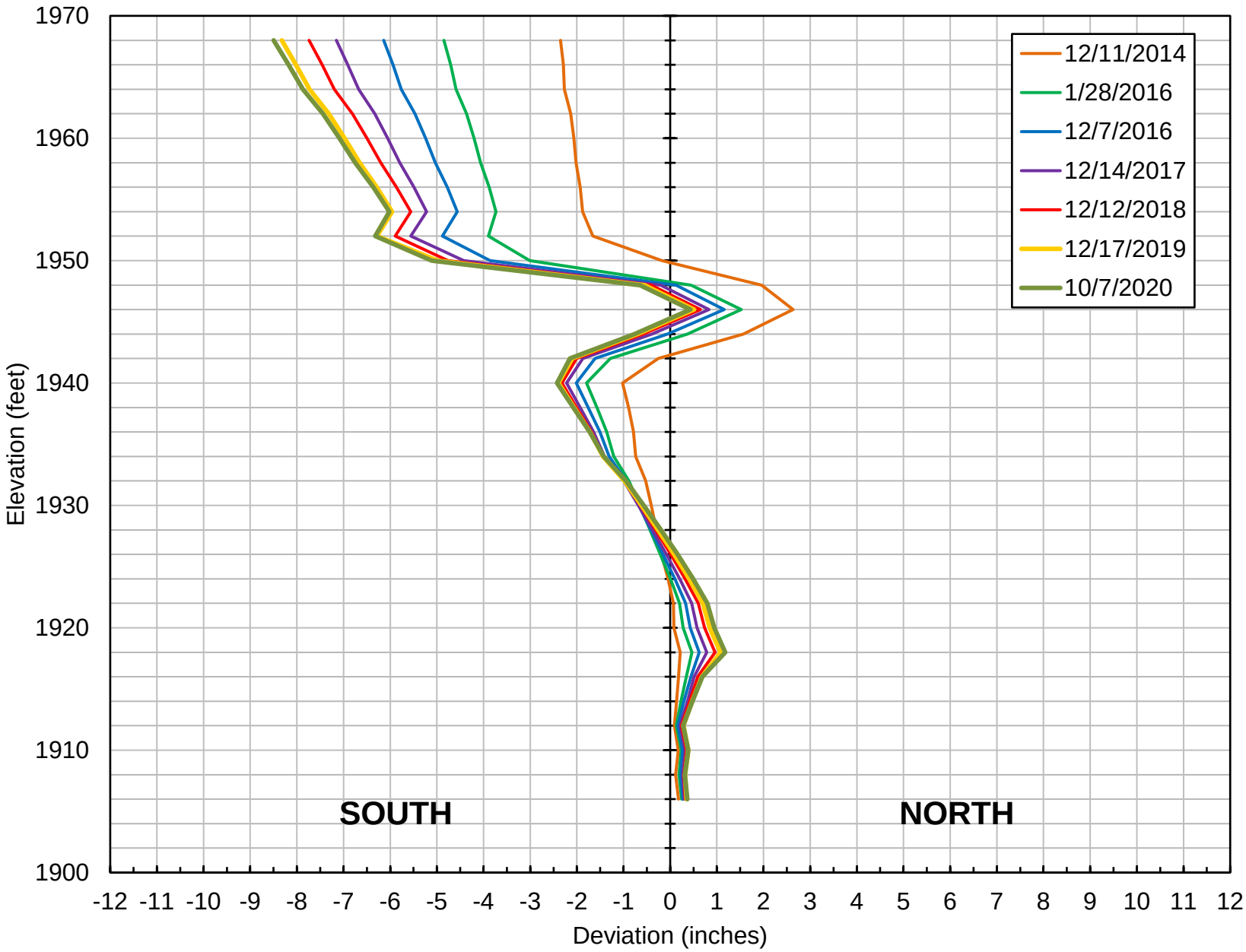
Upstream Raise 92 Piezometer Elevations



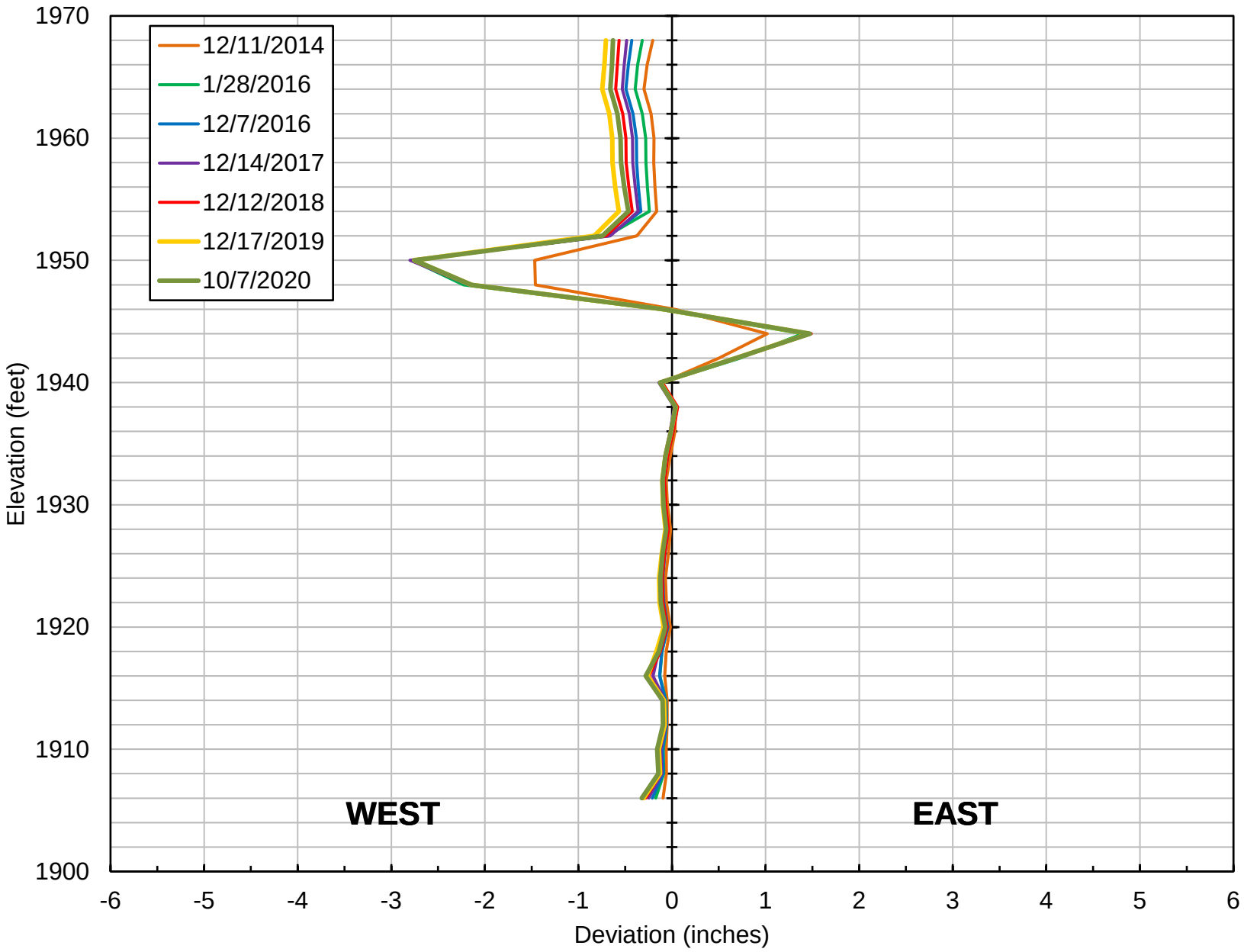
APPENDIX D-2

Inclinometer Information

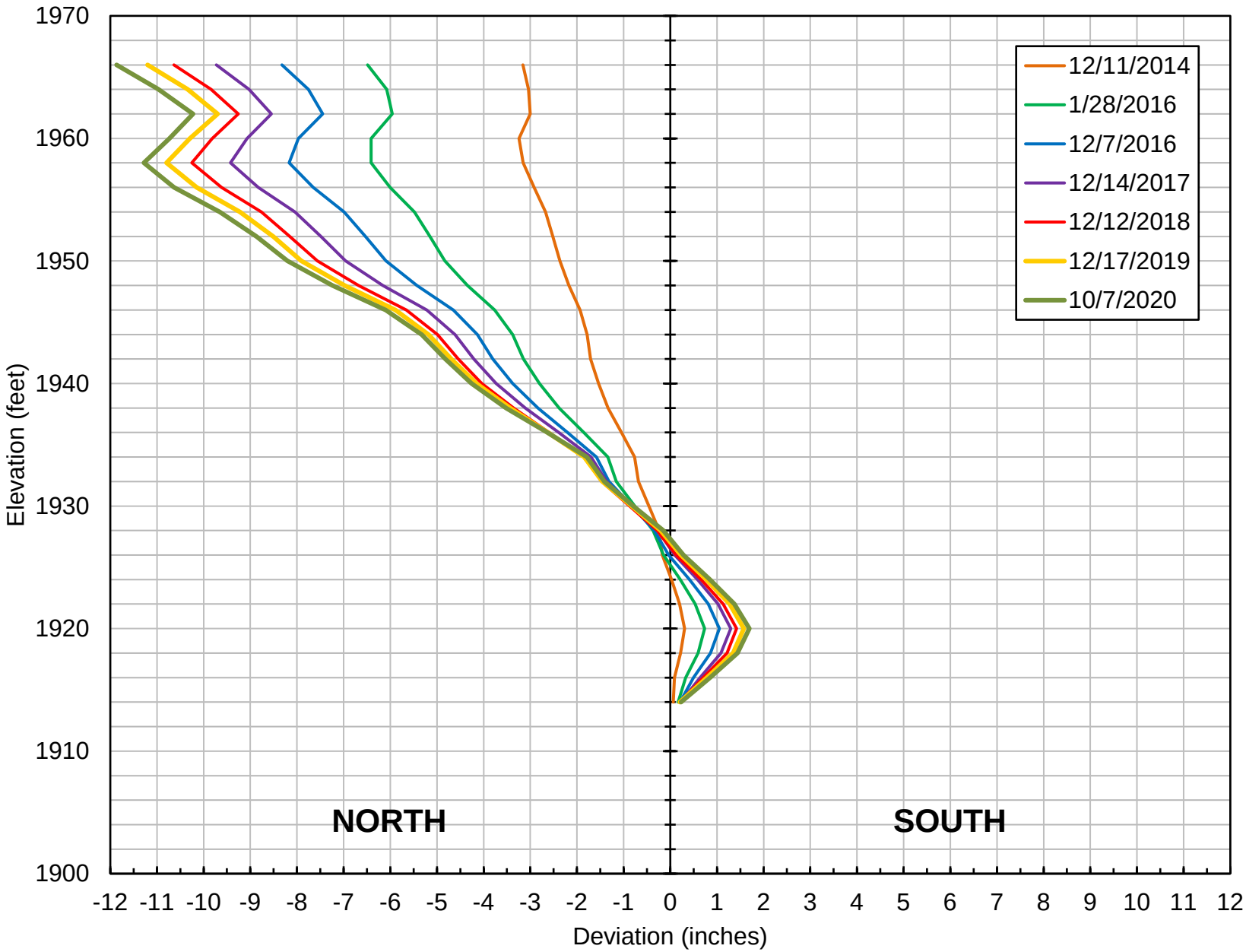
Upstream Raise 92
Inclinometer IN-3 Summary



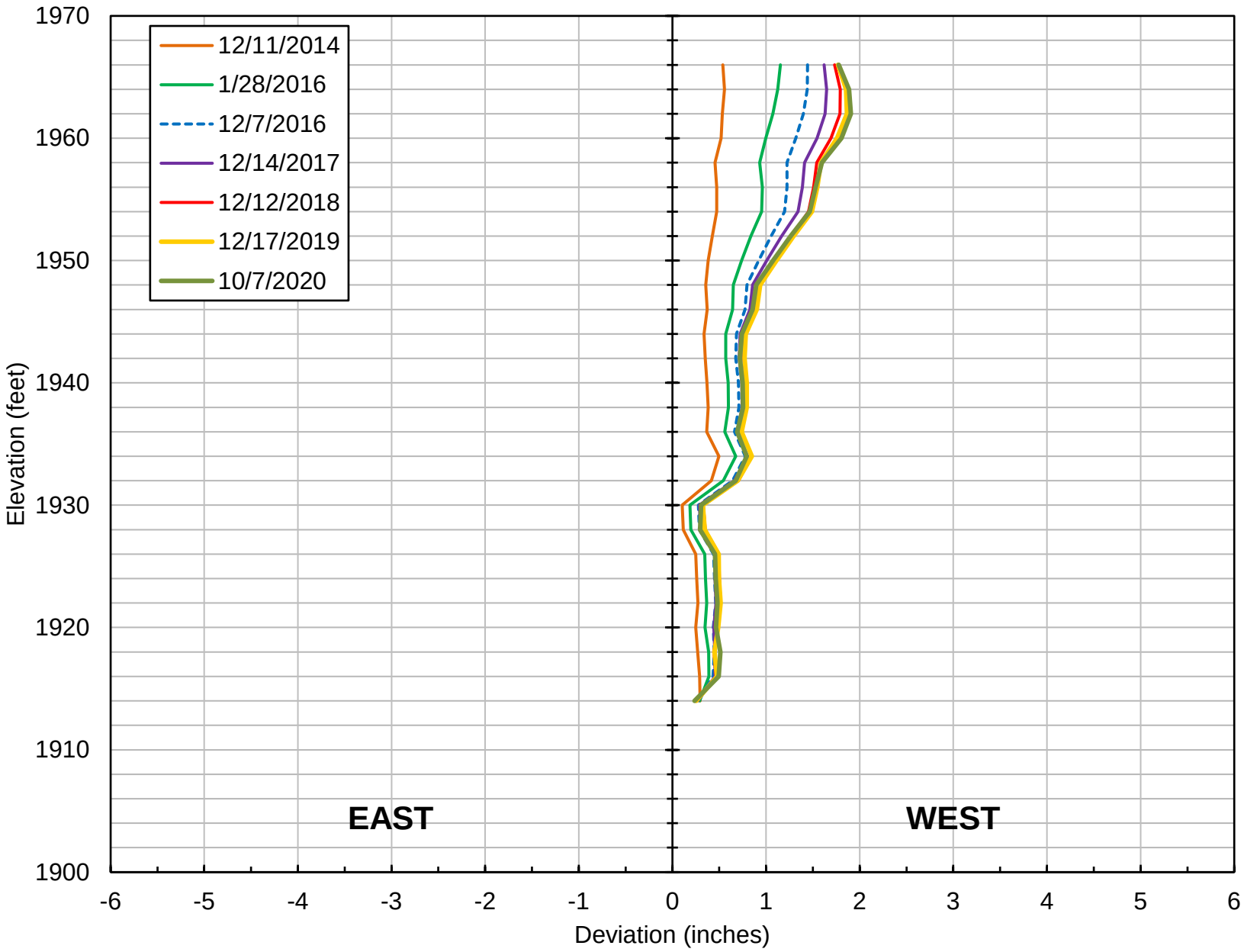
Upstream Raise 92
Inclinometer IN-3 Summary



Upstream Raise 92
Inclinometer IN-4 Summary



Upstream Raise 92
Inclinometer IN-4 Summary



golder.com