GOLDER
MEMBER OF WSP

REPORT

2021 Annual Inspection

Coal Creek Station - Upstream Raise 91 CCR Surface Impoundment

Submitted to:

Great River Energy

2875 Third Street SW
Underwood, North Dakota 58576

Submitted by:

Golder Associates Inc.

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21451024-19-R-0

January 2022

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FIGURES

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 91 at CCS performed August 30, 2021.

2.0 REVIEW OF EXISTING INFORMATION

2.1 Geological Conditions

Upstream Raise 91 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 91 (Figure 2) is located in Sections 16 and 17, Township 145N, Range 82W and covers approximately 70 acres. The facility is used as a combined dewatering and storage facility for CCRs including fly ash, bottom ash, economizer ash, and flue gas desulfurization (FGD) material. Bottom ash, economizer ash, and fly ash are hauled to the facility. Process water enters Upstream Raise 91 through seepage and culvert piping from Upstream Raise 92. FGD material and hydraulic conveyance water enter Upstream Raise 91 through a high-density polyethylene (HDPE) pipe from the plant to varying locations within the facility. The pipe runs above ground from the northeast corner of the facility to the final discharge location. The on-grade HDPE pipe is periodically moved to different areas of Upstream Raise 91 to achieve an even distribution of FGD material in the facility. Upstream Raise 91 is approximately 300 feet south of Lower Samuelson Slough and 100 feet north of rail lines. The Drains Pond System is adjacent to the northwest side of Upstream Raise 91 and Upstream Raise 92 is adjacent to the east side of Upstream Raise 91. A drainage ditch exists along the south and west sides of Upstream Raise 91.

2.3 Site History and Liner Systems

Upstream Raise 91 was originally part of the South Ash Pond, which is a legacy facility for managing CCR at CCS. The South Ash Pond CCR and process water containment area was made by constructing a clay core dike around the perimeter and relying on in-situ low permeability soil to act as a soil liner across the floor. This facility was put into operation in 1979 and operated intermittently from 1979 through 1990. 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 both Upstream Raise 91 and the adjacent Upstream Raise 92. A new composite liner was completed over the regraded Upstream Raise 91 floor and embankments in 1992, 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). An additional 7 acres of composite liner was installed in the southeast corner of Upstream Raise 91 and in the area between Upstream Raise 91 and 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.

Selected construction drawings from the 1992 work and 2016 work as well as the current permit are included in Appendix A.

2.4 Site Geometry

The design crest of the soil berms surrounding Upstream Raise 91 are at a constant elevation (El.) of approximately 1,922 feet (ft). This berm surrounding the facility on the north, west, and south sides 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) slopes to the surrounding grades and perimeter drainage ditches with El. 1,897 ft on the north side of Upstream Raise 91 and El. 1,898 ft on the south and west sides of Upstream Raise 91. The soil perimeter berm downstream slopes have grass vegetation. Berm upstream slopes of the soil perimeter berms have an approximate 3:1 slope to the base of the facility between El. 1,900 ft and El. 1,914 ft. The top of the HDPE liner is anchored at El. 1,920 ft.

The facility is permitted (with the North Dakota Department of Environmental Quality [NDDEQ]) and designed with 5:1 final CCR slopes from the perimeter berms to El. 1,974 ft, 15% final CCR grades between El. 1,974 ft and El. 2,004 feet, and a 5% crown to achieve a final CCR crest 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. Between January and December of 2021, continued bottom ash and fly ash placement has occurred to a maximum elevation at approximate El. 1,944 ft.

2.6 Storage Capacity and Volumes

Based on site disposal records, the facility has a remaining CCR capacity of approximately 5,660,000 cubic yards (CY). The approximate total CCR capacity of Upstream Raise 91 is approximately 8,340,000 CY. Therefore, the

amount of CCR contained in the facility at the time of the inspection is estimated to be approximately 2,680,000 CY.

2.7 Impounded Water

The water level in Upstream Raise 91 varies with time as more CCRs are deposited and as operational variables change (such as gravity drainage pipe elevations). At the time of inspection, the depth of impounded water varied from zero feet on the east side of the facility (near the FGD material deposition location) to approximately three feet in the northwest corner. Based on visual observations of areas within Upstream Raise 91 that contained ponded water, the volume of impounded water at the time of the inspection was approximately 18.4 acre-feet or 6,000,000 gallons.

2.8 Permits

Upstream Raise 91 is currently permitted with the 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; GRE 2015).

2.9 Summary of Previous Inspection

The most recent annual professional engineer inspection of Upstream Raise 91 was performed by Golder in 2020 (Golder 2021). A summary of the observations of that inspection are as follows:

- Generally good vegetation and site maintenance.
- No signs of significant seepage, settlement, or cracking of the perimeter soil berm downstream slopes.
- Isolated areas of sparse, but improved vegetation on perimeter soil berm downstream slopes as well as sparse vegetation on newly constructed safety berms on the north side of the facility.
- Minor erosion of perimeter berm upstream slopes and fly ash that is a part of the CCR downstream slopes.
- Inflow structures and perimeter channels in generally good condition.
- Several animal burrows on downstream slopes and toes, but none that were anticipated to cause areas of structural weakness.

2.10 Summary of 2021 Weekly Inspections

Routine weekly inspections of Upstream Raise 91 were performed by GRE as a part of the final CCR Rule. Based on a review of the available inspection forms, the following items were noted:

- Generally good site maintenance.
- No signs of significant seepage, settlement, or cracking of the berm downstream slopes.
- No signs of animal burrows were noted on berm downstream slopes.
- Fugitive dust was actively controlled using a water truck (as required).

3.0 2021 ANNUAL INSPECTION

On August 30, 2021, Todd Stong and Craig Schuettpelz of Golder performed an inspection of Upstream Raise 91 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

Inflow structures to Upstream Raise 91 consist of buried seepage piping from the Upstream Raise 92, a culvert from Upstream Raise 92, and an inflow pipe for depositing FGD material. The on-grade FGD material piping is periodically moved to different areas of Upstream Raise 91 to achieve an even distribution of FGD material in the facility. This inflow pipe was depositing FGD material in Upstream Raise 91 at the time of the inspection. The culvert on the north side of Upstream Raise 91 and the FGD material piping observed appeared to be in good condition with no noticeable settlement, cracking, significant corrosion, or significant erosion.

Additional pipelines and contact water control features (contact water perimeter channels and culverts) inside Upstream Raise 91 convey water to downstream facilities. These include a series of gravity drainage pipes, seepage pipes, and perimeter channels and culverts that transfer CCR conveyance water from the facility to the adjacent Drains Pond System. The gravity drains are moved as operations progress and appeared to be free from obstructions and in good working order. Seepage piping was below the elevation of the water and could not be observed. The culverts connecting the contact water perimeter channels were in fair condition at the time of the inspection, with some sediment accumulated at the culvert inlets.

The outflow structures from Upstream Raise 91 consist of cross-over pipes directing water to the east cell and center cell of the Drains Pond System. The cross-over pipes were below the water level and could not be observed.

3.2 Perimeter Berm

3.2.1 Berm Upstream Slope

The berm upstream slopes are mostly covered by CCR material. A small amount of the berm upstream slope was visible along the north, west, and south sides of the facility. The observed slopes appeared to match the design slopes of 3:1 and are being protected from erosion with a cemented fly ash layer. Some erosion of the fly ash protective cover has occurred along the north slopes, although significant erosion exposing underlying layers of the liner system was not observed. The berm upstream slopes appeared to be in good condition with no signs of significant distress.

3.2.2 Berm Crest

The berm crest along the north, west, and south sides of Upstream Raise 91 is surfaced with gravel and used for both light vehicle and heavy construction equipment traffic. The berm crest roads on the west and south sides experience little heavy traffic and are mostly exposed to light vehicle traffic (cars, pickups, etc.). The berm crest road on the north side experiences frequent heavy traffic from large haul trucks; however, no rutting was noted even though this has been indicated in past reports. The road on the berm crest of Upstream Raise 91 appears to be in good condition, with no noticeable cracking or settlement, and appears to be well maintained. 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 91 perimeter ditches. When wet, road surfaces can become rutted and slippery. Ruts that develop should be repaired as soon as possible to maintain access.

3.2.3 Berm Downstream Slope

The berm downstream slopes range from 0 to 20 feet in height. Isolated areas on the downstream side of the safety berm noted above and on the southwest and south sides of Upstream Raise 91 are sparsely vegetated. Vegetative growth continues to improve along the south and southwest sides of the facility. Much of the north berm downstream slope below the safety berm is heavily vegetated with native grasses.

Animal burrows, including a few burrows up to 6 inches in diameter, were observed on the north berm downstream slopes. Golder did not observe indications of seepage, sloughing, significant erosion, excessive settlement, or vegetation that seemed to be thriving abnormally. The berm downstream slopes appeared to be in good condition.

3.3 Toe

The environment at the toe of slope varies substantially surrounding Upstream Raise 91. Upstream Raise 92 is directly east of Upstream Raise 91 and there is no downstream slope or toe. North of the facility, the toe of the slope is covered in tall grass with no noticeable wet areas. A site surface water drainage ditch exists along the west and south side toes, directing flow counterclockwise to the south side of Upstream Raise 91 and then east away from the site. At the time of inspection, this surface water ditch contained approximately one to two feet of water. Culverts connecting different areas of this drainage ditch were mostly clear of obstructions at both inlets and outlets. The toes of berm downstream slopes appear to be in good condition.

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 91 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 8 to 10 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 of bottom ash and fly ash. Fly ash makes up the outer portion of the crest and is a “shell” around Upstream Raise 91 primarily for erosion protection and as a trafficking surface. Bottom ash and fly 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

The area above the soil perimeter berm downstream slopes surrounding the north, west, and south sides 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, sloughing, or settlement during the inspections; however, there was 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.

3.5 Instrumentation

Three vibrating wire piezometers were installed in Upstream Raise 91 in late 2017. The piezometers were constructed in the center of Upstream Raise 91 where the FGD material is deposited. Communications cables are

routed to the north side of Upstream Raise 91 to a data logger where information from piezometers is downloaded and reviewed monthly by GRE personnel. In addition, three stand-pipe piezometers were installed and are monitored monthly starting in February of 2020.

Piezometer measurements for the last year are included in Appendix D. The fluctuations in piezometer levels reflect the change in FGD material deposition location and amount of water pooling in the middle of Upstream Raise 91. In general, the water levels in the piezometers are behaving as expected and indicate the seepage system within Upstream Raise 91 is operating as designed.

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 91 were observed during the site inspection in August 2021.

4.0 SUMMARY AND CONCLUSIONS

An annual inspection was performed for Upstream Raise 91 at Coal Creek Station on August 30, 2021. The inspection met the requirements for CCR surface impoundments under 40 CFR Part 257.83. Golder observed fair vegetation and good site maintenance and did not identify significant deficiencies such as seepage, excessive erosion or settlement, or cracking during visual observations of Upstream Raise 91. Several animal burrows were noted, and some minor erosion rills observed along the northern berm downstream slopes. However, 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 perform the required weekly facility inspections to look for signs of potential structural weaknesses. Piezometers will be monitored regularly to ensure proper operation of the equipment and to evaluate the overall performance of the facility.

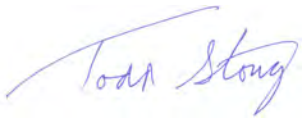
Minor maintenance items that may need to be continually addressed include repairing large animal burrows on perimeter berms as they appear, repairing and re-seeding eroded areas on or adjacent to berm downstream slopes, removal of any woody vegetation growing on the berm downstream slopes, and clean-out of collected material in the contact water perimeter channels and maintaining gravity and culvert piping. In addition, the inflow and outflow piping should be monitored regularly and cleared of debris as required to ensure proper conveyance of water to and from the facility.

Signature Page

Golder Associates Inc.

Madeline Sova
Staff Engineer

Craig Schuettpelz, PE
Senior Engineer



Todd Stong, PE
Practice Leader

MRS/CCS/mb

https://golderassociates.sharepoint.com/sites/140044/project files/6 deliverables/21451024/reports/19-r-ur91_ccr_inspection_report/19-r-0/21451024-19-r-0-ur91_ccr_inspection_report_27jan22.docx

5.0 REFERENCES

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

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

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

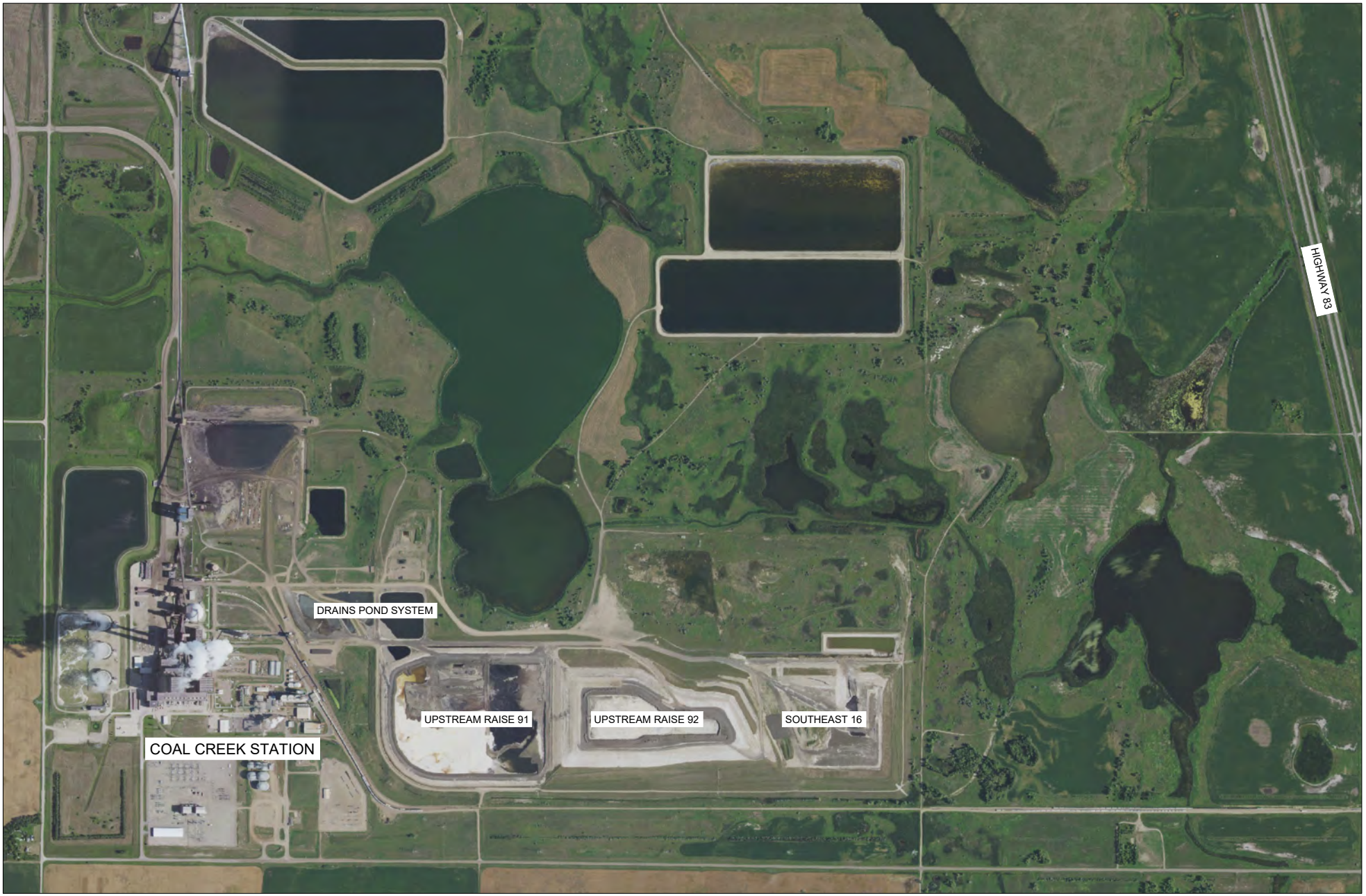
Golder (Golder Associates Inc.). 2021. 2020 Annual Inspection Report – Great River Energy – Coal Creek Station – Upstream Raise 91. January 2021.

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.

GRE. 2015. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated February 2015.

Figures



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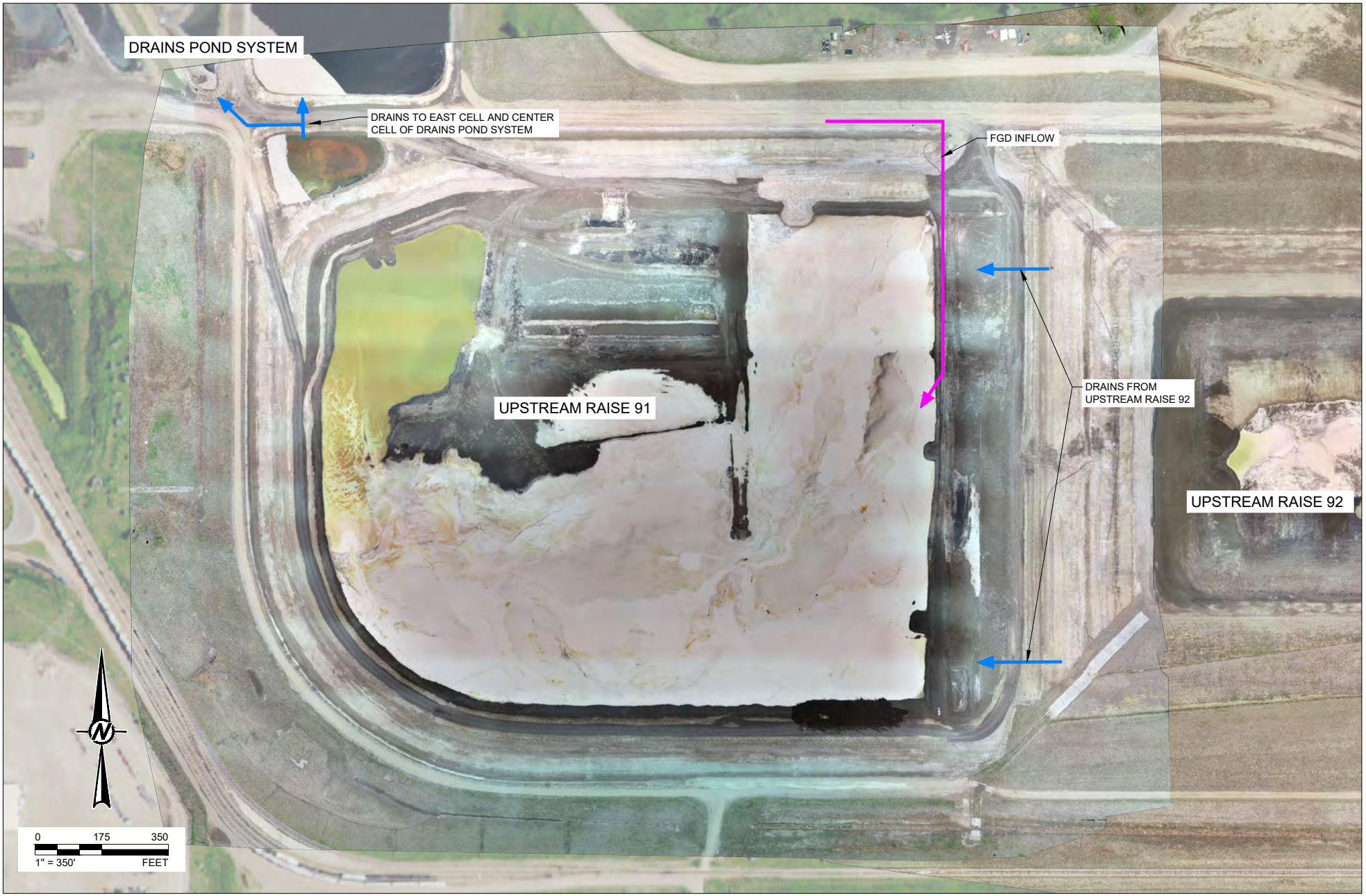
NOTE(S)

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. FOREGROUND AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN IN MAY 2021.
2. BACKGROUND AERIAL IMAGE FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, TAKEN IN 2020.

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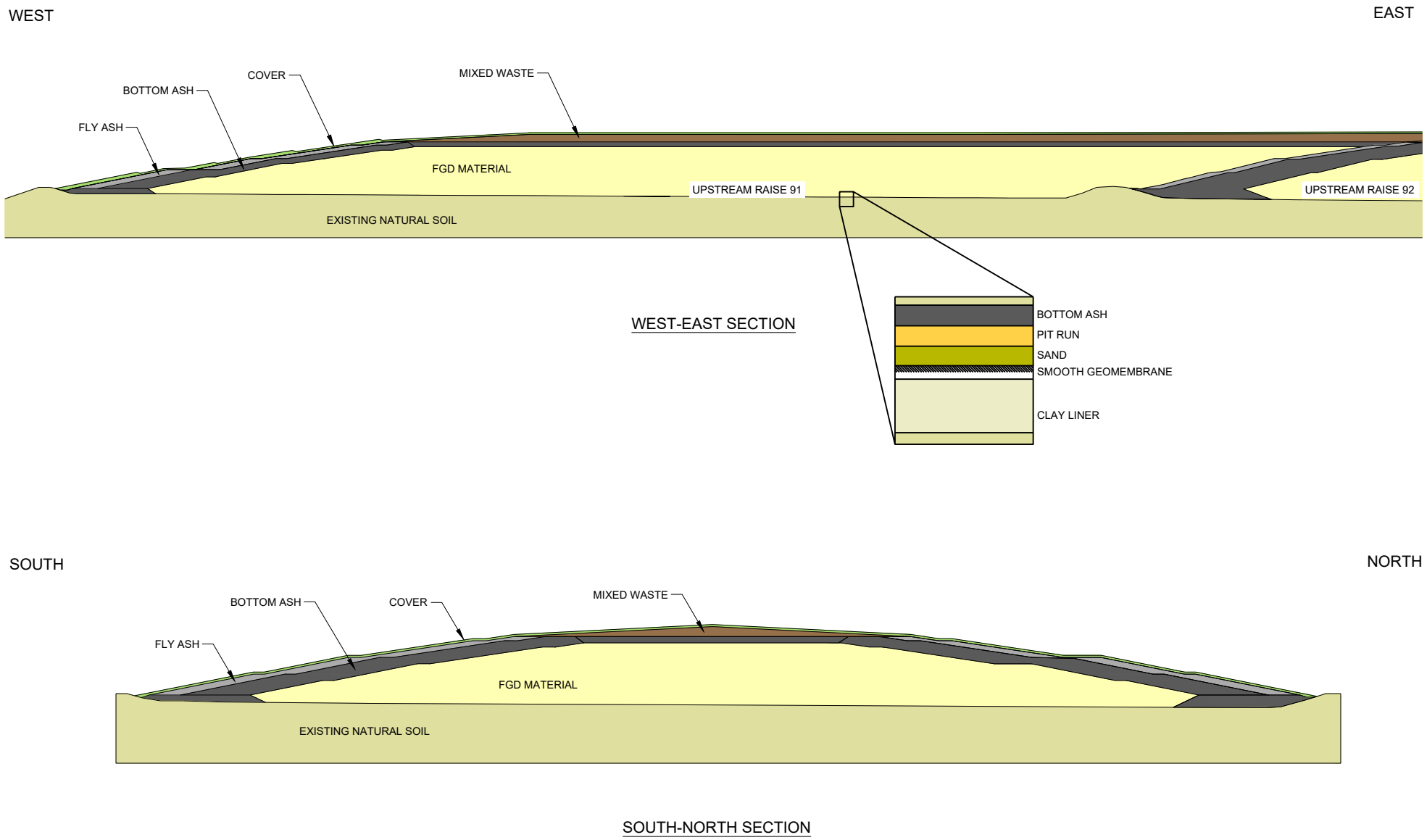
GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 91 - SITE OVERVIEW

FIGURE 2



WEST-EAST SECTION

SOUTH-NORTH SECTION

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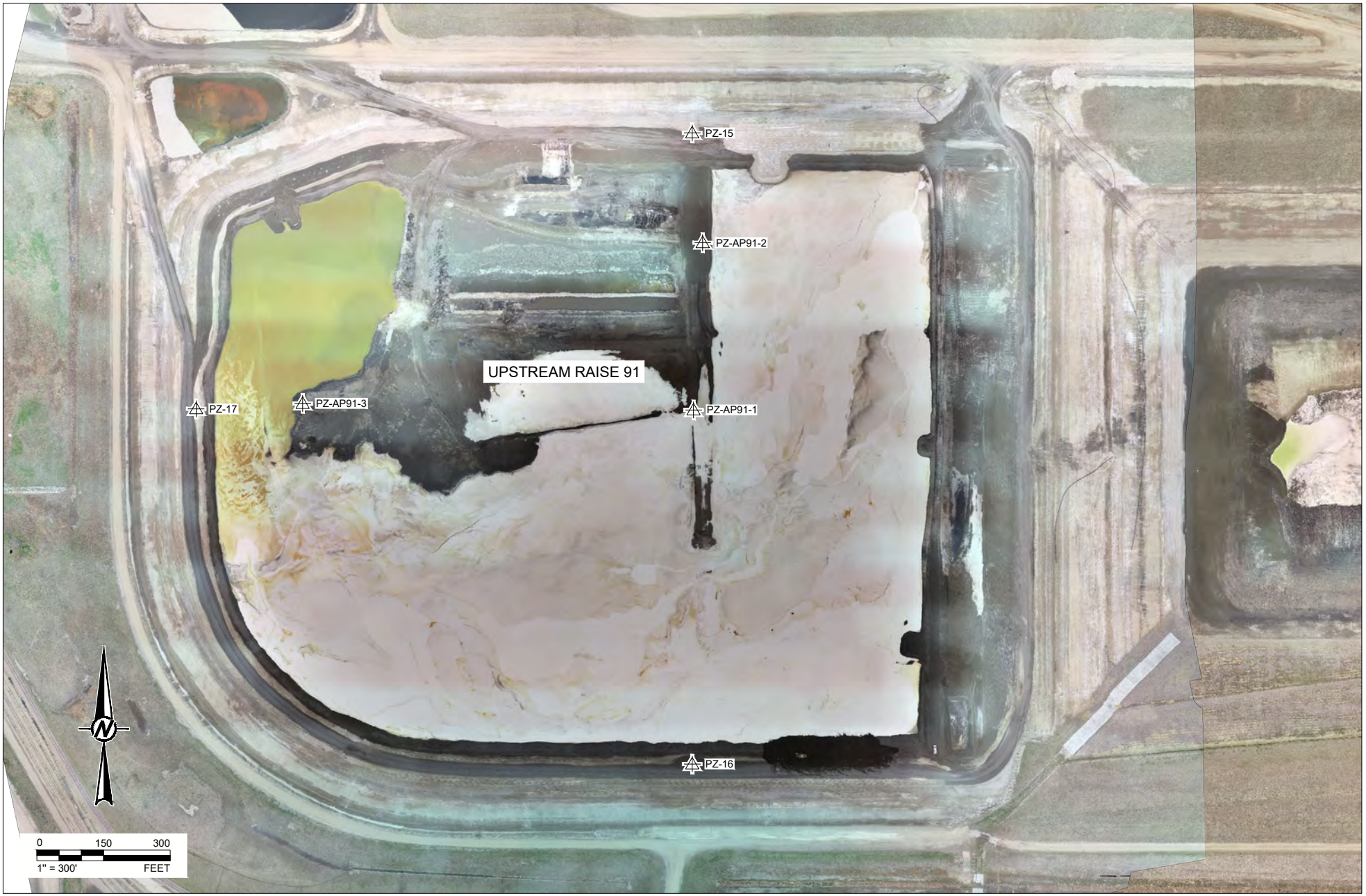
GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 91 - CROSS SECTIONS

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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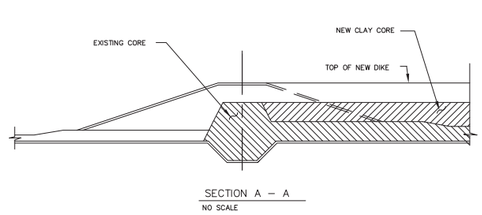
GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 91 INSTRUMENTATION OVERVIEW

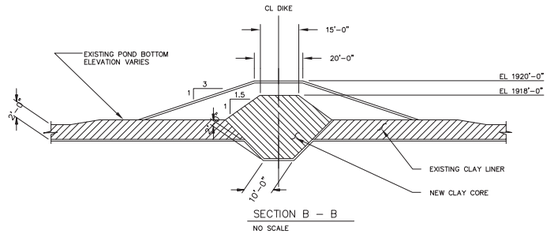
FIGURE 4

APPENDIX A

Selected Construction Drawings and Permit Drawings



SECTION A – A
NO SCALE



SECTION B – B
NO SCALE

GENERAL NOTES

DRAWING NO.	REVISION	REFERENCE DRAWINGS

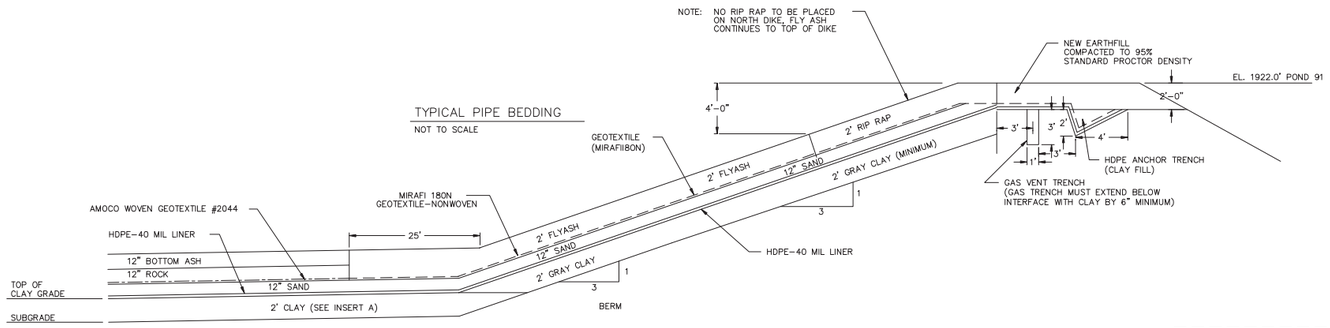
DWN. JJ CHK.
DATE 01/07/91
W/O 91G105

SOUTH ASH POND–
SECTIONS AND ELEVS
1991 ASH DISPOSAL

DRAWING NO.
91G105-26

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP
02/27/91	ISSUED FOR CONSTRUCTION	1	RR	AS	
01/18/91	ISSUED FOR BID	0	JJ	AS	

COOPERATIVE Association POWER



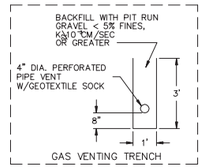
TYPICAL PIPE BEDDING
NOT TO SCALE

INSERT A

6" GRAY CLAY

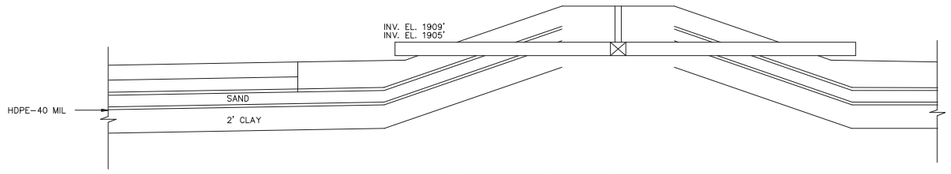
18" BROWN CLAY

BERM & BOTTOM SECTION
ASH POND 91
(1/17) NOT TO SCALE



GAS VENTING TRENCH

NOTE:
1. PROVIDE PERFORATED PIPE VENTS (PVC-SHED40), EACH APPROX. 120' LONG AND 4" DIA. IN THE GAS VENTING TRENCHES. THE EXACT LENGTHES TO BE DETERMINED BY SITE REPRESENTATIVE.
2. THE EXPOSED ENDS OF 4" DIA. GAS VENTING PIPE SHALL BE PROTECTED WITH BOTH A 1/2" STAINLESS STEEL SCREEN AND REGULAR SCREENING MATERIALS.



PIPE PENETRATION - BERM
ASH POND 91 AND DRAIN POND 91
(2/17) NOT TO SCALE

VALVE LIST

ITEM NO.	SYSTEM TAG	DESCRIPTION	B & V FILE NO.	SIZE IN.	PRESS TEMP	PRESS CLASS	TYPE	BODY MAT	END PREP	MFGR NO.	SHOP NO.	REMARKS
	WC08-VL9168	ASH POND 91-PLANT DRAIN POND		18	100	150	GA	CI				UNDERGROUND VALVE WITH VALVE BOX
	WC08-VL9169	PLANT DRAIN POND DISCHARGE		18	100	150	GA	CI				UNDERGROUND VALVE WITH VALVE BOX

GENERAL NOTES

DRAWING NO.	REVISION	REFERENCE DRAWINGS

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP
03-18-92	ISSUED FOR CONSTRUCTION	1	BK	AS	AS
01/09/92	ISSUED FOR BID	0	BK	AS	AS

DWN. BAK CHK.
DATE 12/26/91
W/O 92G213

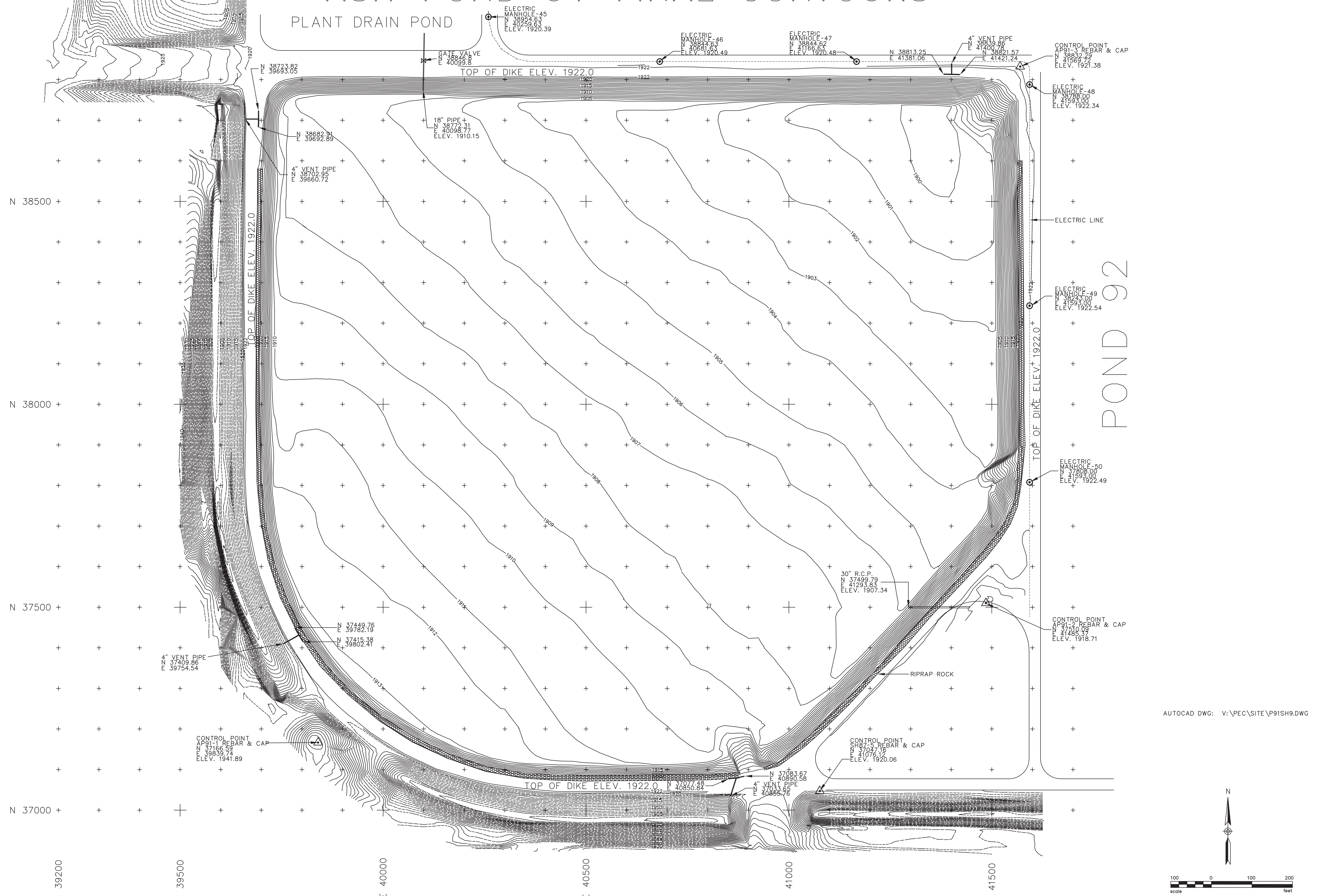
TYPICAL SECTIONS AND DETAILS

1992 ASH DISPOSAL

DRAWING NO. 92G213-17

COOPERATIVE Association POWER

ASH POND 91 FINAL CONTOURS



AUTOCAD DWG: V:\PEC\SITE\P91SH9.DWG

Revision No.	Date	By	Description

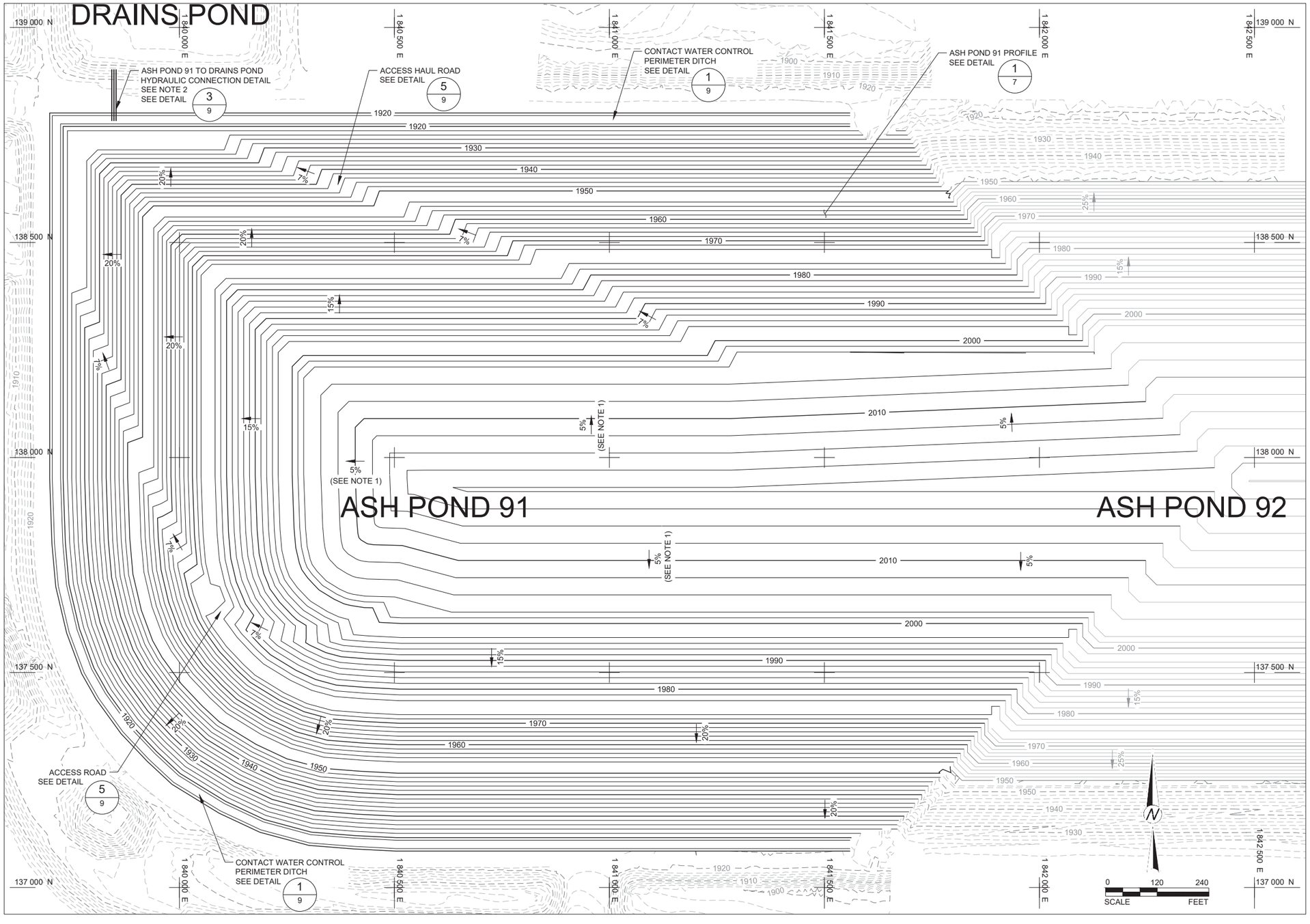
COOPERATIVE POWER ASSOCIATION
UNDERWOOD, NORTH DAKOTA

ASH POND 91 FINAL CONTOURS

Drawn By D.B.J. Project No. B92-17-02
Checked By L.H.K. Date 1/25/94

interstate engineering, inc.
Engineering – Surveying – Planning

9
SHEET NO.



LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 2)
- DESIGN TOP OF CCP GRADES (ASH POND 92 AND SW SECTION 16 UPSTREAM RAISE)
- PROPOSED TOP OF CCP GRADES (ASH POND 91 UPSTREAM RAISE)
- CROSS-OVER PIPING

NOTES

1. CROWN OF CCP GRADES ARE SHOWN AT FIVE PERCENT, BUT MAY BE CONSTRUCTED BETWEEN THREE PERCENT AND FIVE PERCENT.
2. CONTACT WATER IS COLLECTED IN THE PERIMETER DITCH AROUND ASH POND 91. WATER IS DIRECTED THROUGH CROSS-OVER PIPES TO THE DRAINS POND OR DOWNWARD INTO THE UPSTREAM RAISE.

REFERENCES

1. SITE LOCATION: SECTIONS 16 AND 17, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS PROVIDED BY GREAT RIVER ENERGY. THE SURVEYS WERE PERFORMED BETWEEN 1996 AND 2011 EXCEPT DRAINS POND AS-BUILT TOP OF LINER SYSTEM GRADES, WHICH WERE SURVEYED BY INTERSTATE ENGINEERING, INC. AND ARE REFERENCED FROM A SURVEY DRAWING PROVIDED BY GREAT RIVER ENERGY, DATED JANUARY 10, 1994.
3. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
4. THE CONTOUR INTERVAL IS TWO FEET.
5. ALL PROPERTY SHOWN ON THIS MAP IS OWNED BY GREAT RIVER ENERGY.

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
B	2015-02-11	ISSUED FOR PERMIT MODIFICATION	CCS	CCS	TJS	RRJ
A	2014-11-10	ISSUED FOR CLIENT REVIEW	CCS	CCS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

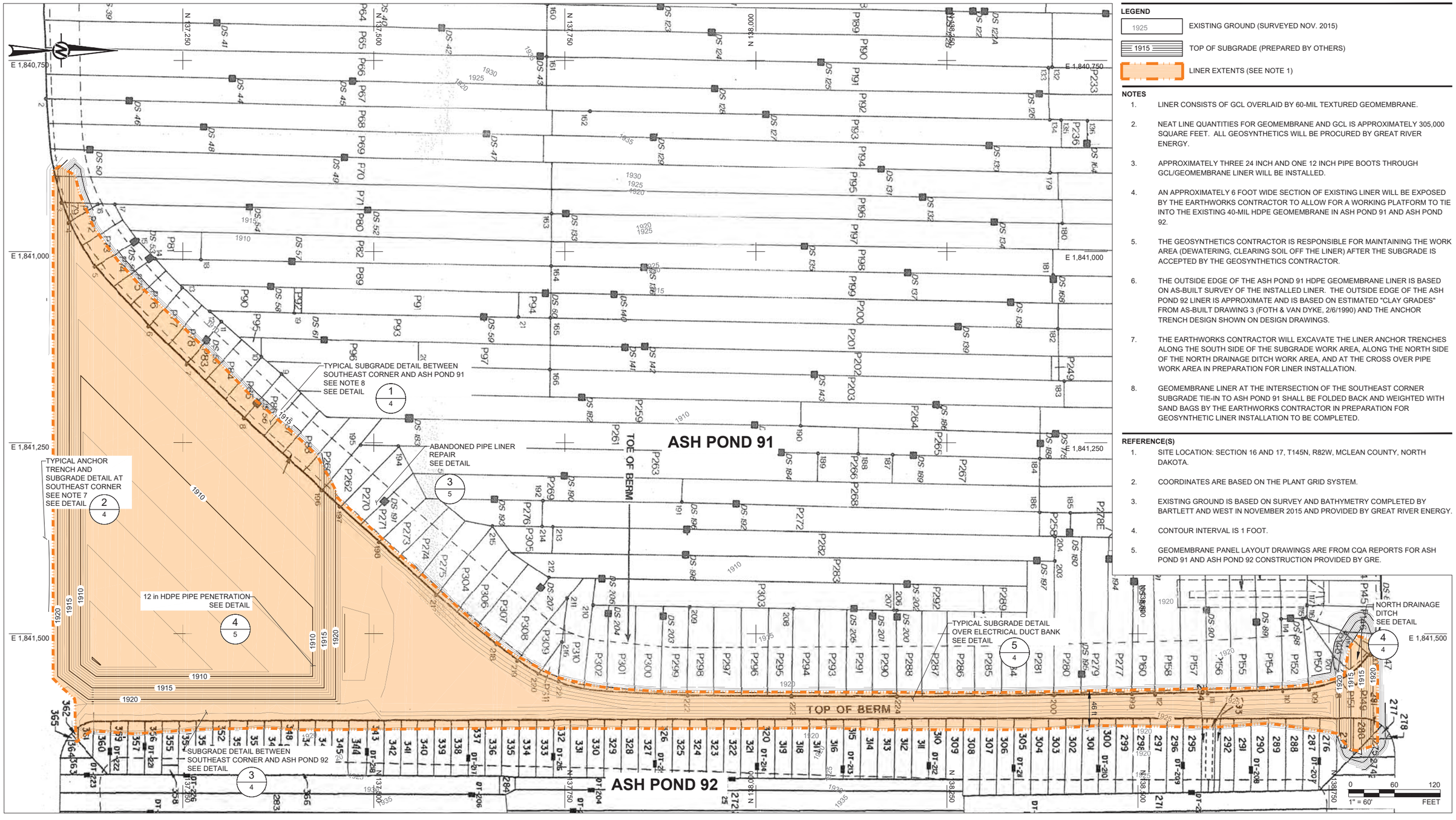
CONSULTANT

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

PROJECT
ASH POND 91
PERMIT NO. 0033 MODIFICATION

TITLE
PROPOSED FINAL CCP GRADES

PROJECT No. 1400644 | Rev. B | 4 of 10 | SHEET 4



LEGEND

- 1925 — EXISTING GROUND (SURVEYED NOV. 2015)
- 1915 — TOP OF SUBGRADE (PREPARED BY OTHERS)
- LINER EXTENTS (SEE NOTE 1)

NOTES

1. LINER CONSISTS OF GCL OVERLAID BY 60-MIL TEXTURED GEOMEMBRANE.
2. NEAT LINE QUANTITIES FOR GEOMEMBRANE AND GCL IS APPROXIMATELY 305,000 SQUARE FEET. ALL GEOSYNTHETICS WILL BE PROCURED BY GREAT RIVER ENERGY.
3. APPROXIMATELY THREE 24 INCH AND ONE 12 INCH PIPE BOOTS THROUGH GCL/GEOMEMBRANE LINER WILL BE INSTALLED.
4. AN APPROXIMATELY 6 FOOT WIDE SECTION OF EXISTING LINER WILL BE EXPOSED BY THE EARTHWORKS CONTRACTOR TO ALLOW FOR A WORKING PLATFORM TO TIE INTO THE EXISTING 40-MIL HDPE GEOMEMBRANE IN ASH POND 91 AND ASH POND 92.
5. THE GEOSYNTHETICS CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE WORK AREA (DEWATERING, CLEARING SOIL OFF THE LINER) AFTER THE SUBGRADE IS ACCEPTED BY THE GEOSYNTHETICS CONTRACTOR.
6. THE OUTSIDE EDGE OF THE ASH POND 91 HDPE GEOMEMBRANE LINER IS BASED ON AS-BUILT SURVEY OF THE INSTALLED LINER. THE OUTSIDE EDGE OF THE ASH POND 92 LINER IS APPROXIMATE AND IS BASED ON ESTIMATED "CLAY GRADES" FROM AS-BUILT DRAWING 3 (FOTH & VAN DYKE, 2/6/1990) AND THE ANCHOR TRENCH DESIGN SHOWN ON DESIGN DRAWINGS.
7. THE EARTHWORKS CONTRACTOR WILL EXCAVATE THE LINER ANCHOR TRENCHES ALONG THE SOUTH SIDE OF THE SUBGRADE WORK AREA, ALONG THE NORTH SIDE OF THE NORTH DRAINAGE DITCH WORK AREA, AND AT THE CROSS OVER PIPE WORK AREA IN PREPARATION FOR LINER INSTALLATION.
8. GEOMEMBRANE LINER AT THE INTERSECTION OF THE SOUTHEAST CORNER SUBGRADE TIE-IN TO ASH POND 91 SHALL BE FOLDED BACK AND WEIGHTED WITH SAND BAGS BY THE EARTHWORKS CONTRACTOR IN PREPARATION FOR GEOSYNTHETIC LINER INSTALLATION TO BE COMPLETED.

REFERENCE(S)

1. SITE LOCATION: SECTION 16 AND 17, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
3. EXISTING GROUND IS BASED ON SURVEY AND BATHYMETRY COMPLETED BY BARTLETT AND WEST IN NOVEMBER 2015 AND PROVIDED BY GREAT RIVER ENERGY.
4. CONTOUR INTERVAL IS 1 FOOT.
5. GEOMEMBRANE PANEL LAYOUT DRAWINGS ARE FROM CQA REPORTS FOR ASH POND 91 AND ASH POND 92 CONSTRUCTION PROVIDED BY GRE.

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2016-08-25	ISSUED FOR CONSTRUCTION	RFS	RFS	CCS	TJS
B	2016-08-01	ISSUED FOR CONTRACTOR INFORMATION	RFS	RFS	CCS	TJS
A	2016-06-28	ISSUED FOR BID	RFS	RFS	CCS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT
GOLDER ASSOCIATES, INC.
44 UNION BLVD, SUITE 300
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www.golder.com

PROJECT
ASH POND 91 UPSTREAM RAISE CONSTRUCTION
GEOSYNTHETICS INSTALLATION

TITLE
GEOSYNTHETICS INSTALLATION PLAN VIEW

PROJECT NO.	REV.	3 of 5	DRAWING
1658202	0		3

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

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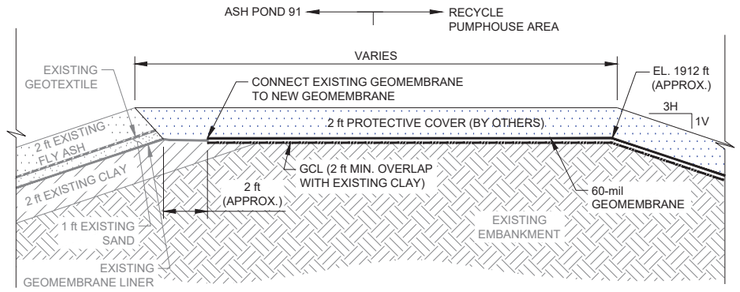
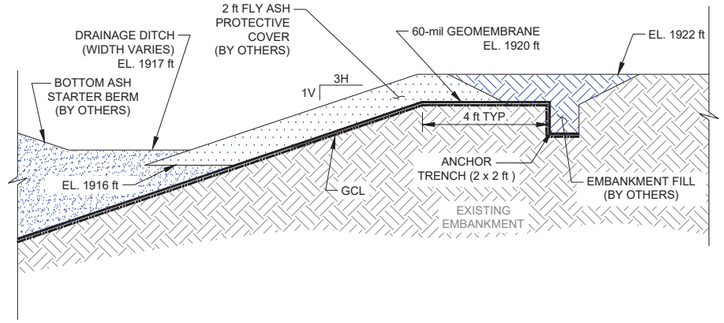
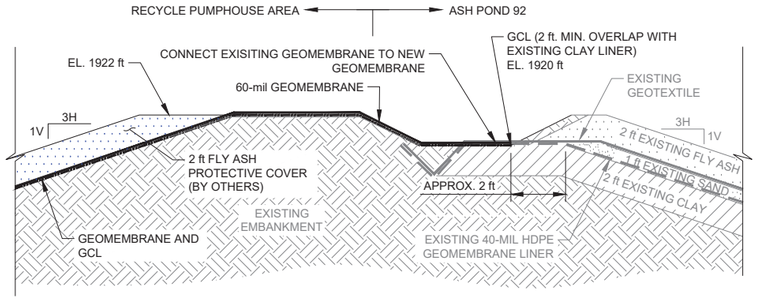


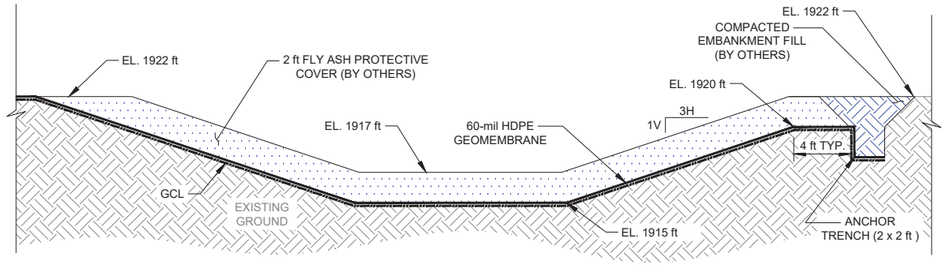
N.T.S. 1/4 ASH POND 91 TO SOUTHEAST CORNER SUBGRADE DETAIL



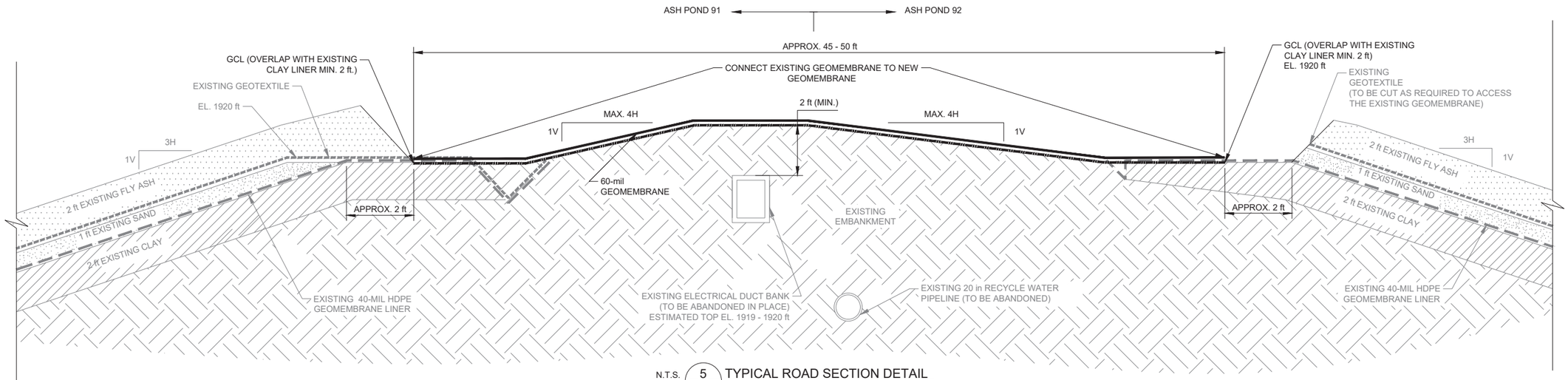
N.T.S. 2/4 SOUTHEAST CORNER ANCHOR TRENCH DETAIL



N.T.S. 3/4 SOUTHEAST CORNER TO ASH POND 92 LINER DETAIL



N.T.S. 4/4 NORTH DRAINAGE DITCH DETAIL



N.T.S. 5/4 TYPICAL ROAD SECTION DETAIL

NOTES

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Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
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A	2016-06-28	ISSUED FOR BID	RFS	RFS	CCS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — STATE OF NORTH DAKOTA

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PROJECT
ASH POND 91 UPSTREAM RAISE CONSTRUCTION
GEOSYNTHETICS INSTALLATION

TITLE
GEOSYNTHETICS DETAILS 1 OF 2

PROJECT No. 1658202 | Rev. 0 | 4 of 5 | DRAWING 4

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

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APPENDIX B

Visual Observations Checklist

INSPECTION CHECKLIST

Facility Name: Upstream Raise 91
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, Todd Stong **Inspection Date:** August 30, 2021
Weather: 85ºF, sunny to partly cloudy with light rain in afternoon, light wind

ITEM	Y	N	N/A	REMARKS
1. Water levels				
a. High water mark			X	El: N/A
b. Current water level			X	El: 1,925 feet
2. Inflow structure (*UR92 cross-over piping and 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 (*not visible at time of inspection)*				
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		
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			Crack in bottom ash noted along west side.
f. CCR downstream slope vegetation		X		
g. Downstream slope seepage/sloughs/cracks/settlement		X		
5. Covered downstream slopes				
a. Erosion			X	
b. Vegetation			X	
c. Rodent burrows			X	
d. Seepage/sloughs/cracks/settlement			X	
e. Damage from vehicles/machinery			X	
6. Perimeter berm				
a. Upstream slope erosion	X			Minor fly ash erosion, perimeter ditch culverts are partially obstructed by sediment.
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 (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			Minor erosion.
k. Downstream slope rodent burrows	X			Many animal burrows, especially noted on north slope.
l. Downstream slope vegetation	X			Good vegetation at most locations, weeds and poor vegetation on recently completed safety berm on north side of facility.
m. Downstream slope seepage/sloughing/cracks/settlement		X		
7. Toe				
a. Vegetation	X			Healthy grass and reeds.
b. Rodent burrows	X			6-inch animal burrows at north slope toe.
c. Settlement		X		
d. Drainage conditions	X			

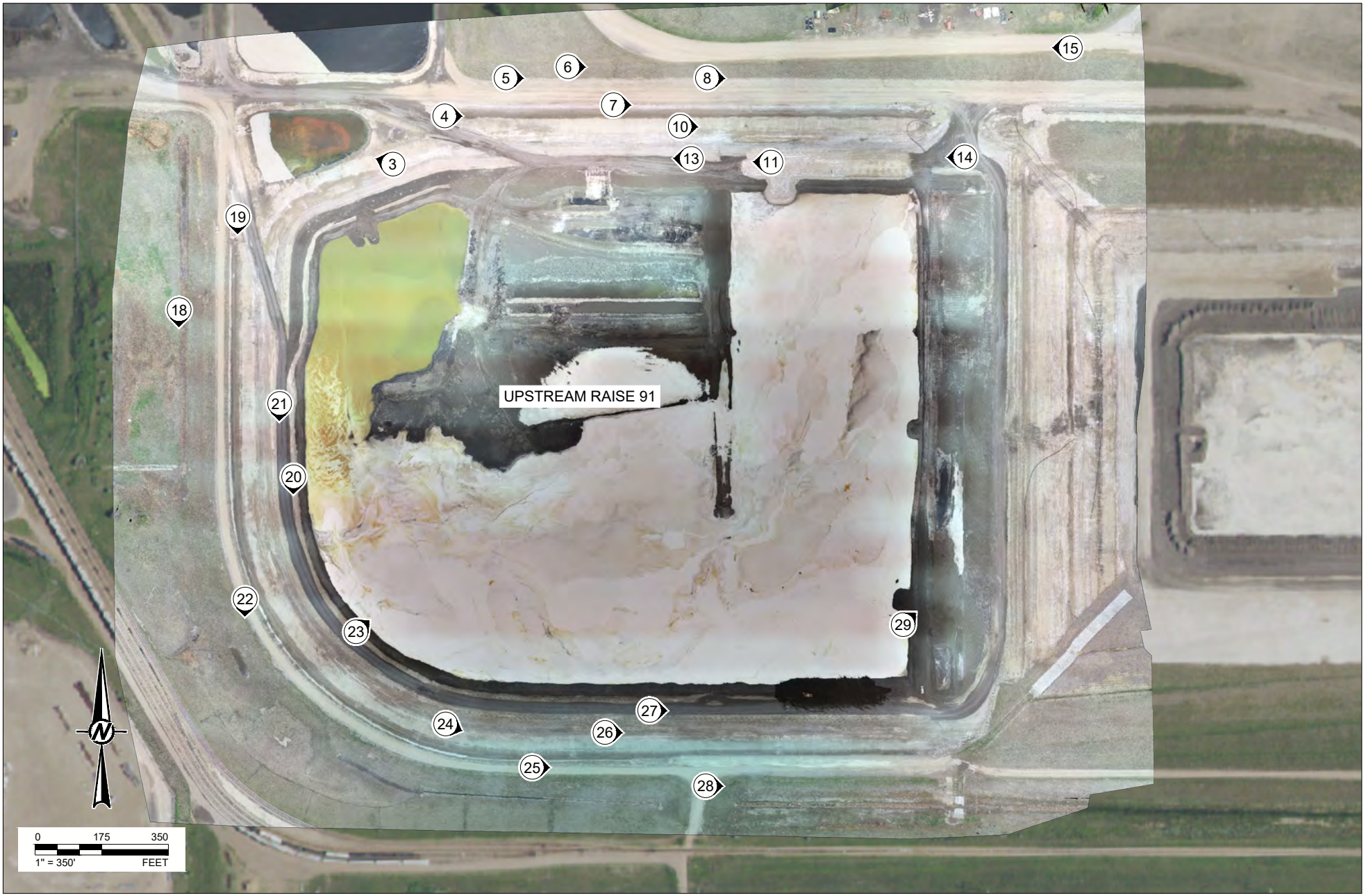
General Remarks: No significant issues. Minor maintenance includes addressing burrows, maintaining fly ash protective cover, maintaining, and removing sediment from inflow and outflow piping and within perimeter ditches, and addressing erosion as observed.

Name of Engineer (Engineer Firm):
Craig Schuettpelz, PE (Golder Associates USA Inc.)
Date: 08/30/2021
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 - UR91.dwg



LEGEND

1 PHOTOGRAPH ID AND LOCATION

NOTE(S)

1. FOREGROUND AERIAL IMAGE FROM GREAT RIVER ENERGY, TAKEN IN 2021.
2. BACKGROUND AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURE AERIAL IMAGERY PROGRAM, TAKEN IN 2020.

GOLDER
MEMBER OF WSP

GREAT RIVER ENERGY - COAL CREEK STATION
2021 ANNUAL CCR FACILITY INSPECTION REPORT
UPSTREAM RAISE 91 - PHOTOGRAPH LOCATIONS

FIGURE 1

Upstream Raise 91

Photograph 1 (North perimeter berm upstream slope and crest)
Haul road and fly ash protective cover on upstream perimeter berm slope in good condition. (IMGP7898.JPG)

Photograph 2 (North perimeter berm upstream slope)
Culvert outlets from north perimeter ditch. (IMGP7901.JPG)

Upstream Raise 91

Photograph 3 (North perimeter berm upstream slope)
Minor erosion of fly ash protective cover on upstream slope. (IMGP7902.JPG)

Photograph 4 (North perimeter berm crest, upstream slope, and CCR dowstream slope)
North perimeter ditch with approximately 6 to 12 inches of standing water and concrete rubble erosion protection near culvert inlets. (IMGP7903.JPG)

Upstream Raise 91

Photograph 5 (North perimeter berm downstream slope and crest)
North safety berm. (IMGP7904.JPG)

Photograph 6 (North perimeter berm downstream slope)
Downstream slope well vegetated with grass, safety berm near crest has mostly weedy vegetation, overall good condition. (IMGP7905.JPG)

Upstream Raise 91

Photograph 7 (North CCR downstream slope)
Minor erosion of fly ash CCR downstream slope and 6 to 12 inches of water present in perimeter ditch.
(IMGP7910.JPG)

Photograph 8 (North perimeter berm downstream slope)
Animal burrows (approximately 6 inches diameter) (IMGP7911.JPG)

Upstream Raise 91

Photograph 9 (North perimeter berm downstream slope)
Irregular grades from safety berm construction and weedy vegetation. (IMGP7912.JPG)

Photograph 10 (North CCR downstream slope)
Vibrating wire piezometer datalogger box. (IMGP7913.JPG)

Upstream Raise 91

Photograph 11 (North CCR crest)
Standpipe piezometer PZ-15, north side. (IMGP7914.JPG)

Photograph 12 (North CCR upstream slope)
CCR upstream slope and FGD deposition area, good condition. (IMGP7923.JPG)

Upstream Raise 91

Photograph 13 (North CCR crest)
Bottom ash and fly ash haul road, good condition. (IMGP7925.JPG)

Photograph 14 (North CCR downstream slope)
Culvert inlet from Upstream Raise 92 north perimeter ditch, free from obstructions. (IMGP7926.JPG)

Upstream Raise 91

Photograph 15 (North perimeter berm downstream slope)
Good vegetation on downstream slope. (IMGP7930.JPG)

Photograph 16 (West perimeter berm crest)
Perimeter berm crest, gravel in good condition. (IMGP2787.JPG)

Upstream Raise 91

Photograph 17 (West perimeter berm downstream slope)
Well-vegetated downstream slope, good condition. (IMGP2788.JPG)

Photograph 18 (West perimeter berm downstream slope and toe)
Standing water and cattails at the toe. (IMGP2789.JPG)

Upstream Raise 91

Photograph 19 (West CCR downstream slope)
Perimeter channel culverts partially obstructed by erosion of fly ash and bottom ash. (IMGP2790.JPG)

Photograph 20 (West CCR upstream slope)
Upstream bottom ash slope and FGD material pool. (IMGP2793.JPG)

Upstream Raise 91

Photograph 21 (West CCR crest)
Cracks in bottom ash on crest. (IMGP2795.JPG)

Photograph 22 (Southwest perimeter berm downstream slope)
Standing water in perimeter ditch at toe of slope. (IMGP2798.JPG)

Upstream Raise 91

Photograph 23 (Southwest CCR upstream slope)
Panoramic view of Upstream Raise 91 from the southwest corner. (IMGP2801.JPG)

Photograph 24 (Southwest perimeter berm downstream slope and toe)
Well-vegetated downstream slope and perimeter ditch concrete channel. (IMGP2802.JPG)

Upstream Raise 91

Photograph 25 (South perimeter berm crest)
Perimeter berm crest, gravel road, good condition. (IMGP2803.JPG)

Photograph 26 (South CCR downstream slope)
Fly ash slope, good condition. (IMGP2804.JPG)

Upstream Raise 91

Photograph 27 (South CCR crest)
Bottom ash crest, good condition. (IMGP2805.JPG)

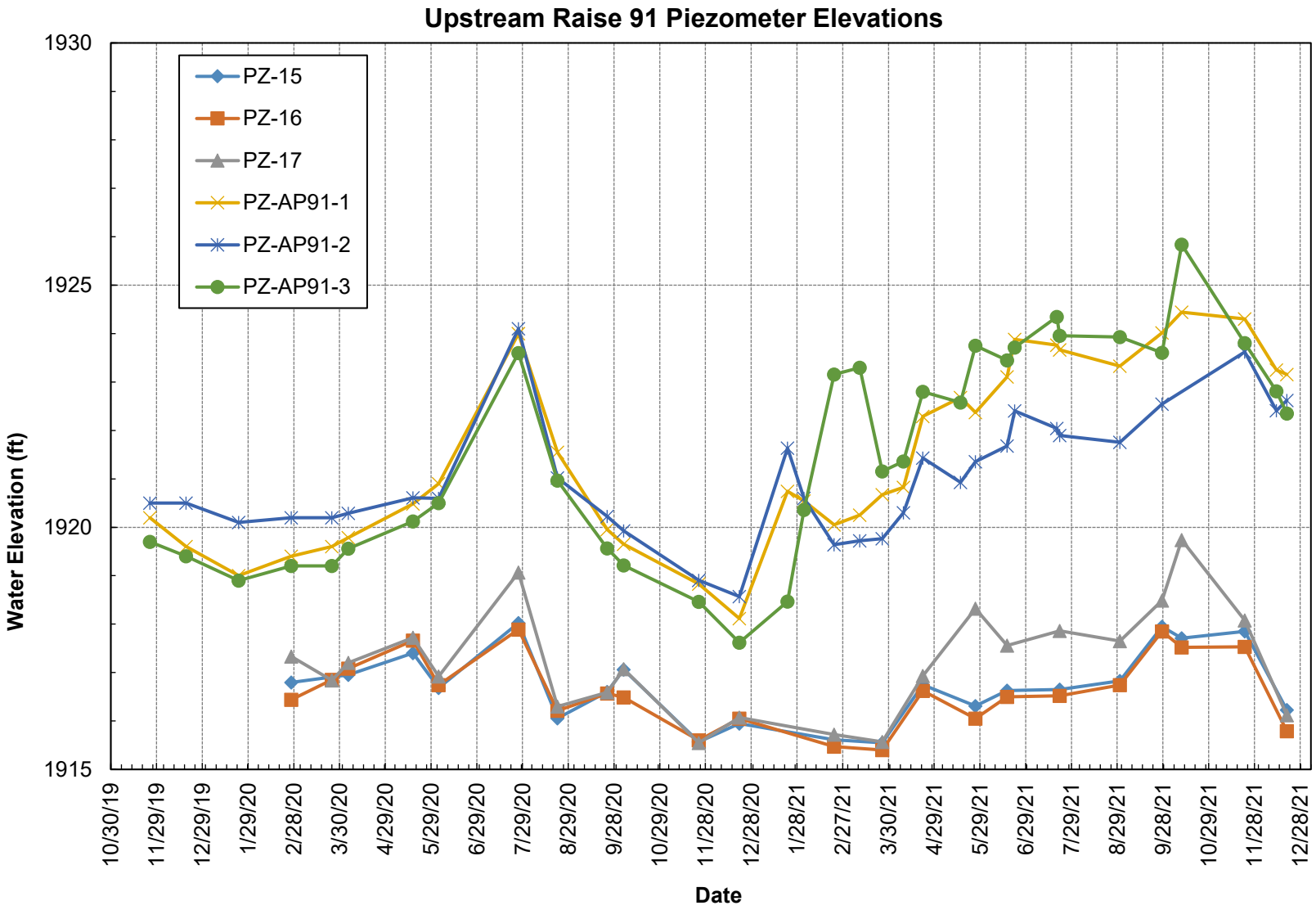
Photograph 28 (Southeast perimeter berm downstream slope and toe)
Well-vegetated downstream slope and toe, good condition. (IMGP2807.JPG)

Upstream Raise 91

Photograph 29 (East CCR crest)
Seepage piping isolation valve connection to Upstream Raise 92, good access via bottom ash placement.
(IMGP2811.JPG)

APPENDIX D

Piezometer Information



*Erroneous data was noted on October 11, 2021 at PZ-AP91-2 and was excluded from this reporting

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