HISTORY OF CONSTRUCTION

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Drains Pond System CCR Surface Impoundment
Coal Creek Station
Great River Energy

Submitted To: Great River Energy
Coal Creek Station
2875 Third Street SW
Underwood, North Dakota 58576

Submitted By: Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, Colorado 80228

October 13, 2016 **1649586**

Golder Associates

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1.0 INTRODUCTION

1.1 Purpose

Golder Associates Inc. (Golder) has prepared the following History of Construction for the Drains Pond System CCR surface impoundment (Drains Pond System) at Great River Energy's (GRE's) Coal Creek Station (CCS). The Environmental Protection Agency's (EPA's) Coal Combustion Residual (CCR) Rule, 40 Code of Federal Regulations (CFR) Part 257, promulgated April 17, 2015 and effective October 19, 2015, requires compilation of the information specified in §257.73(c) to detail the construction history of CCR facilities no later than October 17, 2016 for facilities with either height of 5 feet or more and a storage volume of 20 acre-feet, or a height of more than 20 feet.

1.2 Site Background

CCS is located in McLean County, approximately 10 miles northwest of Washburn, North Dakota. The Drains Pond System consists of three cells. The Drains Pond System has approximately 17.5 acres of lined surface impoundment, of which approximately 7 acres was composite-lined in 1993. The remainder of the Drains Pond System was composite-lined in 2015. The Drains Pond System is used as a dewatering/storage facility for CCRs including bottom ash, pulverizer rejects, and economizer ash. It is also part of the plant process water storage inventory, acting as a clarifier for process water conveyed with CCRs and plant drains that enter the impoundment. Bottom ash, pulverizer rejects, and economizer ash are conveyed to the west cell with the center and east cells acting as clarifier and process water control facilities. The center and east cells do not directly receive CCR materials

2.0 OWNER, OPERATOR, AND UNIT IDENTIFICATION (40 CFR §257.73(C)(1)(I))

CCS (and the Drains Pond System) is currently owned and operated by Great River Energy (GRE).

Corporate Address:

Great River Energy
12300 Elm Creek Boulevard
Maple Grove, Minnesota 55369

Coal Creek Station Address:

Great River Energy
Coal Creek Station
2875 Third Street SW
Underwood, North Dakota 58576

The North Dakota Department of Health (NDDH) Division of Waste Management is the environmental regulatory body for the CCR facilities at CCS. The Drains Pond System is currently permitted with the North Dakota Department of Health (NDDH) under Permit Number 0033.

3.0 HISTORY OF CONSTRUCTION

3.1 Location of Unit (§257.73(c)(1)(ii))

The Drains Pond System is located in Section 17 of Township 145 North, Range 82 West, in McLean County, North Dakota. Figure 1 shows the location of the Drains Pond System on the most recent USGS topographic map, and Figure 2 shows the location of the Drains Pond System on a recent aerial photograph.

3.2 Purpose (§257.73(c)(1)(iii))

The Drains Pond System is used as a dewatering/storage facility for CCRs including bottom ash, pulverizer rejects, and economizer ash. It is also part of the plant process water storage inventory, acting as a clarifier for process water conveyed with CCRs and plant drains that enter the impoundment.

3.3 Watershed Information (§257.73(c)(1)(iv))

The Drains Pond System is located within the following Hydrologic Unit (Watershed-Based Performance Management Using Hydrologic Unit, ND 2016) per the Natural Resources Conservation Service (NRCS): Hydrologic Unit 12 Subwatershed 101301010701 Weller Slough-Coal Lake Coulee (40,582 acres).

3.4 Foundation Information (§257.73(c)(1)(v))

The location of the Drains Pond System was originally characterized by Burns & McDonnell in 1973. A geotechnical investigation was completed by Black & Veatch in 1977 and a hydrogeologic study was performed for CCS by Barr Engineering in 1982. The foundation soils of the Drains Pond System consist of native soils (sandy and silty-clay) and embankment fill materials sourced from nearby native soils (sandy and silty clay). The area was disturbed during original plant construction in the late 1970's, which resulted in the presence of fill materials near the surface. Sandy lean clays dominant the existing natural soils with an effective cohesion of 500 pounds per square foot (psf) and an effective friction angle of 19 degrees (based on shear strength testing).

Four piezometers and one monitoring well were installed near the Drains Pond System in June 2014. The geotechnical investigation report summarizing these borings is included in the 2015 permit modification (GRE 2015a) and is summarized below. In general, borings directly under the proposed area for the Drains Pond System (DP-A and DP-D) show approximately 15 feet of "fill" material underlain by lean clay and/or fat clay consistent with the native soils.

Geotechnical testing was performed on samples collected during the 2014 field investigations. Atterberg Limits tests on grab samples showed soils between depths of 5 feet and 15 feet in DP-A and DP-D (directly under the proposed Drains Pond expansion) had plasticity indices ranging from 30 to 51. Moisture/Density testing was also evaluated for grab samples from DP-A and DP-D. Maximum dry densities ranged from 68 pounds per cubic foot (pcf) to 104 pcf with optimum moisture contents between 18% and 40%.

3.5 Materials and Site Preparation (§257.73(c)(1)(vi))

The Drains Pond System encompasses three cells: west cell, center cell, and east cell.

3.5.1 East Cell

The east cell of the Drains Pond System was originally part of the South Ash Pond, which was built in the late 1970s on a foundation of re-compacted site soils (glacial tills) and put into service in 1979. In 1981, the South Ash Pond was taken out of service to reconstruct the clay liner and was put back into service from 1982 until 1987, at which point CCR materials were removed. The South Ash Pond was then divided into Ash Pond 91 and Ash Pond 92 in 1988 and the east cell of the Drains Pond was separated from Ash Pond 91 by an embankment.

The east cell of the Drains Pond System was lined in 1993 and the liner system consists of an upper component of 40-mil thick high density polyethylene (HDPE) geomembrane liner and a lower component of a minimum of 2 feet of compacted clay (CPA 1993). Clay fill was placed a minimum of two feet thick in horizontal loose lifts of no more than 7 inches in thickness and compacted to above the optimum moisture content and to at least 95% maximum density as determined from a Standard Proctor (CPA 1993). Testing conducted on the clay liner during construction consisted of grain size distribution, Proctor compaction curves, Atterberg limits, and field density and moisture testing. Field density measurements ranged between 95% and 100%. The liner is overlain with 1 foot of sand.

3.5.2 Center Cell

The center cell of the Drains Pond System was constructed in 2015 on native soils (sandy and silty-clay) and embankment fill materials sourced from nearby native soils (sandy and silty clay). The embankments of the facility were constructed of native soils compacted in six-inch loose lifts to 95% of the standard Proctor compaction effort and between +3% and -3% of the standard Proctor optimum moisture content. The center cell of the Drains Pond System has a bottom liner system consisting of (from bottom to top, Golder 2016c):

- 2 feet of compacted clay rich material with a hydraulic conductivity of $1x10^{-7}$ cm/sec
- 60-mil HDPE geomembrane liner
- 2 feet of protective cover

Compacted clay rich material was compacted in 6-inch loose lifts to a minimum of 95% of the standard Proctor compaction effort at a minimum degree of saturation of 75% per project specifications.

3.5.3 West Cell

The west cell of the Drains Pond System was constructed in 2015 on native soils (sandy and silty-clay) and embankment fill materials sourced from nearby native soils (sandy and silty clay). The embankments of the facility were constructed of native soils compacted in 6-inch loose lifts to 95% of the standard Proctor

compaction effort and between +3% and -3% of the standard Proctor optimum moisture content. The west cell of the Drains Pond System has a bottom liner system consisting of (from bottom to top):

- 2 feet of compacted clay rich material with a hydraulic conductivity of $1x10^{-7}$ cm/sec
- 60-mil HDPE geomembrane liner
- Geocomposite drainage layer
- Geosynthetic clay liner (GCL)
- 60-mil HDPE geomembrane liner
- 2 feet of protective cover

Compacted clay rich material was compacted in 6-inch loose lifts to a minimum of 95% of the standard Proctor compaction effort at a minimum degree of saturation of 75% per project specifications.

3.6 Detailed Dimensional Drawings (§257.73(c)(1)(vii))

Permit Drawings for the Drains Pond System are included in Appendix A and show facility dimensions, drainage pathways, and facility surroundings (CPA/UPA 1992 and Golder 2015a).

The center and east cells of the Drains Pond System operate with a minimum freeboard of approximately 2 feet to the top of the liner system (4 feet to the top of the embankment) and a design freeboard of approximately 6 feet. The west cell of the Drains Pond System operates with a minimum freeboard of approximately 2 feet to the top of the liner system (3 feet to the top of the embankment) and a design freeboard of approximately 4 feet.

A run-on analysis was performed as part of the inflow design flood control system plan (Golder 2016a) indicating that the Drains Pond System is operated with adequate freeboard to contain the 24-hour, 100-year storm event.

3.7 Instrumentation (§257.73(c)(1)(viii))

There is currently no instrumentation in the Drains Pond System.

3.8 Area-Capacity Curves (§257.73(c)(1)(ix))

Elevation-capacity information for the Drains Pond System during normal operation is shown in Figure 3. Areas were calculated using as-built topography and design grades. CCR capacities are approximate and were calculated using an average end area method. CCR capacities shown on Figure 3 do not include CCRs that will be placed above the embankments of the cells of the Drains Pond System after the facility is de-watered and closed (see Closure/Post-Closure Plan, Golder 2016b). At closure, the total inventory of CCR in the Drains Pond System is approximately 417,000 cubic yards: 126,000 cubic yards in the west cell, 63,000 cubic yards in the center cell, and 228,000 cubic yards in the east cell.

3.9 Spillways and Diversion Features (§257.73(c)(1)(x))

There are no spillways associated with the Drains Pond System. Existing controls are in place to monitor water levels in the Drains Pond System and limit potential overtopping of the impoundment. The operational inflow to the facility (besides precipitation) includes hydraulically conveyed bottom ash, pulverizer rejects, and economizer ash material into the west cell, plant drains water into the center cell, and process water and run-off from the Upstream Raise CCR Surface Impoundment and Ash Pond 91 CCR Surface Impoundment into the east cell. Water from the west cell decants through pipelines to the center cell. These pipes are designed to maintain the west cell of the Drains Pond System at a constant elevation approximately two feet below the top elevation of the geomembrane liner when the bottom ash conveyance system is operating at capacity. The center cell and east cell of the Drains Pond System are connected via three 24-inch cross-over pipelines, which are designed to maintain these cells at approximately the same elevation during maximum expected flow conditions (i.e., when the bottom ash conveyance system is active).

Existing controls in place to monitor the water levels in the Drains Pond System include monthly observations of water levels by CCS lab personnel, and daily observations by CCS operations personnel. Additional observations are noted by GRE employees familiar with site ash conveyance and handling equipment and operations of the hydraulic ash conveyance systems. After large storm events, CCS personnel evaluate site conditions, including impoundment water levels, and are able to adjust operations to maintain water levels below design maximum elevations. Should water levels within the Drains Pond System reach above desired operating levels, GRE has operating procedures to pump water to the plant for reuse, to site evaporation ponds or to an underground injection well.

3.10 Construction Specifications and Provisions (§257.73(c)(1)(xi))

The following documents contain the specifications, construction quality assurance reports, and provisions for operation of the Drains Pond System.

- The final report for the foundation, liner, and embankment construction completed in 1993 on the east cell of the Drains Pond System (CPA 1993).
- The geomembrane quality assurance services documentation performed in 1993 on the east side of the Drains Pond System (Golder 1993).
- The construction specifications for the 2015 Coal Combustion Residual Facility Construction (Golder 2015b).
- The construction quality assurance documentation for the foundation, liner and embankment construction completed in 2015 (Golder 2016c),
- The operations plan for Drains Pond, Evaporation Ponds 91, 92, 93, and 94 (Golder 2015c).

3.11 Record of Structural Instability (§257.73(c)(1)(xii))

No record of structural instability has been noted for the Drains Pond System. Weekly Inspections are performed by site personnel and annual inspections are performed by a registered professional engineer.

4.0 CLOSING

Golder Associates Inc. has prepared the above History of Construction for the Drains Pond System CCR Surface Impoundment at Great River Energy's Coal Creek Station. Based on our review of the available information, to the extent feasible, this report provides the information required by 40 CFR § 257.73(c)(i) through (xii), as related to the construction of the Drains Pond System CCR Surface Impoundment.

GOLDER ASSOCIATES INC.

Todd Stong, PE
Senior Engineer/Associate

Craig Schuettpelz, PE
Senior Project Engineer

TS/CS/rjg

5.0 REFERENCES

Barr. 1982. *Seepage and Stability Analysis.* Prepared for Cooperative Power Association, February.

Black & Veatch. 1978. *South Ash Pond Geotechnical Data*. March.

Burns & McDonnell. 1973. Report on the Environmental Analysis for a North Dakota Power Supply Project. July.

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CPA/UPA. 1992. *Cooperative Power Association, United Power Association – 1992 Ash Disposal Drawings, Issued for Bid.* January.

EPA. 2015. Environmental Protection Agency, Code of Federal Regulations Title 40 Parts 257 and 261: Hazardous and Solid Waste Management System; *Disposal of Coal Combustion Residuals from Electric Utilities*. April 17.

Golder. 1993. *Geomembrane Quality Assurance Services – Ash Pond 91 and Drains Pond.* November.

Golder. 2015a. *Permit Modification Document (Drains Pond Expansion) Permit No. SP-033.* February.

Golder. 2015b. *Construction Specifications for Great River Energy Coal Creek Station 2015 Coal Combustion Residual Facility Construction.* May.

Golder. 2015c. *Operations Plan for Drains Pond, Evaporation Ponds 91, 92, 93, and 94 – Permit No. SP-033*. February.

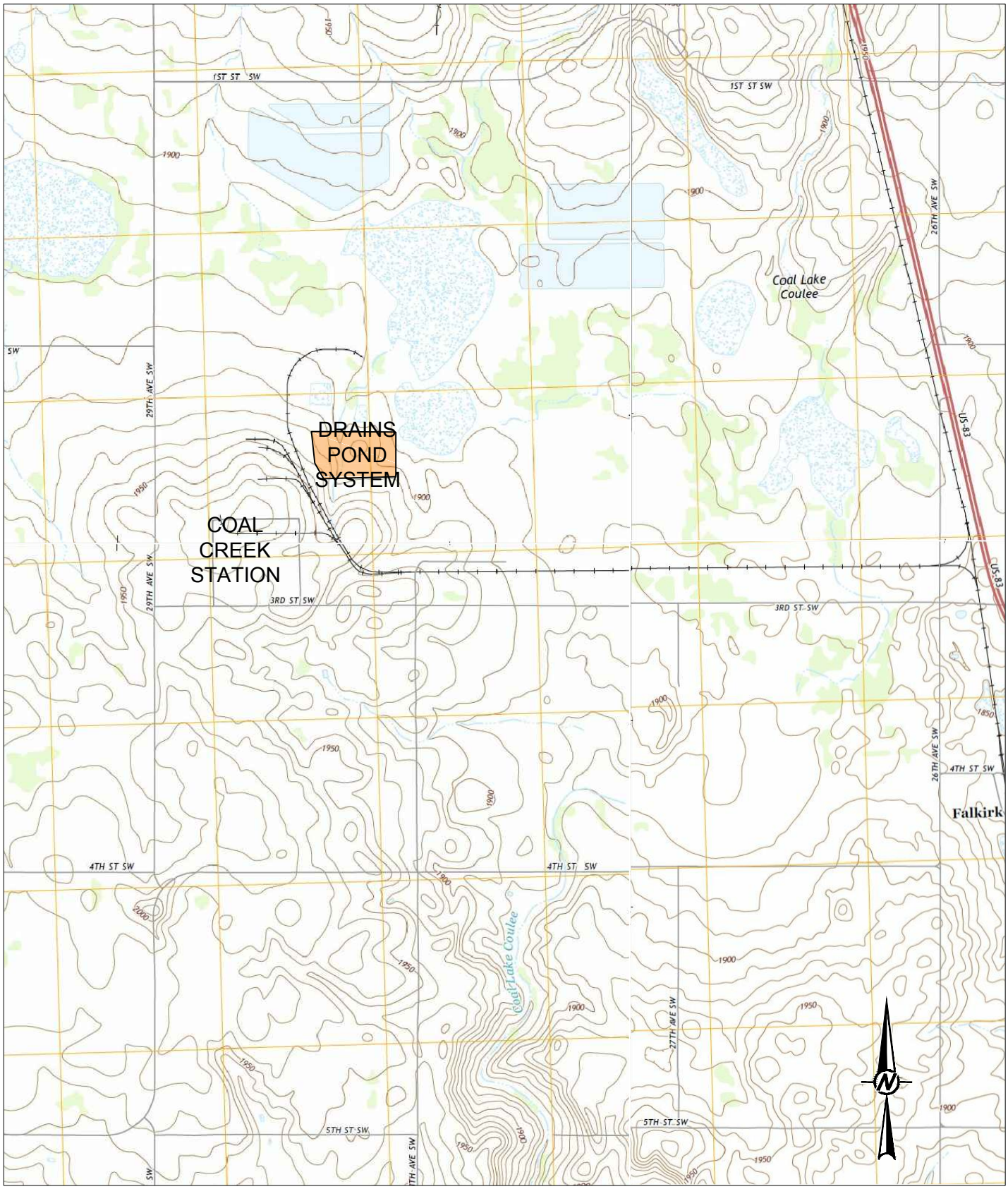
Golder. 2016a. *Inflow Design Flood Control System Plan, Drains Pond System CCR Surface Impoundment*. October.

Golder. 2016b. *Closure and Post-Closure Plan, Drains Pond System CCR Surface Impoundment*. October.

Golder. 2016c. *Construction Quality Assurance Documentation and Certification – Drains Pond Expansion*. June.

ND. 2016. *North Dakota Hub Explorer, North Dakota Geographic Information Systems*. Retrieved: September 30, from https://www.nd.gov/itd/statewide-alliances/gis.

FIGURES



REFERENCES

1. TOPOGRAPHIC MAP WAS COMPILED FROM THE FOLLOWING USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLES:
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   WASHBURN NE, NORTH DAKOTA (2014)
   WASHBURN, NORTH DAKOTA (2014)
   WASHBURN SW, NORTH DAKOTA (2014)

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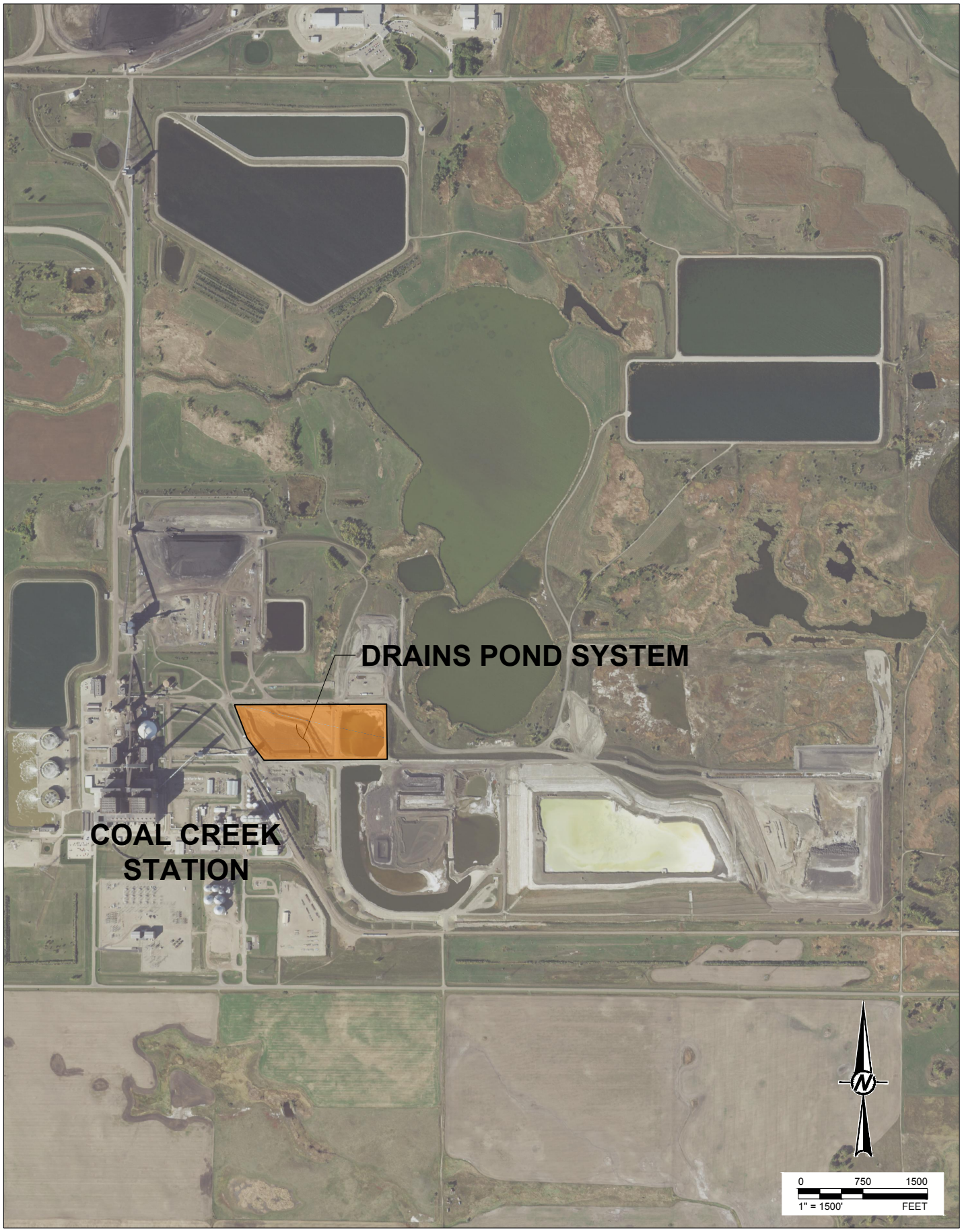
DRAINS POND SYSTEM SITE LOCATION (USGS TOPOGRAPHIC MAPS)

FIGURE 1



DRAINS POND SYSTEM SITE LOCATION (AERIAL PHOTOGRAPH)

FIGURE 2

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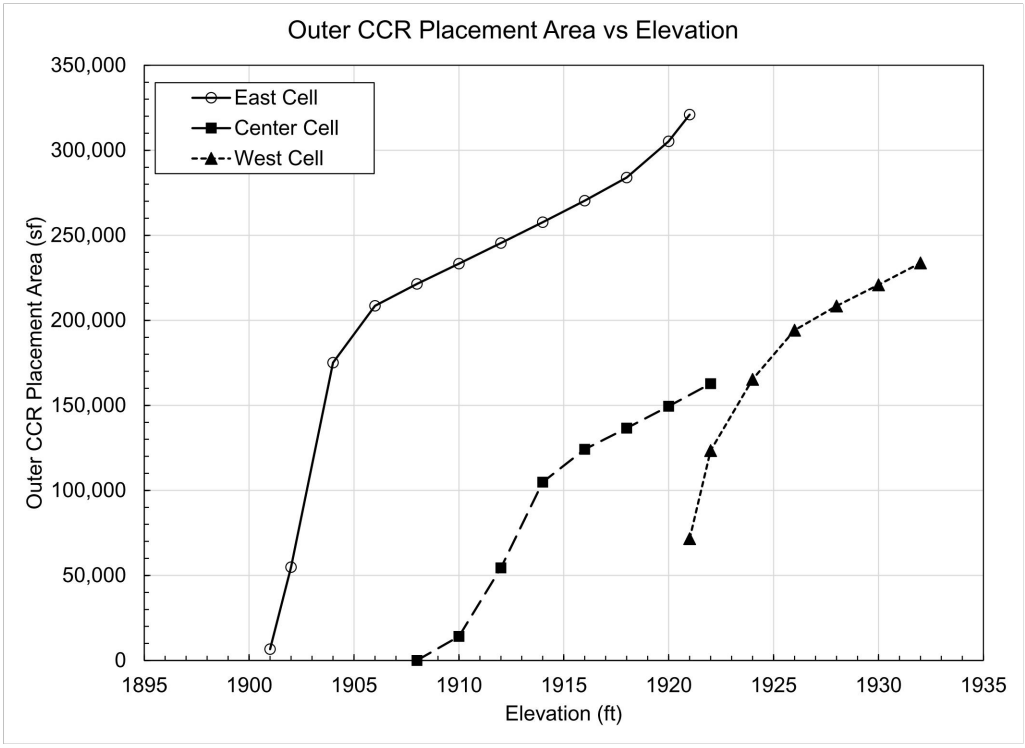
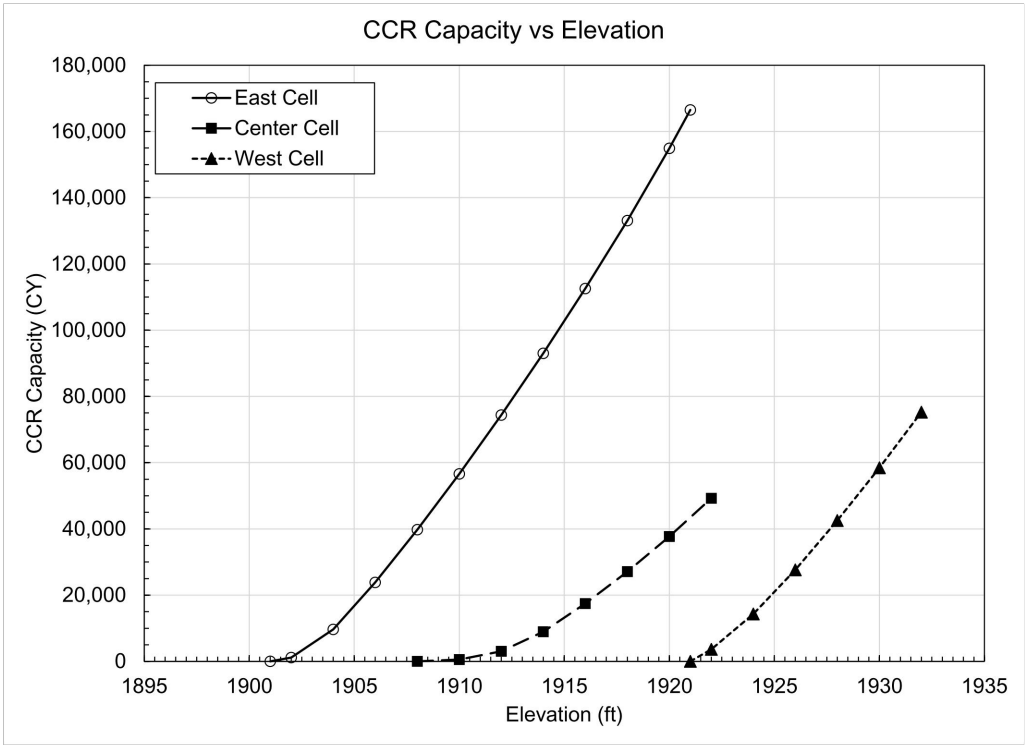
Path: \\Denver.golder.gds\projects\16\JOBS\1649686 GRE CCS\CCR Rules\History of Construction\Drains Pond\ | File Name: Figures.dwg





DRAINS POND SYSTEM AREA/CAPACITY INFORMATION

FIGURE 3

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APPENDIX A
DESIGN DRAWINGS

APPENDIX A-1
DRAINS POND SYSTEM DESIGN DRAWINGS (CPA/UPA 1992)

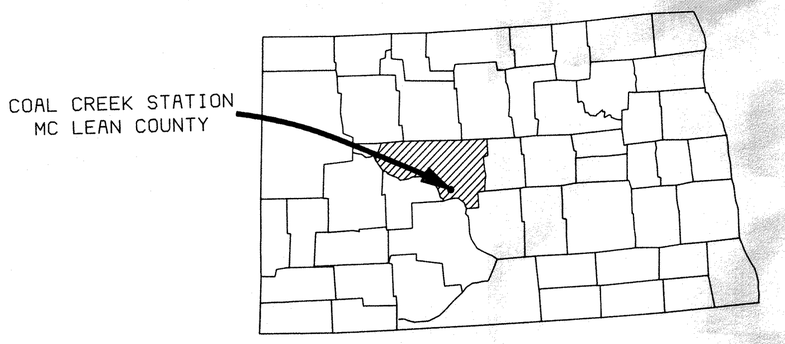
COOPERATIVE POWER ASSOCIATION

UNITED POWER ASSOCIATION

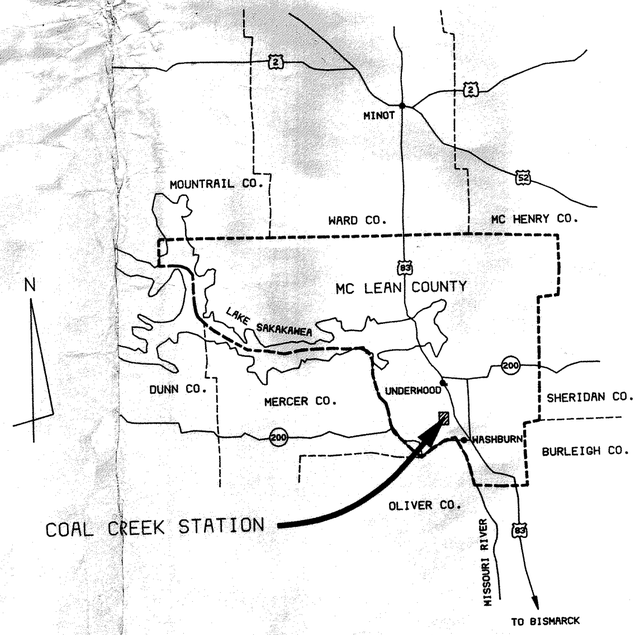
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

COOPERATIVE POWER ASSOCIATION
14615 LONE OAK ROAD
EDEN PRAIRIE, MINNESOTA 55344

UNITED POWER ASSOCIATION
HIGHWAY 10
ELK RIVER, MINNESOTA 55330



NORTH DAKOTA



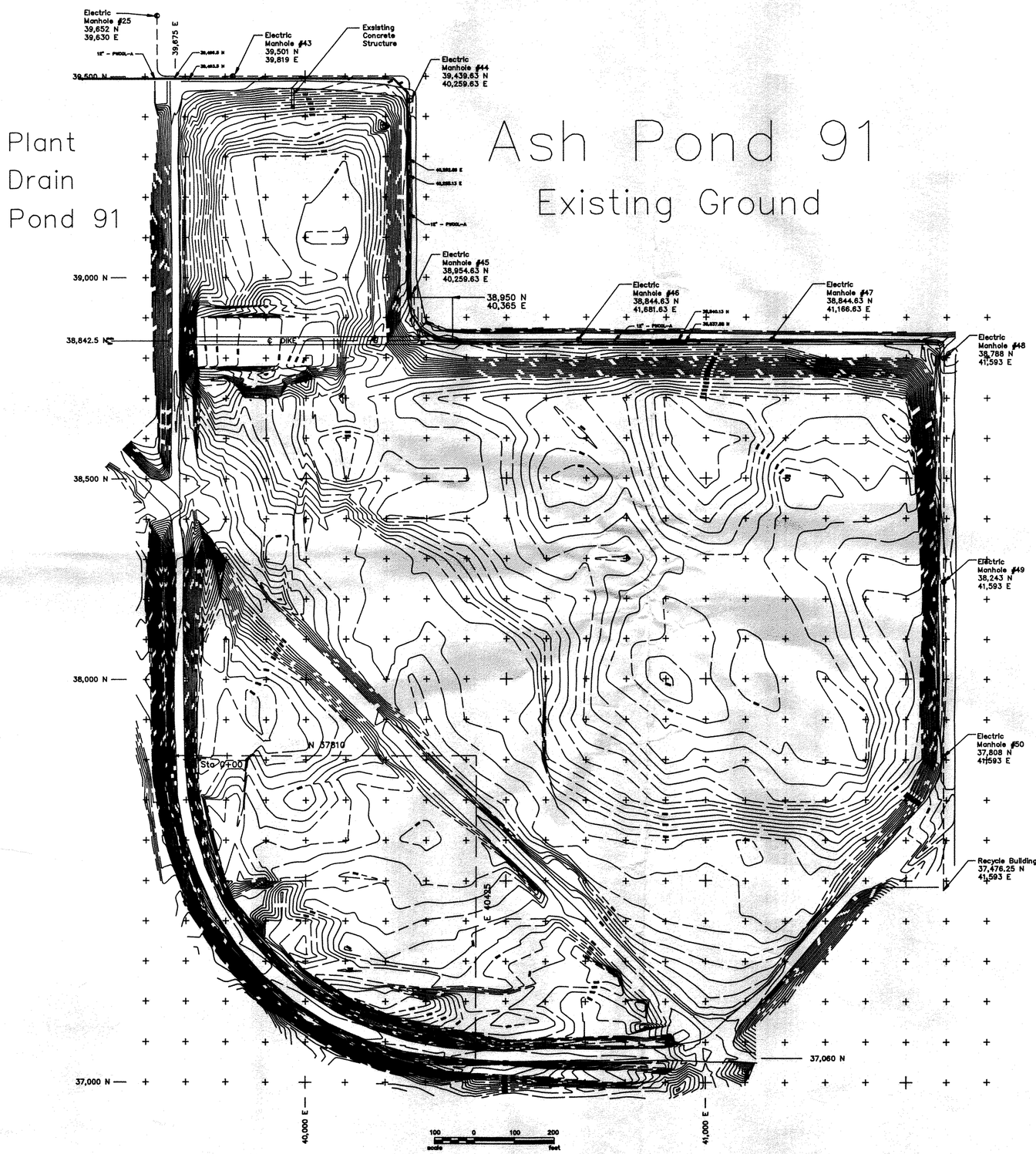
SITE LOCATION MAP

DRAWING NO.	DRAWING TITLE
92G213-1	EXISTING GROUND EVAPORATION POND 93
92G213-2	LAYOUT - TOP OF SUBGRADE EVAPORATION POND 93
92G213-3	LAYOUT - TOP OF BROWN CLAY EVAPORATION POND 93
92G213-4	LAYOUT - TOP OF GRAY CLAY EVAPORATION POND 93
92G213-5	LAYOUT - TOP OF SAND EVAPORATION POND 93
92G213-6	LAYOUT - TOP OF BOTTOM ASH EVAPORATION POND 93
92G213-7	EXISTING GROUND ASH POND 91
92G213-8	LAYOUT - TOP OF SUBGRADE ASH POND 91
92G213-9	LAYOUT - TOP OF BROWN CLAY ASH POND 91
92G213-10	LAYOUT - TOP OF GRAY CLAY ASH POND 91
92G213-11	LAYOUT - TOP OF SAND ASH POND 91
92G213-12	LAYOUT - TOP OF ROCK ASH POND 91
92G213-13	LAYOUT - TOP OF BOTTOM ASH ASH POND 91
92G213-14	LAYOUT - DRAIN SYSTEM ASH POND 91
92G213-15	PIPE ROUTING ALONG POND 94 TO POND 93
92G213-16	TYPICAL SECTIONS AND DETAILS
92G213-17	TYPICAL SECTIONS AND DETAILS
92G213-18	PLAN VIEW-EVAP. POND 92 OUTLET & SEWAGE LINE DETAIL
92G213-19	DETAILS MISCELLANEOUS
92G213-20	DEWATERING, PERFORATED PIPE DETAILS

FOR BID ONLY

PROJECT TITLE:
1992 ASH DISPOSAL

WORKORDER NO.:
92G213



2 12,000 C.Y. OF RIP RAP IS STOCKPILED AT APPROXIMATELY 39,000 E AND 39,000 N.

1 EXISTING ASH IN POND 91 TO BE REMOVED UNDER AN EXISTING CONTRACT. AFTER REMOVAL IS COMPLETE, A SURVEY OF GROUND CONDITIONS WILL BE COMPLETED PRIOR TO CONSTRUCTION OF LINER SYSTEM.

GENERAL NOTES

FOR BID ONLY

DRAWING NO. | REVISION | REFERENCE DRAWINGS

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

DWN. BAK CHK.
DATE 12/30/91
W/O 92G213

COOPERATIVE POWER

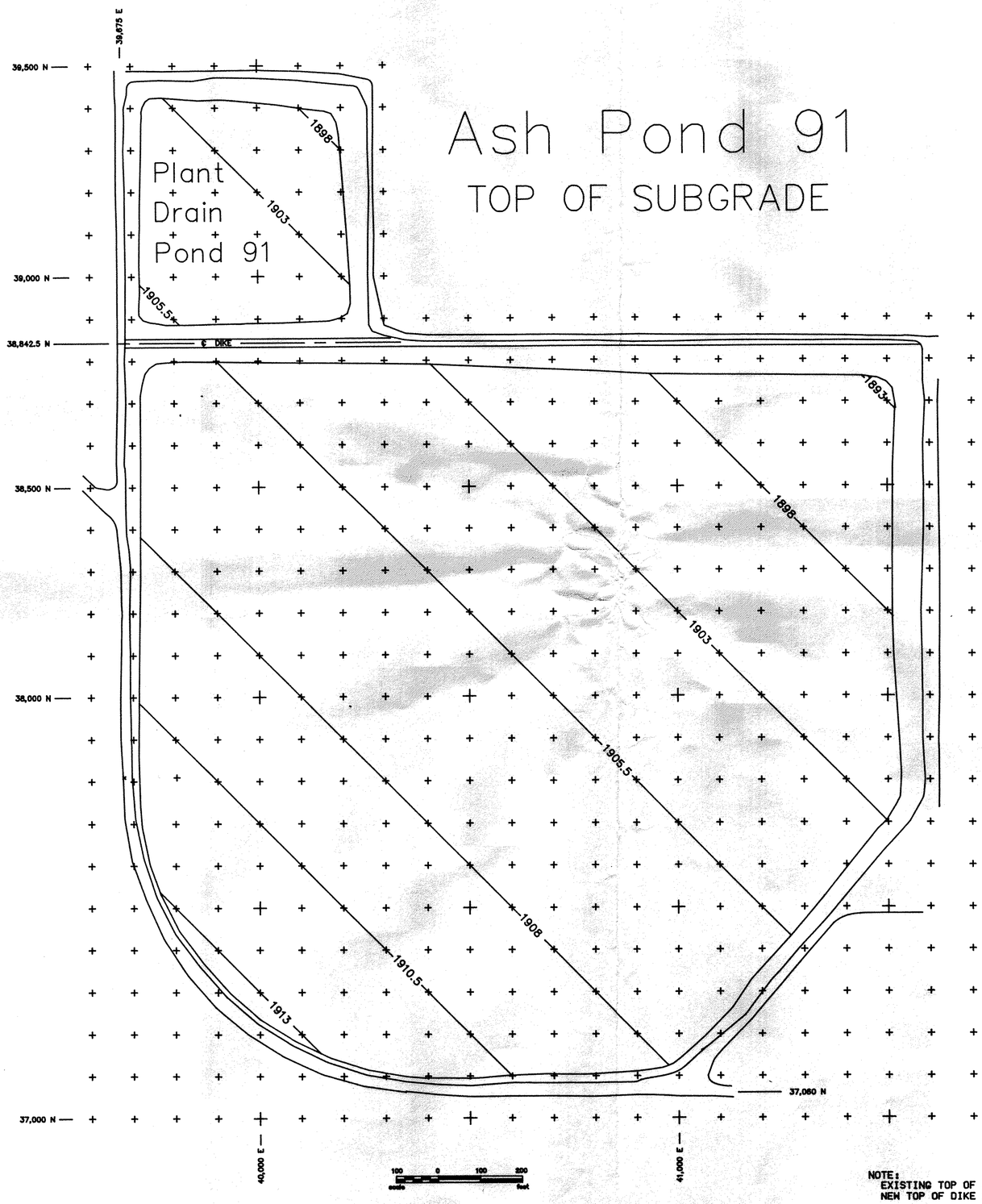
EXISTING GROUND
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO. 92G213-7

Ash Pond 91

TOP OF SUBGRADE



NOTE:
EXISTING TOP OF DIKE 1920'
NEW TOP OF DIKE 1922'

GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

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01/09/92	ISSUED FOR BID	0	BK	AS	AS

DWN. BAK CHK.
DATE 12/30/91
W/O 920213

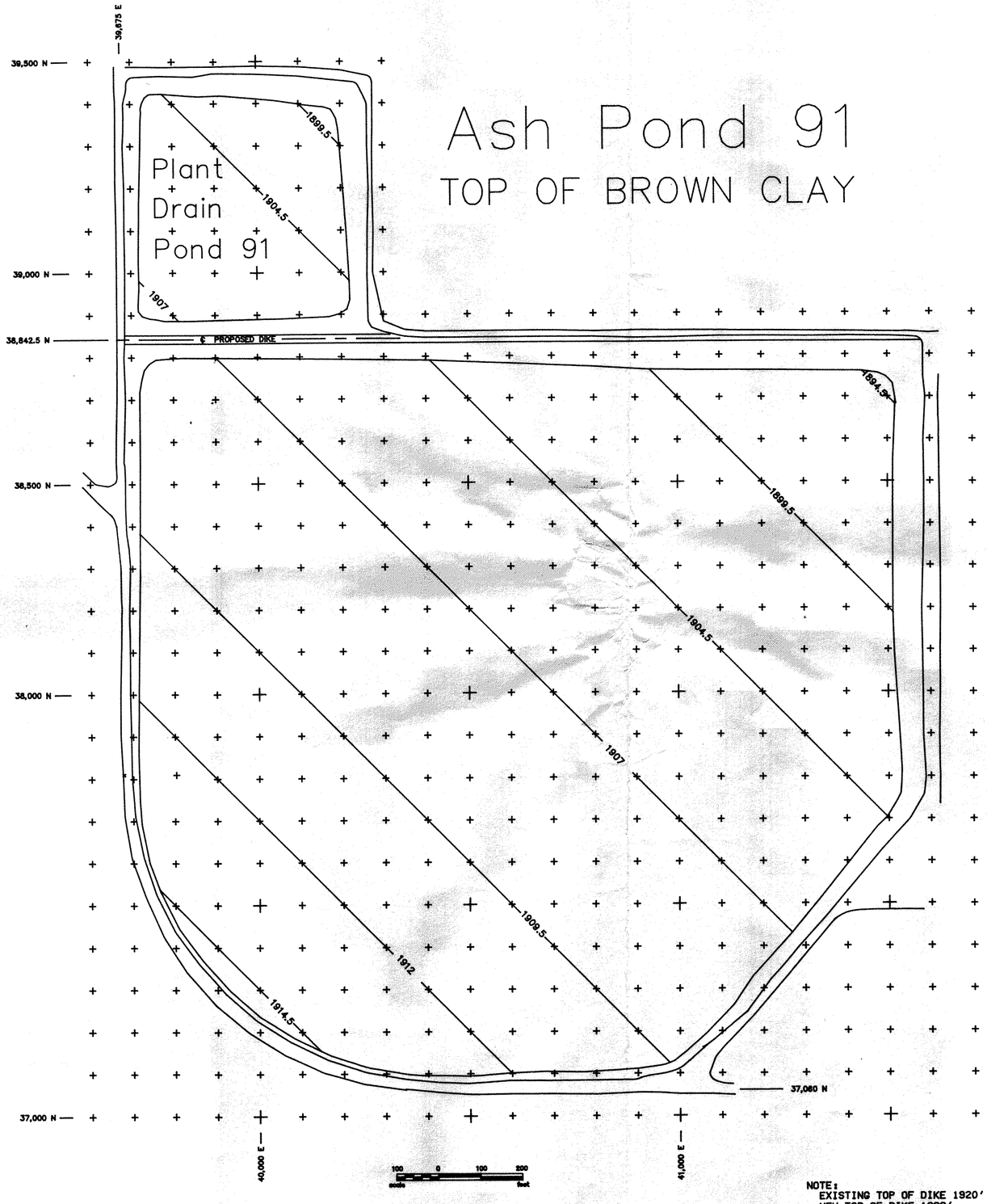
LAYOUT - TOP OF SUBGRADE
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO.
92G213-8

Ash Pond 91

TOP OF BROWN CLAY



NOTE:
EXISTING TOP OF DIKE 1920'
NEW TOP OF DIKE 1922'

GENERAL NOTES

FOR BID ONLY

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0	01/08/92	ISSUED FOR BID	BK	AS	AS

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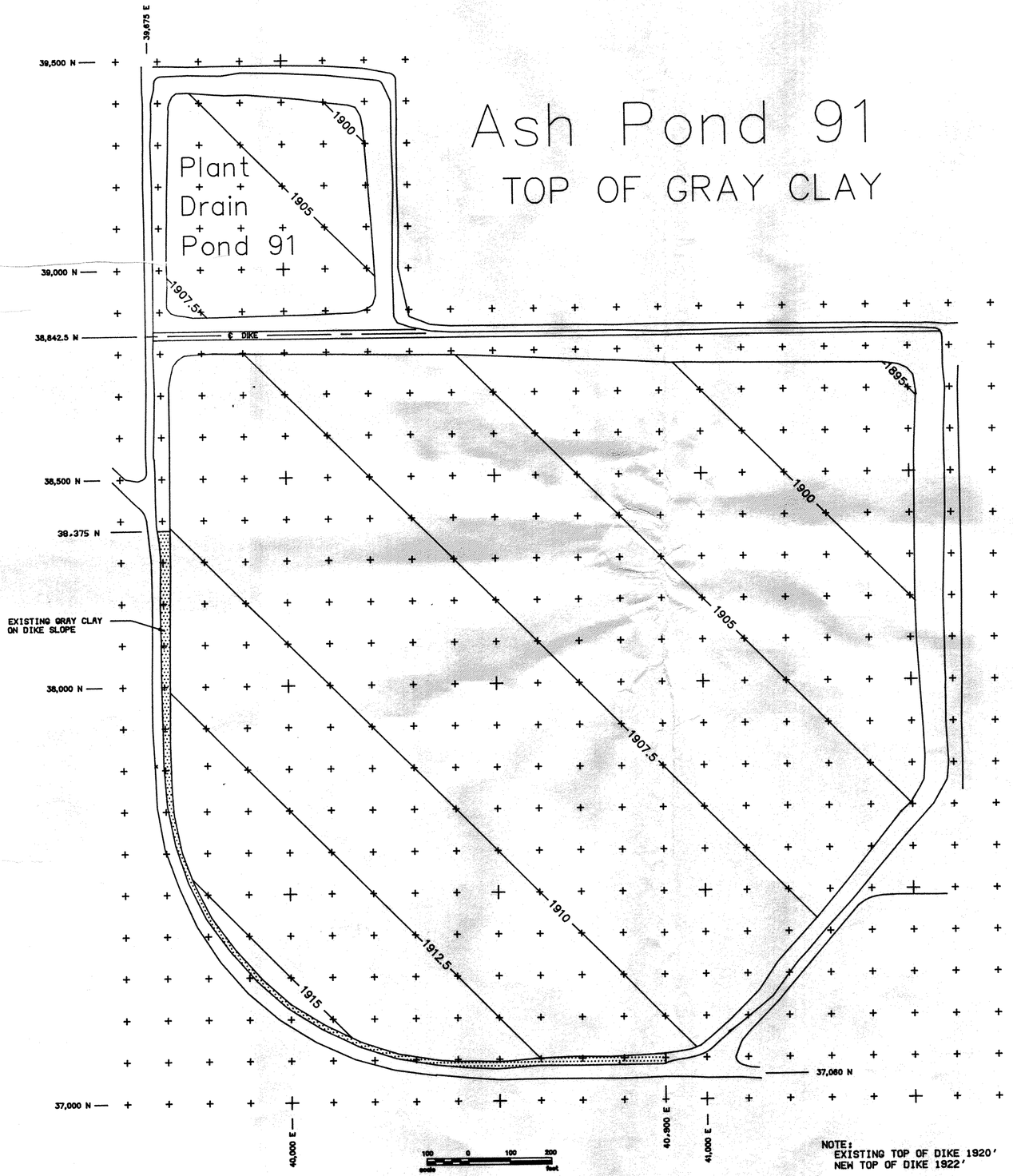
DATE 12/30/91
W/O 92G213

LAYOUT – TOP OF BROWN CLAY
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO. 92G213-9



Ash Pond 91

TOP OF GRAY CLAY

NOTE:
EXISTING TOP OF DIKE 1920'
NEW TOP OF DIKE 1922'

GENERAL NOTES

FOR BID ONLY

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

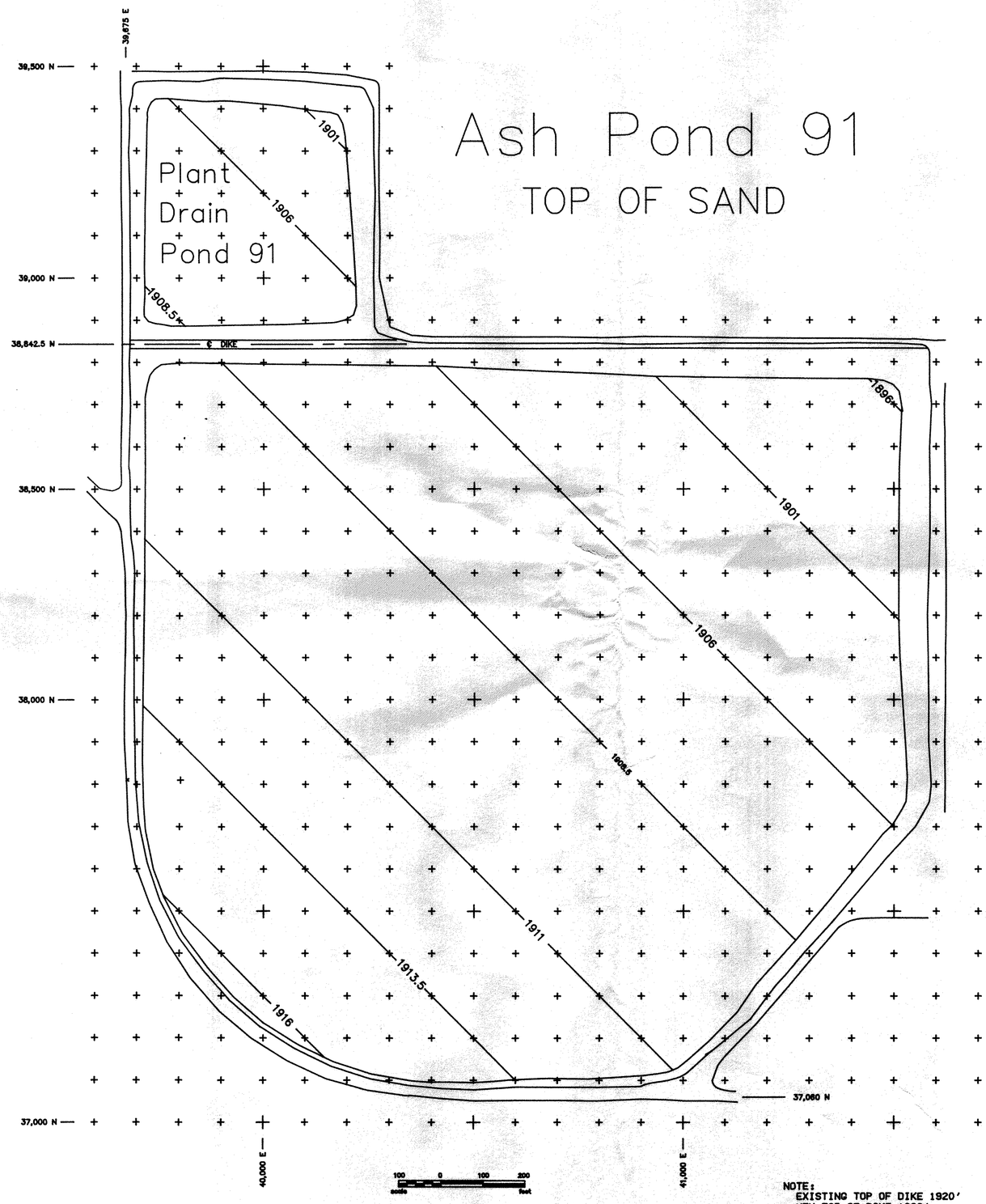
DWN. BAK CHK.
DATE 12/30/91
W/O 920213

LAYOUT - TOP OF GRAY CLAY
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO.
92G213-10

COOPERATIVE POWER



Ash Pond 91

TOP OF SAND

NOTE:
EXISTING TOP OF DIKE 1920'
NEW TOP OF DIKE 1922'

GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

DWN. BAK	CHK.
DATE 12/30/91	
W/O 92G213	

LAYOUT - TOP OF SAND
ASH POND 91

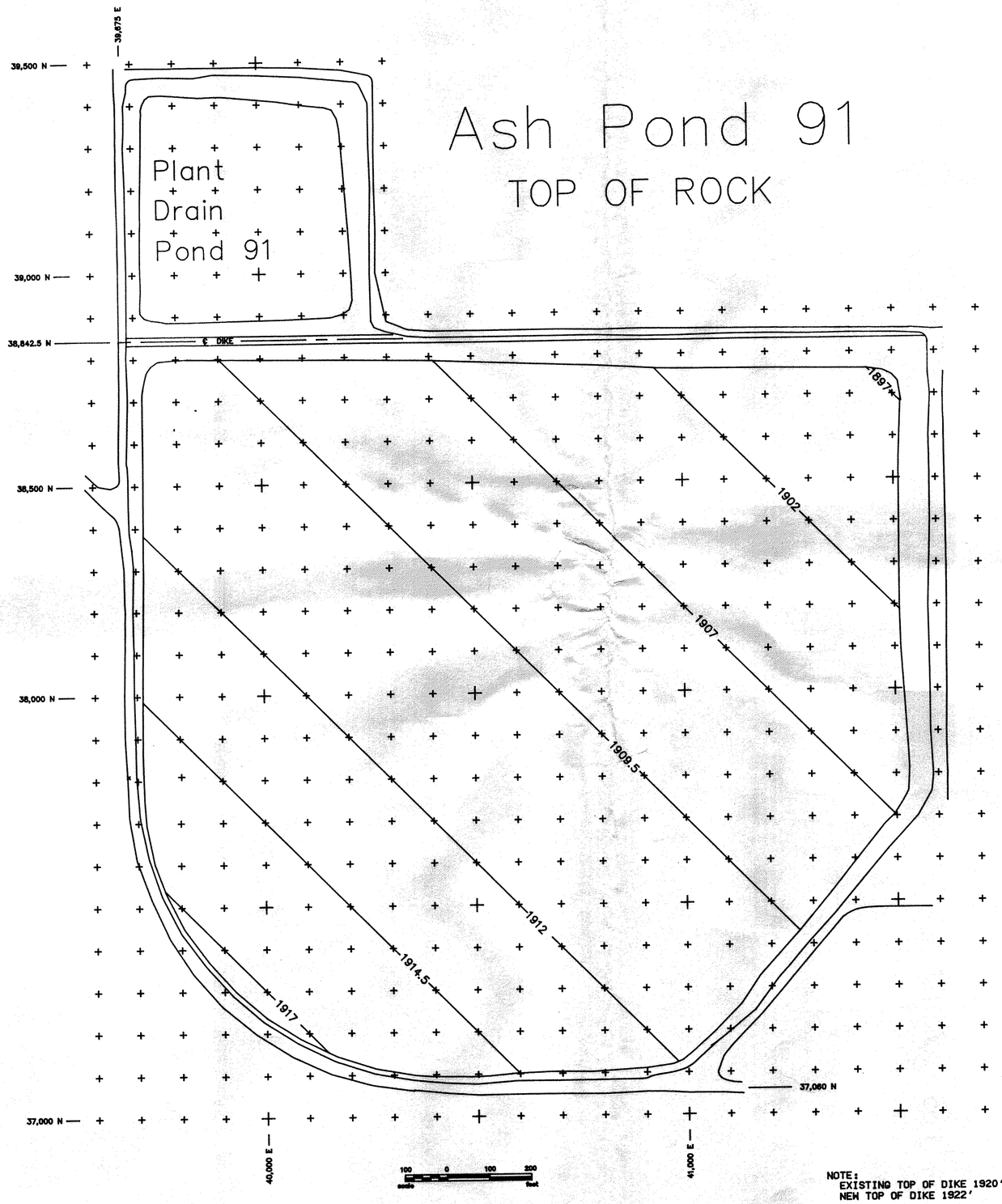
1992 ASH DISPOSAL

DRAWING NO. 92G213-11

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

Ash Pond 91

TOP OF ROCK



NOTE:
EXISTING TOP OF DIKE 1920'
NEW TOP OF DIKE 1922'

GENERAL NOTES

FOR BID ONLY

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DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY CK. APP

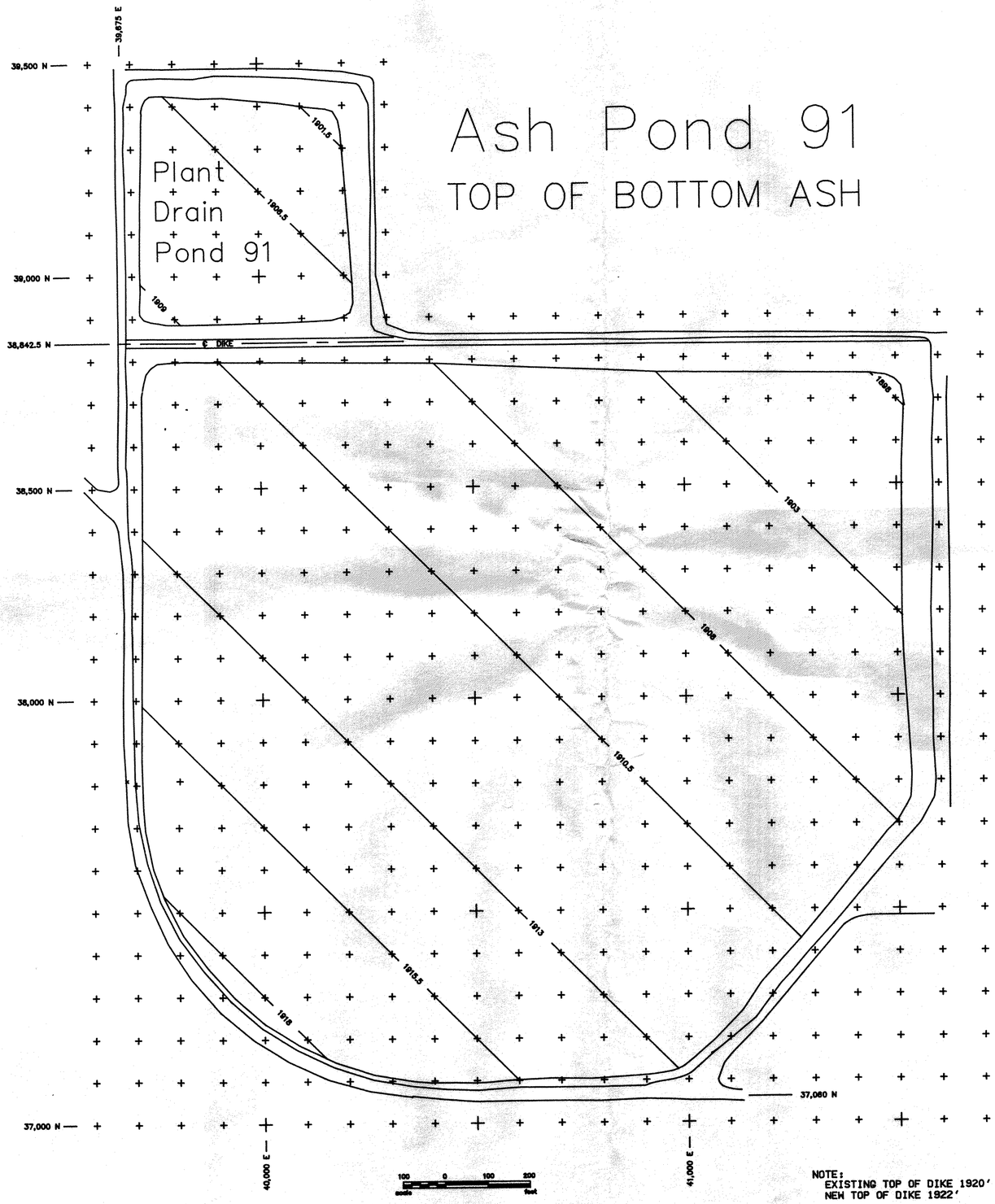
DWN. BAK CHK.
DATE 12/30/91
W/O 920213

LAYOUT - TOP OF ROCK
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO.
92G213-12

COOPERATIVE POWER



GENERAL NOTES

FOR BID ONLY

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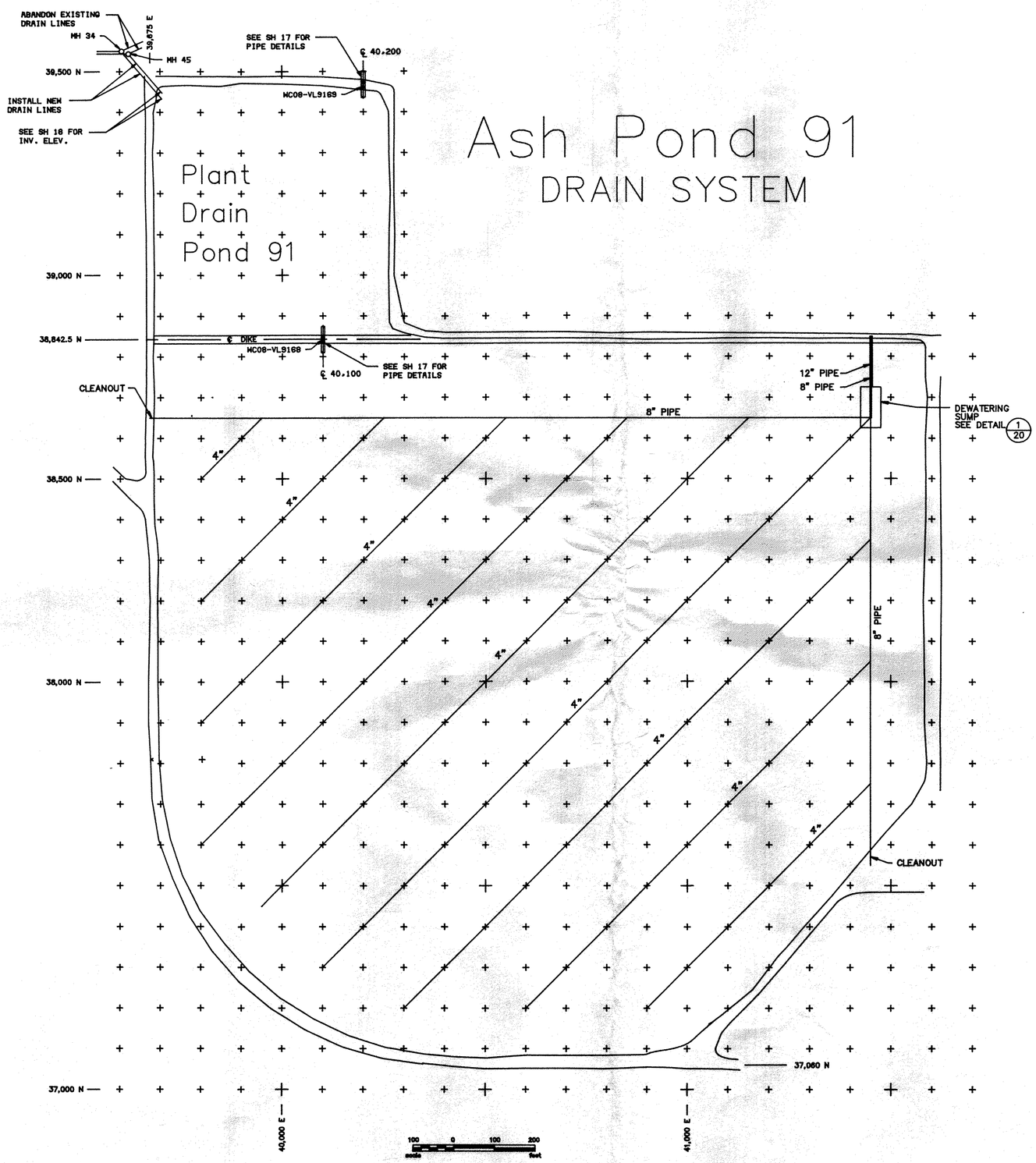
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP

DWN. BAK CHK.
DATE 12/30/91
W/O 92G213

LAYOUT - TOP OF BOTTOM ASH
ASH POND 91

1992 ASH DISPOSAL

DRAWING NO.
92G213-13



GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

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DATE 12/30/91		
W/O 92G213		1992 ASH DISPOSAL
COOPERATIVE POWER		DRAWING NO. 92G213-14

NO.	DATE	REVISIONS AND RECORD OF ISSUE	BY	CK.	APP
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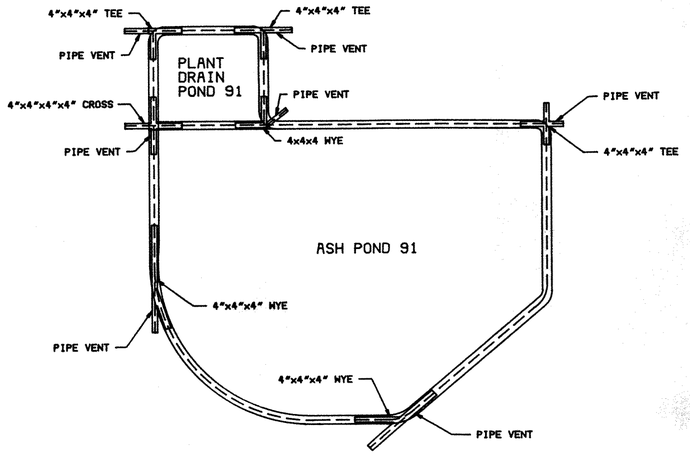
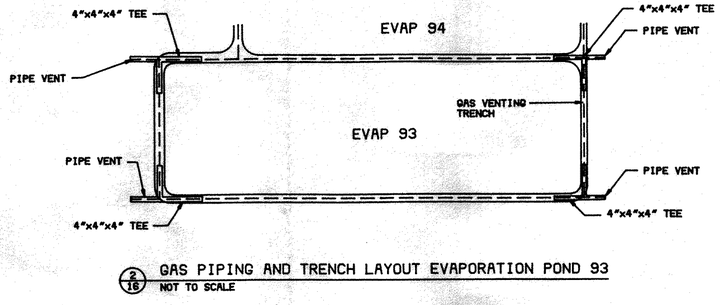
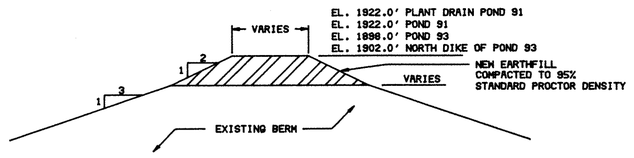


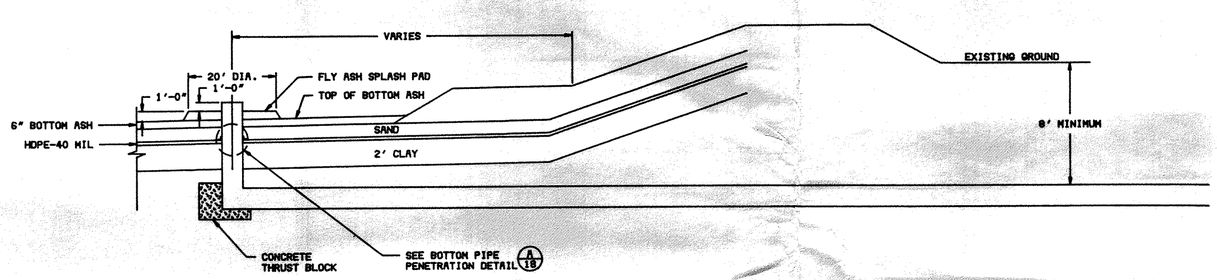
1/16 GAS PIPING AND TRENCH LAYOUT ASH POND 91
NOT TO SCALE



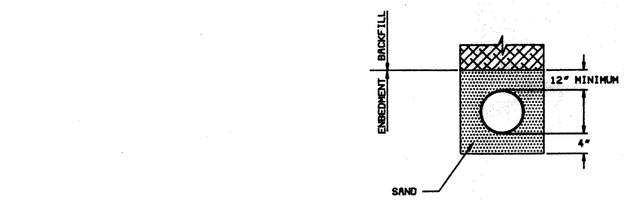
2/16 GAS PIPING AND TRENCH LAYOUT EVAPORATION POND 93
NOT TO SCALE



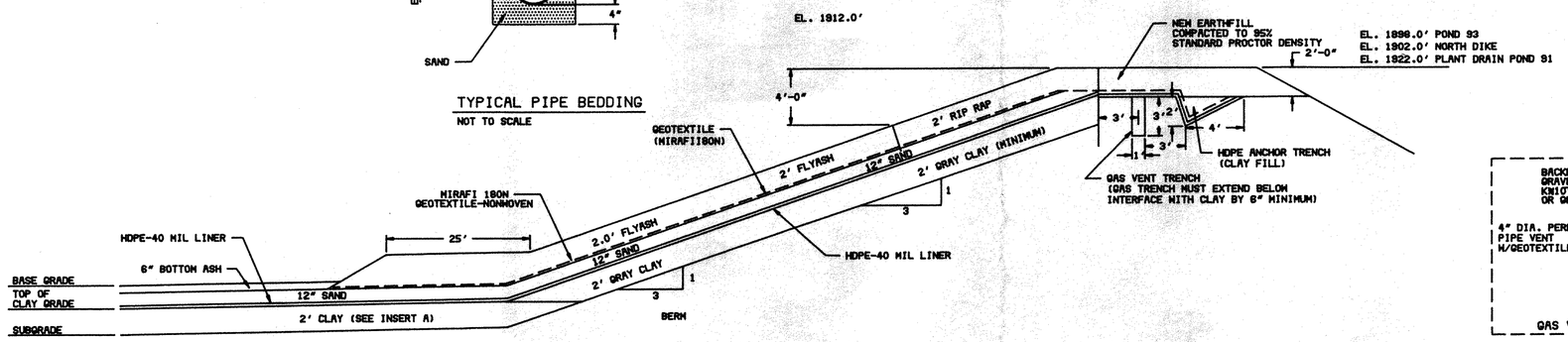
3/16 BERM RAISING DETAIL
NOT TO SCALE



4/16 EVAPORATION POND 93 INLET DETAIL
NOT TO SCALE



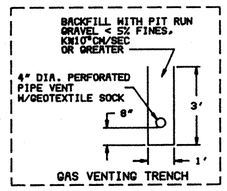
TYPICAL PIPE BEDDING
NOT TO SCALE



INSERT A

6" GRAY CLAY
18" BROWN CLAY

TYPICAL BERM & BOTTOM SECTION
EVAPORATION POND 93 AND PLANT DRAIN POND 91
5/16 NOT TO SCALE



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.

GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

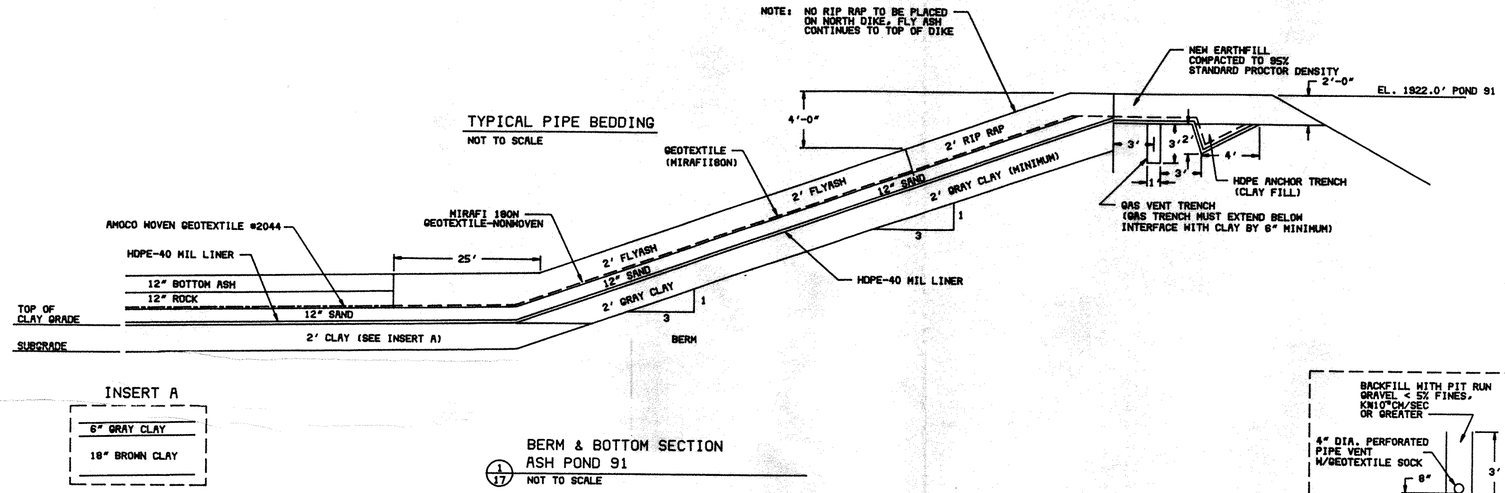
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP
01/09/92	ISSUED FOR BID	0	BK	AS	AS

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

TYPICAL SECTIONS AND DETAILS

1992 ASH DISPOSAL

DRAWING NO. 92G213-16

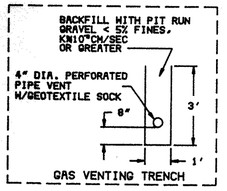


TYPICAL PIPE BEDDING
NOT TO SCALE

INSERT A

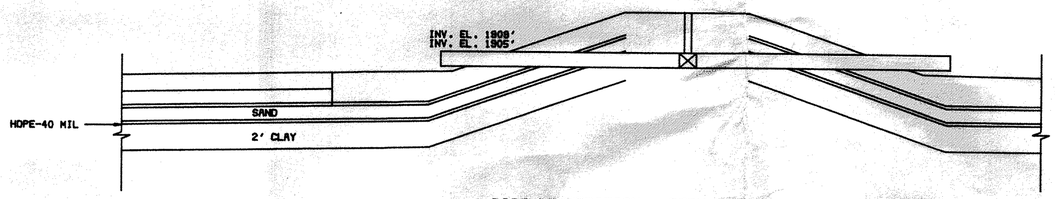
6" GRAY CLAY
18" BROWN CLAY

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
	MC08-VL9168	ASH POND 91-PLANT DRAIN POND		18	100	150	GA	CI				UNDERGROUND VALVE WITH VALVE BOX
	MC08-VL9169	PLANT DRAIN POND DISCHARGE		18	100	150	GA	CI				UNDERGROUND VALVE WITH VALVE BOX

GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

NO.	BY	CK.	AS	AS	DATE	REVISIONS AND RECORD OF ISSUE
0	BK	AS	AS		01/09/92	ISSUED FOR BID

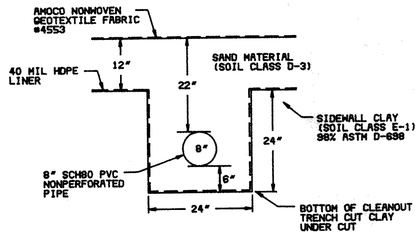
DWN. BAK CHK.
DATE 12/26/91
W/O 92G213

COOPERATIVE POWER

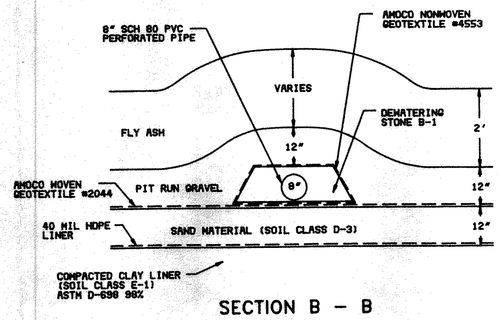
TYPICAL SECTIONS AND DETAILS

1992 ASH DISPOSAL

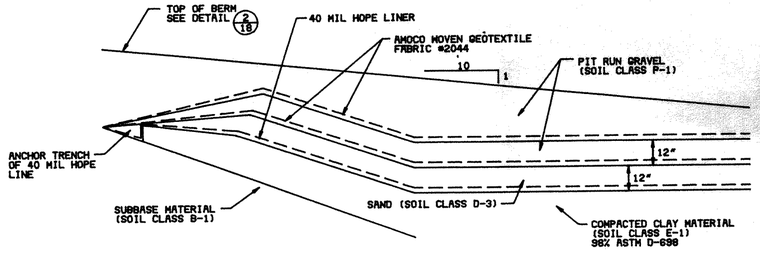
DRAWING NO. 92G213-17



SECTION A – A



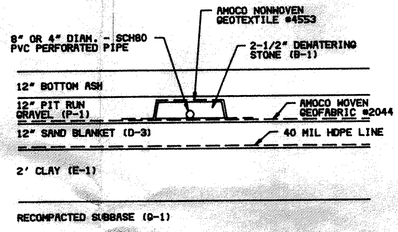
SECTION B – B



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

1/19

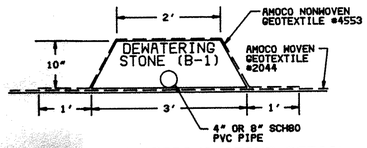
NOT TO SCALE



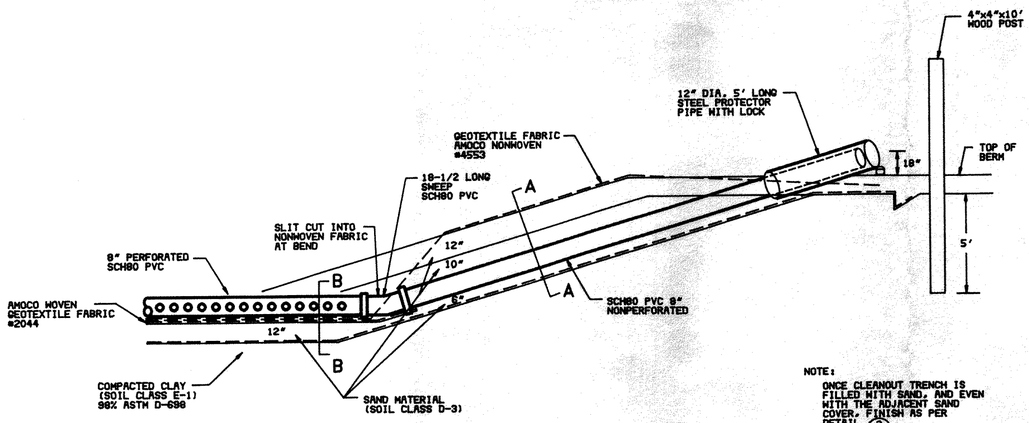
TYPICAL DEWATERING AND HEADER TRENCH DETAIL
WITH DETAIL OF THE BEDDING AROUND THE
PERFORATED PIPE

2/19

NOT TO SCALE



TYPICAL DEWATERING STONE DETAIL



TYPICAL CLEAN-OUT RISERS
EAST AND WEST SLOPES

3/19

NOT TO SCALE

GENERAL NOTES

FOR BID ONLY

DRAWING NO.	REVISION	REFERENCE DRAWINGS

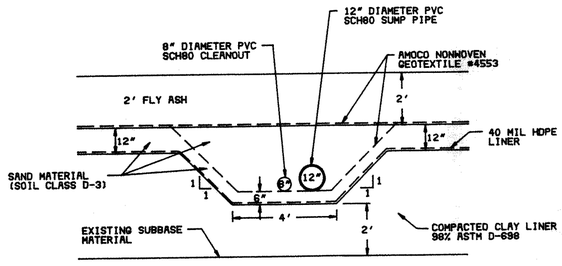
DWN. BAK	CHK.
DATE 01/02/92	
W/O 92G213	

DETAILS
MISCELLANEOUS

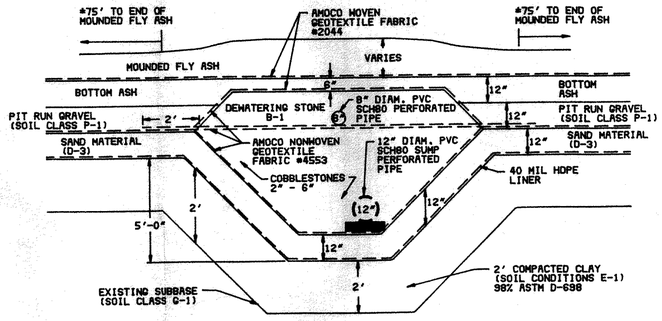
1992 ASH DISPOSAL

DRAWING NO. 92G213-19

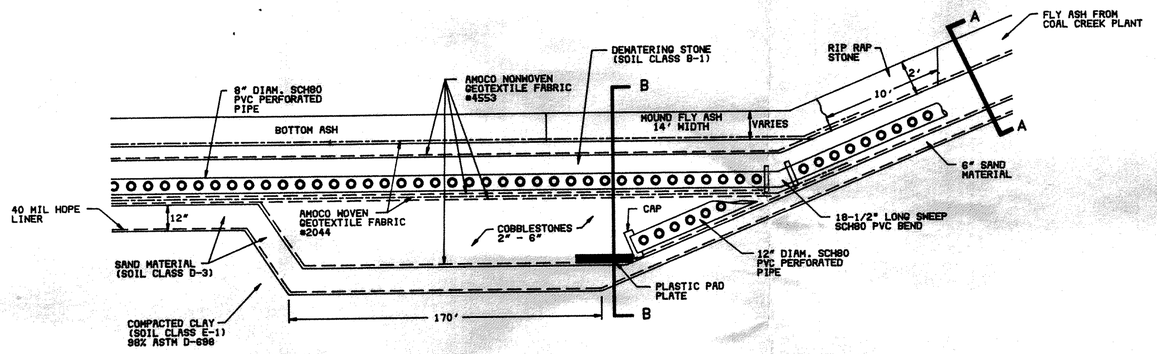
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP
01/09/92	ISSUED FOR BID	0	BK	AS	AS



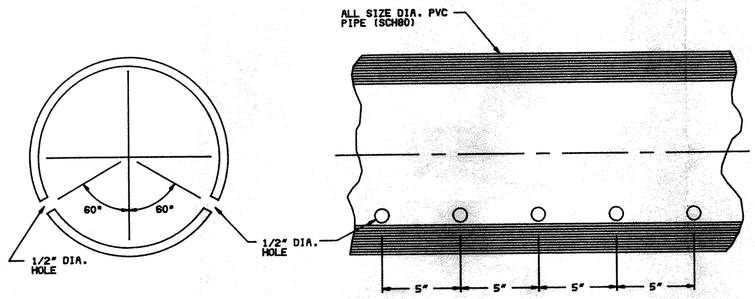
SECTION A – A



SECTION B – B



1/20 DEWATERING SUMP DETAIL
NOT TO SCALE



2/20 PERFORATED PIPE DETAIL (ALL SIZES)
NOT TO SCALE

GENERAL NOTES

DRAWING NO.	REVISION	REFERENCE DRAWINGS

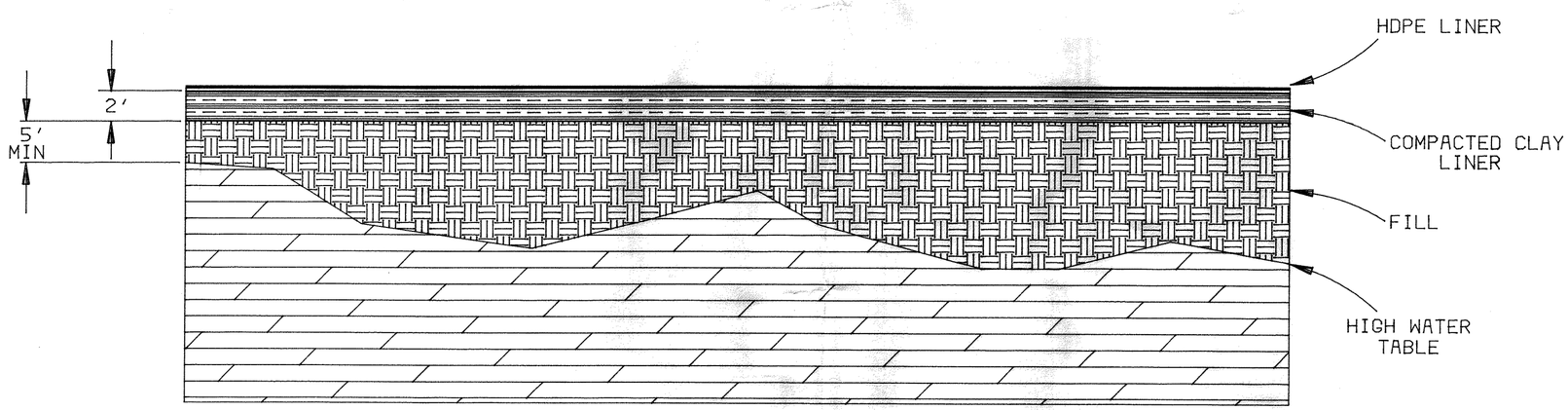
01/03/92	ISSUED FOR BID	0	BK	AS	AS
DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP

DWN. bak CHK.
DATE 01/03/92
W/O 92G213

DEWATERING, PERFORATED PIPE DETAILS

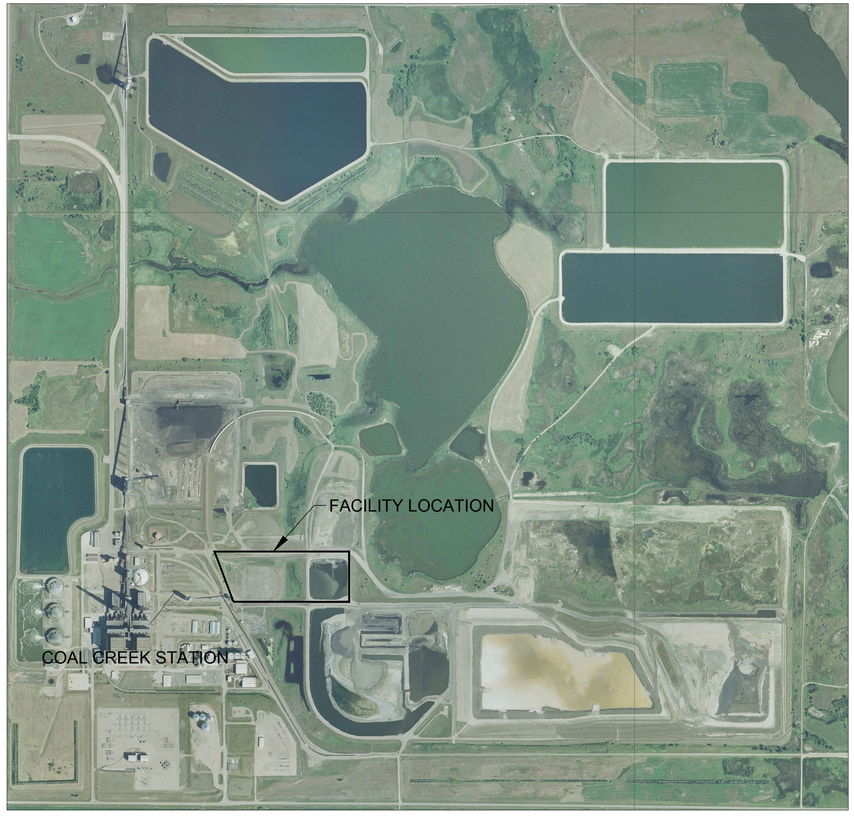
1992 ASH DISPOSAL

DRAWING NO. 92G213-20


2'
5'
MIN
HDPE LINER
COMPACTED CLAY
LINER
FILL
HIGH WATER
TABLE

APPENDIX A-2
DRAINS POND SYSTEM LATERAL EXPANSION PERMIT DRAWINGS (2015A)

GREAT RIVER ENERGY
PERMIT NO. 033 MODIFICATION
DRAINS POND EXPANSION



Prepared for:

GREAT RIVER ENERGY®
A Touchstone Energy® Cooperative

Coal Creek Station
Underwood, North Dakota

Prepared by:

Golder Associates

Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, Colorado USA 80228

DRAWING LIST

DRAWING NO.	TITLE	REVISION
1	TITLE SHEET	B
2	EXISTING CONDITIONS	B
3	PROPOSED TOP OF LINER	B
4	CROSS SECTIONS	B
5	DETAILS SHEET 1 OF 2	B
6	DETAILS SHEET 2 OF 2	B

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
B	2015-02-11	ISSUED FOR PERMIT MODIFICATION	RFS	RFS	TJS	RRJ
A	2014-12-12	ISSUED FOR CLIENT REVIEW	RFS	RFS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 2/11/2015
NORTH DAKOTA

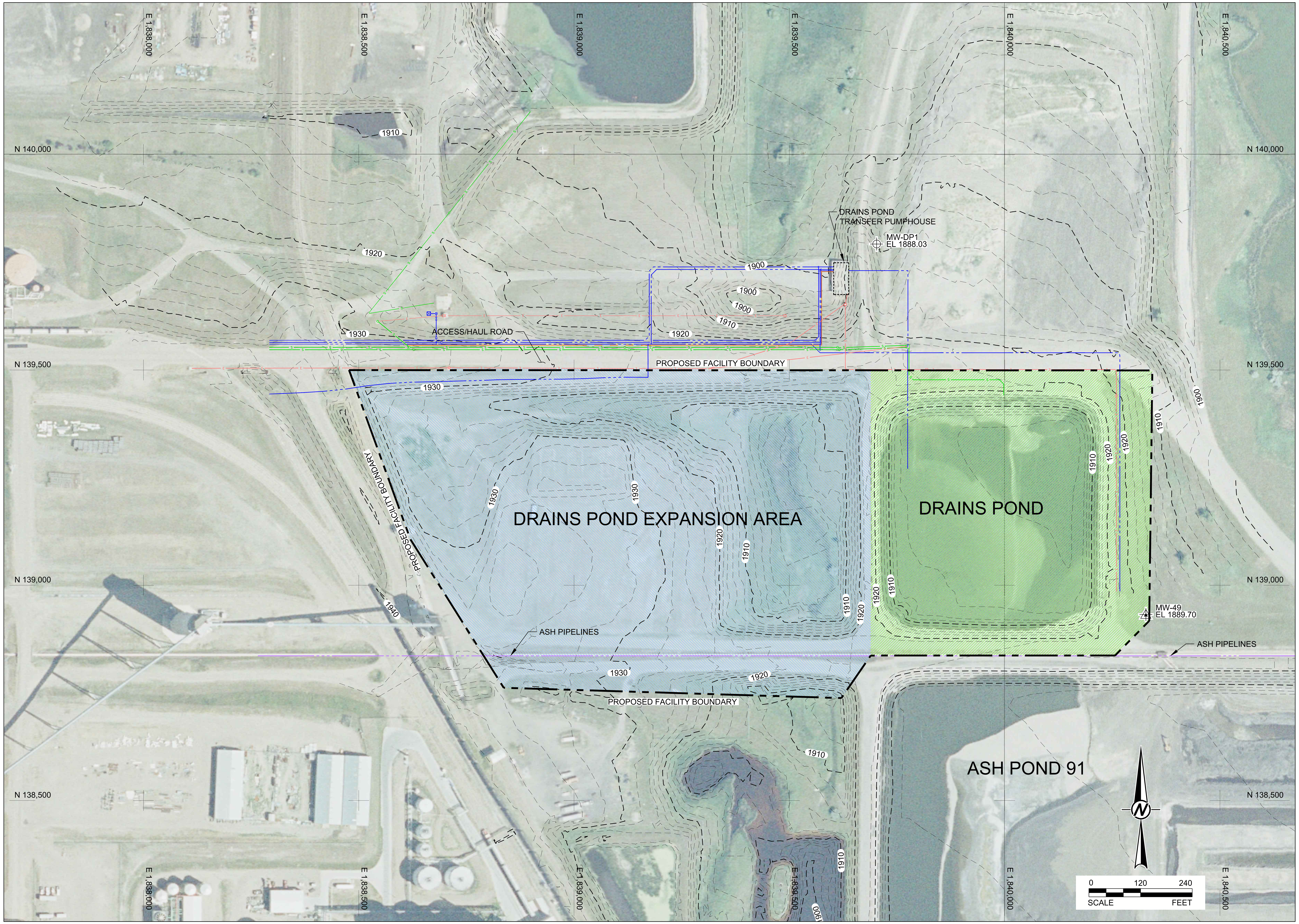
CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

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

PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

TITLE
TITLE SHEET

PROJECT No. 1400644
Rev. B
1 of 6
DRAWING 1



LEGEND

- EXISTING TOPOGRAPHY (REFERENCE 2)
- MW-49 EL 1889.70 — EXISTING DOWNSTREAM MONITORING WELL
- MW-DP1 EL 1888.03 — DOWNSTREAM MONITORING WELL INSTALLED JUNE 2014
- DRAINS POND FACILITY BOUNDARY (NOTE 1)
- EXISTING WATER LINE
- EXISTING ASH LINE
- EXISTING DRAIN LINE
- EXISTING ELECTRICAL
- EXISTING COMPRESSED AIR LINE

NOTES

1. THE PROPOSED FACILITY BOUNDARY IS APPROXIMATE.
2. EXISTING UTILITIES ARE ONLY SHOWN IN THE AREA NEAR THE DRAINS POND.

REFERENCES

1. SITE LOCATION: SECTION 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. THE SITE AERIAL IMAGE IS FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURAL IMAGERY PROGRAM AND WAS ACQUIRED IN 2012. THE LOCATION OF THE AERIAL IMAGE IS APPROXIMATE.
4. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
5. THE CONTOUR INTERVAL IS TWO FEET.
6. 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	2014-12-12	ISSUED FOR CLIENT REVIEW	CCS	CCS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER TODD J. STONG PE-6144 DATE 2/11/2015 NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

Golder Associates

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

PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

TITLE
EXISTING CONDITIONS

PROJECT No.	Rev.		DRAWING
1400644	B	2 of 6	2

LEGEND

- EXISTING TOPOGRAPHY (REFERENCE 2)
- PROPOSED TOP OF PRIMARY LINER (NOTE 2)
- DRAINS POND FACILITY BOUNDARY (NOTE 1)
- EXISTING WATER LINE
- EXISTING ASH LINE
- EXISTING DRAIN LINE
- EXISTING ELECTRICAL
- EXISTING COMPRESSED AIR LINE
- PROPOSED PIPING

NOTES

1. THE PROPOSED FACILITY BOUNDARY IS APPROXIMATE.
2. PROPOSED GRADES REPRESENT THE TOP OF THE PRIMARY GEOMEMBRANE LINER (LINED AREAS) AND THE TOP OF WORKING ROAD SURFACE (UNLINED AREAS).

REFERENCES

1. SITE LOCATION: SECTION 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. LOCATIONS OF EXISTING UTILITIES WERE PROVIDED BY GREAT RIVER ENERGY.
4. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
5. THE CONTOUR INTERVAL IS ONE FOOT.
6. 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	2014-12-12	ISSUED FOR CLIENT REVIEW	CCS	CCS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — NORTH DAKOTA — DATE 2/11/2015

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

GOLDER ASSOCIATES INC.
44 UNION BLVD. SUITE 300
LAKEWOOD, COLORADO
USA
(303) 980-0540
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PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

TITLE
PROPOSED TOP OF LINER

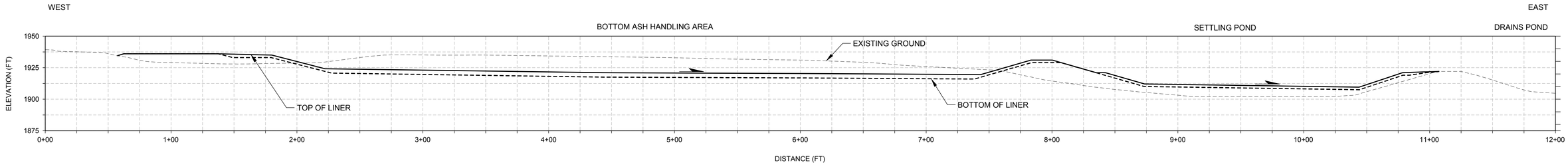
PROJECT No. 1400644 | Rev. B | 3 of 6 | DRAWING 3

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

Path: \\Denver.golder.gds\acad\141\1400644\...B DRAINS POND\... | File Name: 1400644B003.dwg

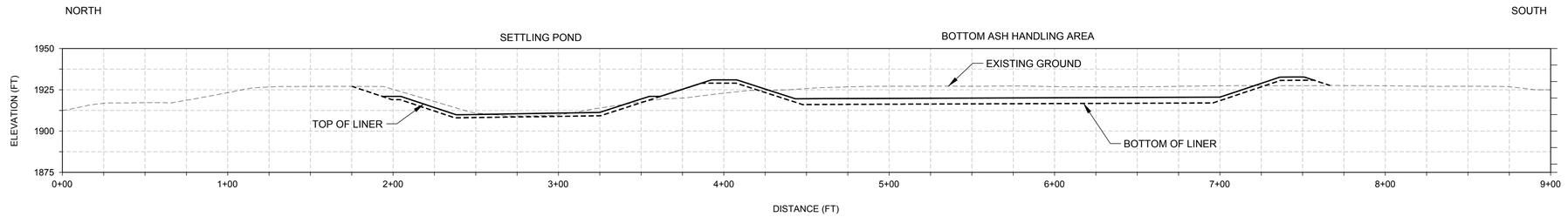
LEGEND

- EXISTING GROUND
- PROPOSED TOP OF LINER
- PROPOSED BOTTOM OF LINER



A SECTION A
NO VERT. EX. 4

0 40 80
SCALE FEET



B SECTION B
NO VERT. EX. 4

0 40 80
SCALE FEET

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
B	2015-02-11	ISSUED FOR PERMIT MODIFICATION	RFS	RFS	TJS	RRJ
A	2014-12-12	ISSUED FOR CLIENT REVIEW	RFS	RFS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 2/11/2015
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

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44 UNION BLVD. SUITE 300
LAKEWOOD, COLORADO
USA
(303) 980-0540
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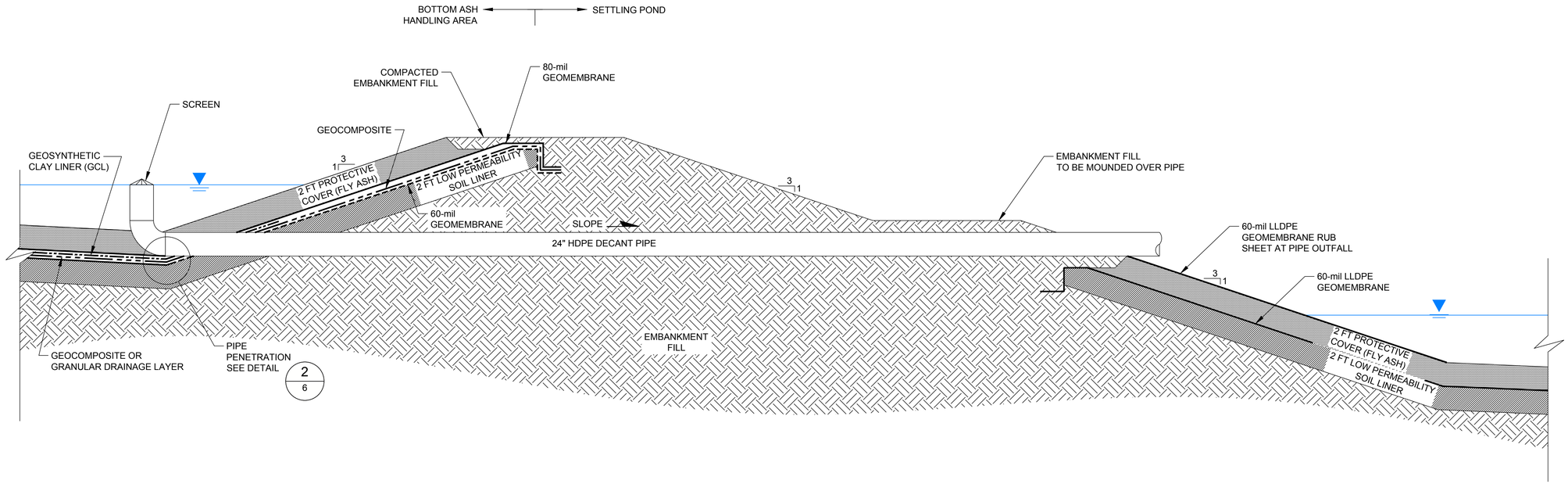
PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

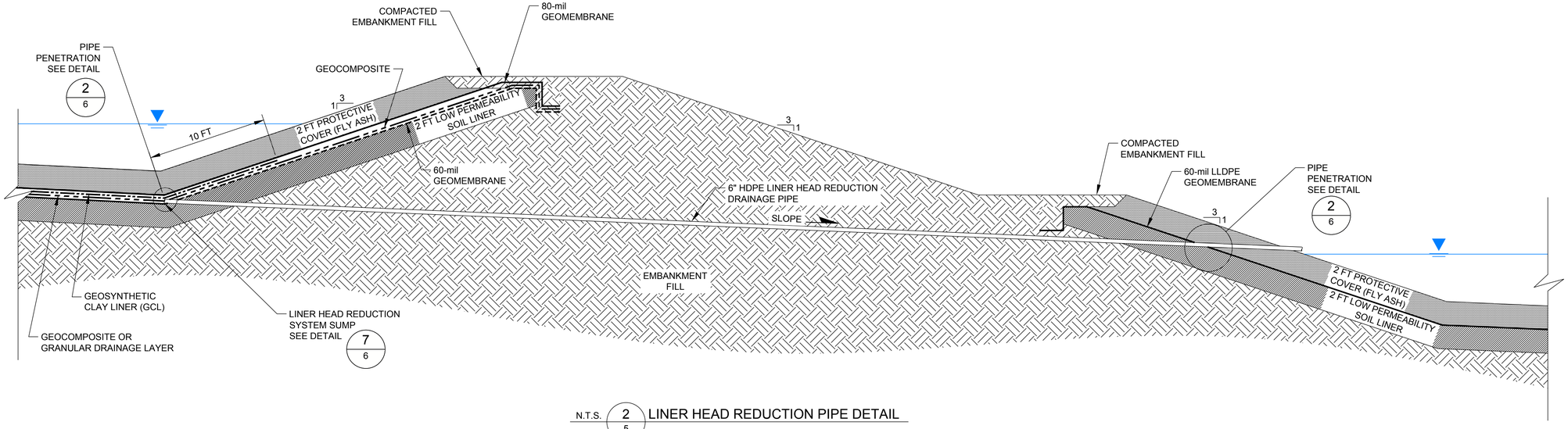
TITLE
CROSS SECTIONS

PROJECT No. 1400644
Rev. B

DRAWING 4



N.T.S. 1/5 DECANT PIPE DETAIL



N.T.S. 2/5 LINER HEAD REDUCTION PIPE DETAIL

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
B	2015-02-11	ISSUED FOR PERMIT MODIFICATION	RFS	RFS	TJS	RRJ
A	2014-12-12	ISSUED FOR CLIENT REVIEW	RFS	RFS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 2/11/2015 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

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LAKEWOOD, COLORADO
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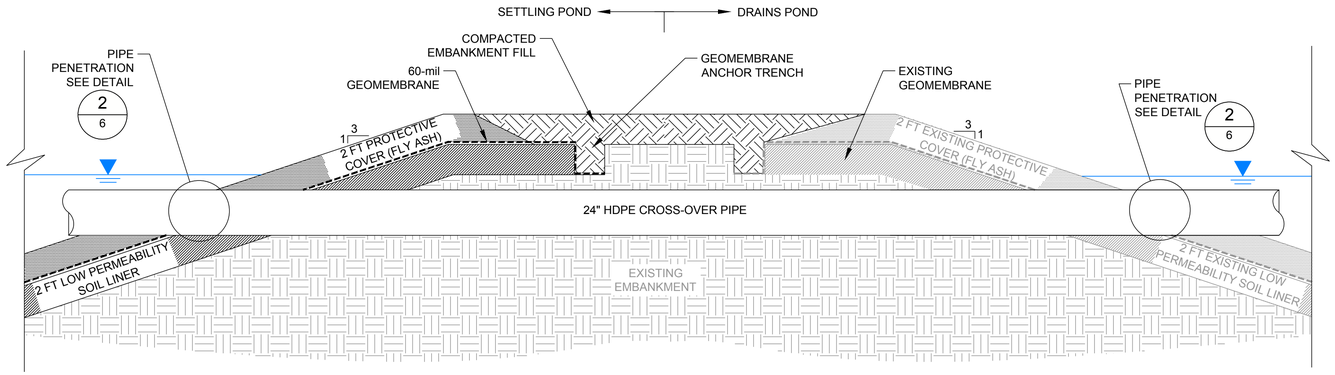
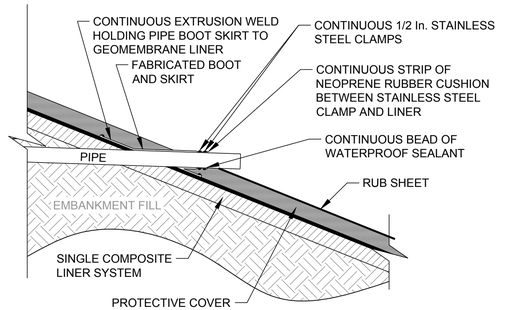
PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

TITLE
DETAILS SHEET 1 OF 2

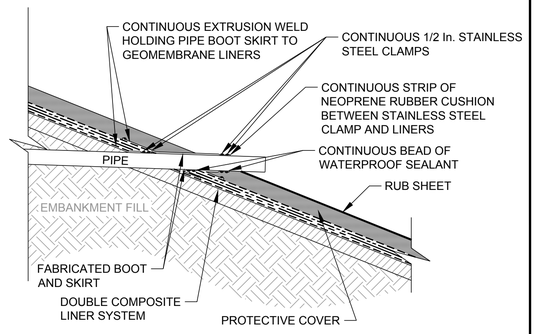
PROJECT No. 1400644 | Rev. B | 5 of 6 | DRAWING 5



N.T.S. 1/6 SETTLING POND TO DRAINS POND DETAIL

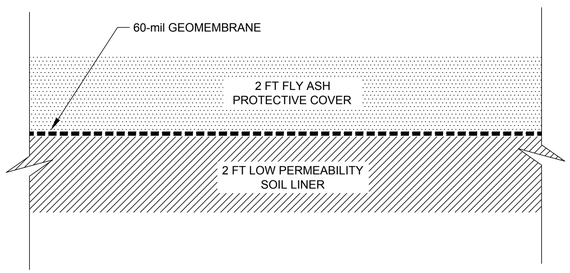


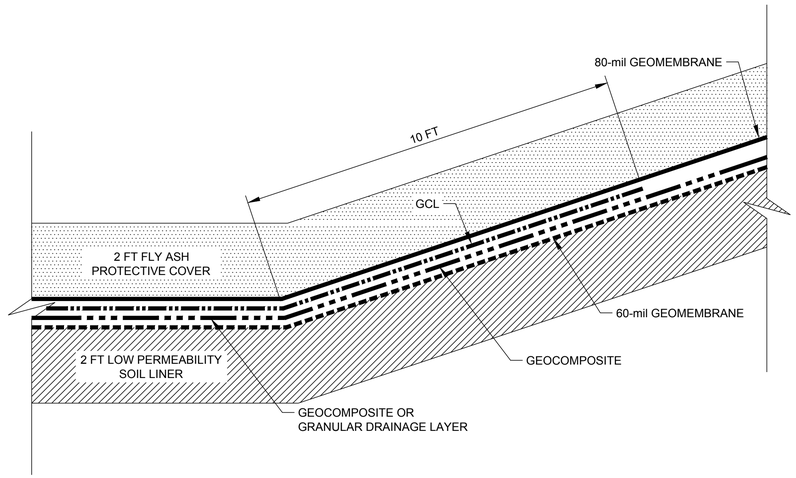
SINGLE COMPOSITE LINER PIPE PENETRATION



DOUBLE COMPOSITE LINER PIPE PENETRATION

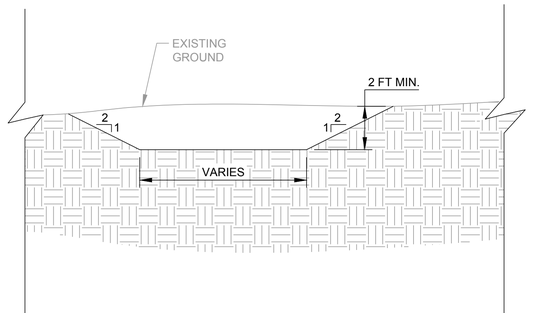
N.T.S. 2/6 PIPE PENETRATION DETAIL



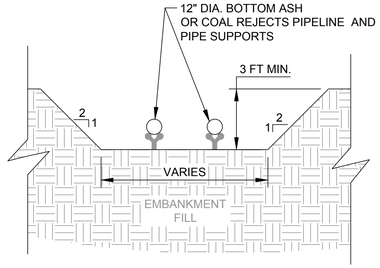


N.T.S. 3/6 SETTLING POND LINER DETAIL

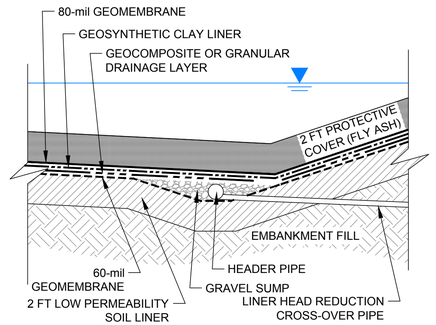
N.T.S. 4/6 BOTTOM ASH HANDLING AREA LINER DETAIL



N.T.S. 5/6 PERIMETER SURFACE WATER DRAINAGE CHANNEL DETAIL



N.T.S. 6/6 BOTTOM ASH AND COAL REJECTS PIPELINE TRENCH DETAIL



N.T.S. 7/6 LINER HEAD REDUCTION SYSTEM SUMP DETAIL

POND ELEVATIONS TABLE

	BOTTOM ASH HANDLING AREA	SETTLING POND	DRAINS POND
TYPICAL OPERATING WATER LEVEL	1928	1917	1916
MAXIMUM OPERATING WATER LEVEL	1930	1920	1920
TOP OF LINER	1930	1920	1920
TOP OF BERM	1932	1922	1922

NOTES
- ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL.
- TYPICAL OPERATING WATER LEVELS HAVE AT LEAST 2 FEET FREEBOARD BETWEEN THE WATER LEVEL AND THE TOP OF THE LINER ELEVATIONS.
- MAXIMUM OPERATING WATER LEVELS HAVE AT LEAST 2 FEET OF FREEBOARD BETWEEN THE WATER LEVEL AND THE TOP OF BERM ELEVATIONS (NDAC 33-20-08.1).

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
B	2015-02-11	ISSUED FOR PERMIT MODIFICATION	RFS	RFS	TJS	RRJ
A	2014-12-12	ISSUED FOR CLIENT REVIEW	RFS	RFS	TJS	RRJ

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 2/11/2015 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

Golder Associates

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

PROJECT
DRAINS POND EXPANSION
PERMIT NO. 0033 MODIFICATION

TITLE
DETAILS SHEET 2 OF 2

PROJECT No. 1400644 | Rev. B | 6 of 6 | DRAWING 6

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

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Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Inc.
44 Union Boulevard, Suite 300
Lakewood, Colorado 80228 USA
Tel: (303) 980-0540
Fax: (303) 985-2080

Golder Associates