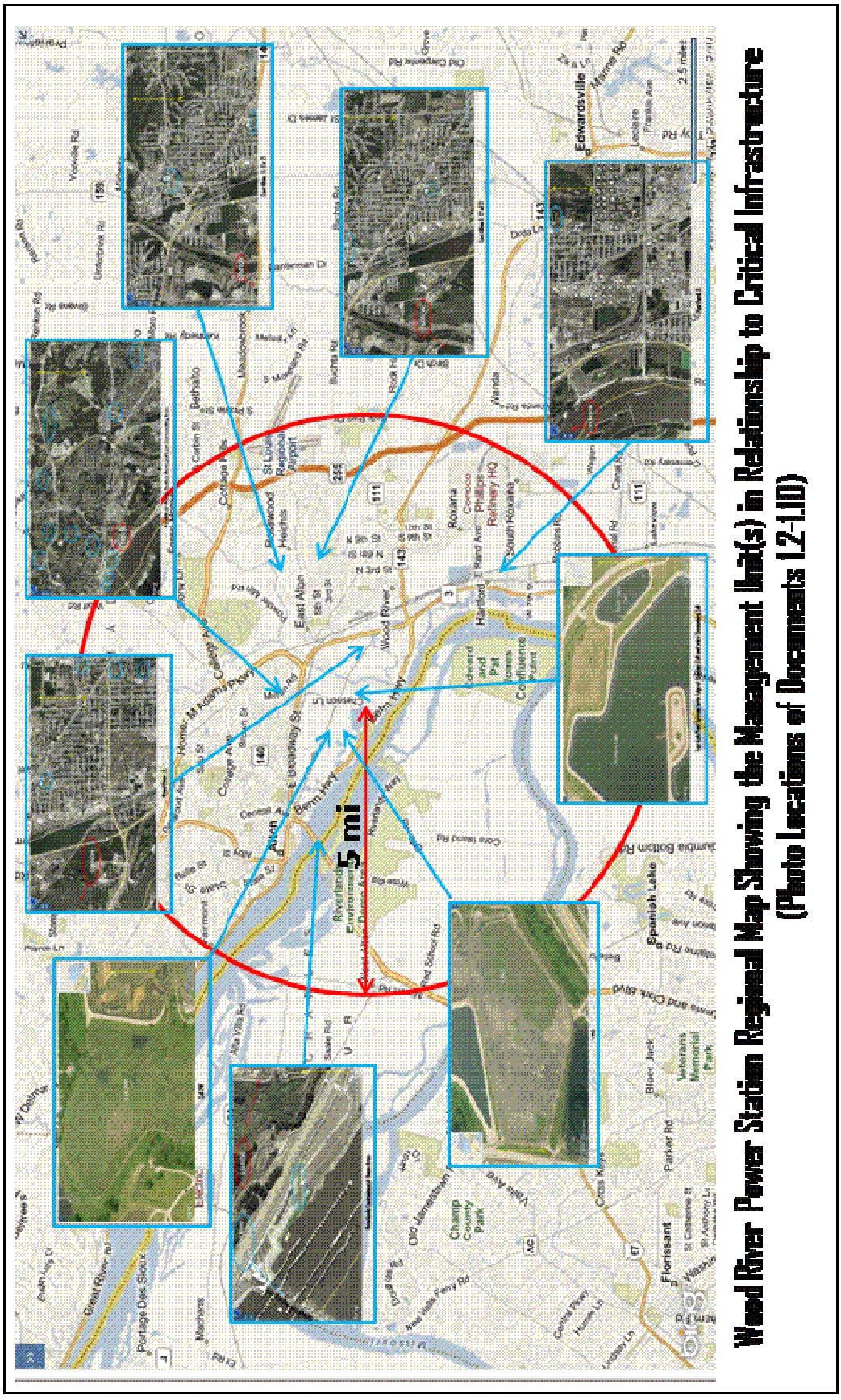
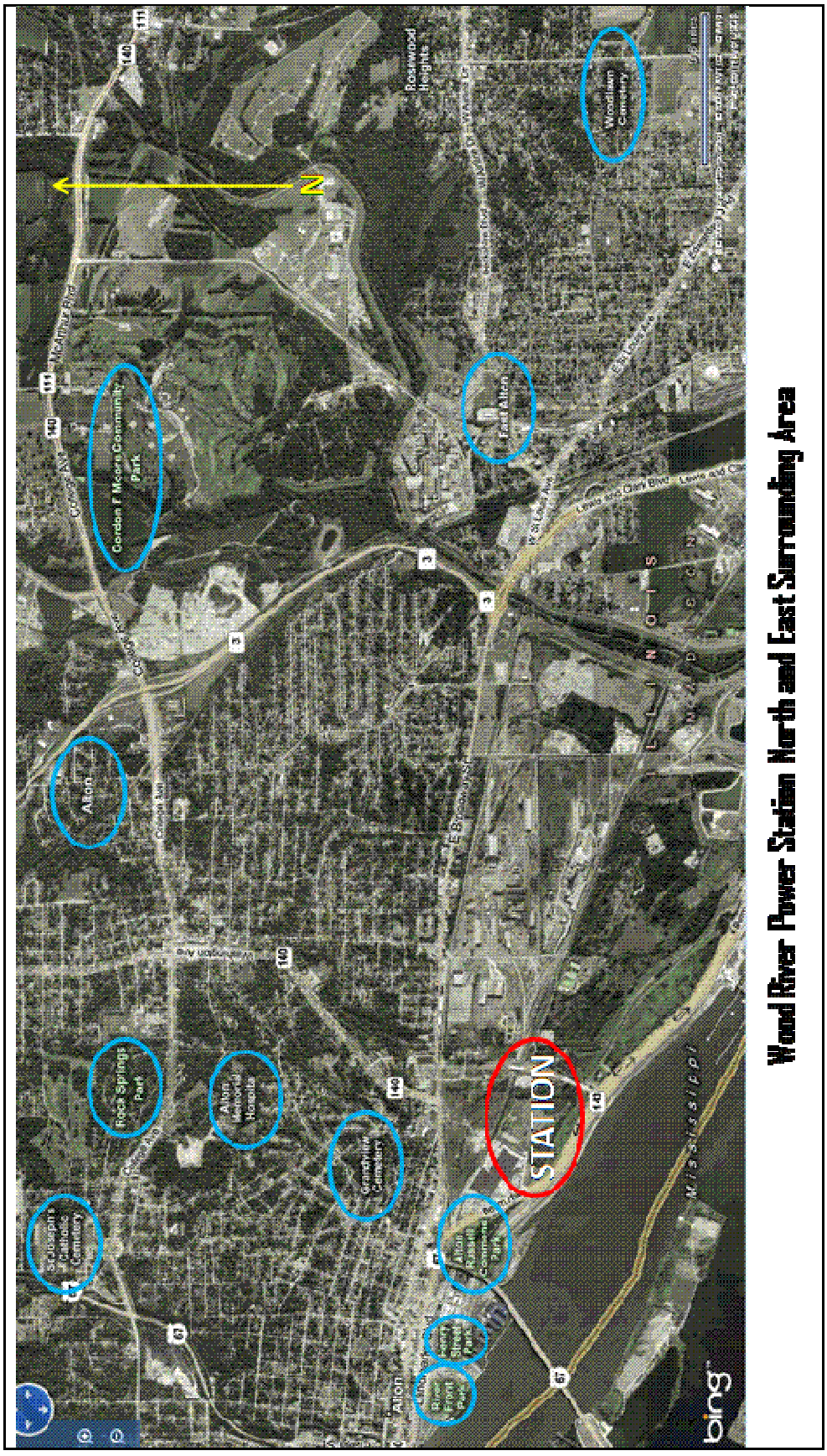
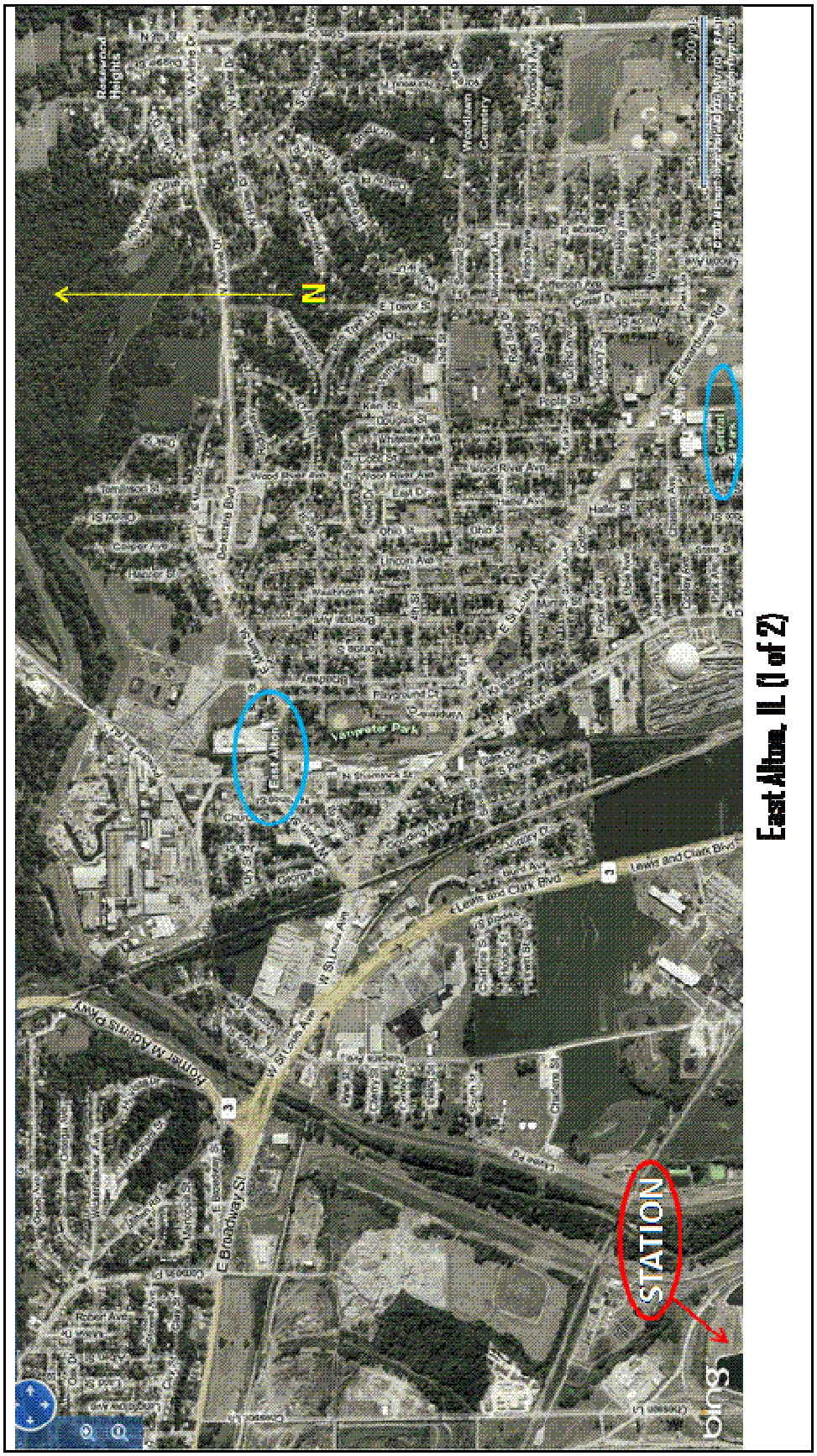

5 mi
2.5 miles
Wood River Power Station Regional Map Showing the Management Unit(s) in Relationship to Critical Infrastructure
(Photo Locations of Documents 1.2-1.10)

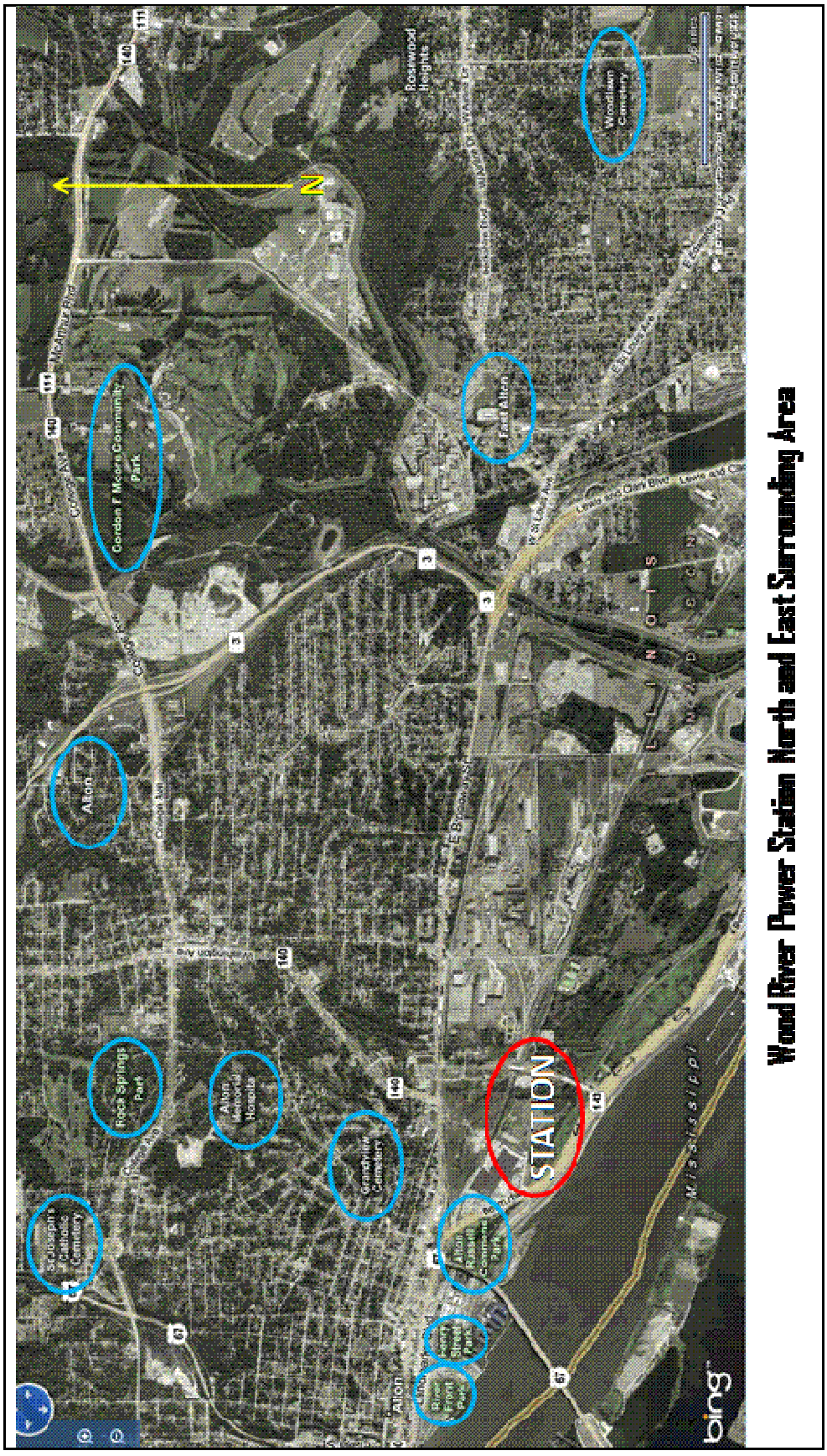
DRAFT

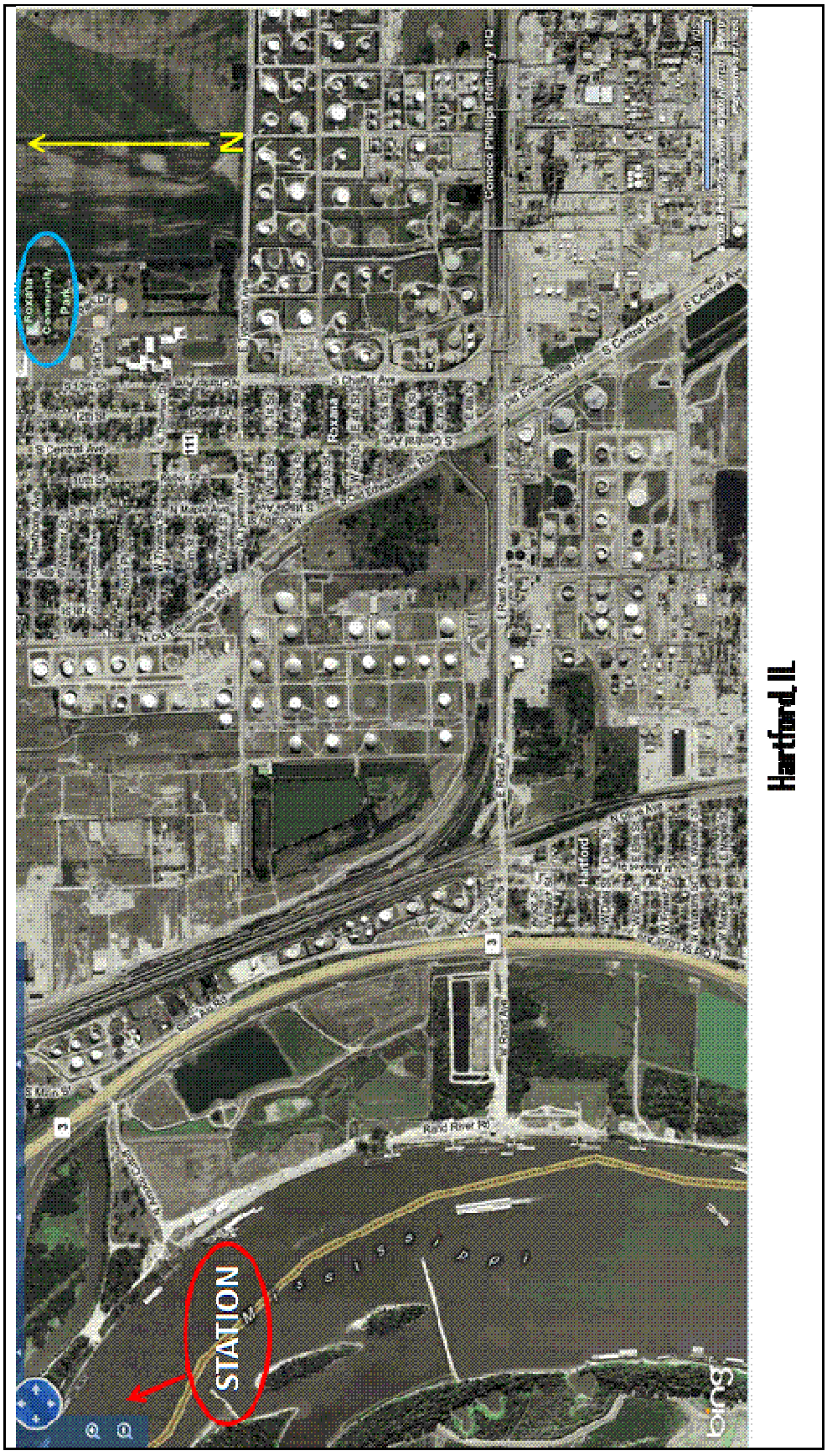

Wood River Power Station North and East Surrounding Area
STATION
N
Gordon F Moore Community Park
Alton
Rock Springs Park
Alton Memorial Hospital
Greenview Cemetery
St Joseph Catholic Cemetery
Alton Riverfront Park
Rosewood Heights
Woodlawn Cemetery
Mississippi
bing


N
STATION
East Alton, IL (1 of 2)


N
STATION
East Alton, IL (2 of 2)

DRAFT


Wood River Power Station North and East Surrounding Area
STATION
N
Alton
Gordon F Moore Community Park
Rock Springs Park
Alton Memorial Hospital
Greenview Cemetery
St Joseph Catholic Cemetery
Alton Riverfront Park
Riverfront Park
Rosewood Heights
Woodlawn Cemetery
Wisconsin
Illinois
Mississippi
bing


N
STATION
Hartford, IL

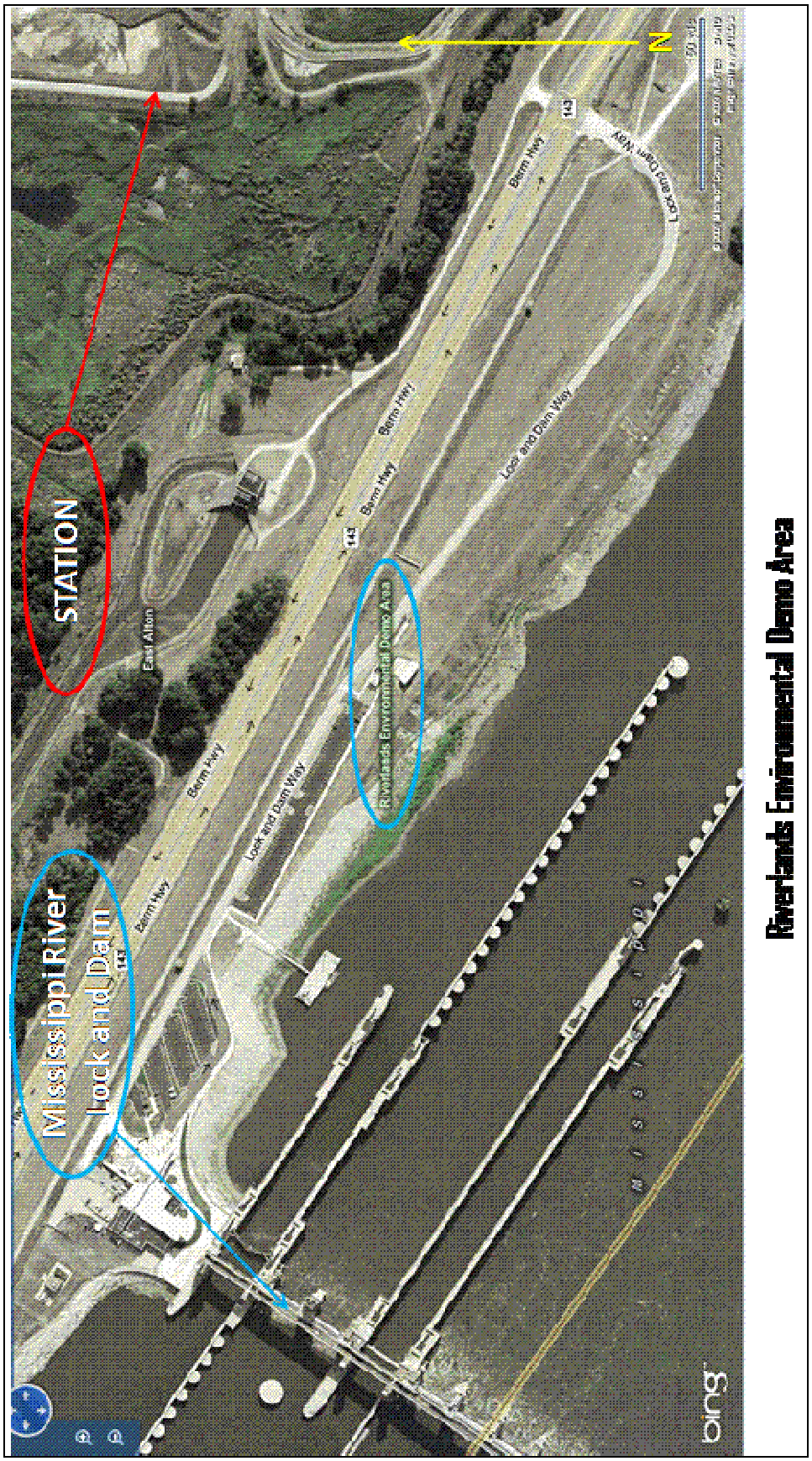


East Ash Pond System North Edge of Primary Cell and Entire Secondary Cell

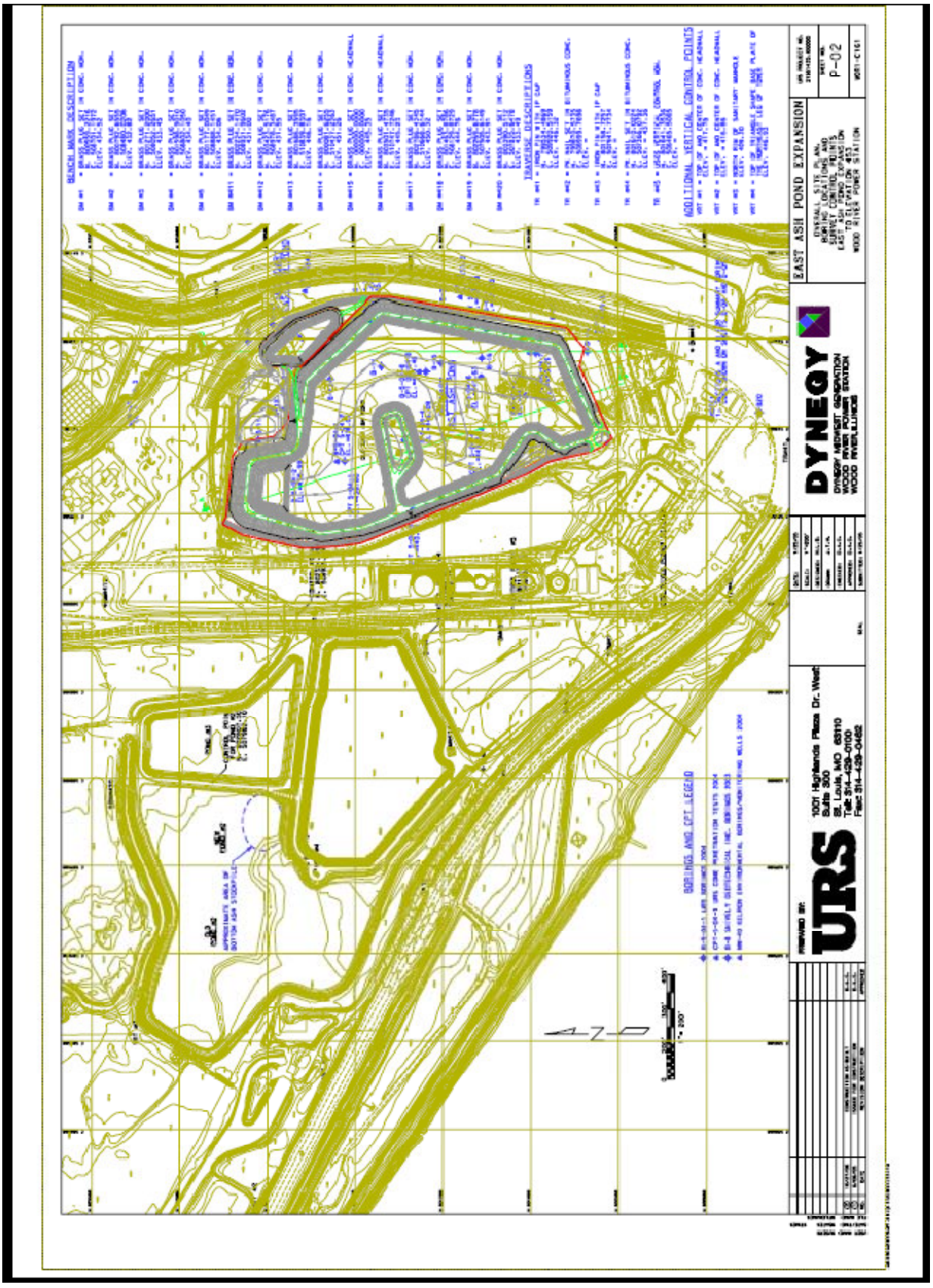

N
Cell 1
Cell 1
bing



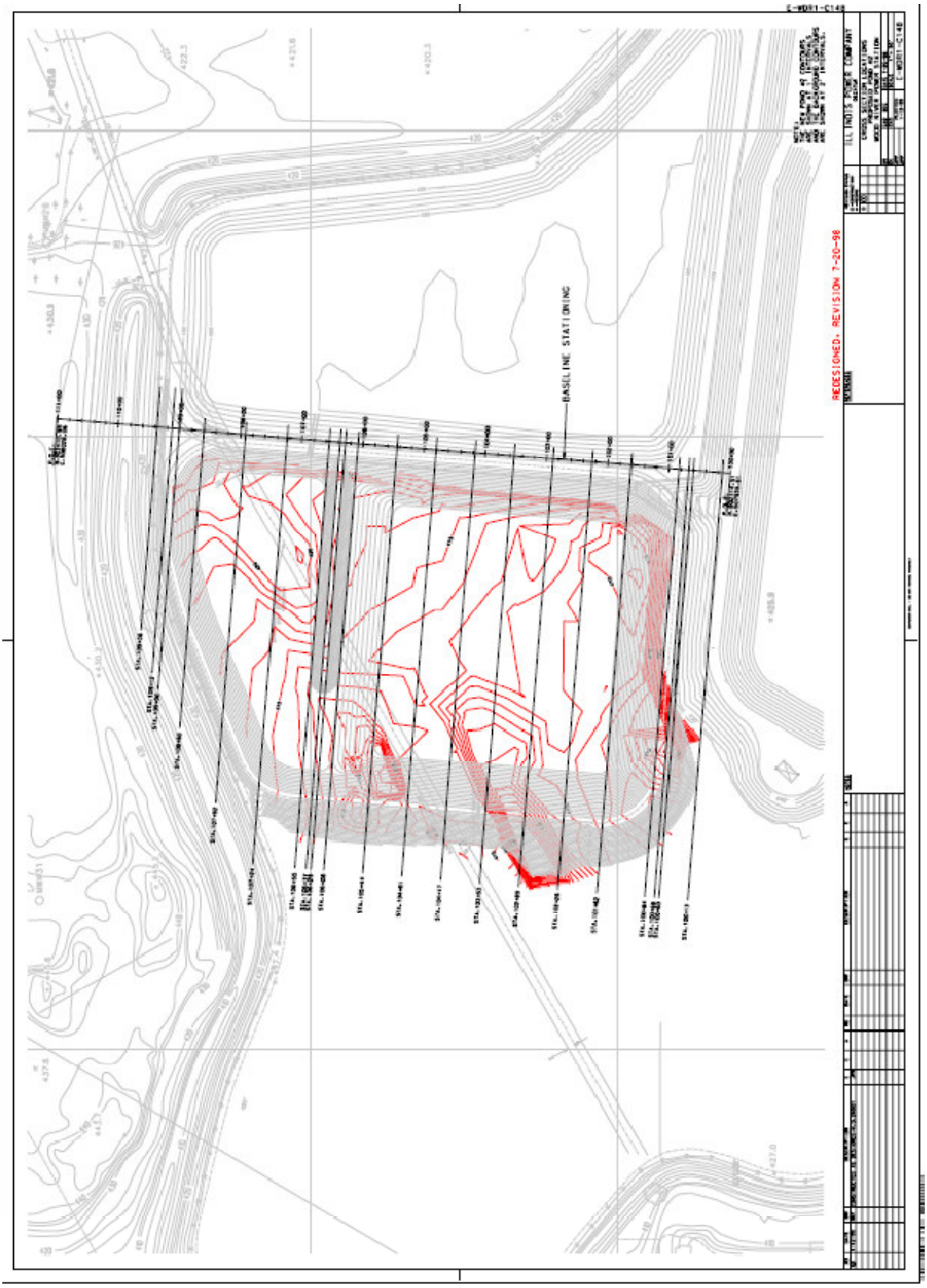
Cell 2W

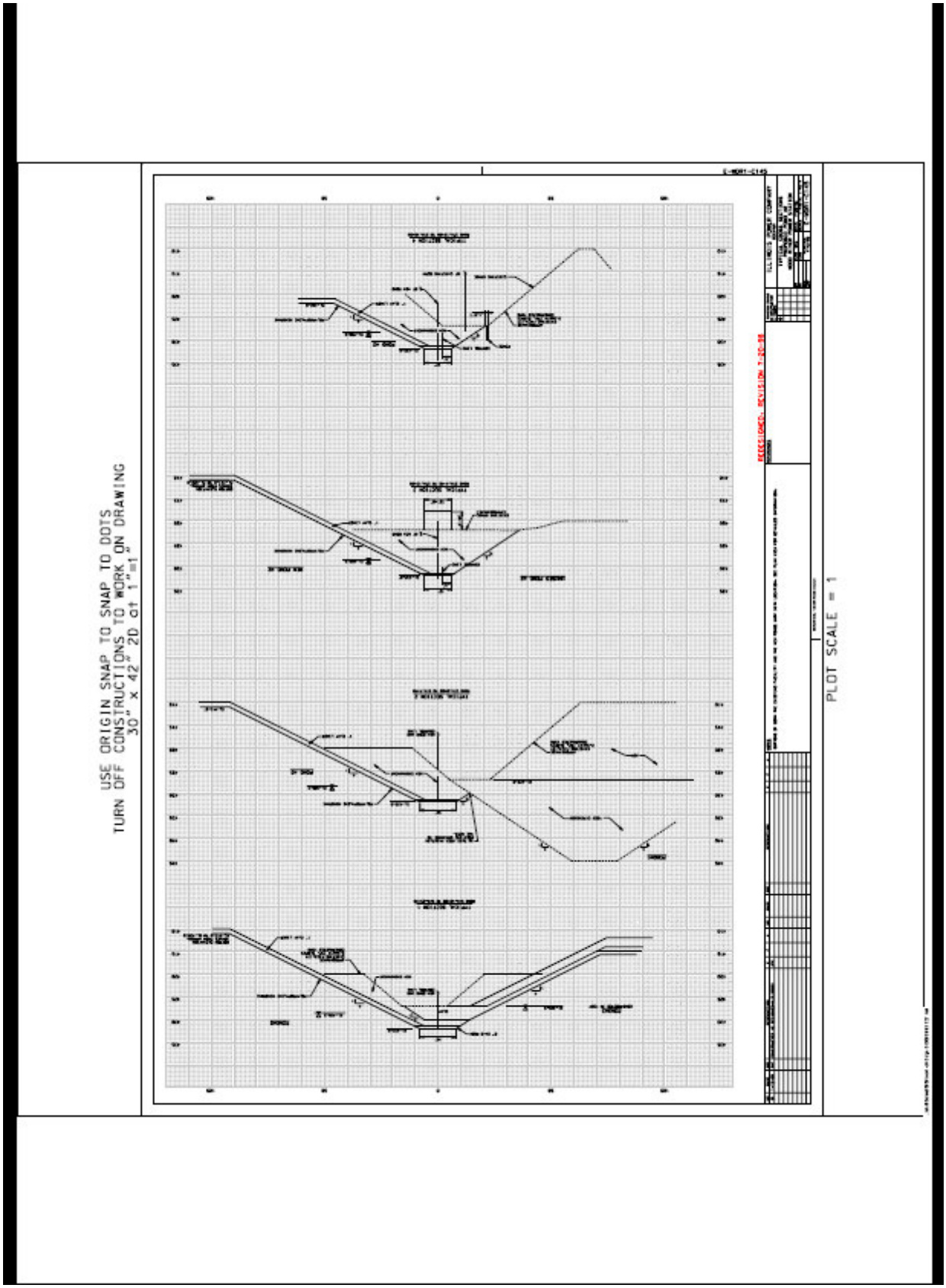

STATION
Mississippi River
Lock and Dam
Riverlands Environmental Demo Area
Riverlands Environmental Demo Area
N
Lock and Dam Way
Delmo Hwy
East Alton
bing

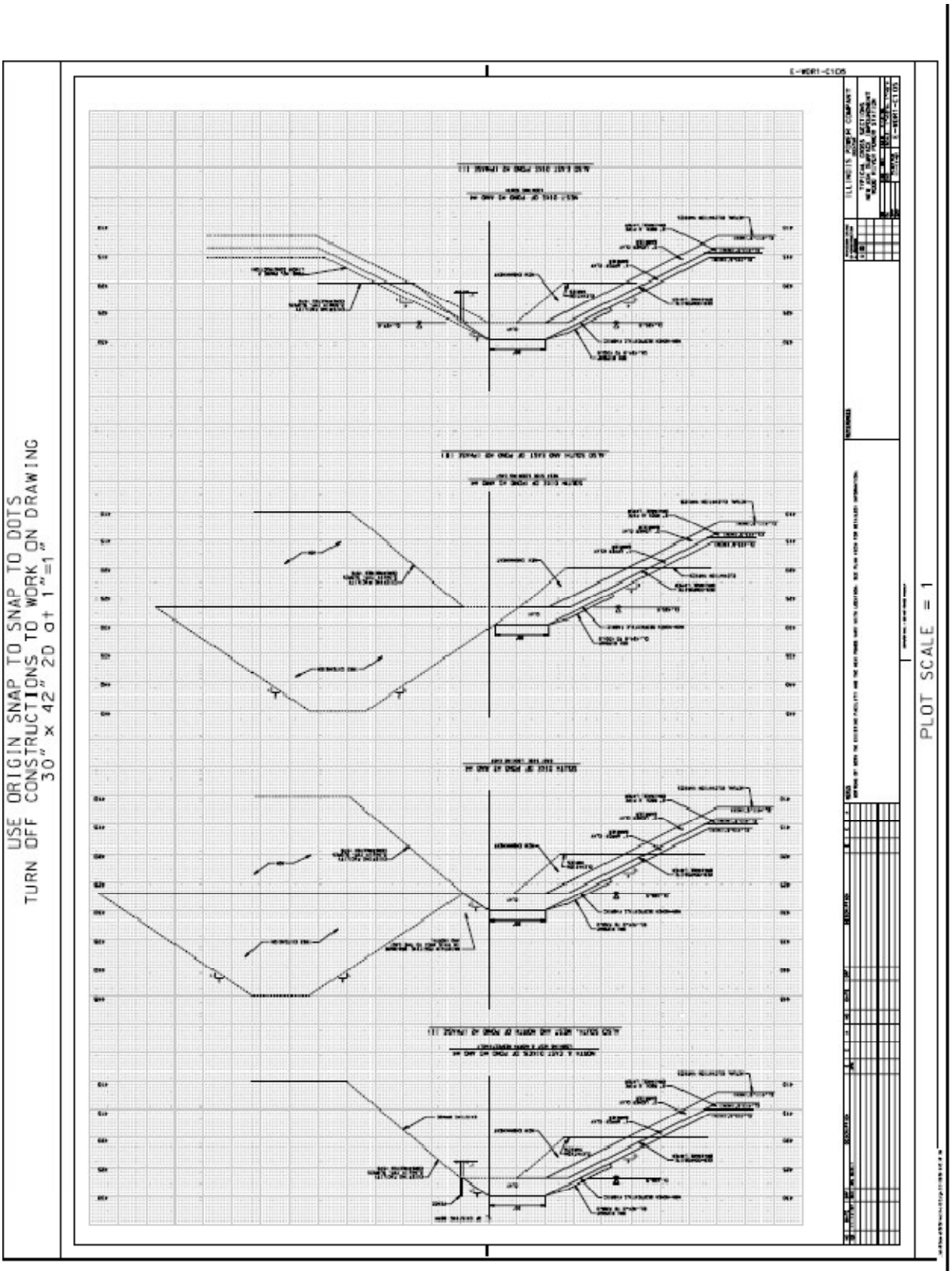
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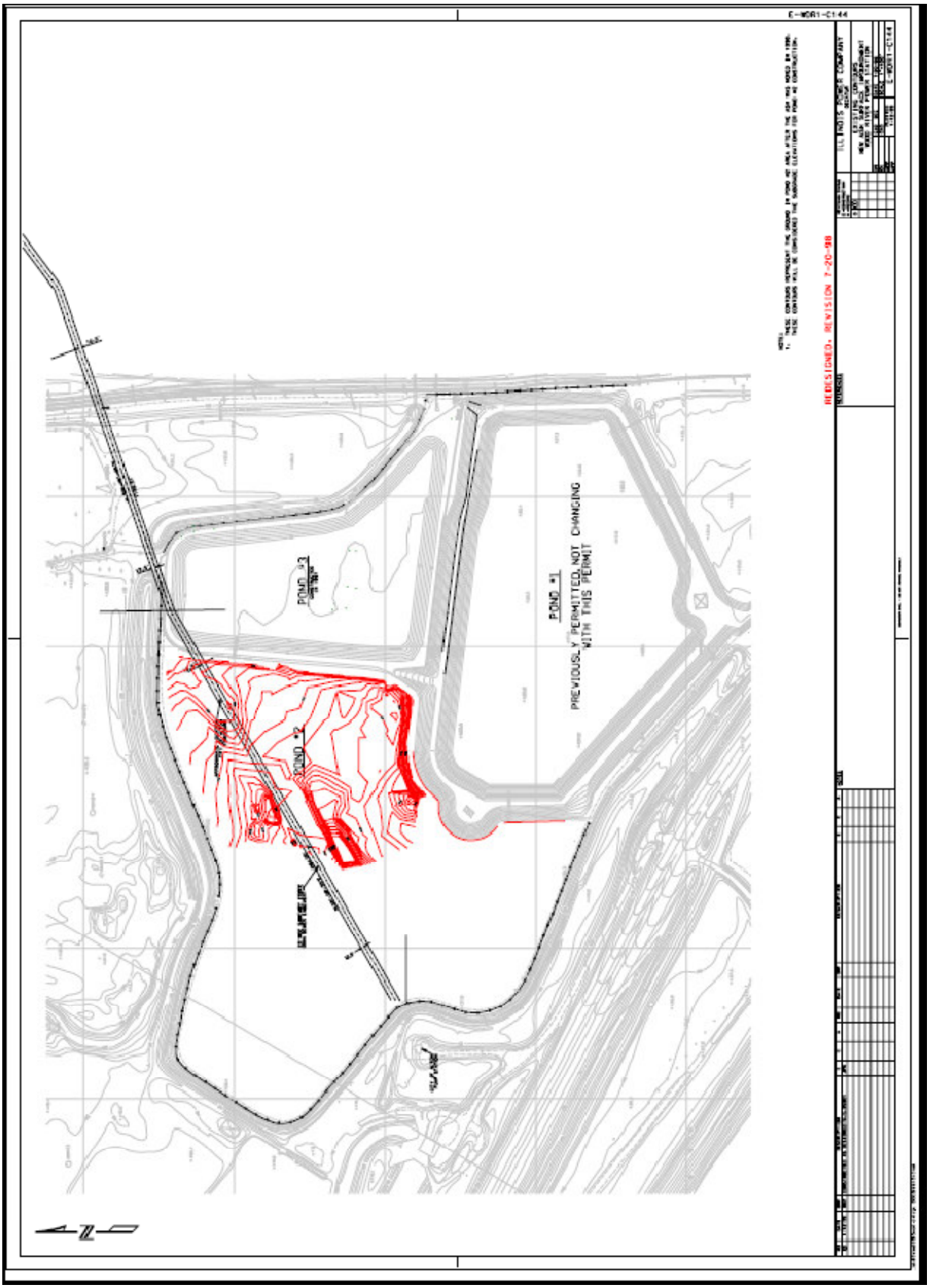

EAST ASH POND EXPANSION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
P-02

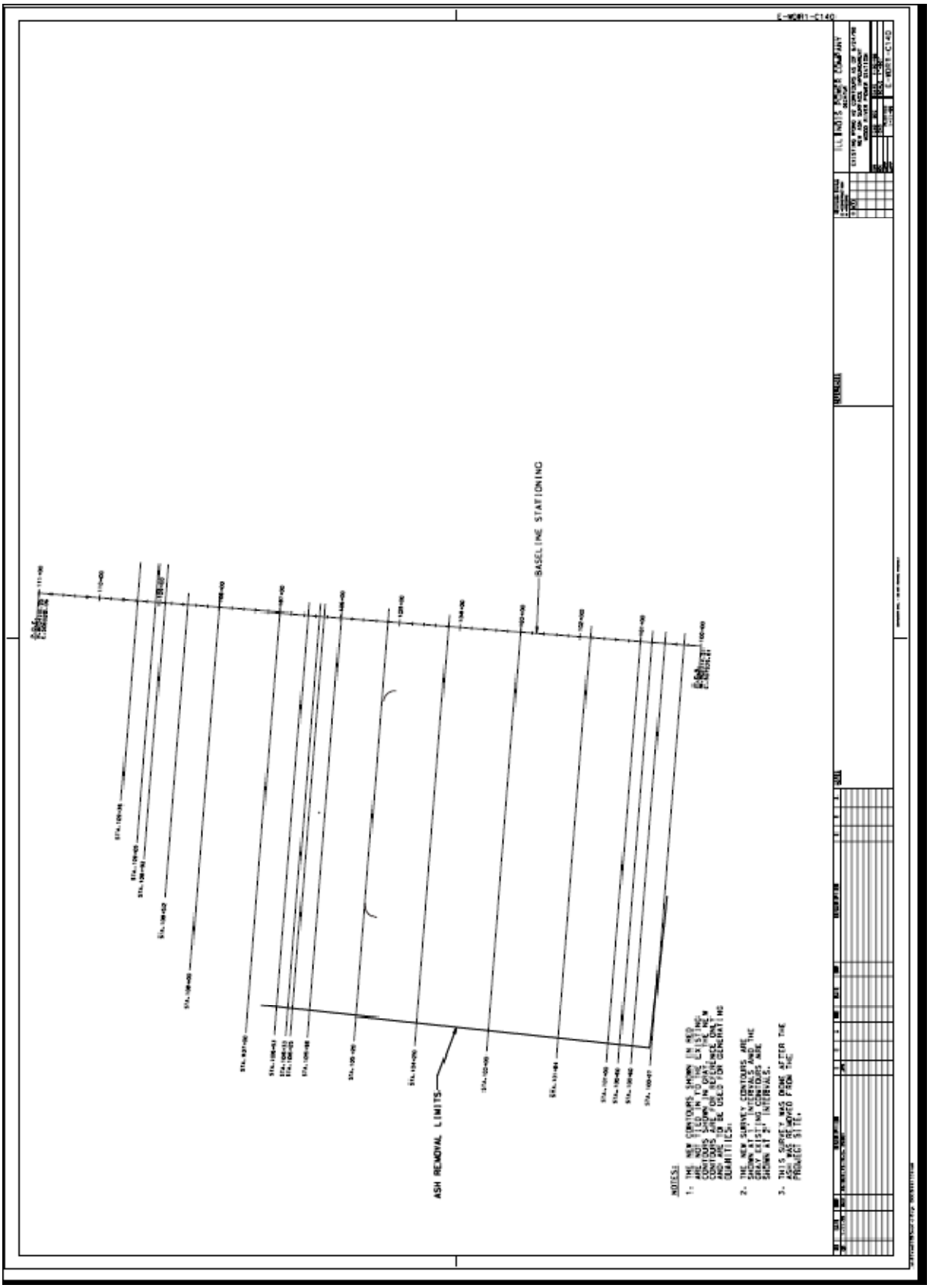
DRAFT


BASELINE STATIONING
REDESIGNED. REVISION 7-20-98
ILLINOIS POWER COMPANY


USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=1"
PLOT SCALE = 1


USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=1"
PLOT SCALE = 1


POND #3
POND #2
POND #1
PREVIOUSLY PERMITTED, NOT CHANGING WITH THIS PERMIT
REDESIGNED, REVISION 7-20-98


BASELINE STATIONING
ASH REMOVAL LIMITS
NOTES:
1. THE NEW CONTOURS SHOWN IN RED ARE NOT TIED IN TO THE EXISTING CONTOURS SHOWN IN BLACK. THEY ARE SHOWN FOR REFERENCE ONLY AND ARE NOT TO BE USED FOR GENERATING QUANTITIES.
2. THE NEW SURVEY CONTOURS ARE SHOWN AT 1' INTERVALS AND THE EXISTING CONTOURS ARE SHOWN AT 2' INTERVALS.
3. THIS SURVEY WAS DONE AFTER THE ASH WAS REMOVED FROM THE PROJECT SITE.

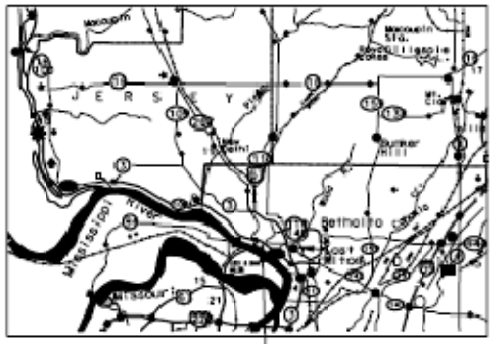
ILLINOIS POWER COMPANY
ENGINEERING AND TECHNICAL SERVICES

PLANS FOR PROPOSED
NEW ASH SURFACE IMPOUNDMENT - POND#2
WOOD RIVER POWER STATION
W.O. 26901/66901

ILLINOIS POWER

INDEX OF SHEETS

DRAWING TITLE	DRAWING NUMBER
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OVERALL SITE PLAN	C-WDR1-C142
ASH REMOVAL, BASELINE AND SURVEY LAYOUT	C-WDR1-C143
EXISTING CONTOURS	C-WDR1-C144
TYPICAL CROSS SECTIONS	C-WDR1-C145
MISCELLANEOUS MEMBRANE AND PIPING	C-WDR1-C146
OUTFALL STRUCTURE AND PIPING DETAILS	C-WDR1-C147
CROSS SECTION LOCATIONS	C-WDR1-C148
CROSS SECTIONS, SHEET 1	C-WDR1-C149
CROSS SECTIONS, SHEET 2	C-WDR1-C150
CROSS SECTIONS, SHEET 3	C-WDR1-C151
CROSS SECTIONS, SHEET 4	C-WDR1-C152
CROSS SECTIONS, SHEET 5	C-WDR1-C153
CROSS SECTIONS, SHEET 6	C-WDR1-C154
CROSS SECTIONS, SHEET 7	C-WDR1-C155
EXISTING POND #2 AS OF 4/28/98	C-WDR1-C139
EXISTING POND #2 AS OF 6/24/98	C-WDR1-C140



LOCATION MAP



AS-BUILTS 1-12-98
CONSTRUCTED AS DESIGNED

REDESIGNED, REVISION 7-20-98

E-WDR1-C141

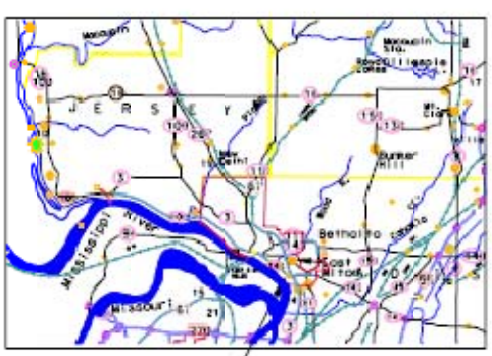
ILLINOIS POWER COMPANY
ENGINEERING AND TECHNICAL SERVICES

PLANS FOR PROPOSED
NEW ASH SURFACE IMPOUNDMENT
WOOD RIVER POWER STATION
W.O. 26254/66254

ILLINOIS POWER

INDEX OF SHEETS

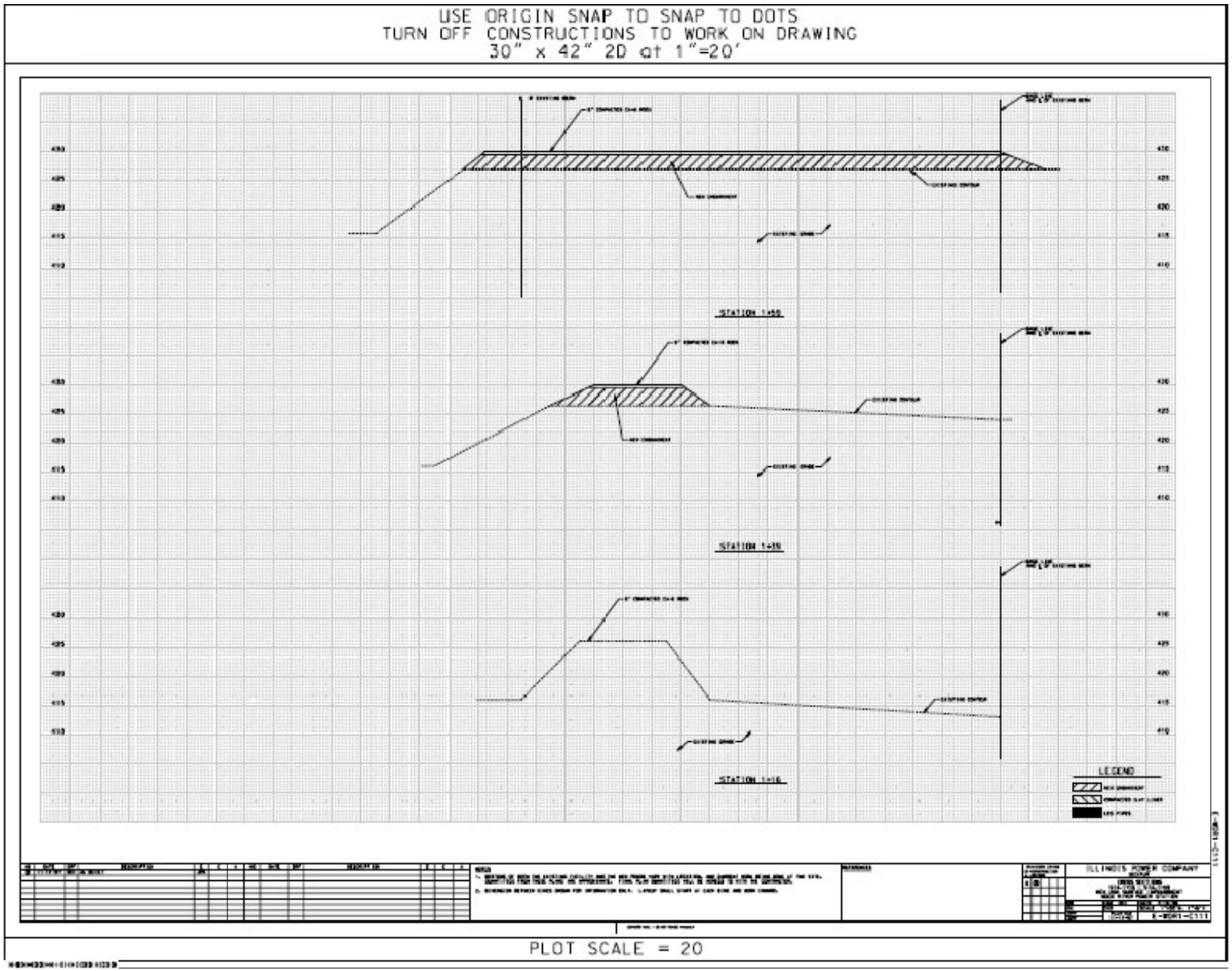
DRAWING TITLE	DRAWING NUMBER
TITLE SHEET	E-WDR1-C104
OVERALL SITE PLAN	E-WDR1-C94
TYPICAL CROSS SECTIONS	E-WDR1-C105
EXISITNG CONTOURS	E-WDR1-C118
LEACHATE COLLECTION SYSTEM PIPING PLAN	E-WDR1-C106
FINISHED GRADE CONTOURS	E-WDR1-C107
PIPING DETAILS	E-WDR1-C108
SUMP AND MISC. DETAILS	E-WDR1-C109
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CROSS SECTIONS, SHEET 4	E-WDR1-C114
CROSS SECTIONS, SHEET 5	E-WDR1-C115
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PLAN & DETAILS FOR OUTFALL STRUCTURE	E-WDR1-C99
DETAILS FOR OUTFALL STRUCTURE	E-WDR1-C100
DETAILS FOR OUTFALL STRUCTURE	E-WDR1-C101
OUTFALL STRUCTURE FOUNDATIONS	E-WDR1-C102
CLEANOUT PIPE LAYOUT	E-WDR1-C103



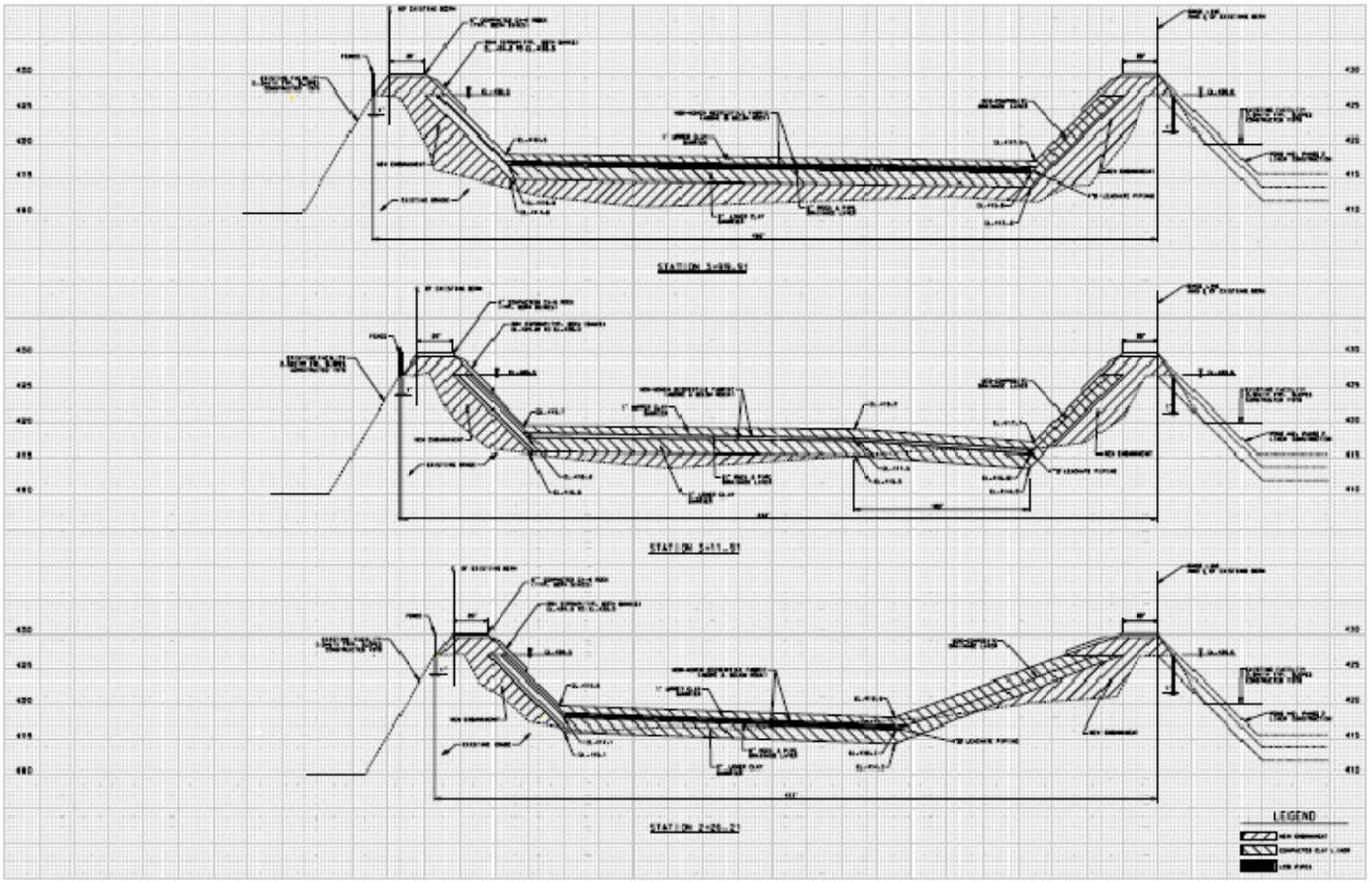


LOCATION MAP

E-WDR1-104

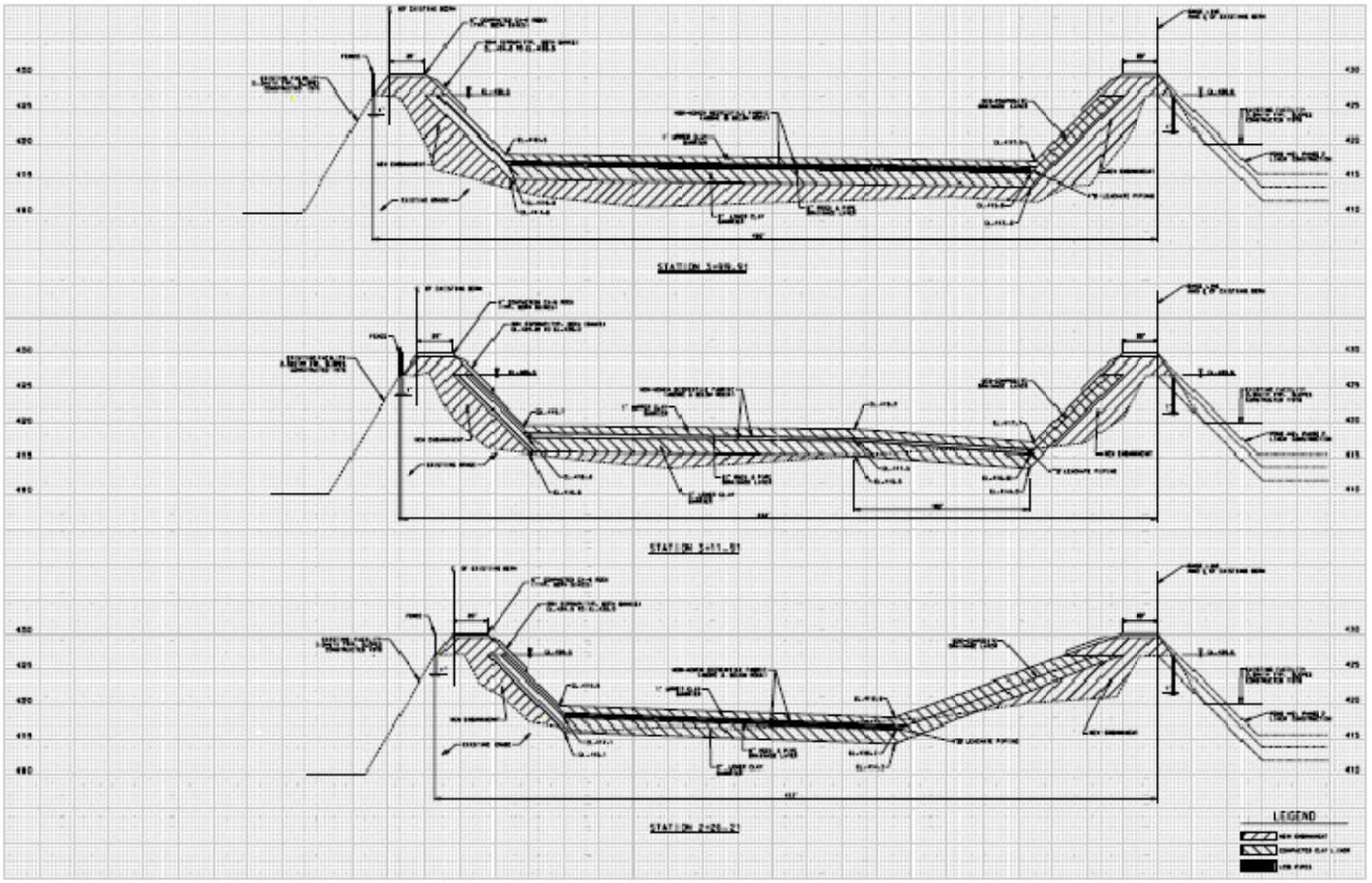

USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=20'
STATION 1+50
STATION 1+10
STATION 1+16
LEGEND
ILLINOIS POWER COMPANY
PLOT SCALE = 20

USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=20'



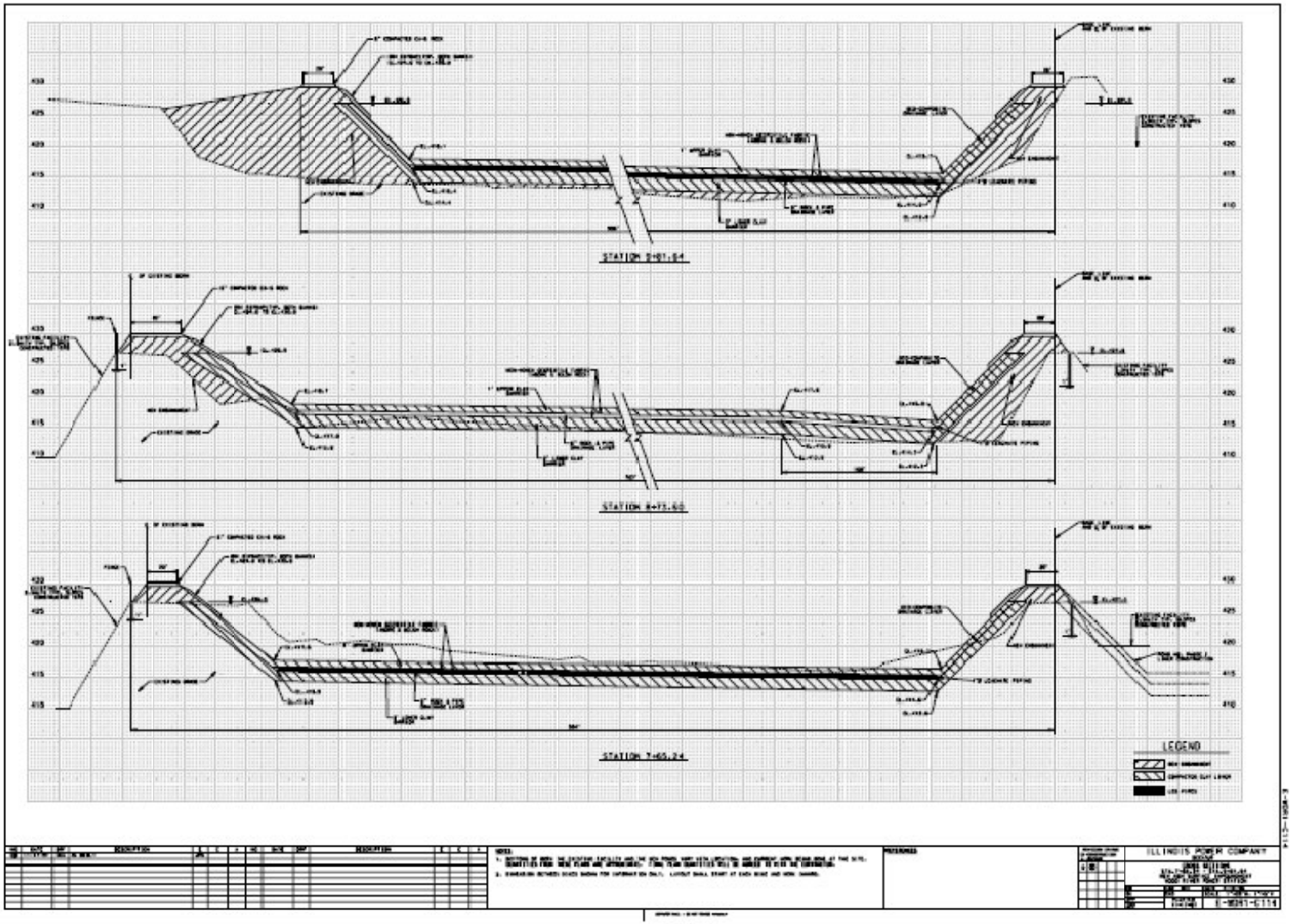
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USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=20'

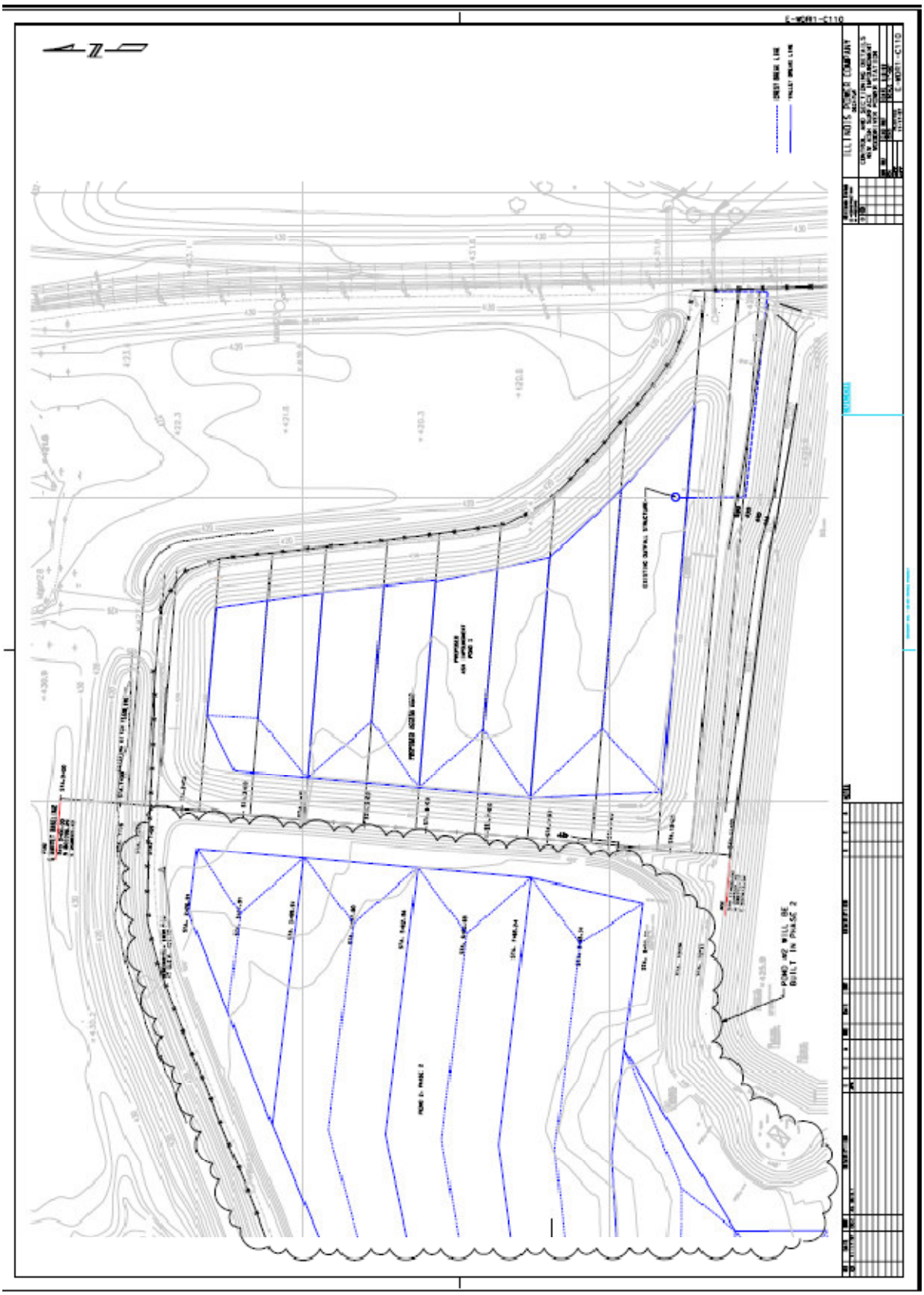


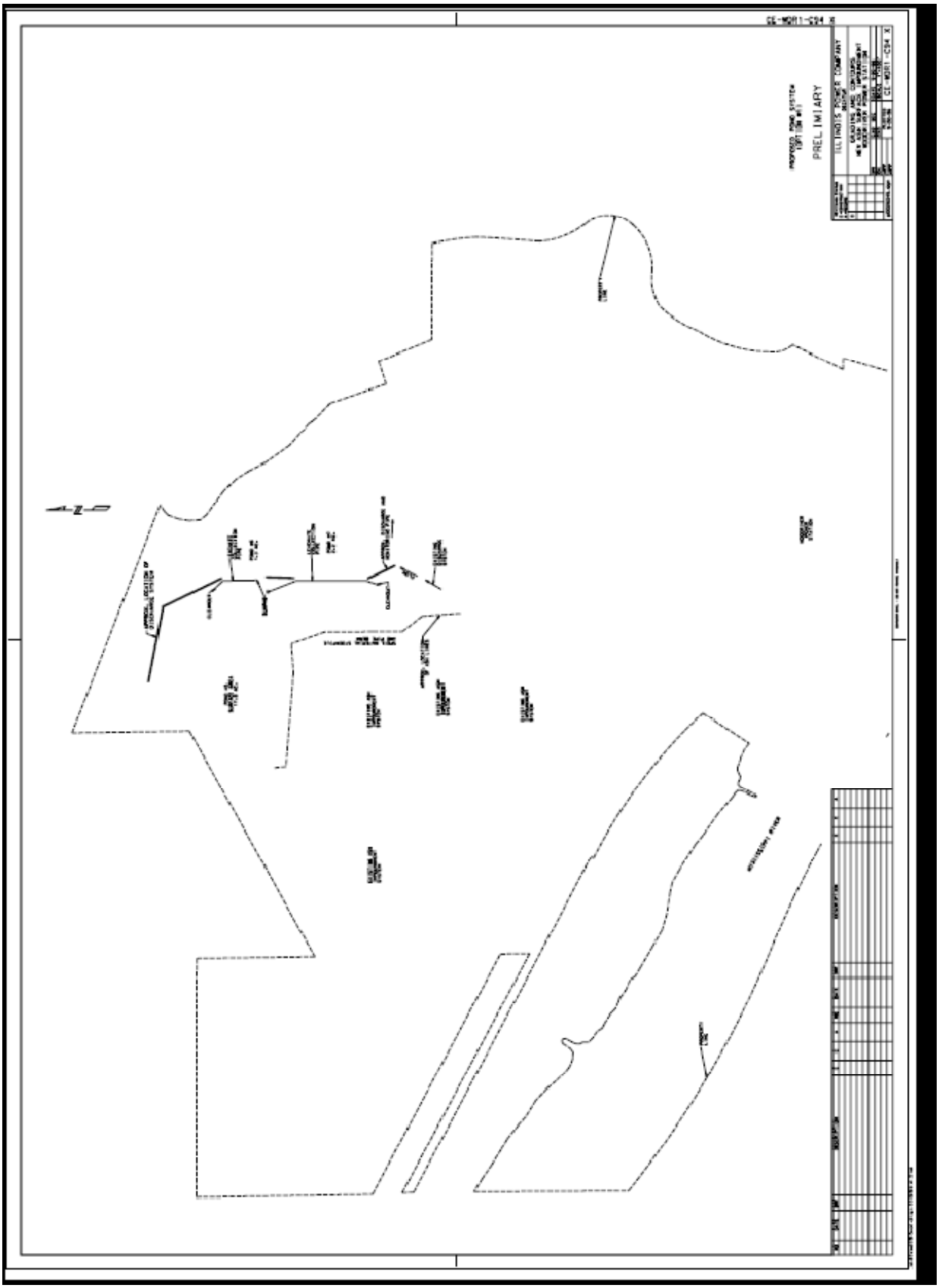
PLOT SCALE = 20

USE ORIGIN SNAP TO SNAP TO DOTS
TURN OFF CONSTRUCTIONS TO WORK ON DRAWING
30" x 42" 2D at 1"=20'

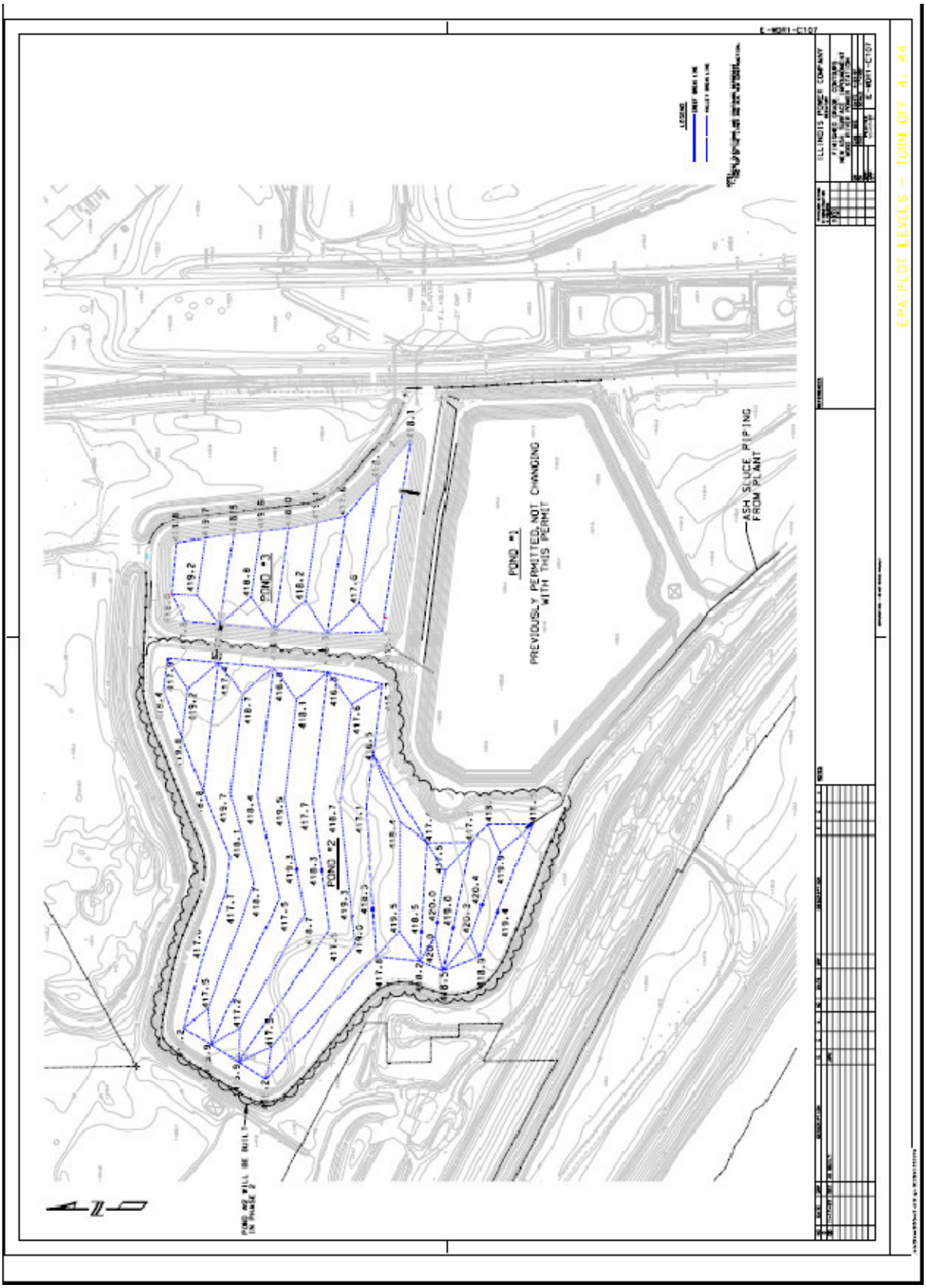


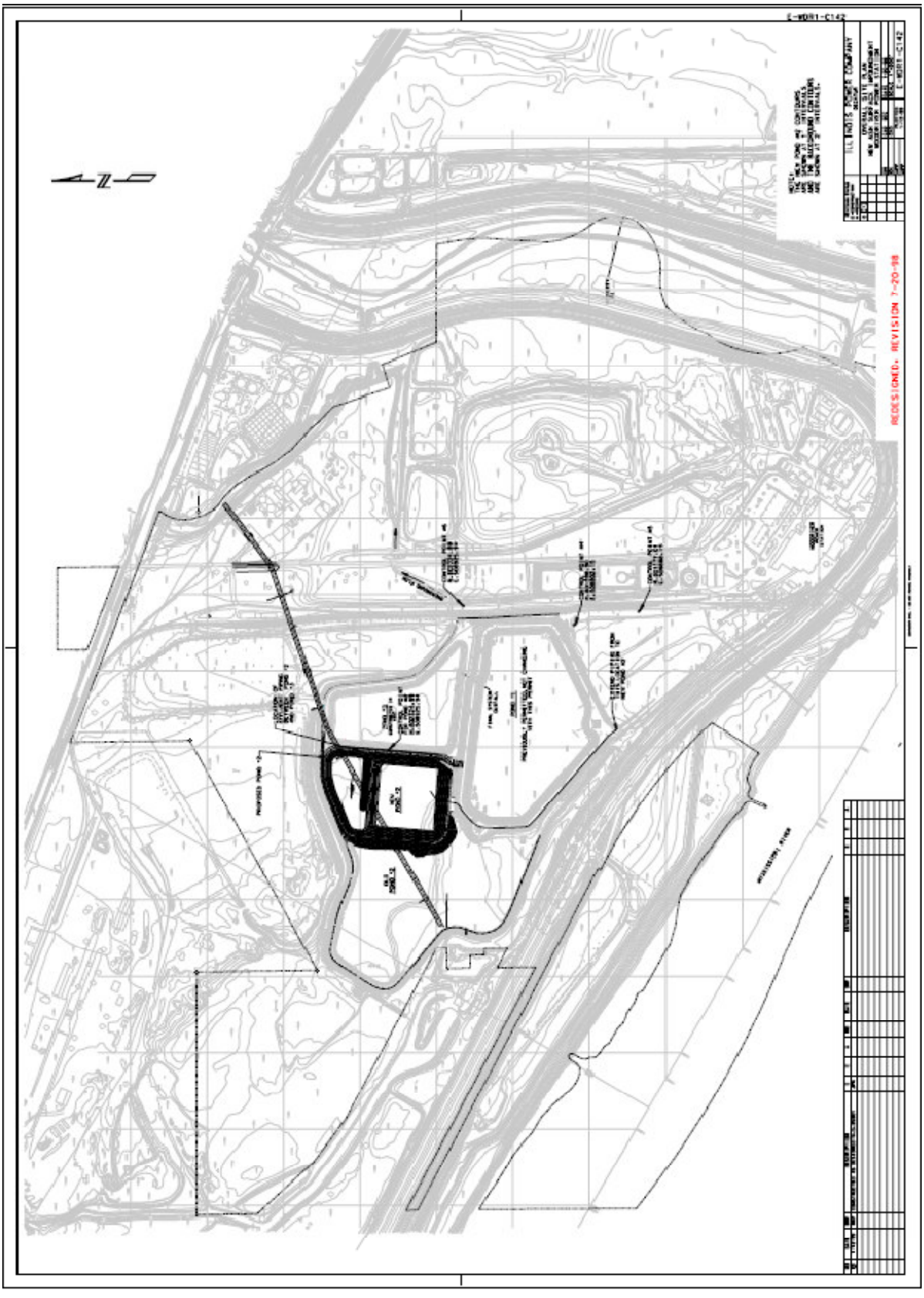
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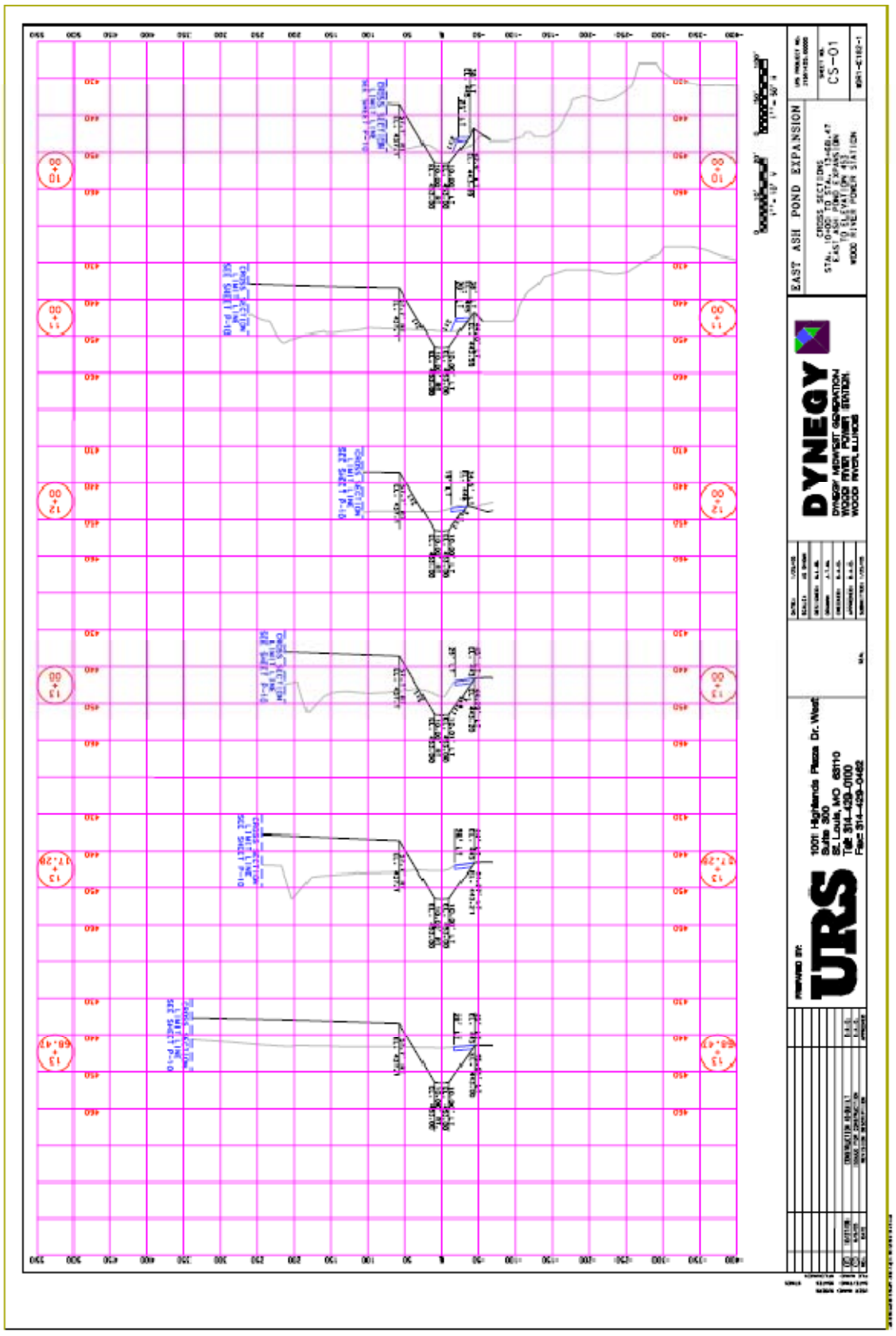

POND #2 WILL BE
BUILT IN PHASE 2

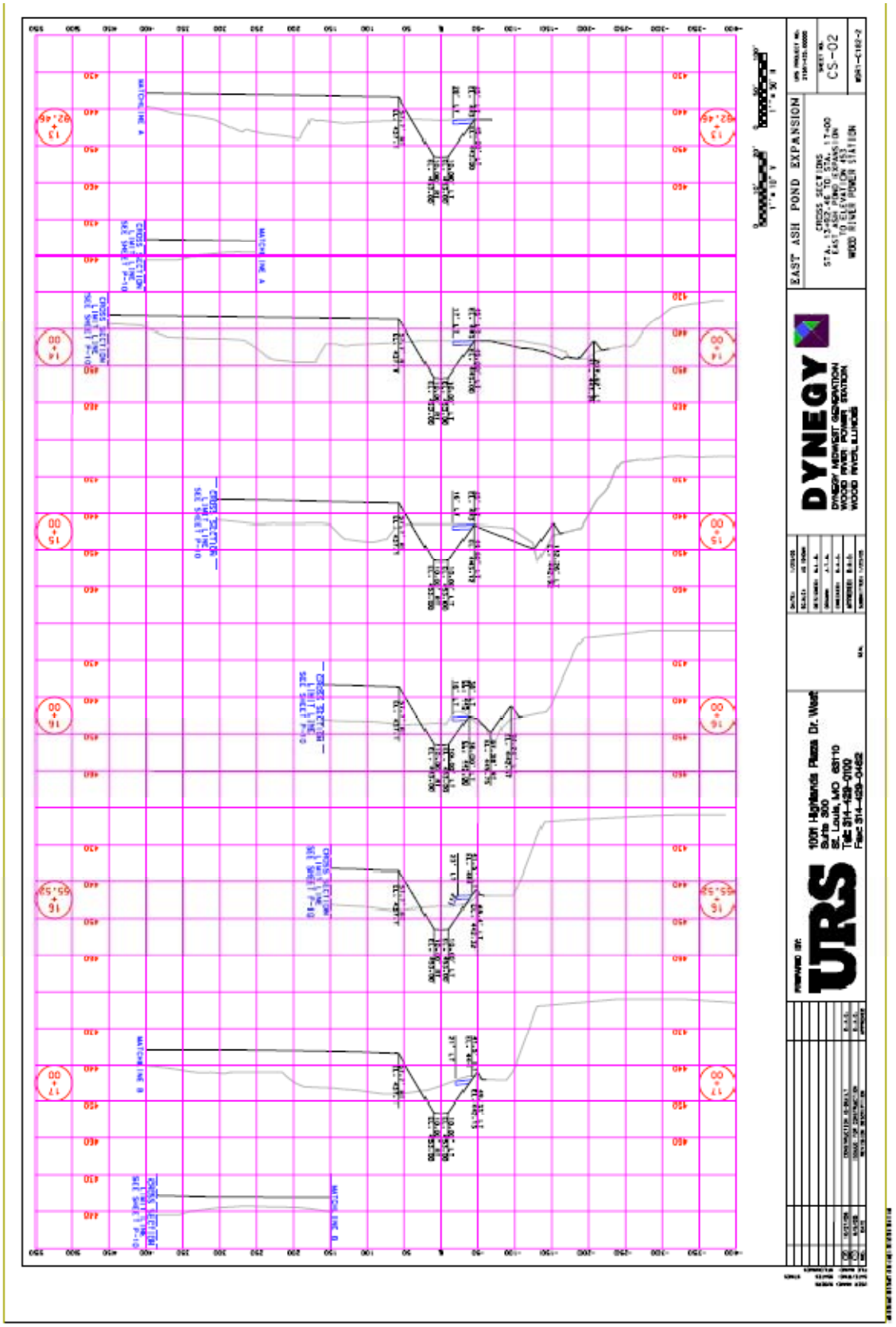

PRELIMINARY

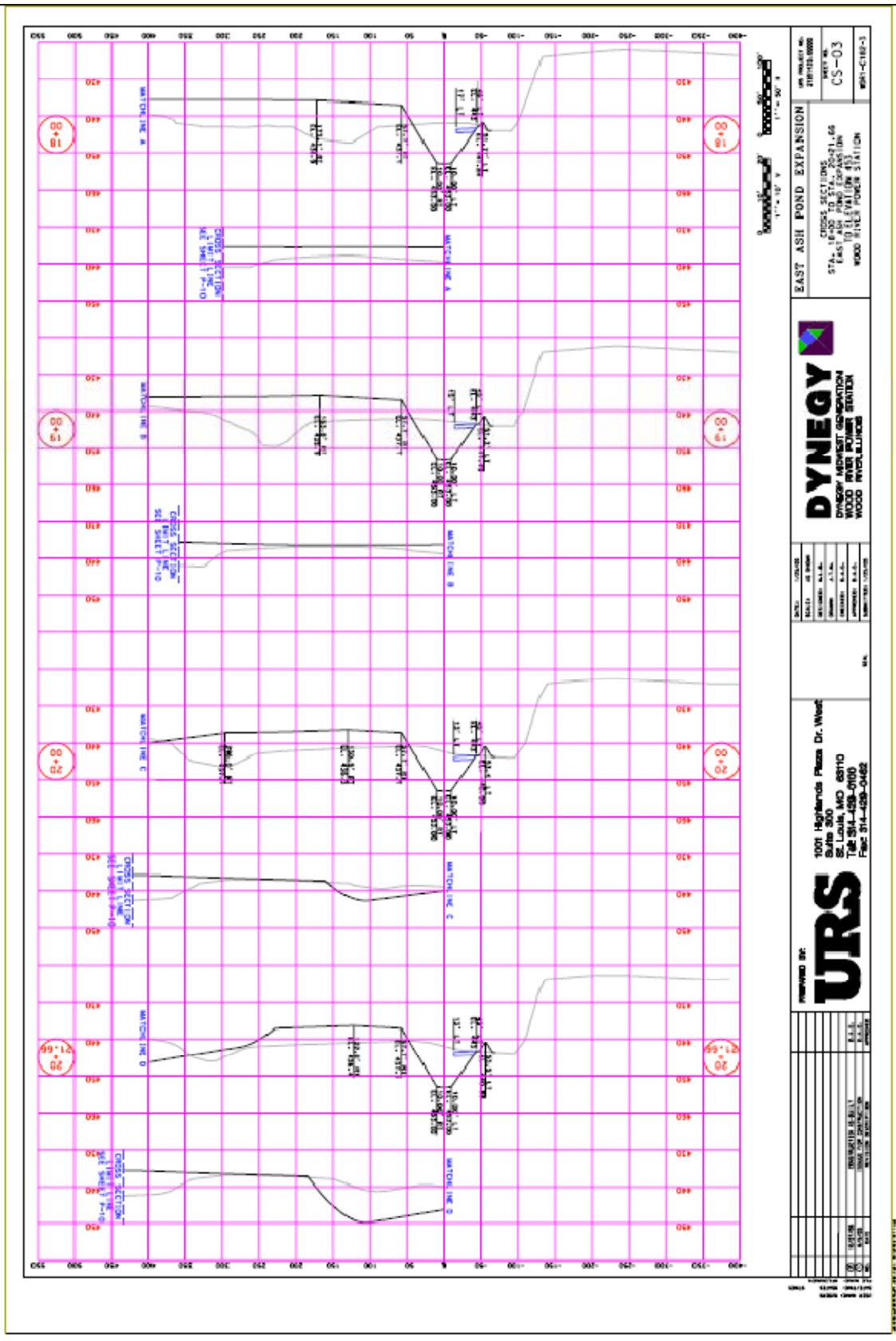


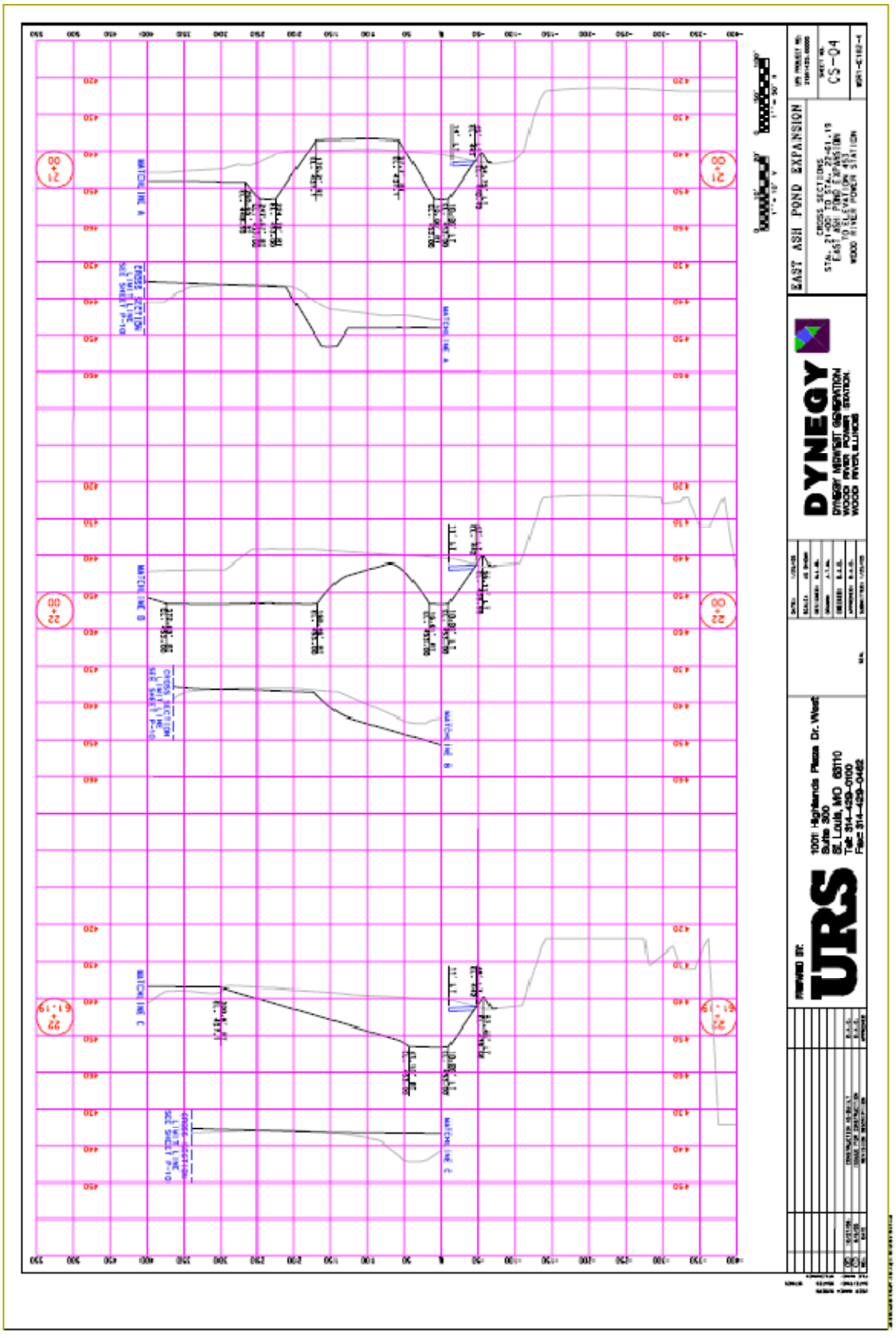

POND #1
PREVIOUSLY PERMITTED, NOT CHANGING WITH THIS PERMIT
POND #2
POND #3
ASH SLUICE PIPING FROM PLANT
EPA PLOT LEVELS – TURN OFF 4, 44

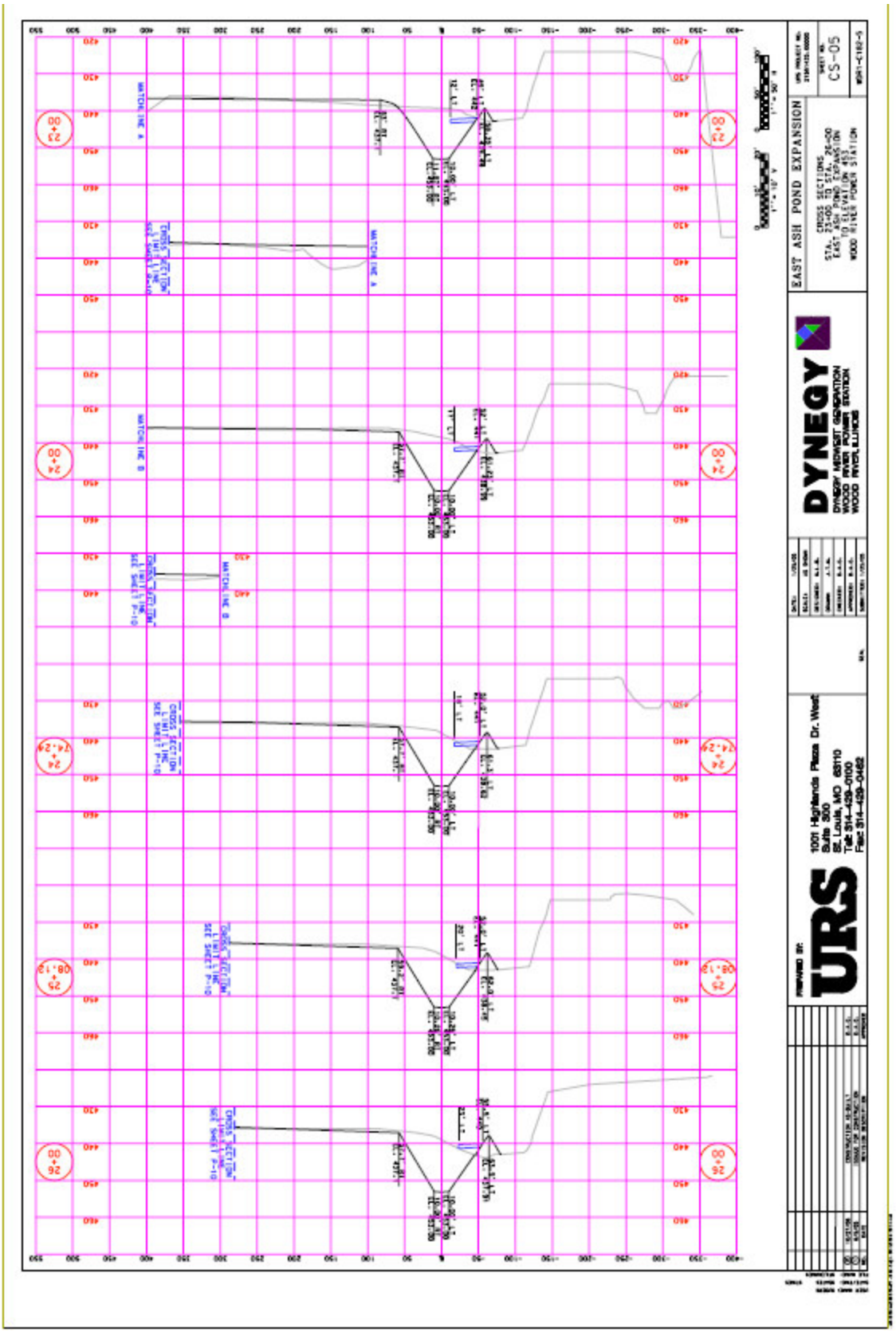

E-WDR1-C142
REDESIGNED: REVISION 7-20-98

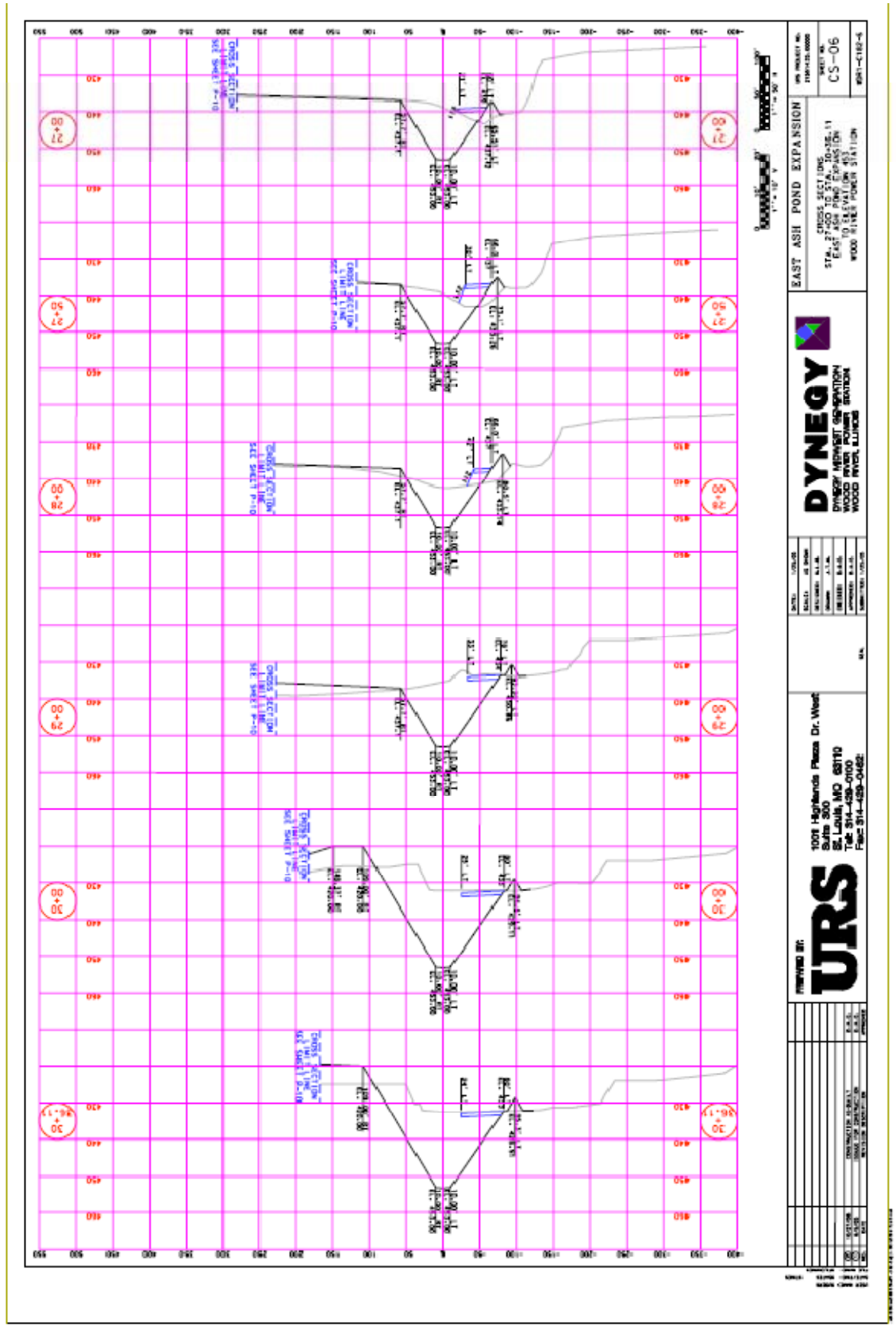

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 10+00 TO STA. 13+68.47
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
CS-01
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

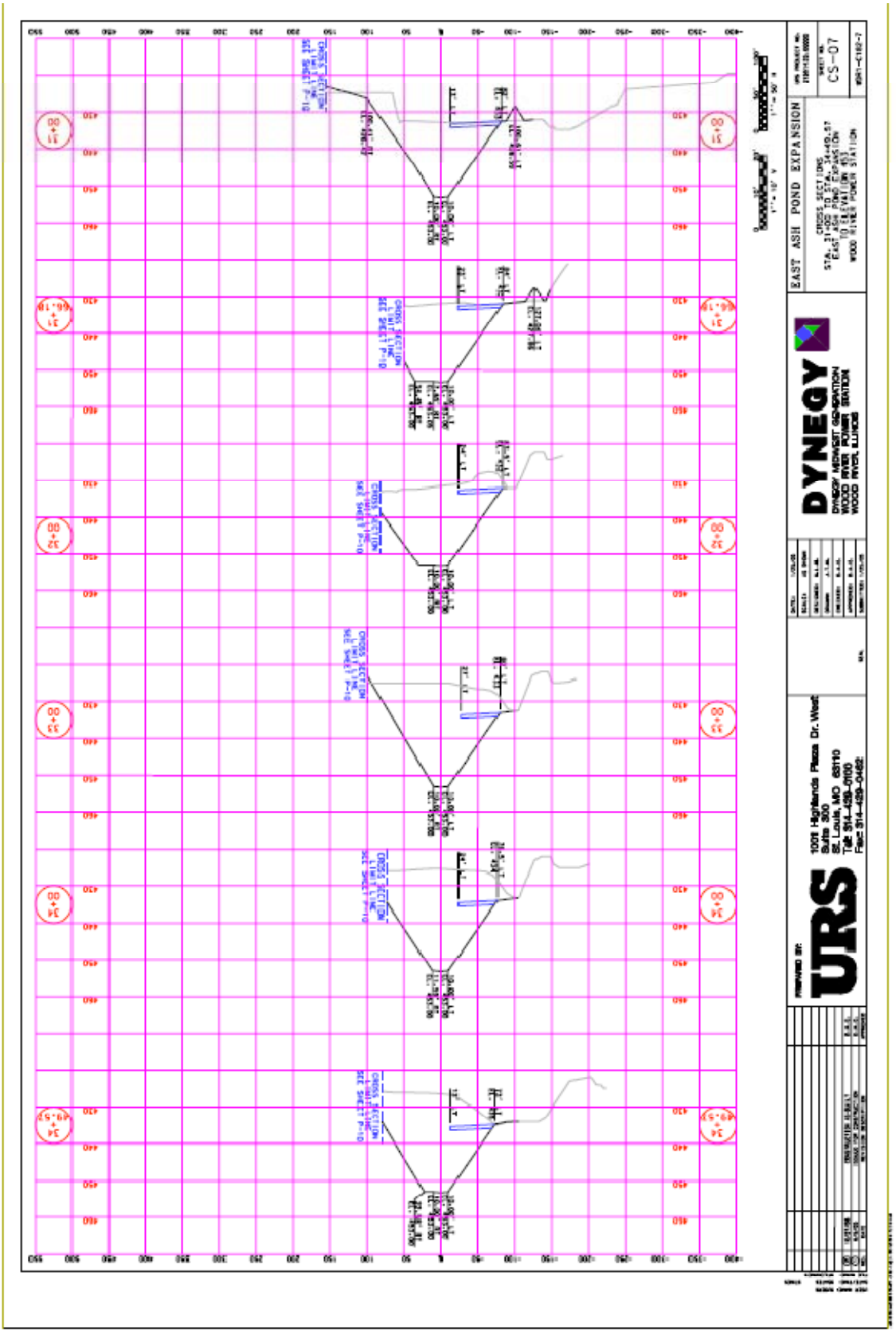

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 13+62.45 TO STA. 17+00
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
CS-02
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

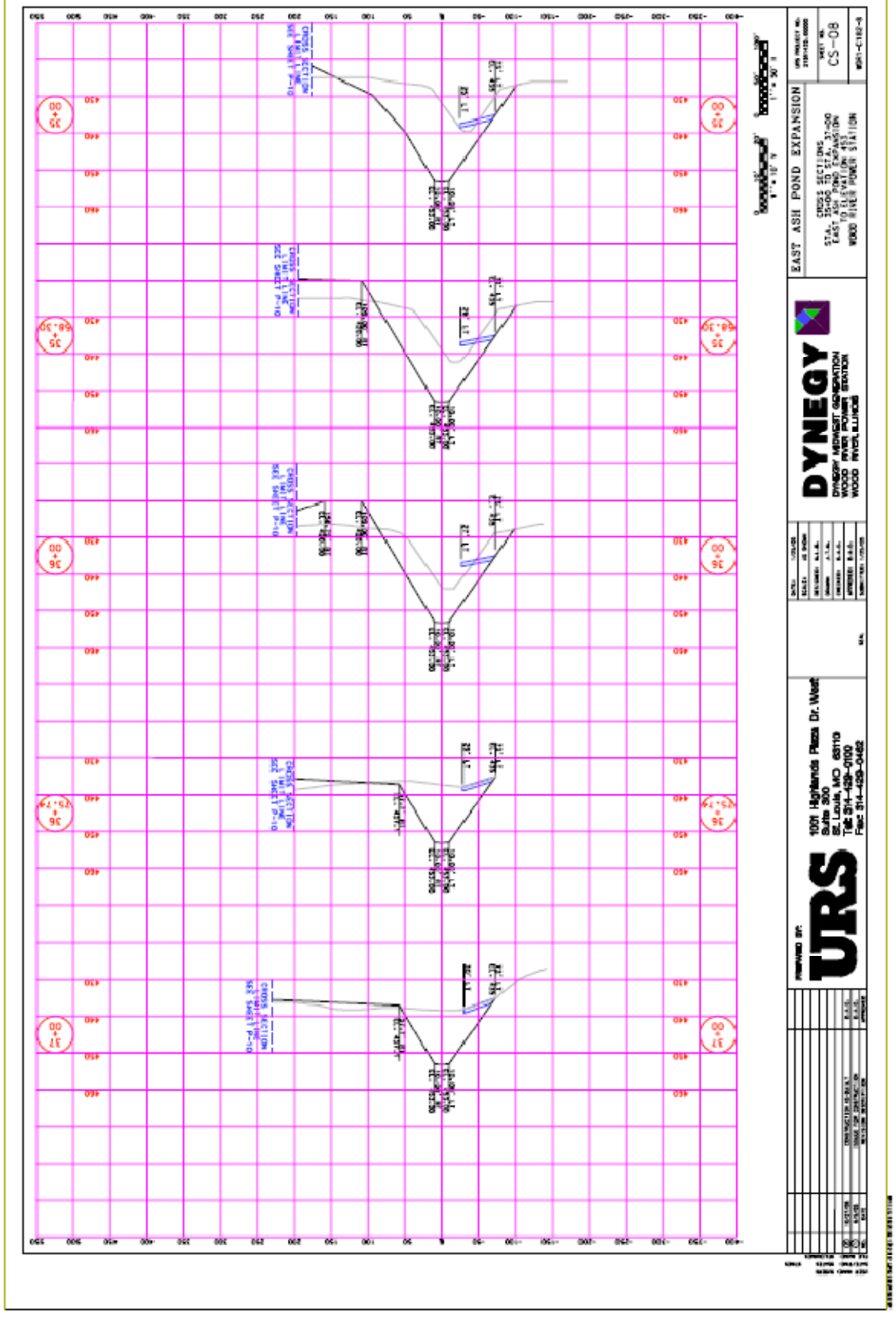

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 18+00 TO STA. 20+71.66
EAST ASH POND EXPANSION
(0 ELEVATION 451)
WOOD RIVER POWER STATION
CS-03
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel 314-429-0100
Fax 314-429-0462

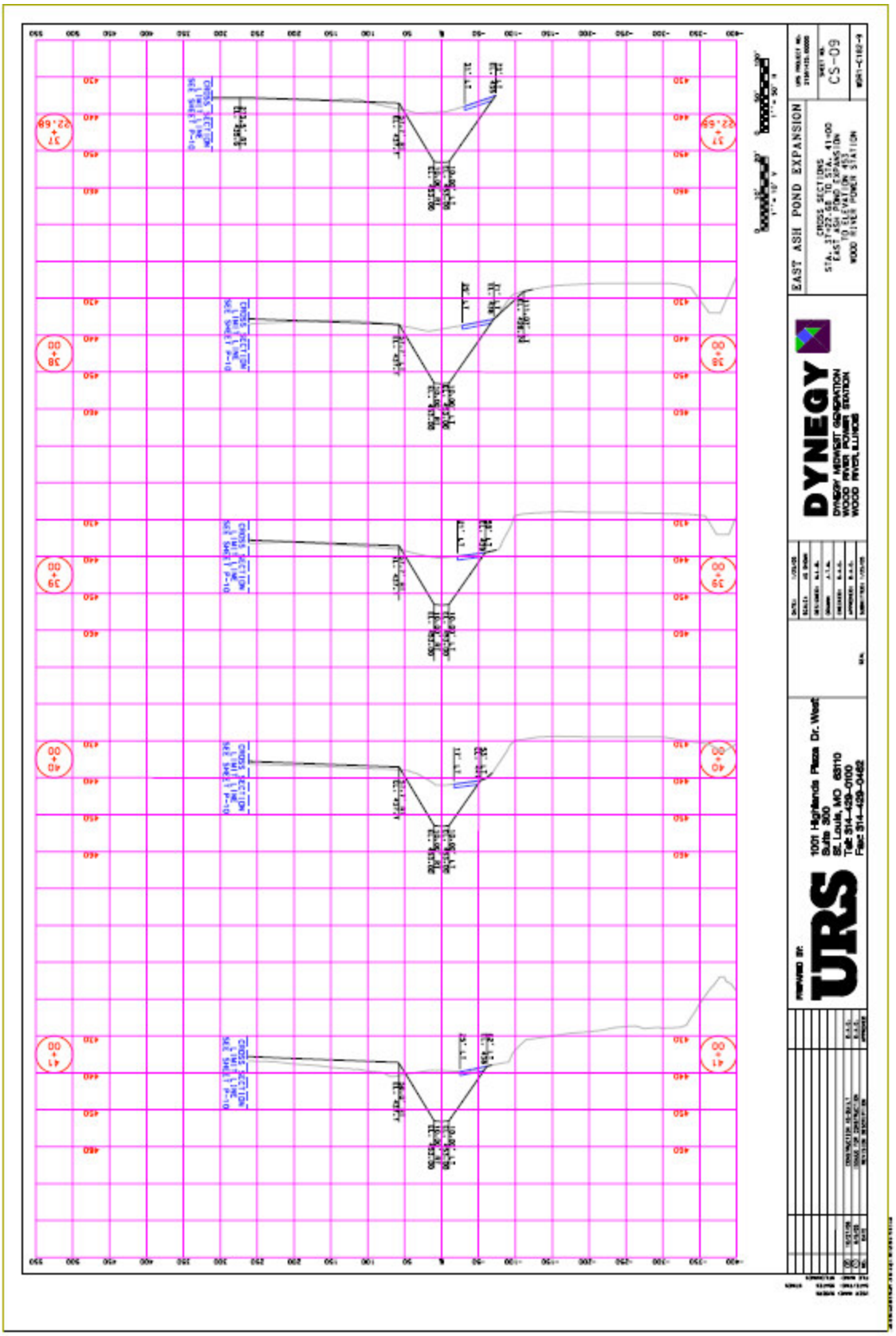

EAST ASH POND EXPANSION
CROSS SECTIONS
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
CS-04
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
prepared by:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

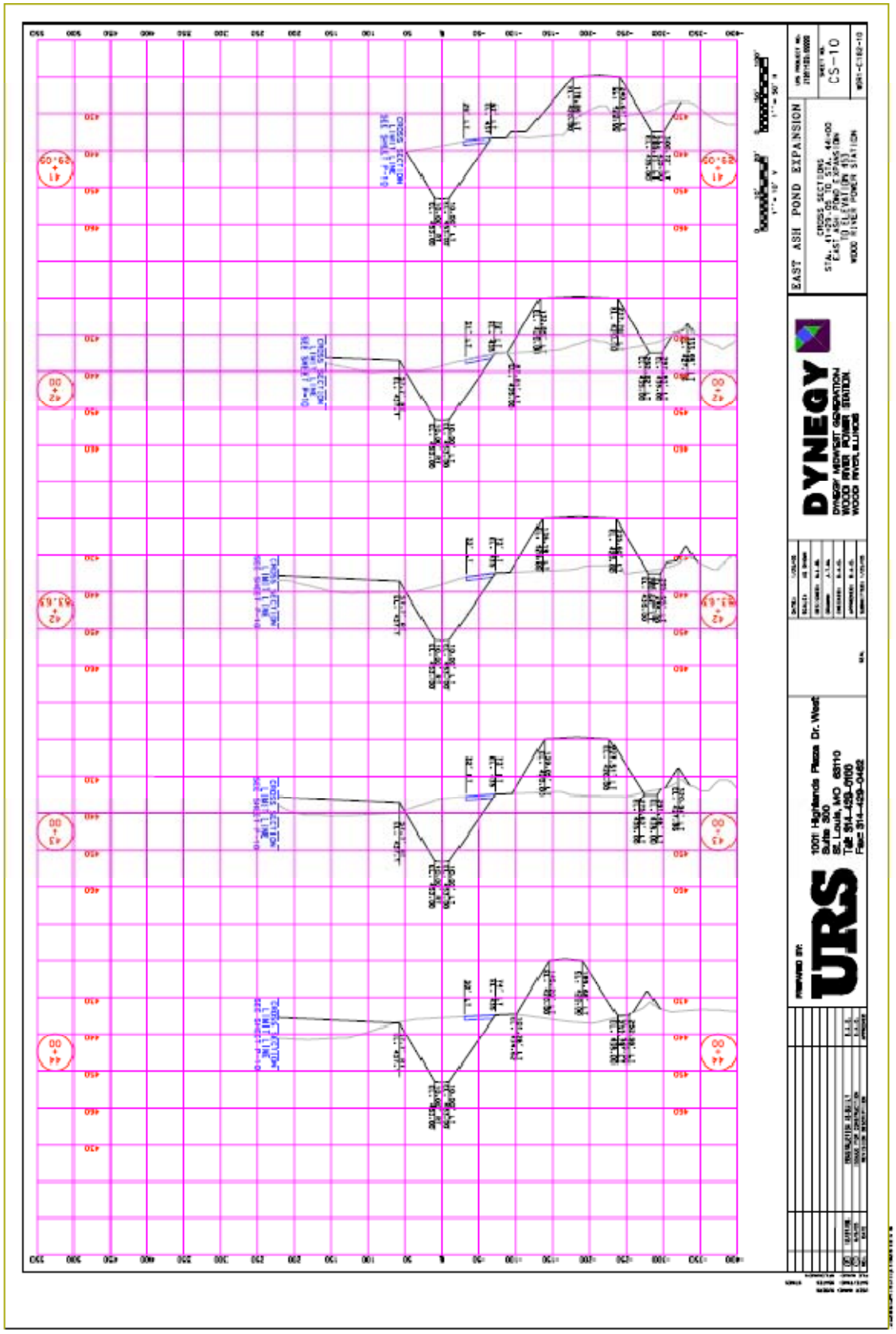

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 23+00 TO STA. 26+00
EAST ASH POND EXPANSION
TO ELEVATION 455
WOOD RIVER POWER STATION
CS-05
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel 314-429-0100
Fax 314-429-0462

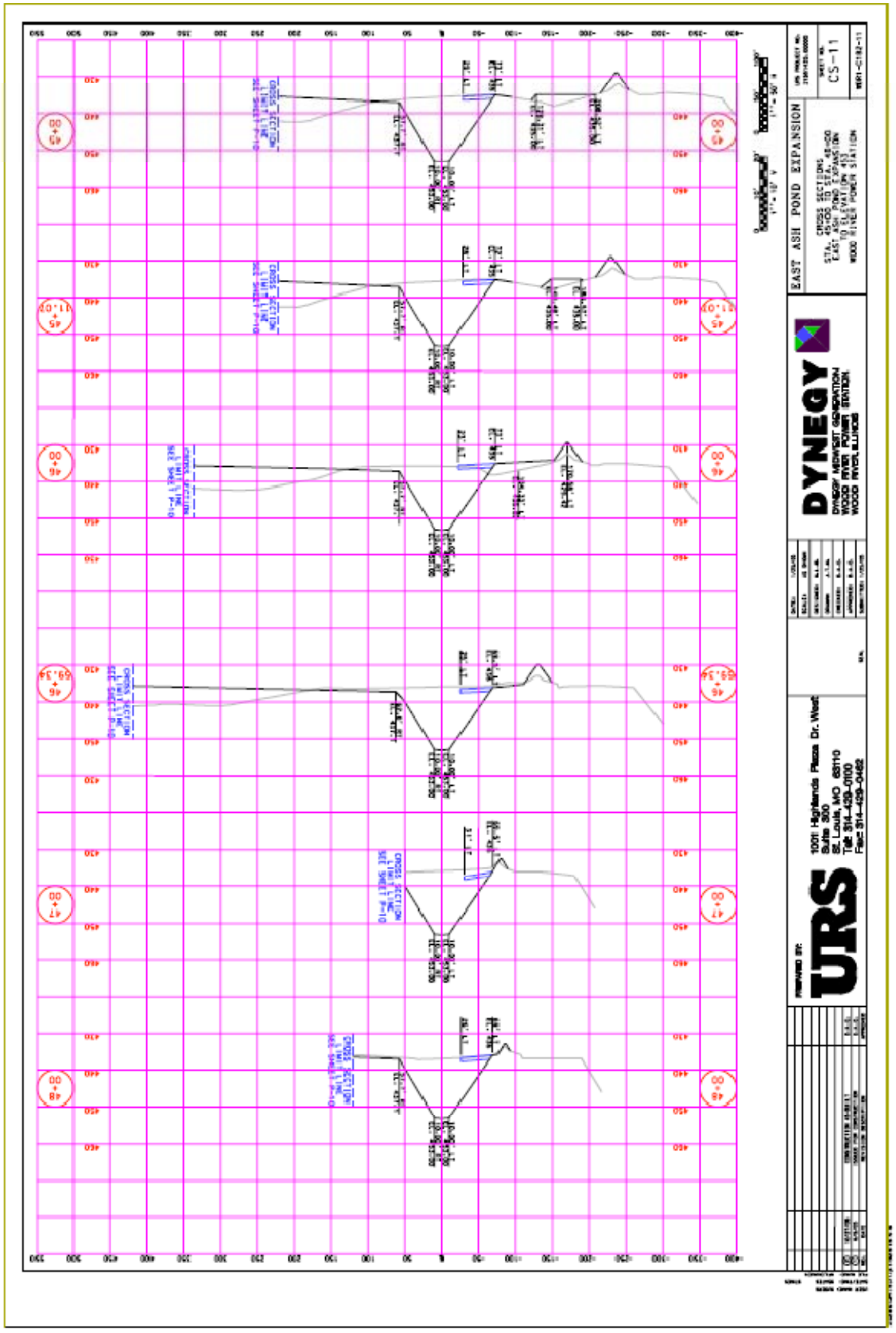

EAST ASH POND EXPANSION
CS-06
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
prepared for:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

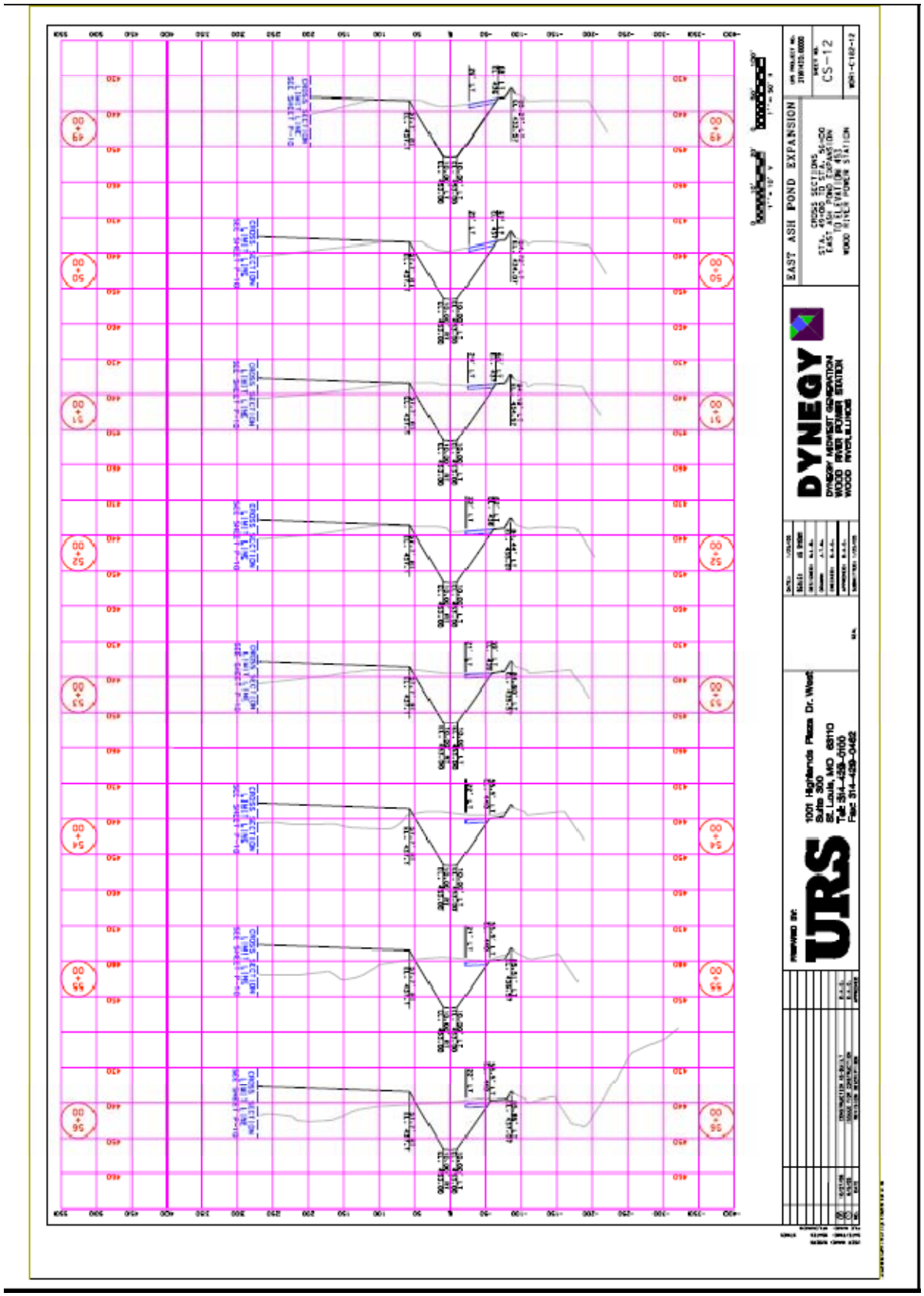

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 31+00 TO STA. 34+49.57
EAST ASH POND EXPANSION
WOOD RIVER POWER STATION
CS-07
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel 314-429-0100
Fax 314-429-0462

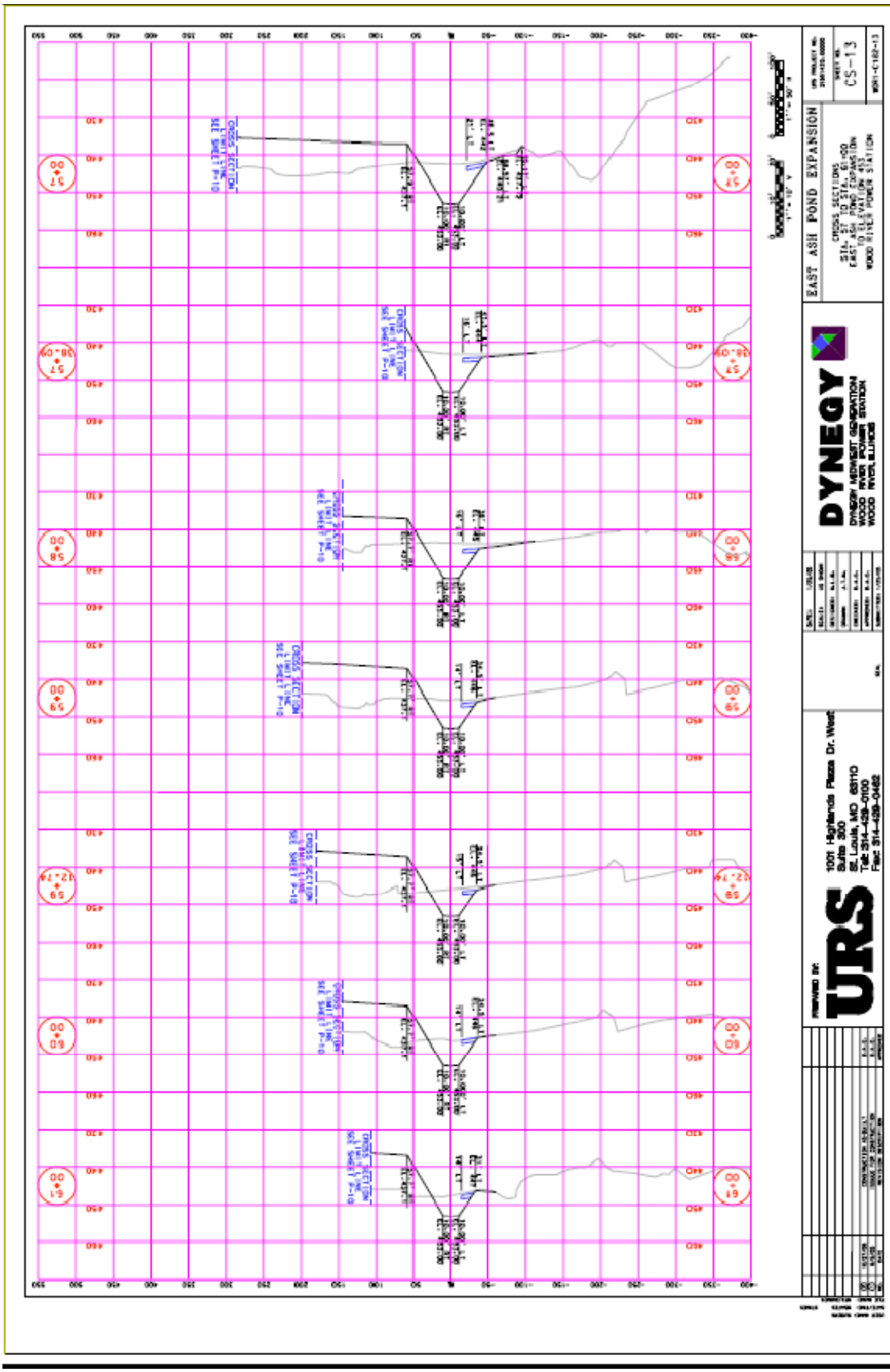

EAST ASH POND EXPANSION
CS-08
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

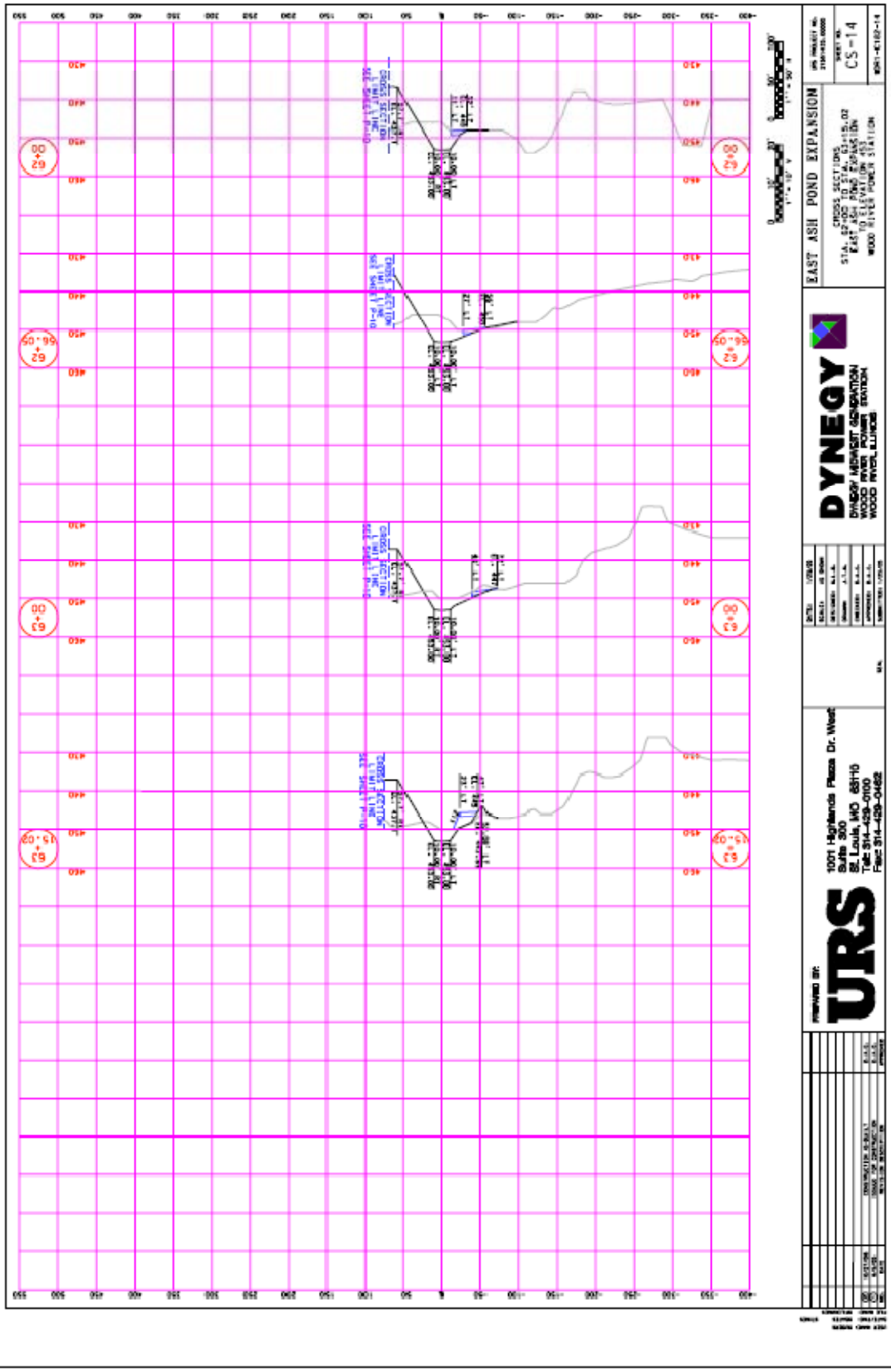

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 37+22.68 TO STA. 41+00
EAST ASH POND EXPANSION
TO ELEVATION 453
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
CS-09

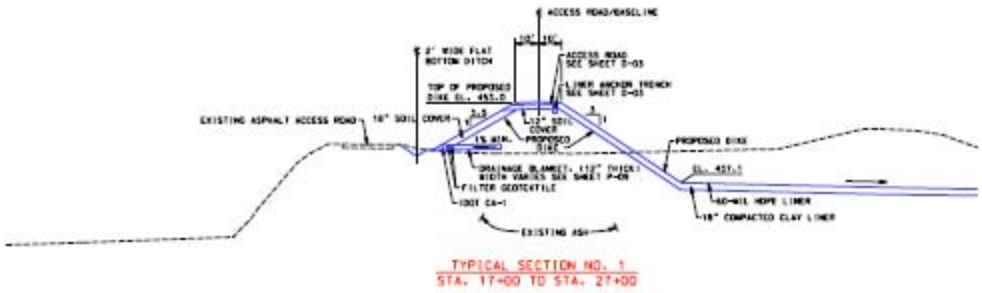

EAST ASH POND EXPANSION
CROSS SECTIONS
CS-10
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
prepared for:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462


EAST ASH POND EXPANSION
CROSS SECTIONS
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
CS-11
PREPARED BY:
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Tel: 314-429-0100
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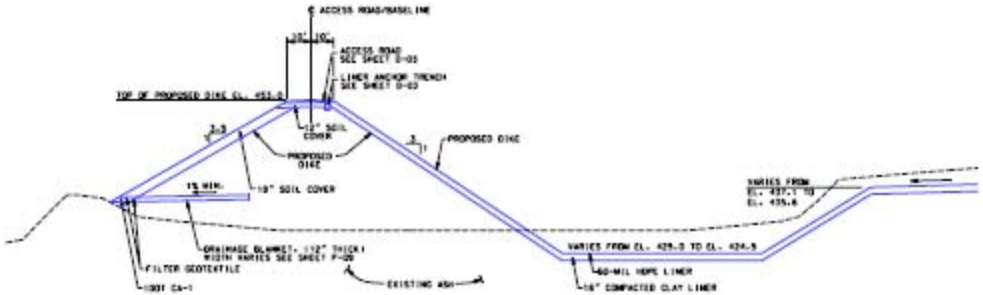

EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 49+00 TO STA. 56+00
EAST ASH POND EXPANSION
WOOD RIVER POWER STATION
CS-12
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER JUNCTION
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462


EAST ASH POND EXPANSION
CROSS SECTIONS
SHEET NO.
CS-13
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
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1001 Highlands Plaza Dr. West
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Tel: 314-429-0100
Fax: 314-429-0462


EAST ASH POND EXPANSION
CROSS SECTIONS
STA. 62+00 TO STA. 63+15.02
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
CS-1.4
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63146
Tel: 314-429-0100
Fax: 314-429-0462



TYPICAL SECTION NO. 1
STA. 17+00 TO STA. 27+00



TYPICAL SECTION NO. 2
STA. 32+00 TO STA. 34+00

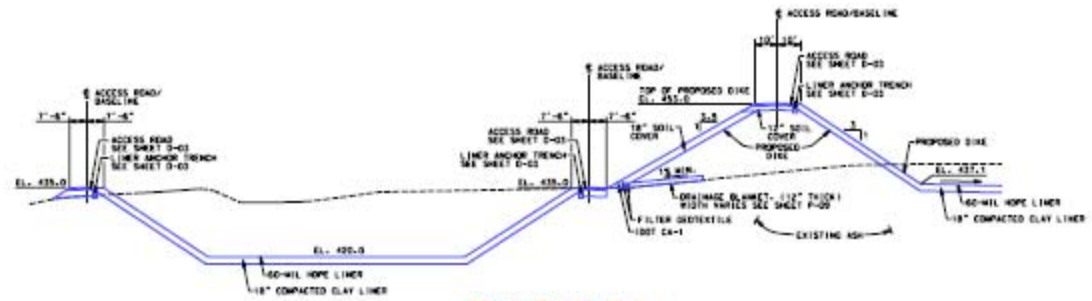
PREPARED BY:
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1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS

EAST ASH POND EXPANSION

TYPICAL SECTIONS NO. 1 AND NO. 2
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION

SHEET NO.
TS-01



TYPICAL SECTION NO. 3
STA. 42+00 TO STA. 44+00



TYPICAL SECTION NO. 4
STA. 47+00 TO STA. 57+00

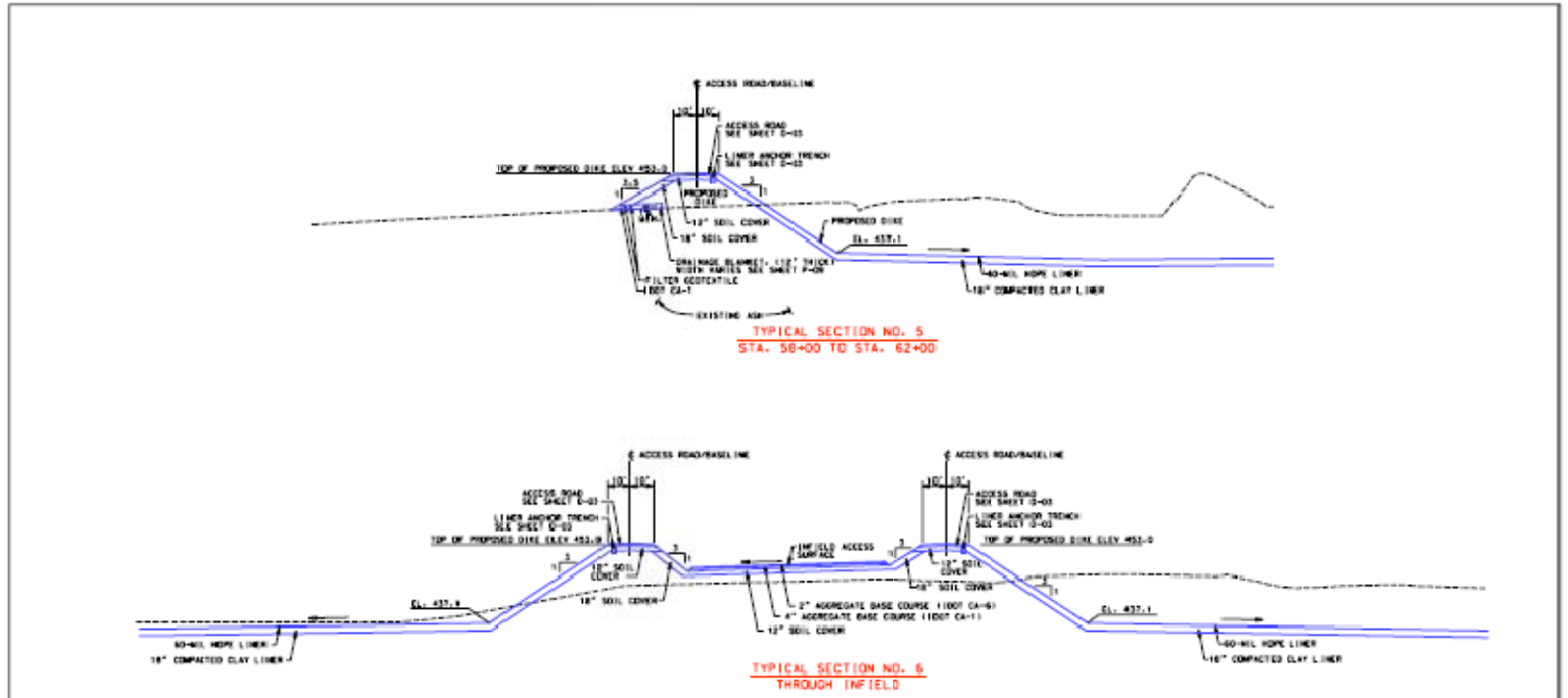
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St. Louis, MO 63110
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Fax: 314-429-0462

DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS

EAST ASH POND EXPANSION

TYPICAL SECTIONS NO. 3 AND NO. 4
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION

SHEET NO.
TS-02



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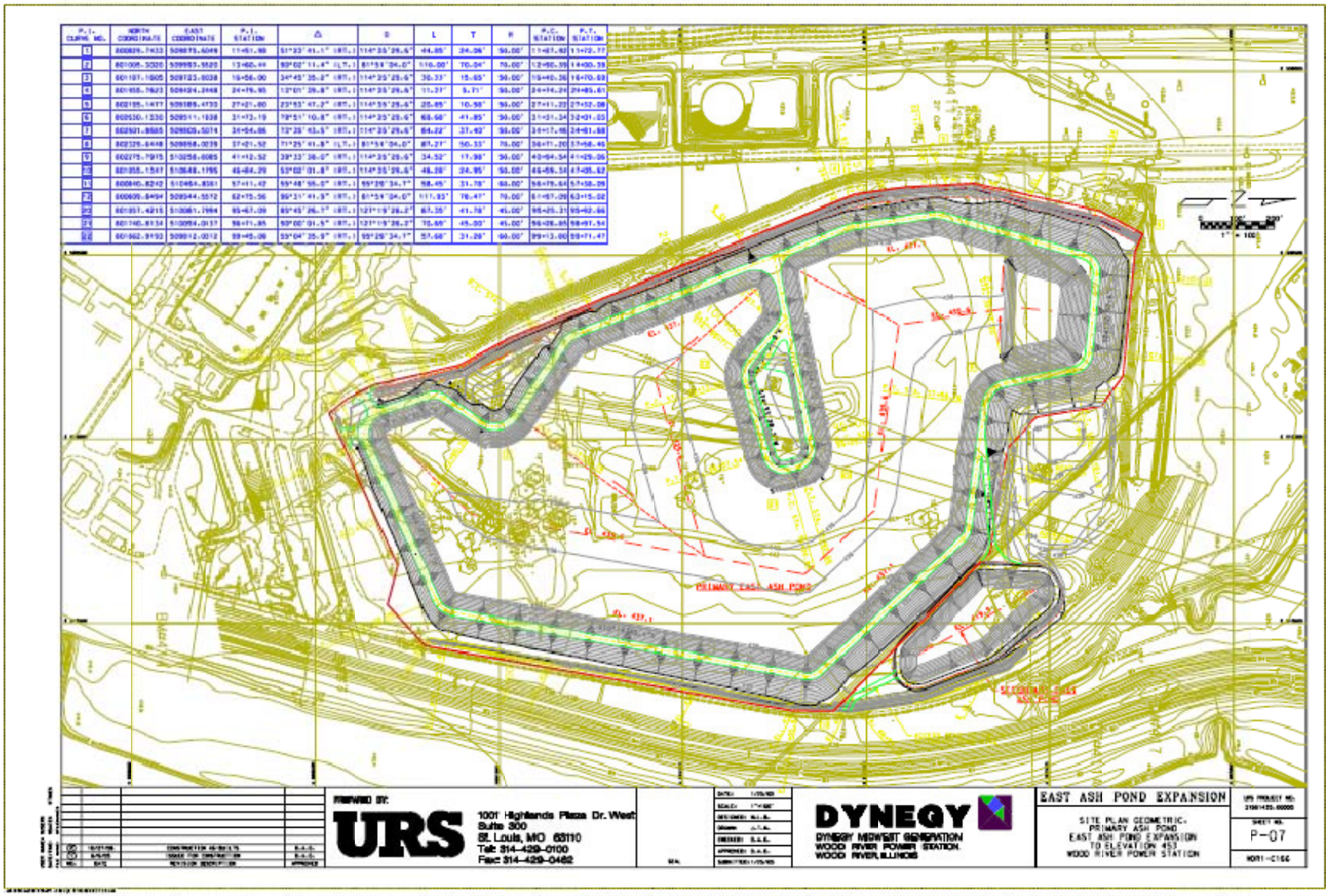
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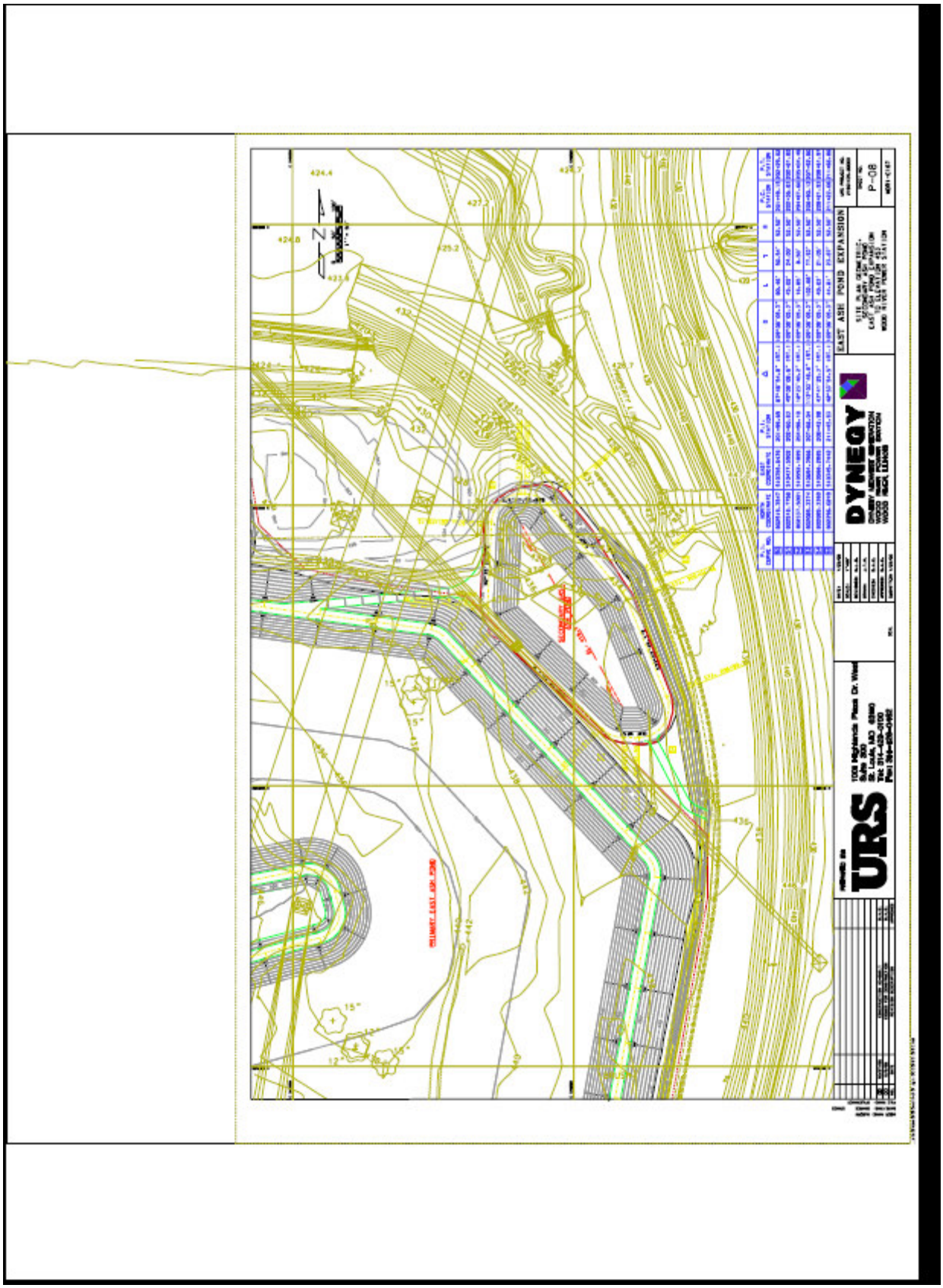
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS

EAST ASH POND EXPANSION

TYPICAL SECTIONS NO. 5 AND NO. 6
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION

SHEET NO. TS-03


P.I. CURVE NO.
NORTH COORDINATE
EAST COORDINATE
P.I. STATION
Δ
D
L
T
R
P.C. STATION
P.T. STATION
PRIMARY EAST ASH POND
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
EAST ASH POND EXPANSION
SITE PLAN GEOMETRIC-
PRIMARY ASH POND
EAST ASH POND EXPANSION
TO ELEVATION 457
WOOD RIVER POWER STATION
SHEET NO.
P-07


EAST ASH POND EXPANSION
DYNEGY
URS

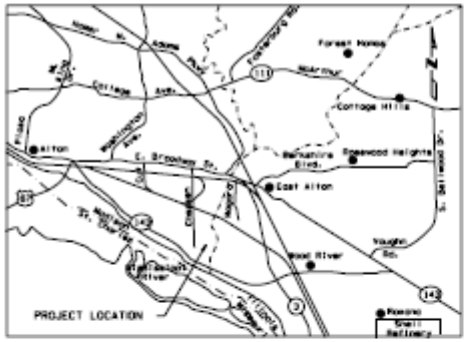
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS

PLANS FOR
EAST ASH POND EXPANSION
TO ELEVATION 453

DYNEGY

LIST OF DRAWINGS

SHEET NO.	DYNEGY MIDWEST GENERATION REF. NO.	TITLE
P-01	WDR1-C160	TITLE SHEET
P-02	WDR1-C161	OVERALL SITE PLAN, BORING LOCATIONS AND SURVEY CONTROL POINTS
P-03	WDR1-C162	SITE CLEARING AND LAYDOWN AREA PLAN
P-04	WDR1-C163	HYDRAULIC STRUCTURES AND PIPING LAYOUT
P-05	WDR1-C164	HYDRAULIC STRUCTURES PIPING PLAN/PROFILE
P-06	WDR1-C165	DRAINAGE CULVERT - PLAN AND PROFILE
P-07	WDR1-C166	SITE PLAN GEOMETRIC, PRIMARY ASH POND
P-08	WDR1-C167	SITE PLAN GEOMETRIC, SECONDARY ASH POND
P-09	WDR1-C168	GEOMEMBRANE/CLAY LINER AND DRAINAGE BLANKET PLAN
P-10	WDR1-C169	SITE PLAN SHOWING CROSS SECTION LOCATIONS
TS-01	WDR1-C170	TYPICAL SECTIONS - NO.1 AND NO.2
TS-02	WDR1-C171	TYPICAL SECTIONS - NO.3 AND NO.4
TS-03	WDR1-C172	TYPICAL SECTIONS - NO.5 AND NO.6
D-01	WDR1-C173	DETAILS - OUTLET HYDRAULIC STRUCTURE FOR PRIMARY ASH POND
D-02	WDR1-C174	DETAILS - OUTLET HYDRAULIC STRUCTURE FOR SECONDARY ASH POND
D-03	WDR1-C175	DETAILS - MISCELLANEOUS
D-04	WDR1-C176	OUTFALL WALKWAY STRUCTURE FOR SECONDARY ASH POND
D-05	WDR1-C177	OUTFALL WALKWAY STRUCTURE FOR PRIMARY ASH POND
D-06	WDR1-C178	DETAILS - OUTFALL WALKWAY STRUCTURES
D-07	WDR1-C179	DETAILS - MISCELLANEOUS
D-08	WDR1-C180	SUMMARY BORING LOGS, SHEET 1 OF 2
D-09	WDR1-C181	SUMMARY BORING LOGS, SHEET 2 OF 2
CS-01	WDR1-C182-1	CROSS SECTIONS STA. 10+00.00 TO STA. 13+93.47
CS-02	WDR1-C182-2	CROSS SECTIONS STA. 13+92.46 TO STA. 17+00.00
CS-03	WDR1-C182-3	CROSS SECTIONS STA. 17+00.00 TO STA. 20+21.66
CS-04	WDR1-C182-4	CROSS SECTIONS STA. 21+00.00 TO STA. 22+44.19
CS-05	WDR1-C182-5	CROSS SECTIONS STA. 23+00.00 TO STA. 26+00.00
CS-06	WDR1-C182-6	CROSS SECTIONS STA. 27+00.00 TO STA. 30+36.11
CS-07	WDR1-C182-7	CROSS SECTIONS STA. 31+00.00 TO STA. 34+49.57
CS-08	WDR1-C182-8	CROSS SECTIONS STA. 35+00.00 TO STA. 37+00.00
CS-09	WDR1-C182-9	CROSS SECTIONS STA. 37+22.68 TO STA. 41+00.00
CS-10	WDR1-C182-10	CROSS SECTIONS STA. 41+29.06 TO STA. 44+00.00
CS-11	WDR1-C182-11	CROSS SECTIONS STA. 45+00.00 TO STA. 48+00.00
CS-12	WDR1-C182-12	CROSS SECTIONS STA. 49+00.00 TO STA. 56+00.00
CS-13	WDR1-C182-13	CROSS SECTIONS STA. 57+00.00 TO STA. 61+00.00
CS-14	WDR1-C182-14	CROSS SECTIONS STA. 62+00.00 TO STA. 63+45.02



LOCATION MAP



ILLINOIS COUNTY MAP

NO.	DATE	REVISION DESCRIPTION	APPROVED
2	10/27/06	CONSTRUCTION AS-BUILT	D.A.E.
1	6/26/06	ISSUED FOR CONSTRUCTION	D.A.E.

PREPARED BY

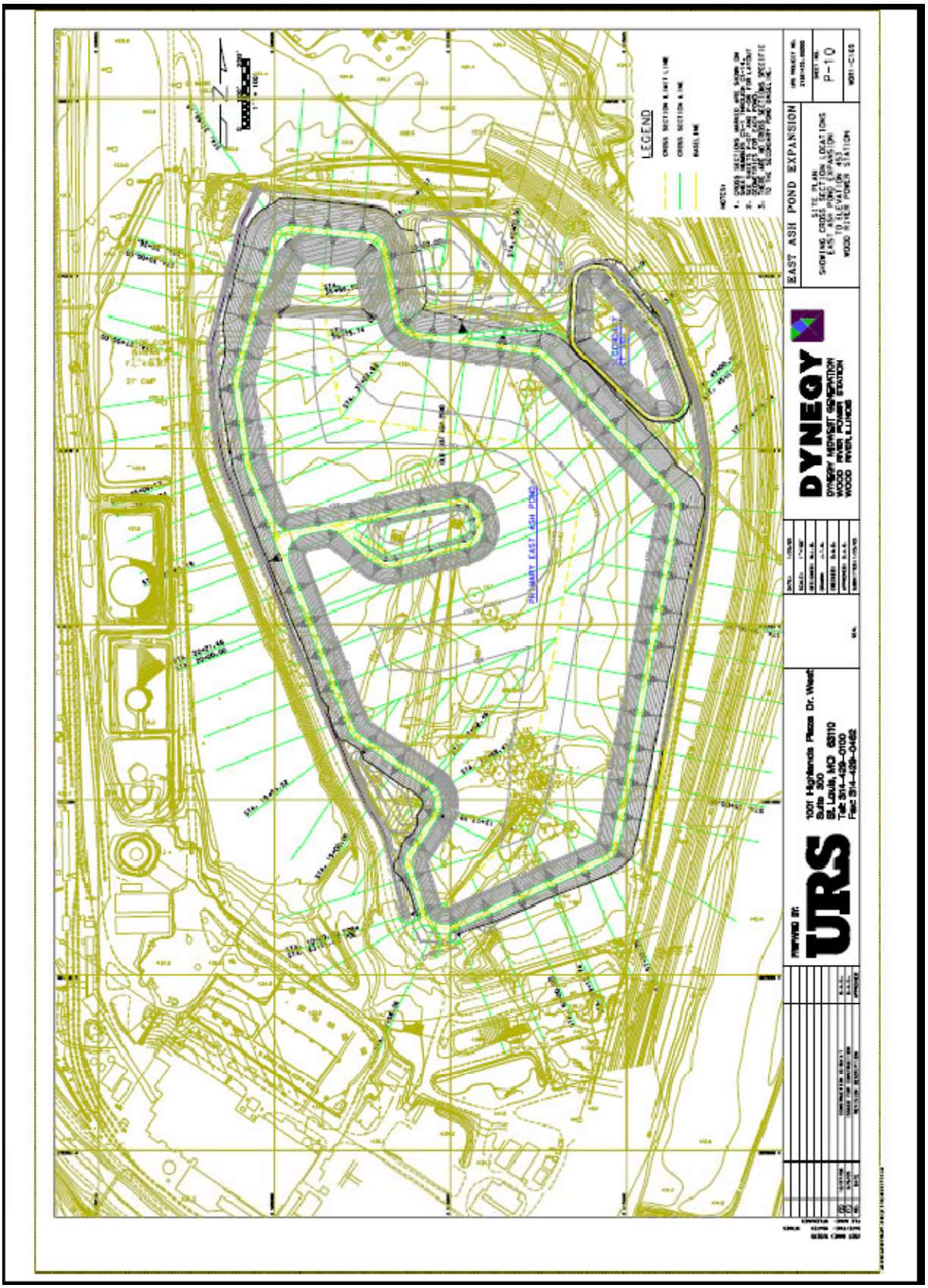
URS

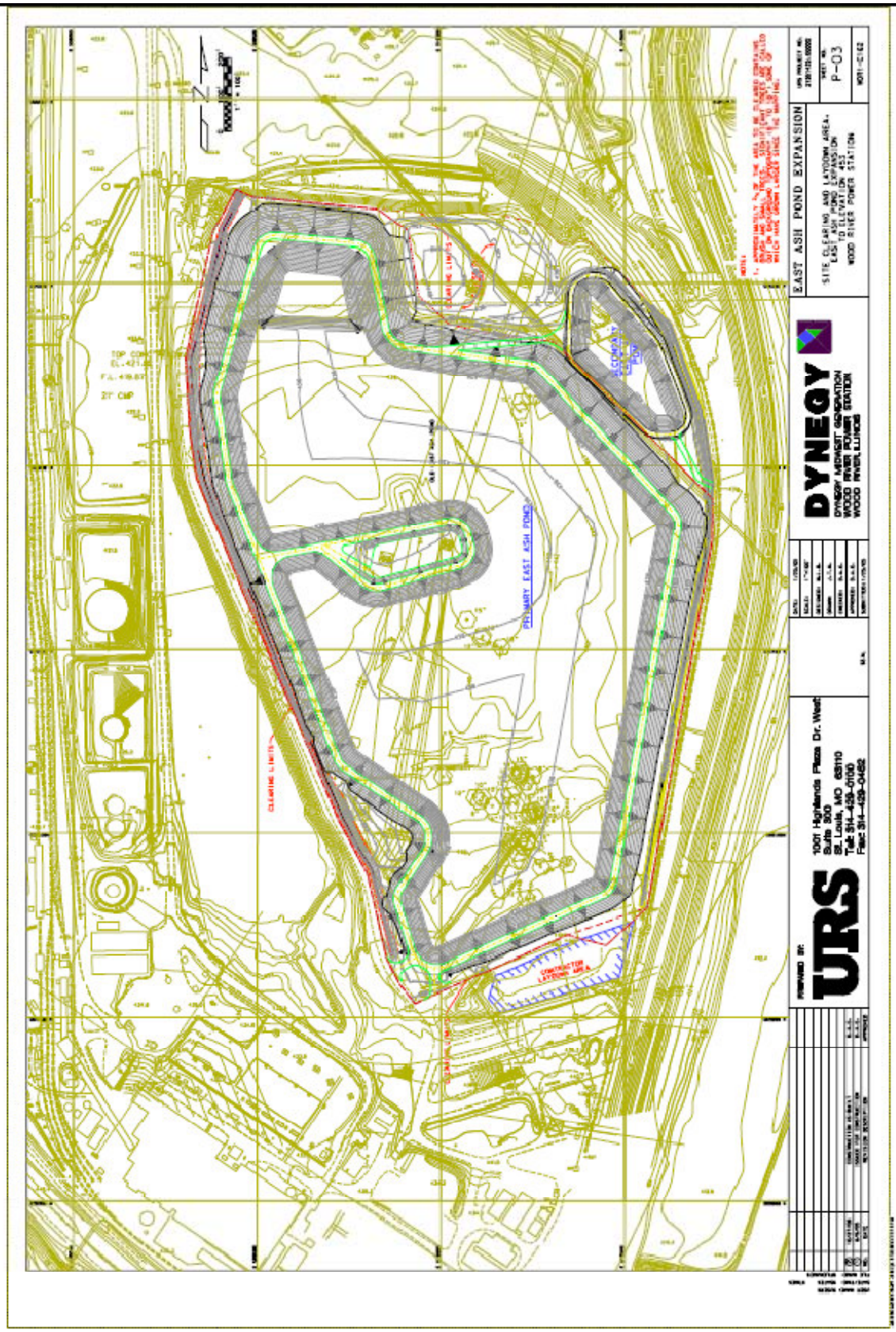
1019 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel 314-429-0020
Fax 314-429-0462

URS PROJECT NO.

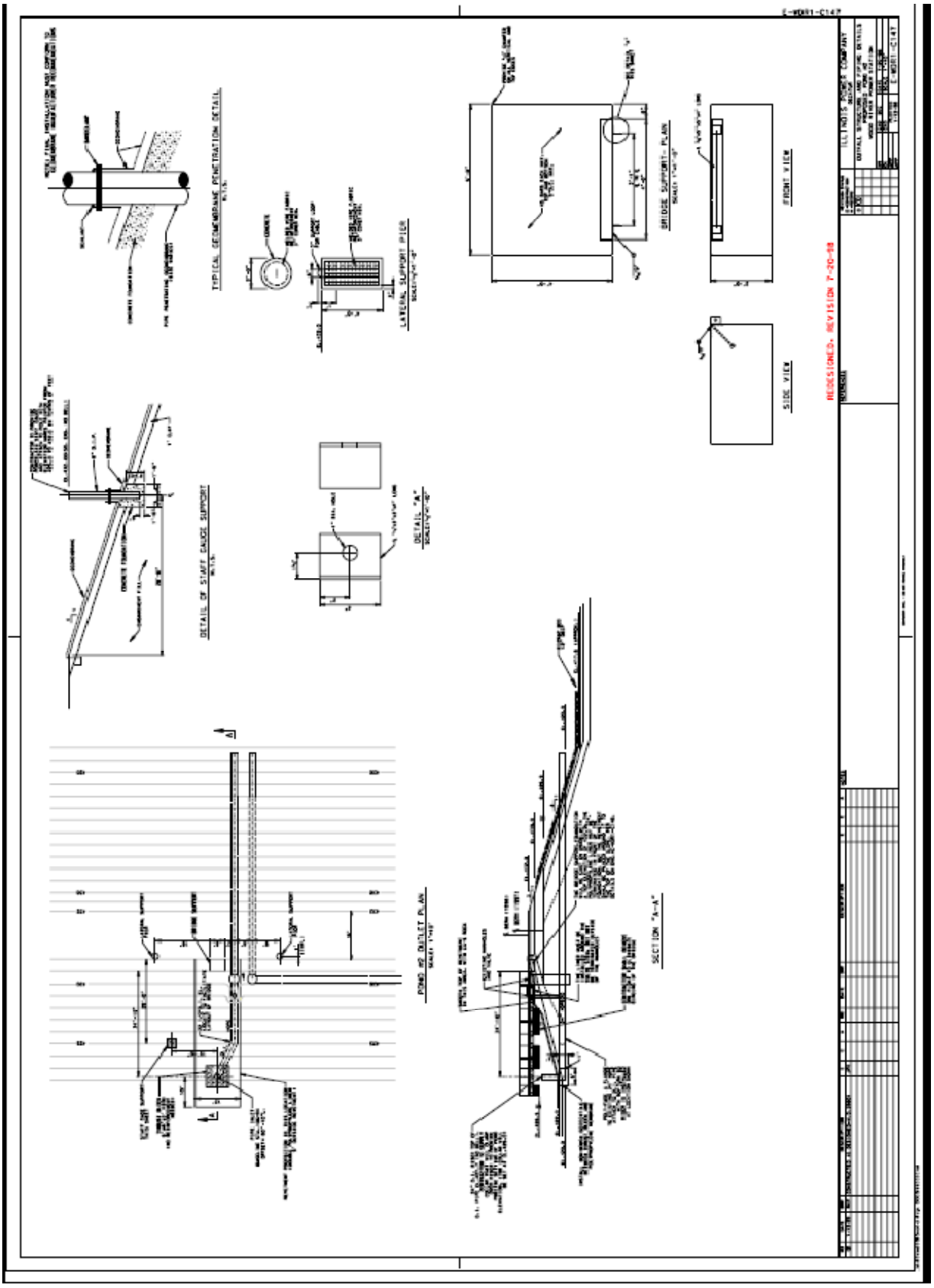
SHEET NO.
P-01

WDR1-C160

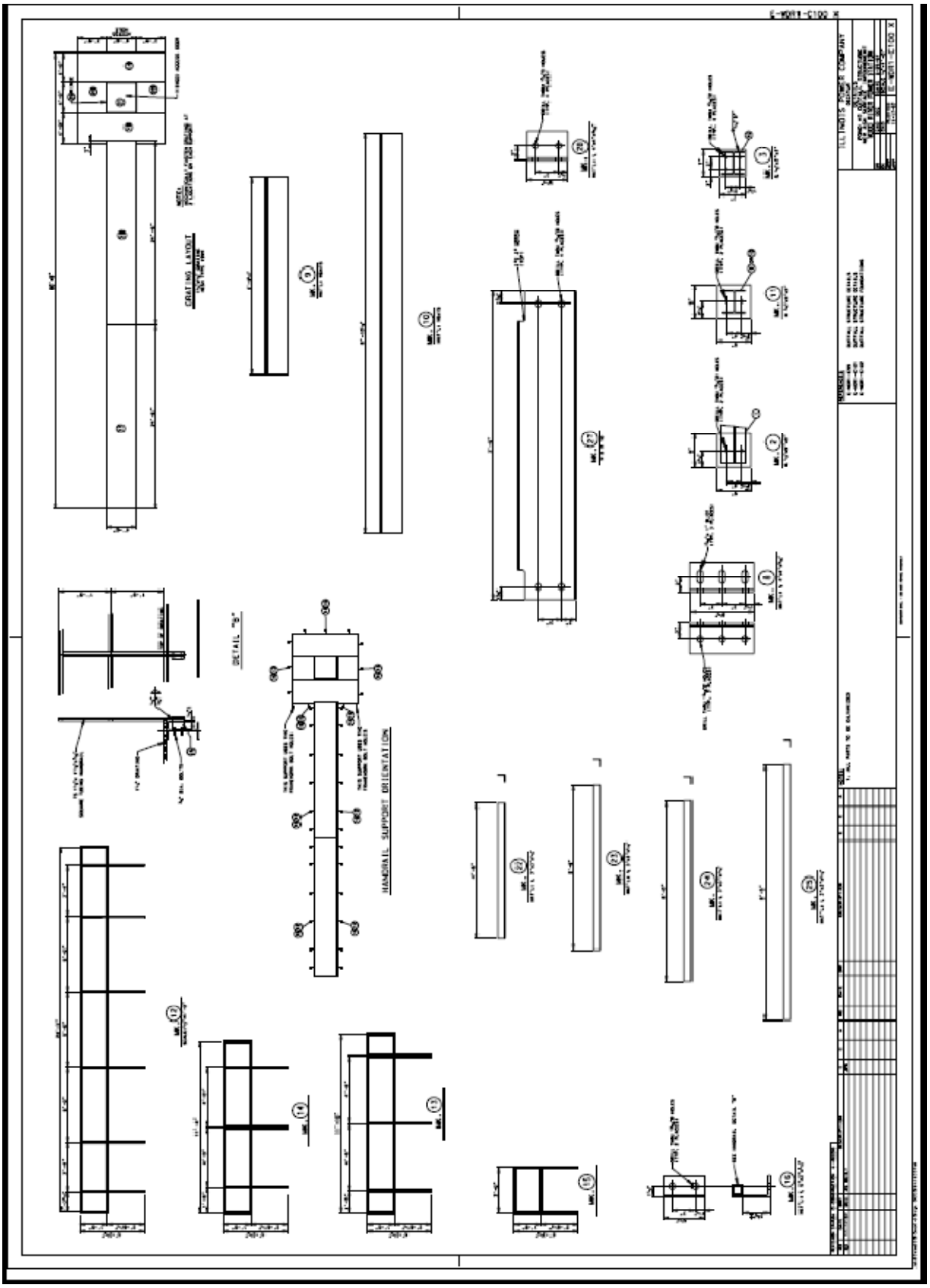

EAST ASH POND EXPANSION
SITE PLAN
SHOWING CROSS SECTION LOCATIONS
EAST ASH POND EXPANSION
TO ELEVATION 450
WOOD RIVER POWER STATION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel 314-429-0100
Fax 314-429-0462
LEGEND
CROSS SECTION A-A' LINE
CROSS SECTION B-B' LINE
BASEL BND
NOTES:
P-10
PRIMARY EAST ASH POND
SECONDARY POND
21" CMP


EAST ASH POND EXPANSION
SITE CLEARING AND LAGOON AREA
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
PRIMARY EAST ASH POND
CLEARING LIMITS
CONTRACTOR LAYDOWN AREA
P-03

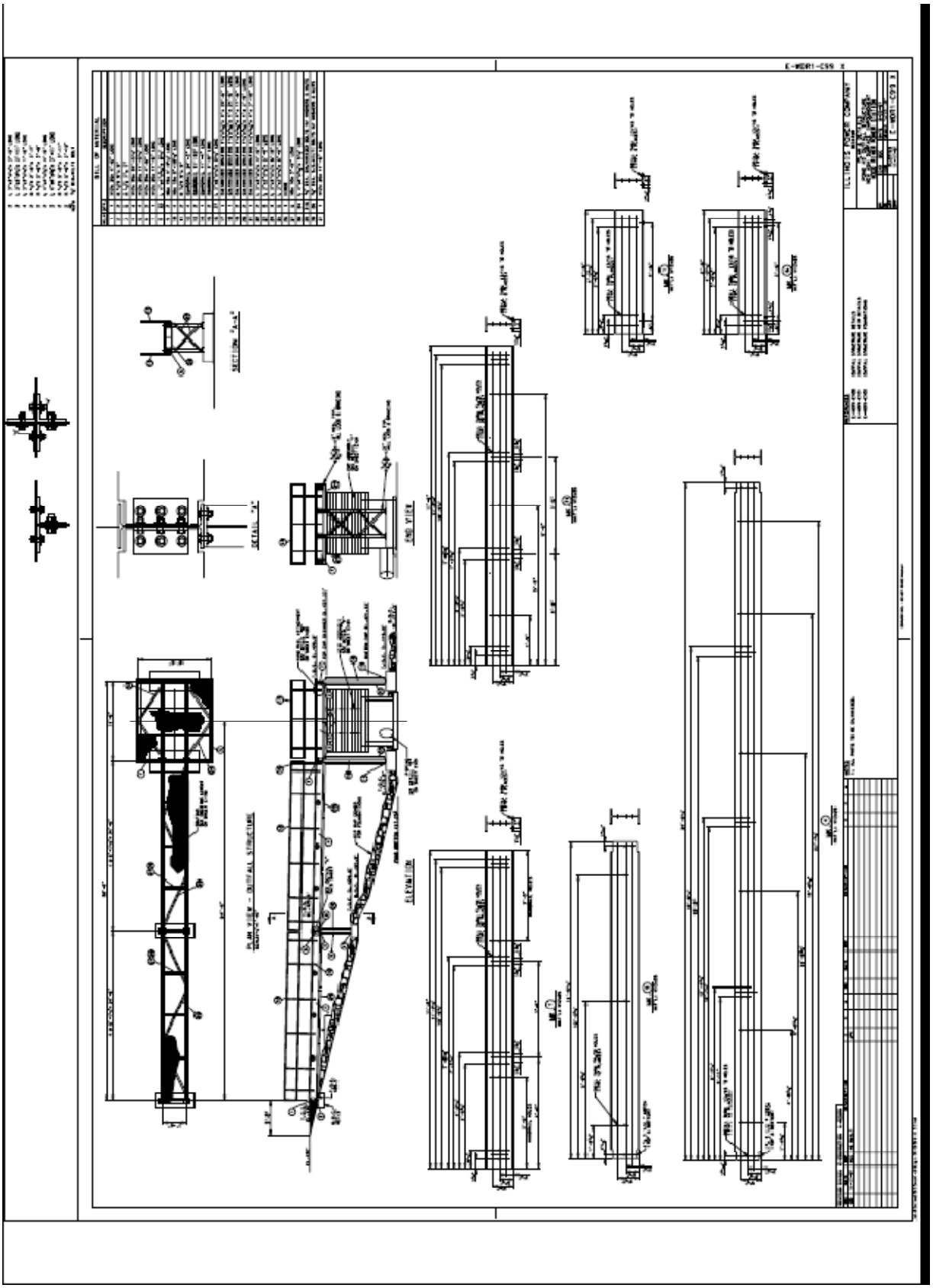
DRAFT

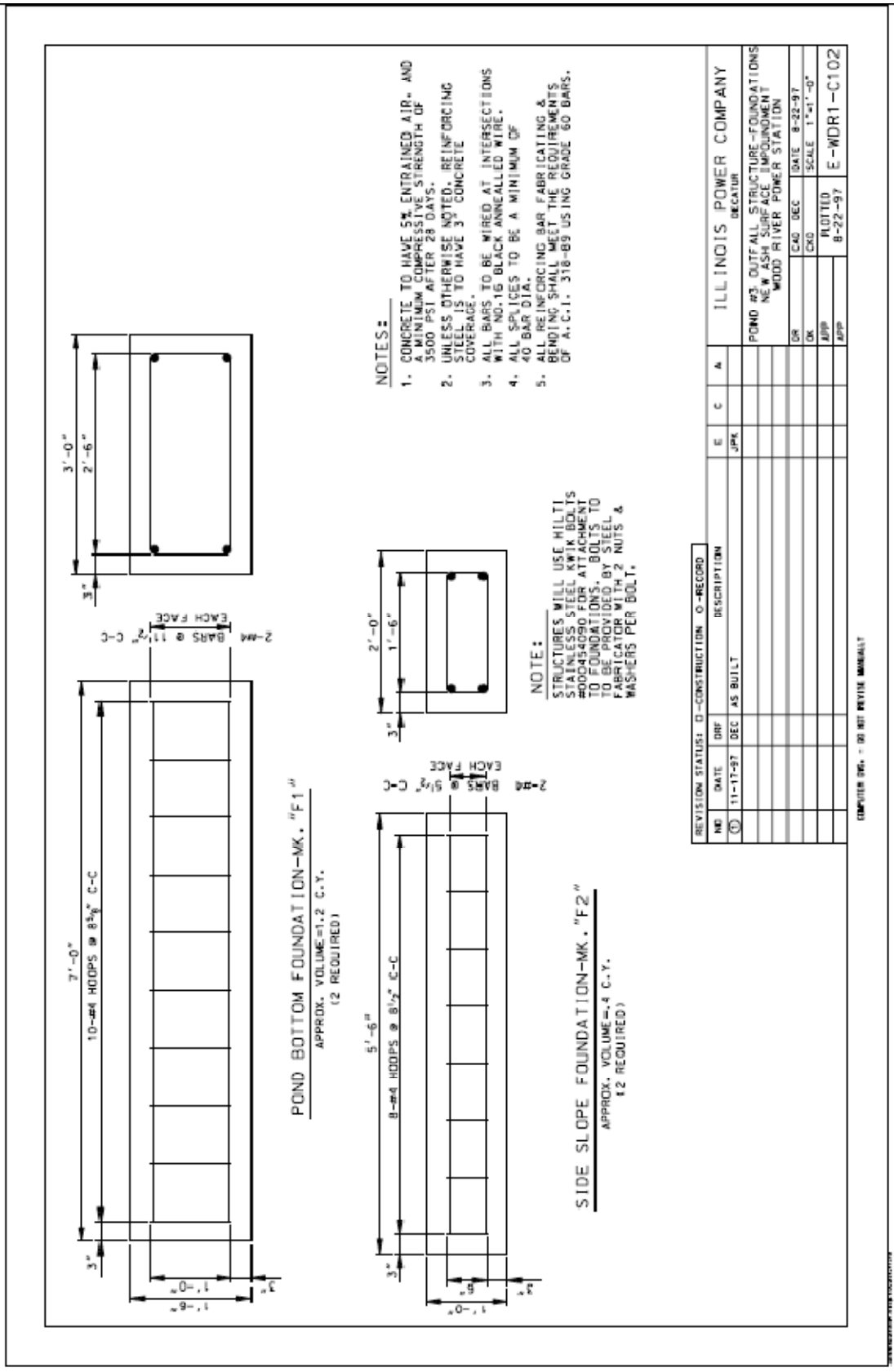

TYPICAL DIAPHRAGM PENETRATION DETAIL
LATERAL SUPPORT PIER
BRIDGE SUPPORT PLAN
FRONT VIEW
SIDE VIEW
DETAIL OF STAFF GAUGE SUPPORT
DETAIL "A"
POND #2 OUTLET PLAN
SECTION "A-A"
REDESIGNED, REVISION 7-20-98

DRAFT

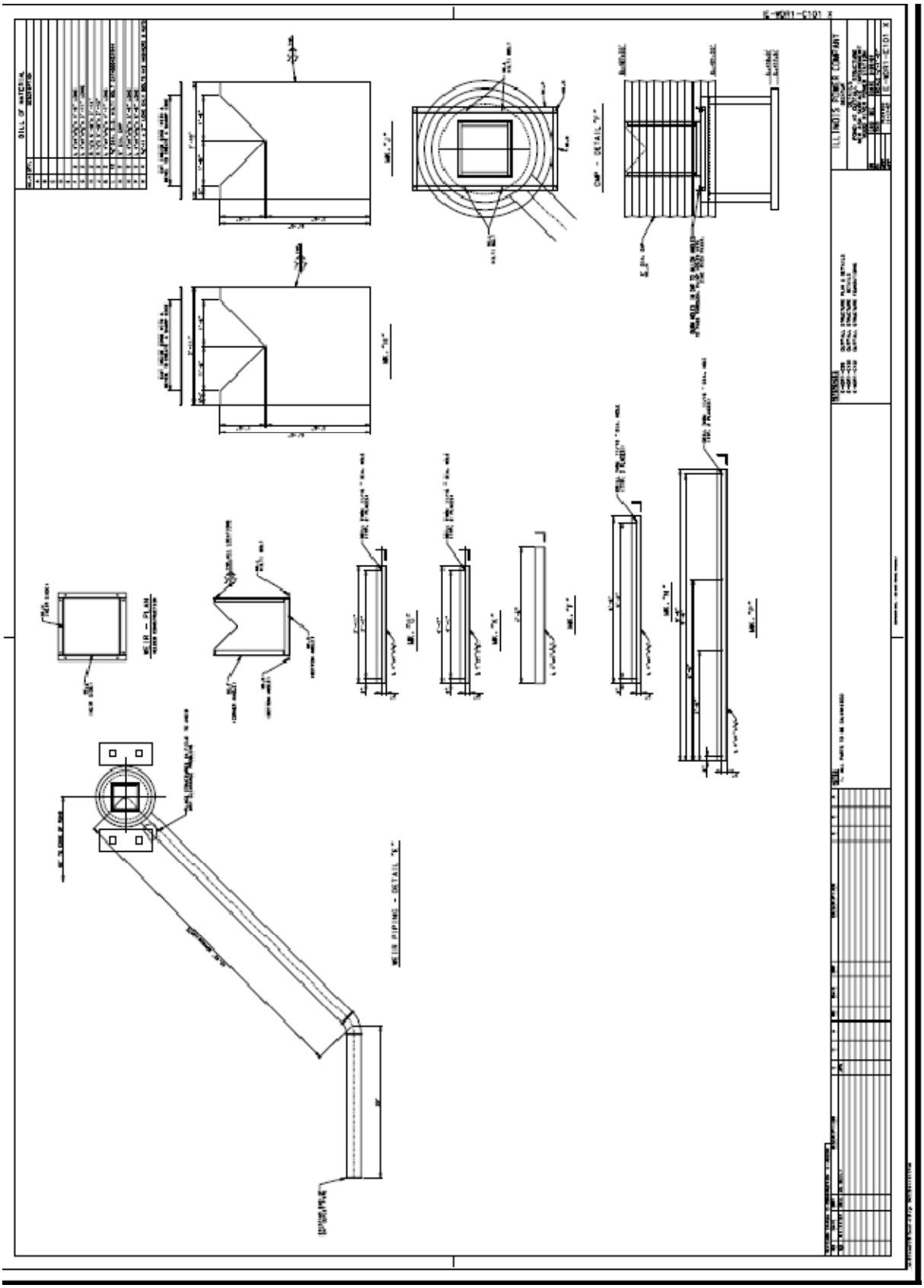


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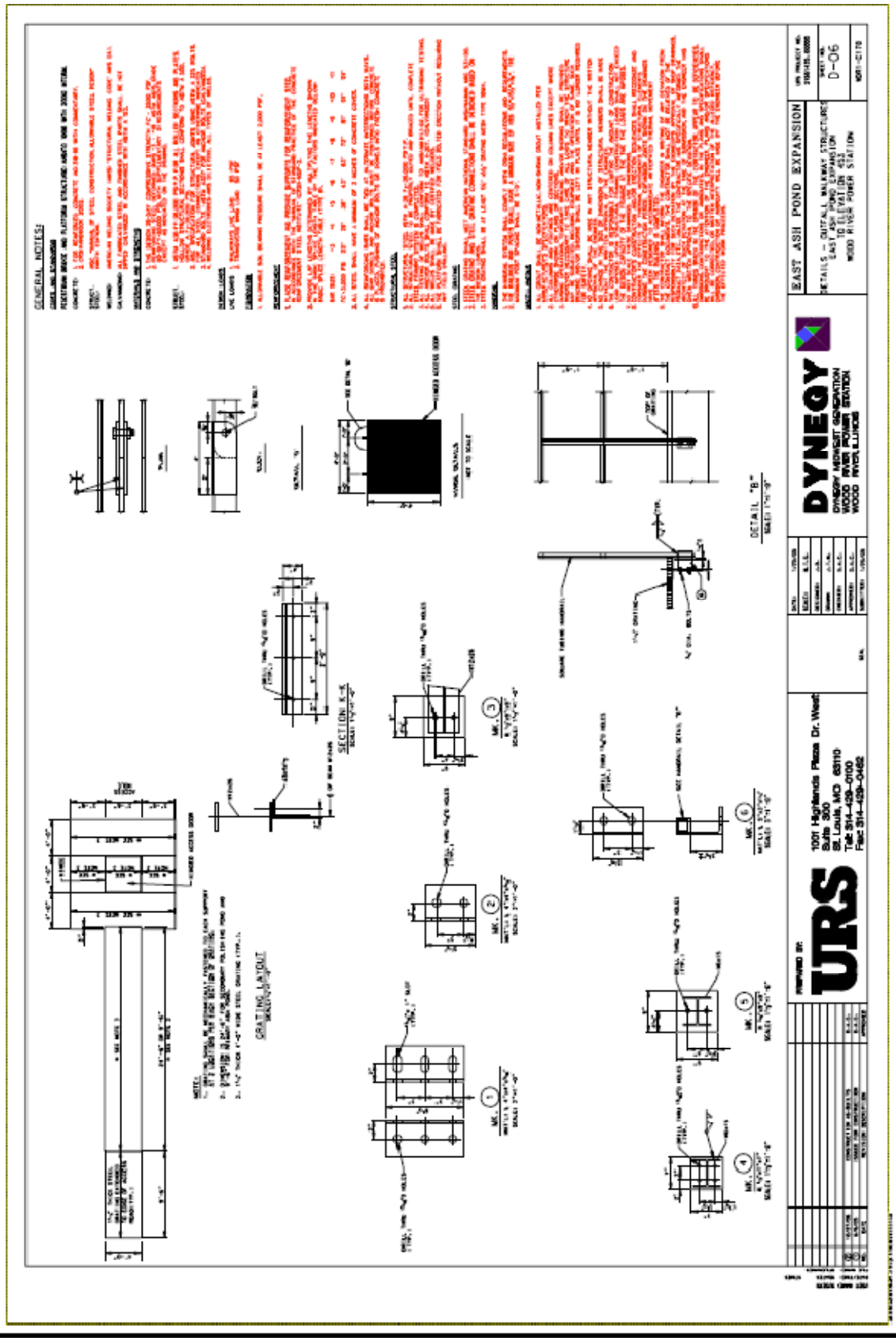


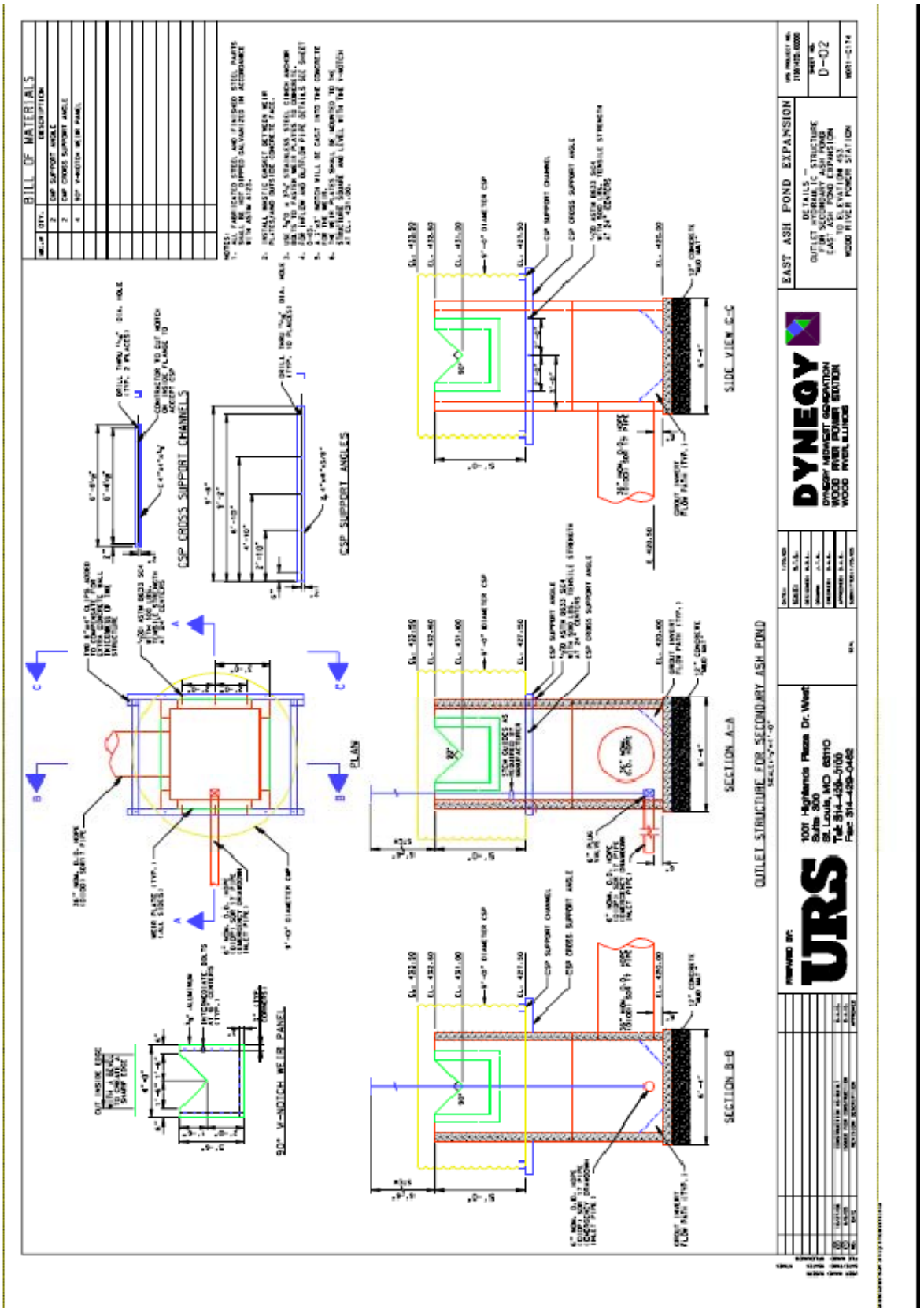

NOTES:
1. CONCRETE TO HAVE 5% ENTRAINED AIR, AND A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AFTER 28 DAYS.
2. UNLESS OTHERWISE NOTED, REINFORCING STEEL IS TO HAVE 3" CONCRETE COVERAGE.
3. ALL BARS TO BE WIRED AT INTERSECTIONS WITH NO.16 BLACK ANNEALLED WIRE.
4. ALL SPLICES TO BE A MINIMUM OF 40 BAR DIA.
5. ALL REINFORCING BAR FABRICATING & BENDING SHALL MEET THE REQUIREMENTS OF A.C.I. 318-89 USING GRADE 60 BARS.
NOTE:
STRUCTURES WILL USE HILTI STAINLESS STEEL KWIK BOLTS #DDO454090 FOR ATTACHMENT TO FOUNDATIONS. BOLTS TO TO BE PROVIDED BY STEEL FABRICATOR WITH 2 NUTS & WASHERS PER BOLT.
POND BOTTOM FOUNDATION-MK. "F1"
APPROX. VOLUME=1.2 C.Y.
(2 REQUIRED)
SIDE SLOPE FOUNDATION-MK. "F2"
APPROX. VOLUME=.4 C.Y.
(2 REQUIRED)
10-#4 HOOPS @ 8½" C-C
8-#4 HOOPS @ 8½" C-C
2-#4 BARS @ 11½" C-C EACH FACE
REVISION STATUS: O-CONSTRUCTION O-RECORD
NO DATE DRF DESCRIPTION E C A
0 11-17-97 DEC AS BUILT JPK
ILLINOIS POWER COMPANY
DECATUR
POND #3 OUTFALL STRUCTURE-FOUNDATIONS
NEW ASH SURFACE IMPOUNDMENT
WOOD RIVER POWER STATION
DR CAD DEC DATE 8-22-97
CK CKD SCALE 1"=1'-0"
APP'D PLOTTED 8-22-97
E-WDR1-C102

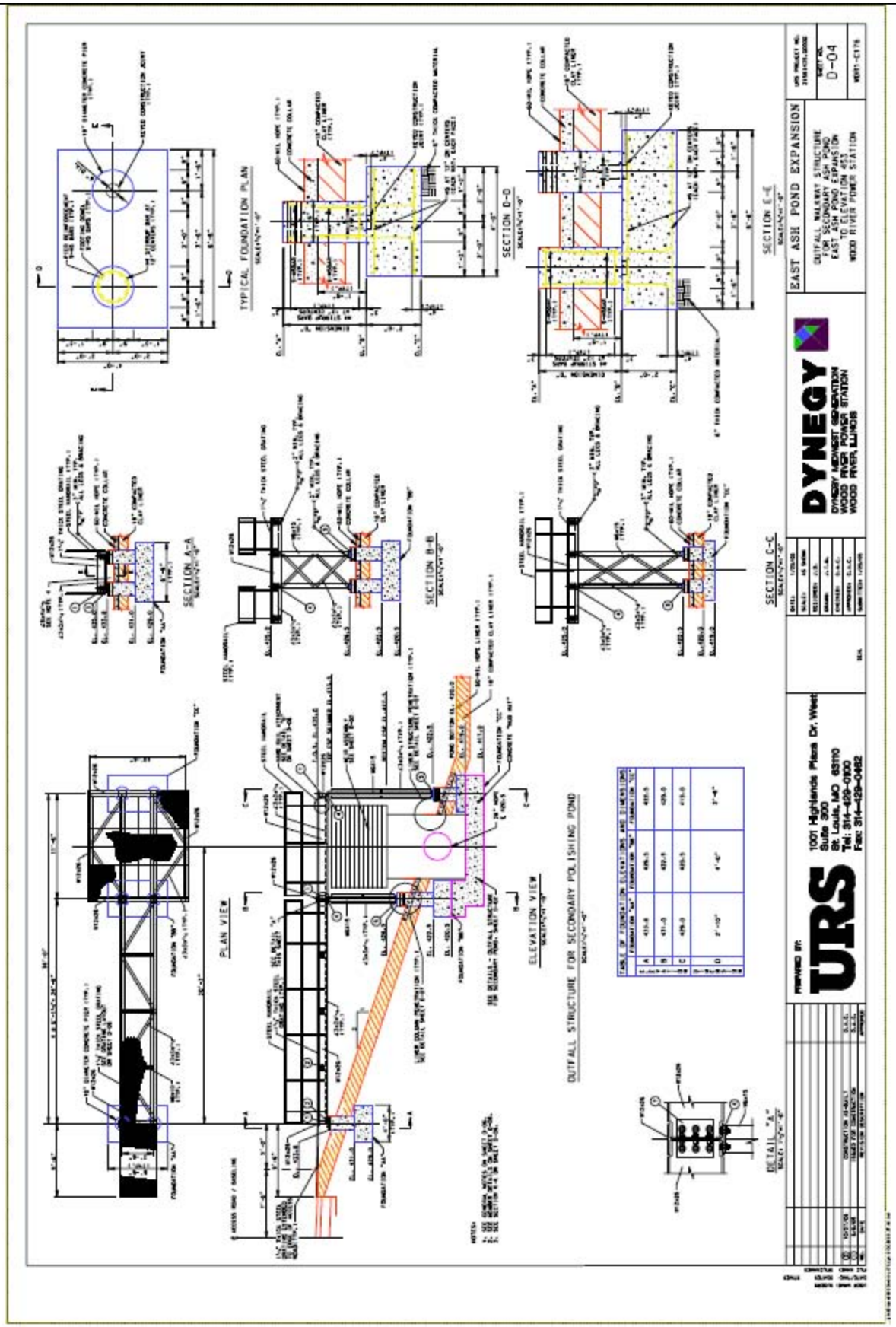
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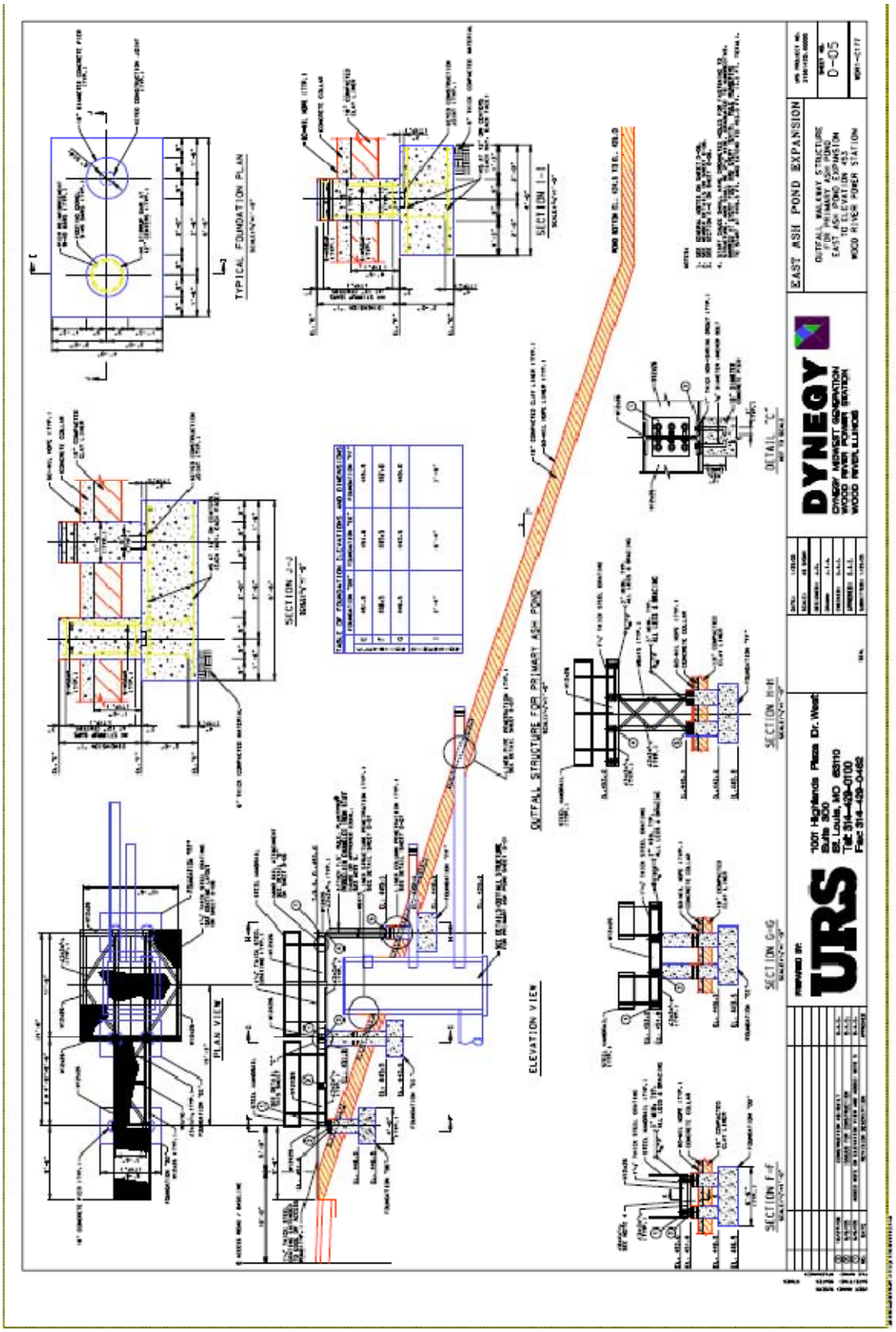


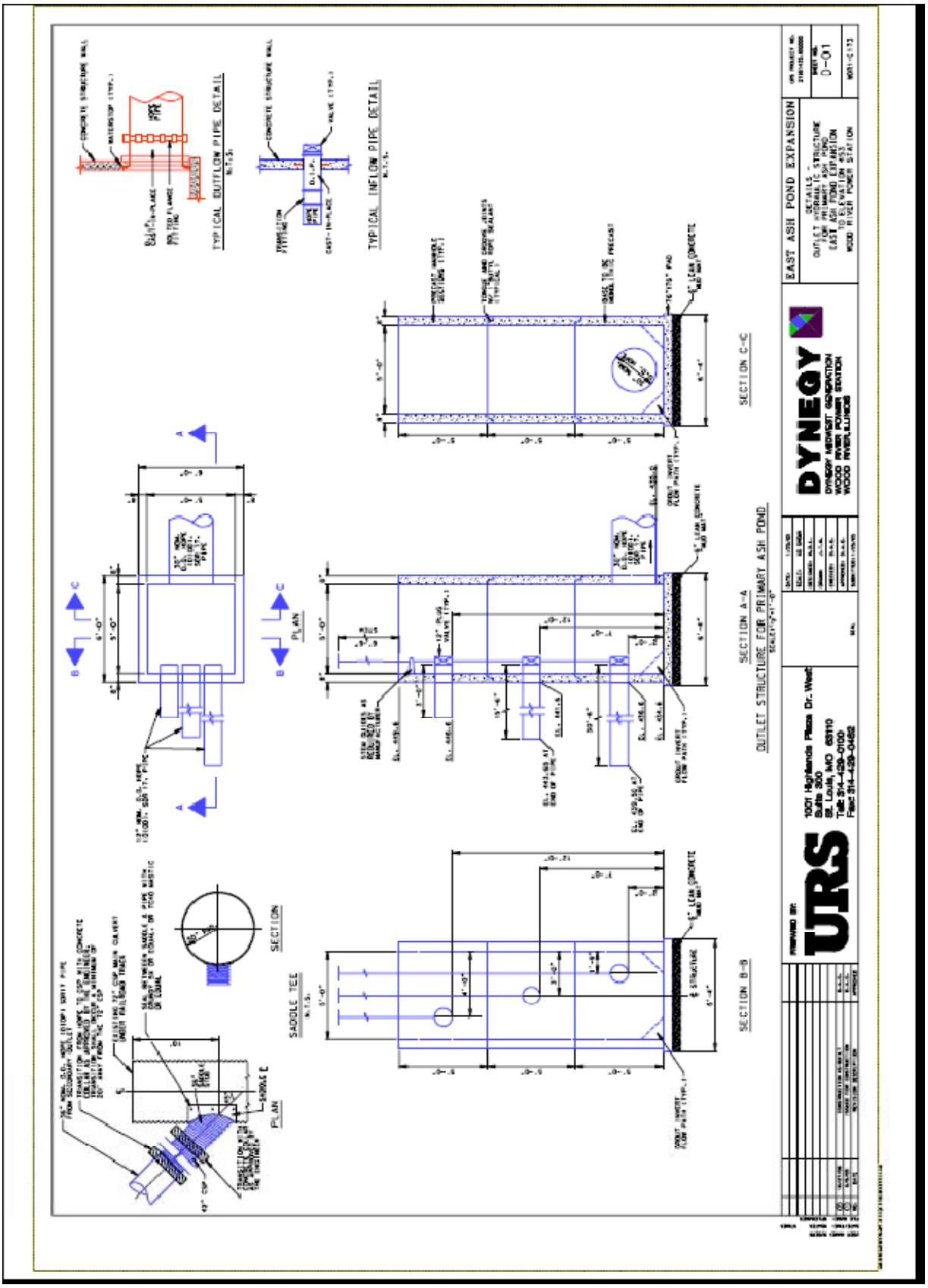
DRAFT


GENERAL NOTES:
EAST ASH POND EXPANSION
DETAILS – OUTFALL WALKWAY STRUCTURE
EAST ASH POND EXPANSION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
D-06
GRATING LAYOUT
SECTION A-A
DETAIL "B"

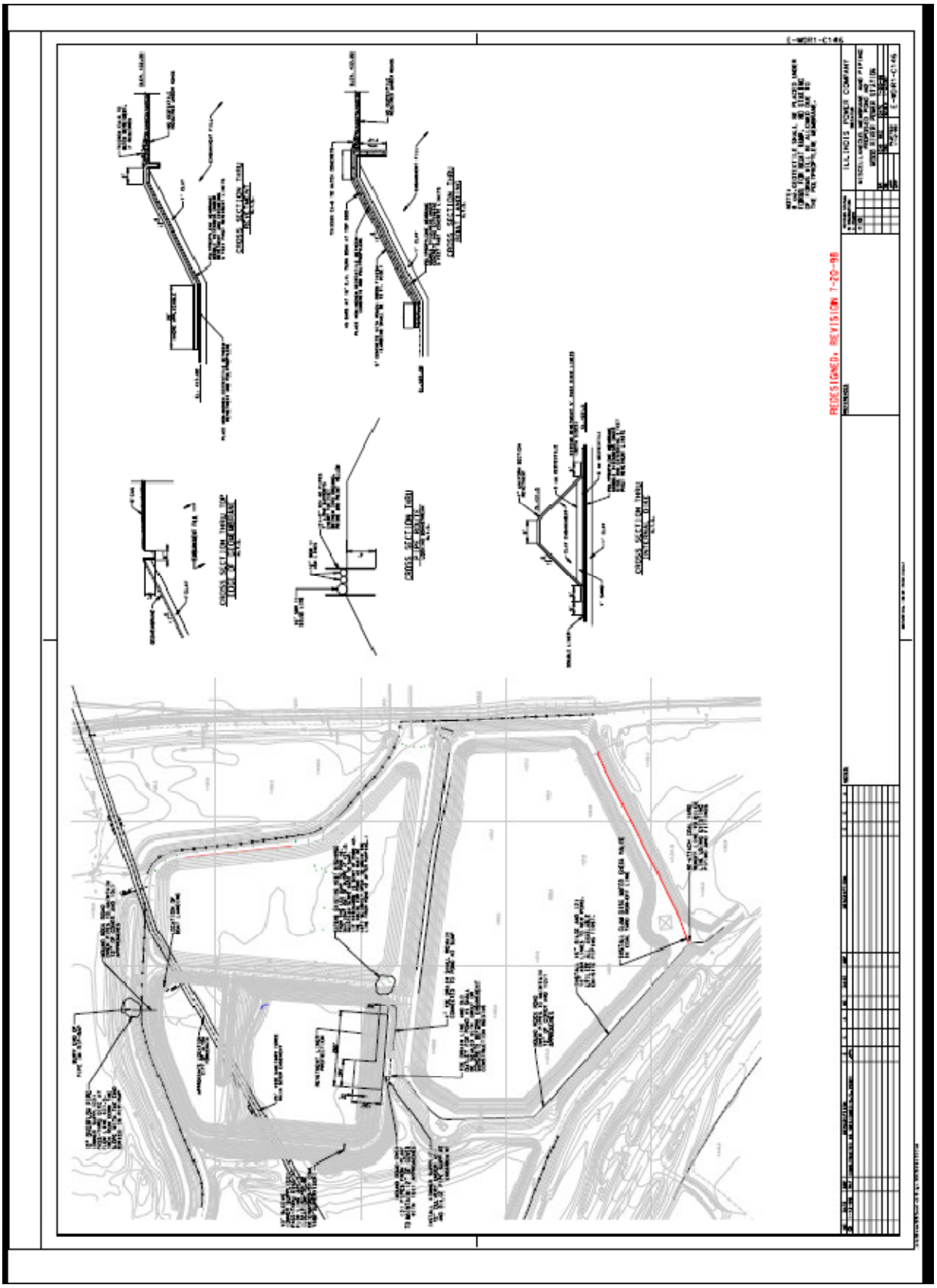

BILL OF MATERIALS
CSP SUPPORT ANGLE
CSP CROSS SUPPORT ANGLE
90° V-NOTCH WEIR PANEL
CSP CROSS SUPPORT CHANNELS
CSP SUPPORT ANGLES
PLAN
SECTION A-A
SECTION B-B
SIDE VIEW C-C
OUTLET STRUCTURE FOR SECONDARY ASH POND
EAST ASH POND EXPANSION
DETAILS - STRUCTURE
OUTLET STRUCTURE FOR SECONDARY ASH POND
EAST ASH POND EXPANSION
TO EL ELEVATION 453
WOOD RIVER POWER STATION
DYNEGY
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
D-02


EAST ASH POND EXPANSION
OUTFALL RAILWAY STRUCTURE
FOR SECONDARY ASH POND
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
D-04
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
PLAN VIEW
ELEVATION VIEW
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
TYPICAL FOUNDATION PLAN
DETAIL
OUTFALL STRUCTURE FOR SECONDARY POLISHING POND

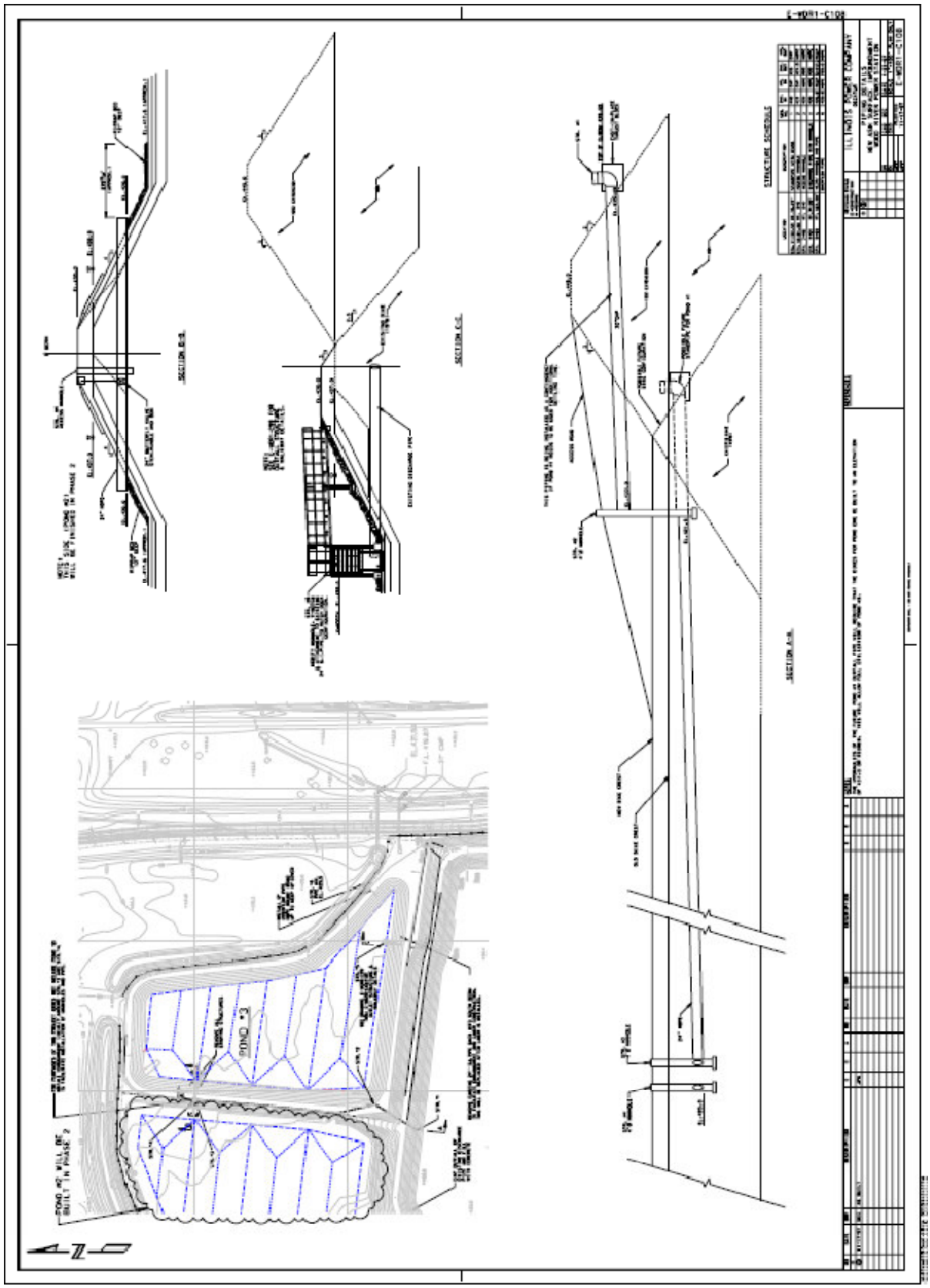

EAST ASH POND EXPANSION
OUTFALL WALKWAY STRUCTURE
FOR PRIMARY ASH POND
EASTERN PROPERTY EXPANSION
TO ELEVATION 455
WOOD RIVER POWER STATION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
D-05
OUTFALL STRUCTURE FOR PRIMARY ASH POND
ELEVATION VIEW
PLAN VIEW
TYPICAL FOUNDATION PLAN
SECTION I-I
SECTION J-J
SECTION H-H
SECTION G-G
SECTION F-F
DETAIL "C"

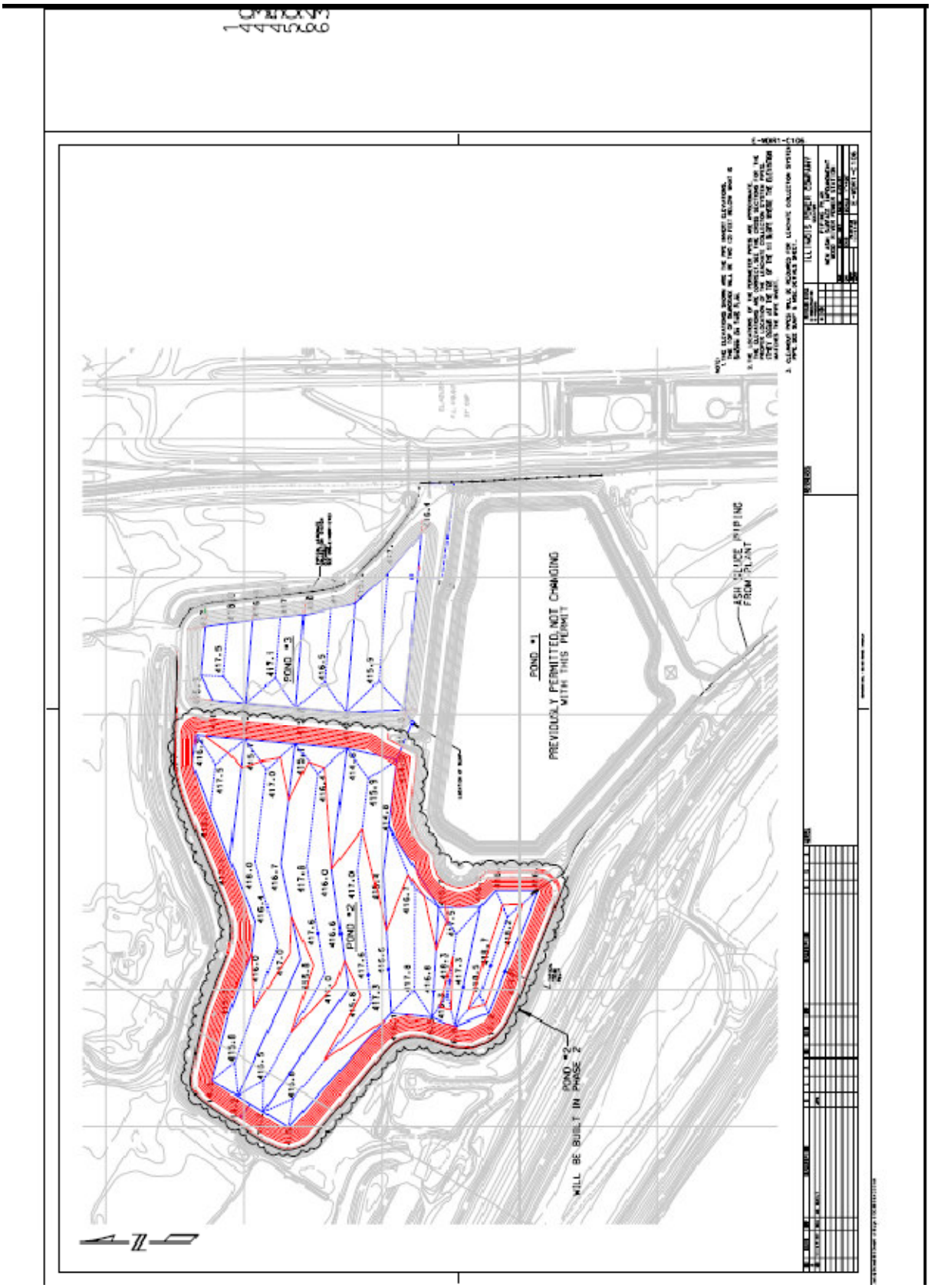

EAST ASH POND EXPANSION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
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Tel: 314-429-0100
Fax: 314-429-0462
OUTLET STRUCTURE FOR PRIMARY ASH POND
SECTION A-A
SECTION B-B
SECTION C-C
PLAN
SECTION
SADDLE TEE
TYPICAL OUTFLOW PIPE DETAIL
TYPICAL INFLOW PIPE DETAIL
D-01

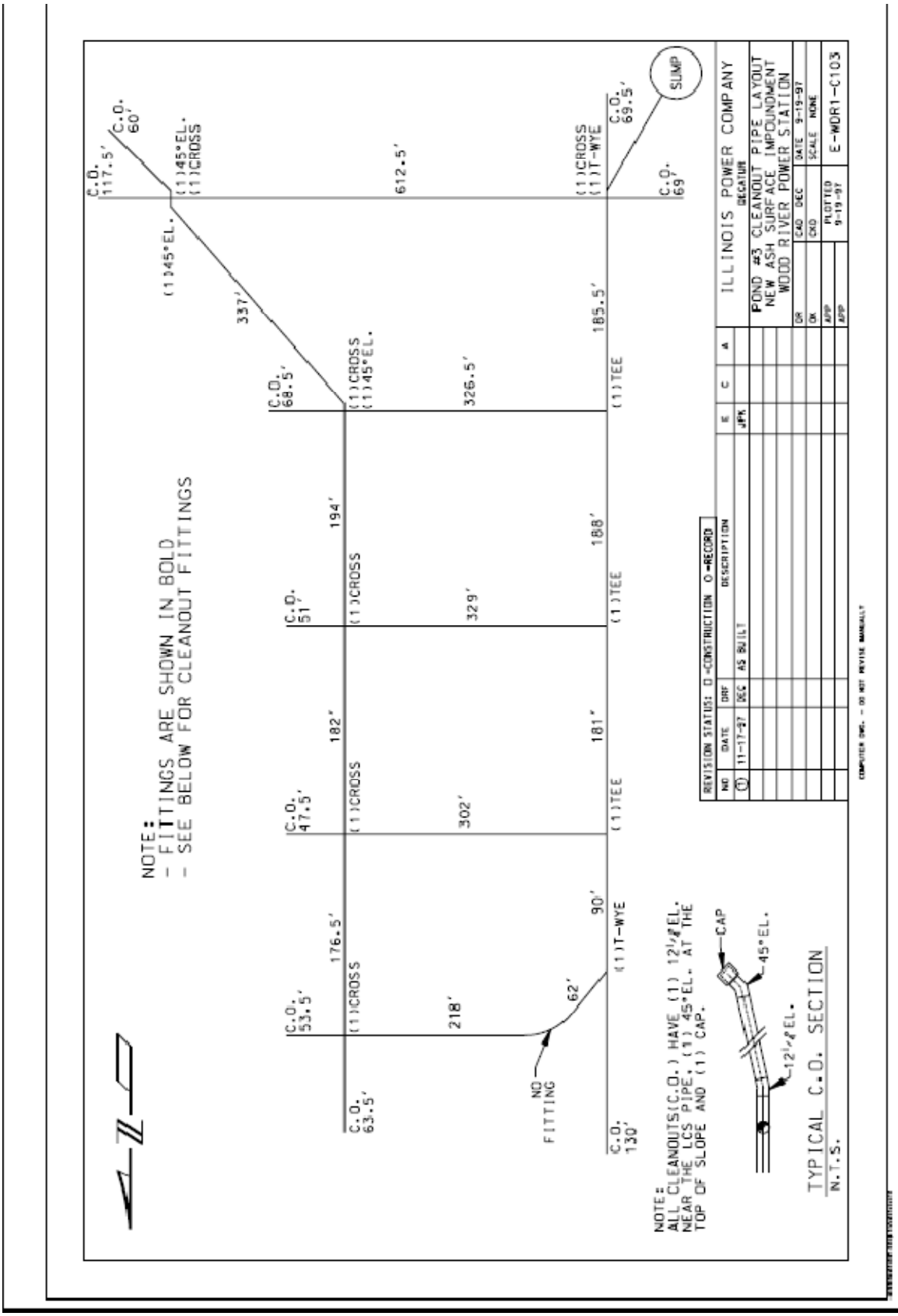
DRAFT



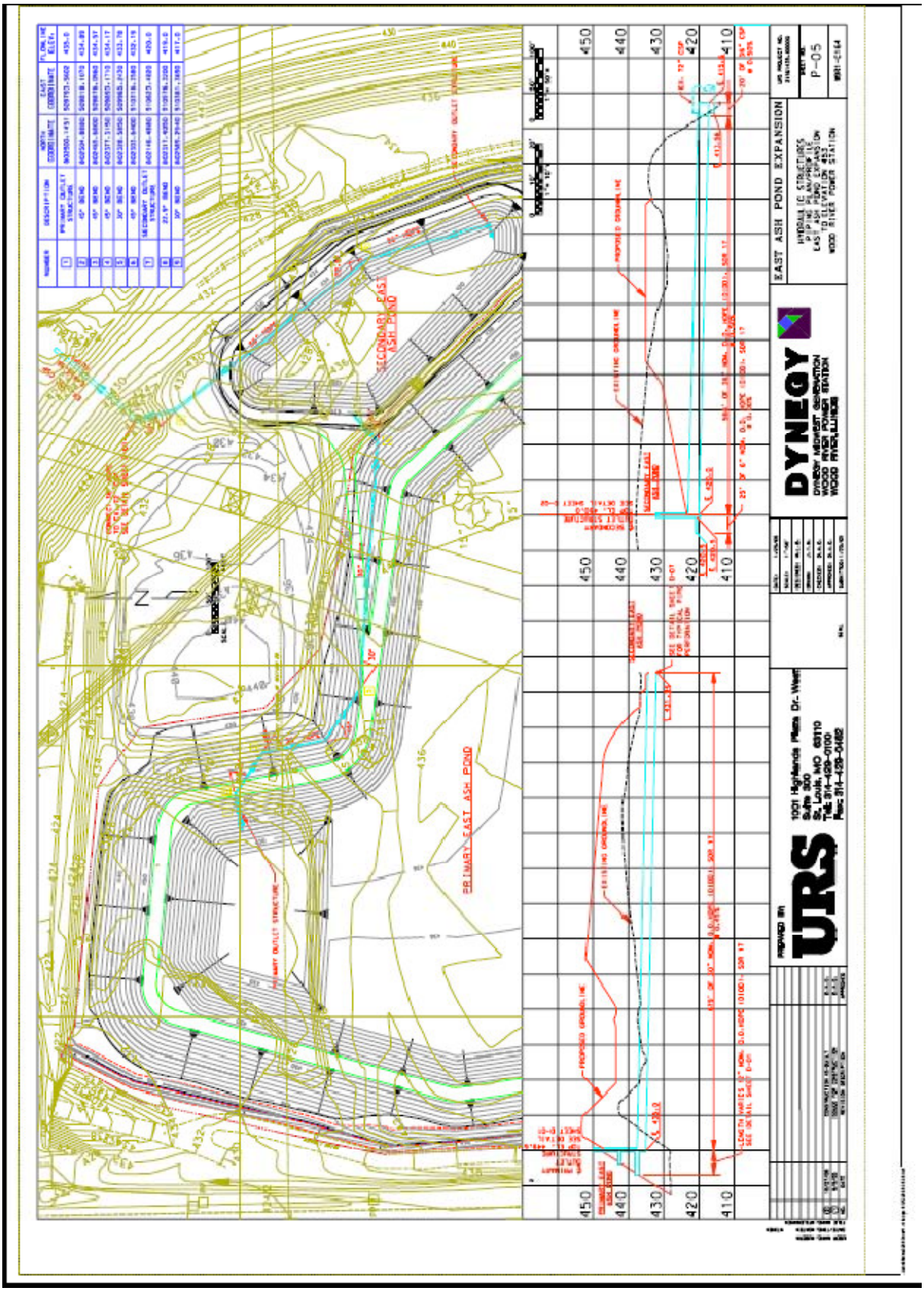
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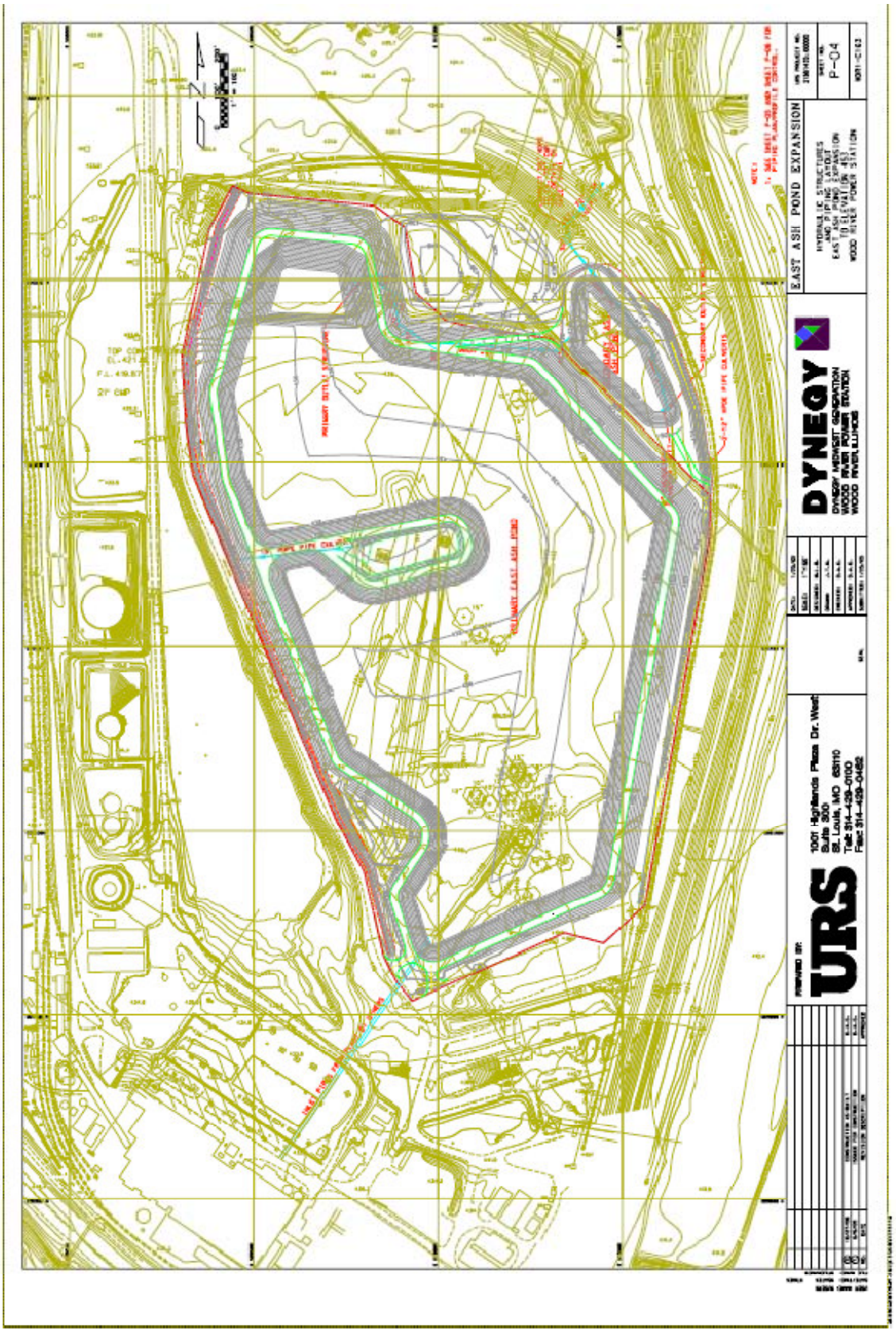

POND #1
PREVIOUSLY PERMITTED, NOT CHANGING
WITH THIS PERMIT
ASH SLUICE PIPING
FROM PLANT
POND #3
POND #2
POND #2
WILL BE BUILT IN PHASE 2

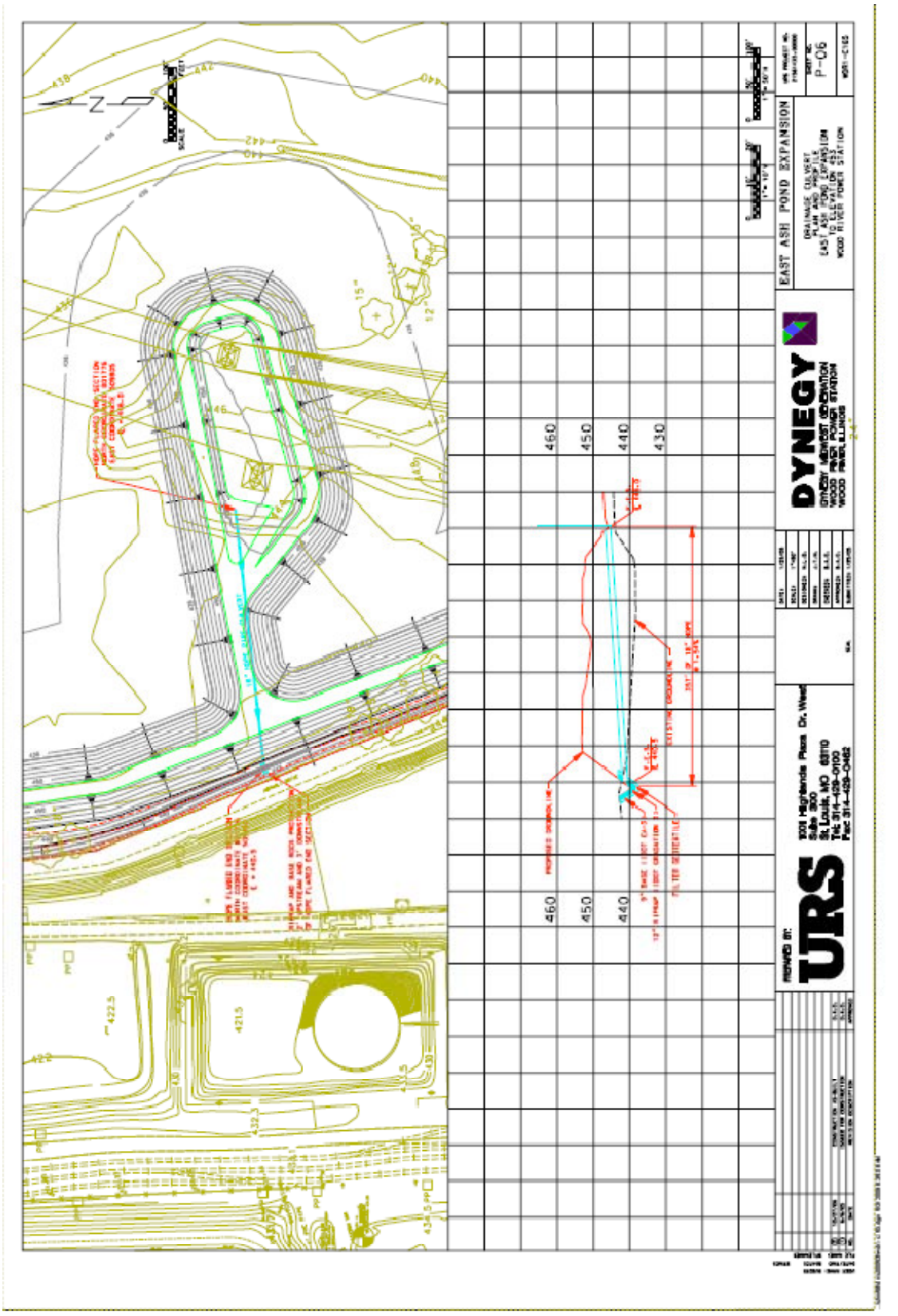

NOTE:
- FITTINGS ARE SHOWN IN BOLD
- SEE BELOW FOR CLEANOUT FITTINGS
C.O. 53.5'
(1)CROSS
176.5'
C.O. 47.5'
(1)CROSS
182'
C.O. 51'
(1)CROSS
194'
C.O. 68.5'
(1)CROSS (1)45°EL.
337'
(1)45°EL.
(1)45°EL. (1)CROSS
612.5'
C.O. 117.5'
C.O. 60'
C.O. 63.5'
218'
302'
329'
326.5'
NO FITTING
62'
90'
(1)T-WYE
181'
(1)TEE
188'
(1)TEE
185.5'
(1)CROSS (1)T-WYE
C.O. 69.5'
SUMP
C.O. 130'
C.O. 69'
NOTE:
ALL CLEANOUTS(C.O.) HAVE (1) 12"ø EL. NEAR THE LCS PIPE, (1) 45°EL. AT THE TOP OF SLOPE AND (1) CAP.
CAP
45°EL.
12"ø EL.
TYPICAL C.O. SECTION
N.T.S.
REVISION STATUS: D-CONSTRUCTION O-RECORD
NO DATE DRF DESCRIPTION E C A
0 11-17-97 DEC AS BUILT JPK
ILLINOIS POWER COMPANY
DECATUR
POND #3 CLEANOUT PIPE LAYOUT
NEW ASH SURFACE IMPOUNDMENT
WOOD RIVER POWER STATION
DR CAD DEC DATE 9-19-97
CK CKD SCALE NONE
APP PLOTTED 9-19-97
APP
E-WOR1-C103
COMPUTER GNRL. - DO NOT REVISE MANUALLY

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EAST ASH POND EXPANSION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
P-05
PRIMARY EAST ASH POND
SECONDARY EAST ASH POND

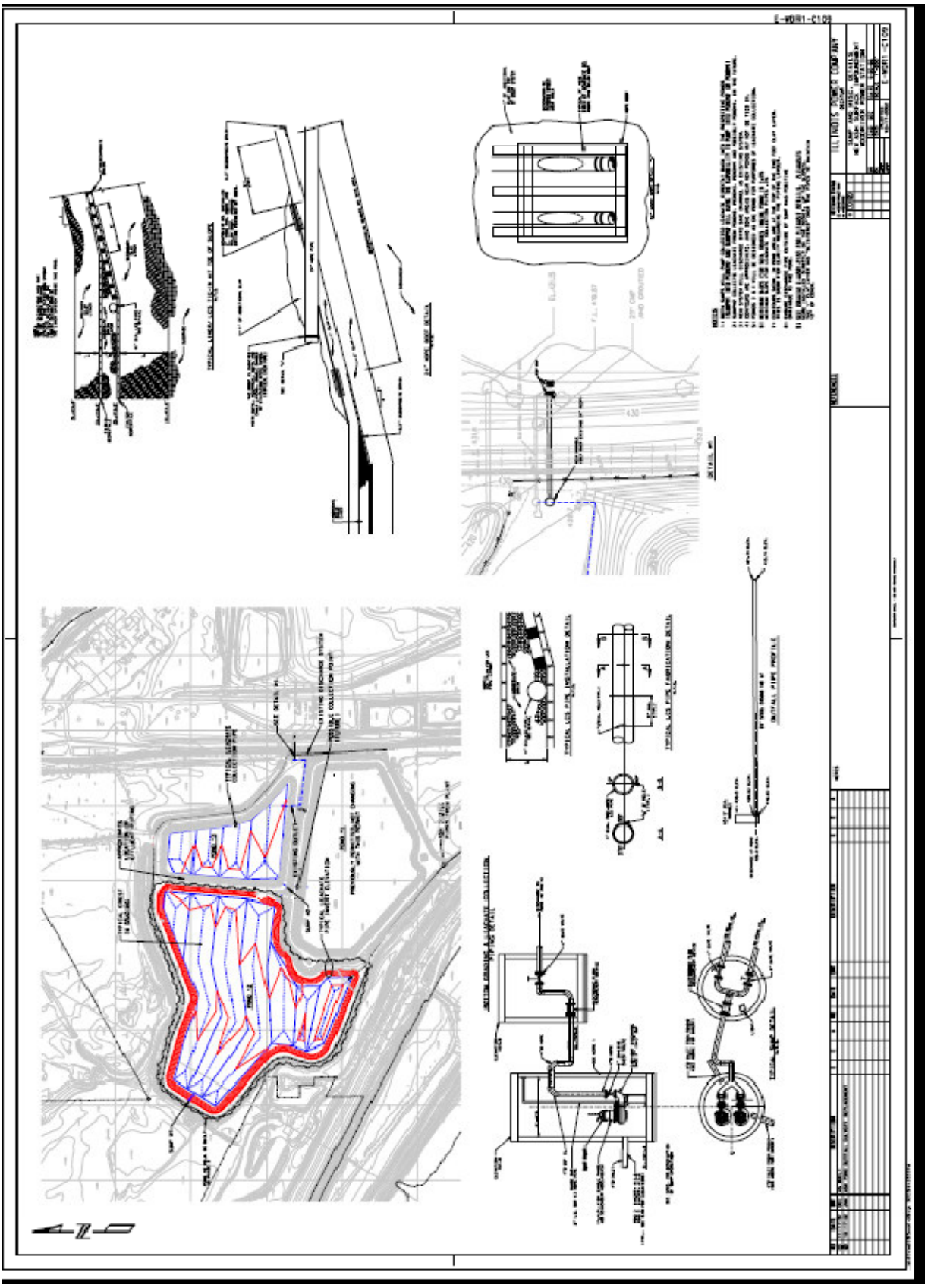
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EAST ASH POND EXPANSION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
P-04


EAST ASH POND EXPANSION
DRAINAGE CULVERT
PLAN AND PROFILE
EAST ASH POND EXPANSION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
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P-06
460
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SPECIFICATIONS

DYNEGY WOOD RIVER EAST ASH POND EXPANSION TO EL. 453

Prepared for

Dynegy Midwest Generation
No. 1 Chessen Lane
Alton, IL 62002

February 8, 2005

URS

21561435.00000

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SECTION 1: PROJECT DESCRIPTION

1.0 GENERAL DESCRIPTION AND SCOPE OF WORK

1.1 Background

The ash generated from burning coal during the production of power at the Wood River Power Station is washed (or sluiced) through pipes from the plant to a primary ash settling/disposal pond. Water is detained in the pond to allow the ash to settle out before being routed to a secondary settling pond. The secondary pond provides additional detention time before the water is discharged into a drainage ditch, which eventually drains into the Wood River. The primary pond provides most of the settling and, therefore, storage/disposal of the ash. The secondary pond is considered a "polishing" pond for final treatment before discharge.

DMG has identified that the existing ash disposal pond system at the Wood River Power Station is nearing capacity. A Feasibility Study investigating alternatives of expanding the existing ash pond system or constructing a new pond was prepared. That study determined that expansion of the existing, inactive, East Ash Pond would be the best option. The overall goal for Dynegy Midwest Generation (DMG) is to increase the water storage capacity of their Wood River Power Station East Ash Pond and prepare it as a facility permitted by the IDNR and IEPA.

The East Ash Pond Expansion will be operated as generally described above. The primary and secondary ponds have been designed as Class I small dams. The ponds will be stand-alone structures constructed above existing grades using a lined, earthen and fly ash structural fill ring-berm or dike with 3H:1V inside slopes and 3.5H:1V outside slopes.

The site is located in the City of Alton in Madison County, IL. Refer to the site location Drawings for the general and detailed layout of the facility.

1.2 Scope of Work

Generally, the work will consist of:

- Clearing the existing grass, brush and trees on the surface of the existing pond.

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- Re-grading the upper portion of existing pond to construct the dike embankment and foundation for the liner in the new primary and secondary pond area (including wasting excess cut, if required). Existing fly ash and bottom ash from within the pond will be used for structural fill. Soft areas in the subgrade may require base stabilization with reinforcing geotextile and gravel. Bottom ash will be used as a drainage layer in the lower section of the dike embankment on the primary pond.

- Installing hydraulic structures, piping and access structures connecting the ponds to each other and discharging to a culvert on the north end of the ponds.

- Installing a clay and geomembrane liner in the bottom and on the slopes of the graded pond areas.

- Installing soil cover on the top and outside slopes of the dike embankments (seeded and mulched).

- Installing gravel access roads on top of the dike embankments and in the infield area around the power line towers.

Time is of the essence on this project. This work is being done in accordance with the Drawings and Specifications making up these bid documents and under the supervision of the Project Manager.

1.3 General Pond Parameters

The overall footprint of the proposed primary east ash pond is approximately 36 acres. The bottom area is 23.7 acres. The majority of the pond floor is at approximately El. 436. A small area of the bottom of the primary pond is at El. 420 near the outlet. The primary pond will have a maximum operating pool of El. 450. The ground elevation outside the area of the existing pond varies from approximately El. 420 to 435. Within the area of the existing pond, the existing ground elevation is approximately El. 435 to 450. The primary east ash pond will operate with a varying water elevation. The water will be maintained at four to five feet above the ash level in the pond during normal operation.

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The footprint for the secondary east ash pond will be approximately 2.1 acres. The floor will be at El. 420 and be about 0.7 acres. The secondary east ash pond water level will maintained at El. 432 ft water during normal operation.

END OF SECTION ONE

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2.4 SUBSURFACE INFORMATION

It is strongly emphasized that the subsurface information is made available to the Contractor without guarantee or obligation of any kind whatsoever on the part of the Owner. The Owner does not guarantee the correctness of the designations of any materials shown on the Drawings, nor any interpretations, deductions, or conclusions shown on any drawings, logs, reports, or other documents relative to subsurface conditions. Conditions affecting the Contractor's performance and schedule may differ from those indicated or described. Bidders will be deemed to have inspected the site and satisfied themselves on all matters affecting the Contract and Specifications. Bidders may, at their own expense and with the approval of the Owner, make additional investigations if they so desire. The Bidders and Contractor must assume all responsibility for deductions and conclusions as to the nature or condition of soil, and other materials to be excavated, the difficulties of making and maintaining the required excavation, and of doing other work affected by the geology of the job site.

END OF SECTION TWO

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2.4 SUBSURFACE INFORMATION

It is strongly emphasized that the subsurface information is made available to the Contractor without guarantee or obligation of any kind whatsoever on the part of the Owner. The Owner does not guarantee the correctness of the designations of any materials shown on the Drawings, nor any interpretations, deductions, or conclusions shown on any drawings, logs, reports, or other documents relative to subsurface conditions. Conditions affecting the Contractor's performance and schedule may differ from those indicated or described. Bidders will be deemed to have inspected the site and satisfied themselves on all matters affecting the Contract and Specifications. Bidders may, at their own expense and with the approval of the Owner, make additional investigations if they so desire. The Bidders and Contractor must assume all responsibility for deductions and conclusions as to the nature or condition of soil, and other materials to be excavated, the difficulties of making and maintaining the required excavation, and of doing other work affected by the geology of the job site.

END OF SECTION TWO

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SECTION 6: EARTHWORK

6.0 SCOPE

This Specification covers the minimum performance requirements, materials, and references necessary to govern earthwork and related operations. Earthwork is the movement of soil, sand, fly ash, bottom ash, or rock from one location to another, shaping the materials in accordance with the plans and specifications, and achieving the desired physical condition of the materials by various methods.

Earthwork associated with this project includes, but is not necessarily limited to, the following:

Stripping topsoil, if any.

Mass excavation

Selective base stabilization as agreed with Owner's Representative and Engineer

Dike construction (structural fill)

Disposal of excess fly ash and bottom ash excavation

Soil cover construction

Clay liner construction

Drainage blanket construction

Grading and ditch construction

Excavation and backfill for manhole(s) and piping

Furnishing, placing, and compacting

- coarse aggregate base course
- coarse aggregate base stabilization material
- coarse aggregate under concrete outlet structures
- coarse aggregate at outlet end of drainage blanket

Most of the material for dike construction will come from the mass excavation of the materials in the existing East Ash Pond and the proposed Secondary East Ash Pond. Bottom ash for the drainage blanket will be obtained from the existing bottom ash stockpile in the southeastern

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corner of New Pond No. 2 about 1/2 mile west of the Proposed Primary East Ash Pond. Material for relatively impervious soil cover and the compacted clay liner will be imported from approved offsite sources submitted by Contractor. The top of dike surfacing will be coarse aggregate base course meeting IDOT material specifications for CA-1 and CA-6. A "plug" of IDOT CA-1 coarse aggregate will be placed on the outlet end of the drainage blanket to improve stability, and reduce seepage piping and runoff erosion. IDOT CA-3 coarse aggregate will be used for base stabilization at selected locations as agreed with the Owner's Representative.

Existing vegetation shall be stripped from the area within the clearing limits shown on the drawings and burned in an area designated by the Owner's Representative in accordance with Section 5, Clearing and Grubbing.

6.1 DIKE EMBANKMENT (STRUCTURAL FILL)

Dike embankment shall be constructed using a mixture of fly ash and bottom ash from the mass excavation required to construct the ash pond. The material shall be placed in maximum 8-inch thick loose lifts for fill compacted with large, self-propelled rollers and 4-inch thick loose lifts for fill compacted by other methods, at a moisture content between 2% below and 3% above the optimum moisture content specified in ASTM D 698 "Standard Proctor" and shall be compacted to at least 95% of maximum density as determined by ASTM D 698 "Standard Proctor".

6.2 CLAY LINER

Impervious borrow from an approved offsite source shall be used to construct the clay liner as shown on the Drawings. Materials for the clay liner shall include only materials meeting the following classifications of ASTM D 2487, "Classification of Soils for Engineering Purposes," placed as described in these Specifications or as approved by the Engineer.

Clays: CL, CH, CL-ML

Combinations of the above

Contractor shall thoroughly investigate and test proposed source of borrow for clay liner and submit results of his investigation to Owner's Representative for approval. To verify that the material to be obtained from the Contractor's borrow source will be suitable, Contractor shall engage a qualified independent geotechnical laboratory with demonstrated experience in performing flexible wall permeameter tests on clay to prepare

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test specimens and perform tests in accordance with ASTM D-5084[2]. The experience and qualifications of the laboratory shall be submitted for approval, as well as the resume of the registered engineer who will oversee the testing and sign the test reports. The investigation and scope of each borrow source shall be in general conformance with EPA Technical Guidance Document 600/R/-93-182 [3](latest revision), pages 61 through 65 (Article 2.4). Relevant excerpts from this document are included in Appendix B. Adequate subsurface explorations will be made to verify that the borrow source contains an adequate volume of suitable clay for the liner construction. Material testing shall include (at minimum) water content, Atterberg limits, particle size distribution, ASTM D698 compaction curve, and hydraulic conductivity in accordance with ASTM D-5084. Procedures for preparation of test specimens shall be in accordance with the procedures given in EPA 600/R-93/182. The target water content shall be optimum water content and the target dry density shall be 95% of the maximum dry density. The minimum frequencies of the various types of tests to be performed shall be in accordance with Table 2.3 on Page 65 of the EPA guidance document (see Appendix B).

The liner material shall be placed in maximum 8-inch thick loose lifts for fill compacted with large, self-propelled rollers or and 4-inch thick loose lifts for liner compacted by other methods, at a moisture content between optimum and 3% above the optimum moisture content as determined by ASTM D 698 and shall be compacted to at least 95% of maximum density as determined by ASTM D 698. The maximum particle size in clay liner compacted with large, self-propelled rollers shall be 3 inches and the maximum particle size in clay liner compacted using other equipment shall be 2 inches. Oversize material shall be removed from the liner.

Contractor shall be responsible for maintaining clay liner in a condition such that its hydraulic conductivity is not increased above 1.0 x 10^{-7} cm/sec by drying, physical disturbance, or other factors. Steps that Contractor may take toward this end include but are not limited to wetting the surface periodically, applying a suitable membrane curing compound, adding moisture and recompacting, or a combination of such actions. Contractor shall submit a plan for maintenance of hydraulic conductivity to Engineer for approval.

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[2] "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter"
[3] EPA/600/R-93-182, Quality Assurance and Quality Control for Waste Containment Facilities, September 1993, pp 60-65

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Contractor shall be responsible for preparing and maintaining the surface of the clay liner for placement of the geomembrane liner. The surface will be smooth, which will be accomplished by a smooth drum roller. The surface shall be free of all rocks larger than 3/8 inch, roots, sharp object or debris of any description. The surface of the clay liner shall provide a firm, unyielding foundation for the geomembrane with no voids or depressions greater than 2 inches in any dimension, nor abrupt changes or breaks in grade. No standing water or excessive moisture shall be permitted during installation of the liner material. Any voids and depressions shall be filled with clay liner material to complete a level surface.

6.3 DRAINAGE BLANKET

Bottom ash shall be used to construct the drainage blanket as shown on the Drawings. Materials available for construction of drainage blanket shall be obtained from the on-site stockpile of bottom ash at the southeast corner of New Ash Pond No. 2 and shall include materials meeting the following classifications of ASTM D 2487 placed as described in the Specifications or as approved by the Engineer.

Sands: SW, SP

Gravels: GW, GP

Combinations of the above

The Drainage Blanket shall be compacted with large, self-propelled vibratory rollers or track-laying tractors and shall be placed in maximum 14-inch thick loose lifts and shall be compacted by 2 passes of the equipment used for compaction. The maximum loose lift thickness for fill compacted by other methods shall be 8 inches.

6.4 SOIL COVER

Soil cover shall be used to construct the portion of the dike as shown on the Drawings. Materials available for construction of soil cover shall be obtained from approved off-site borrow sources. Relatively impervious materials having ASTM D2487 classifications of CL and CL-ML may be used as soil cover.

The maximum particle size in fill compacted with large self-propelled rollers shall be 3 inches and the maximum particle size in other fill shall be 2 inches. Oversize material shall be removed from the fill. The material shall be placed in maximum 8-inch thick loose lifts with large, self-propelled rollers and 4-inch thick loose lifts for fill compacted

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by other methods, at a moisture content between 2% below and 3% above the optimum moisture content determined by ASTM D 698 and shall be compacted to at least 95% of maximum density determined by ASTM D 698.

6.5 BASE STABILIZATION

Base stabilization material shall be placed and compacted in selected locations as detailed on the drawings and as agreed with Owner's Representative. The material shall consist of IDOT CA-3 coarse aggregate, shall be placed in one 24-in. thick lift, and shall be compacted with 4 passes of a large, self-propelled roller or 140+-HP track-laying tractor.

6.6 ROADWAY BASE

Roadway base shall consist of a 4-inch thick layer of IDOT CA-1 topped with 2 inches of IDOT CA-6. Contractor shall place and compact coarse aggregate base along the top of the dike and in the infield as shown on the drawings. The base rock shall be distributed in layers of uniform thickness using a Jersey spreader or comparable equipment. The subgrade shall be prepared in accordance with current IDOT construction requirements[4] for aggregate base course (Section 351.04). The base shall be constructed in accordance with IDOT Section 351.05 for Type B base course. The Contractor shall submit samples of the base course materials to the Owner's Representative for approval.

6.7 COARSE AGGREGATE PLUG ALONG OUTBOARD SIDE OF DRAINAGE BLANKET

IDOT CA-1 shall be used for the plug on the outboard side of the drainage blanket as shown on the drawings. Filter geotextile shall be placed as shown on the drawings and trimmed to within ½ in. of the slope. The aggregate shall be placed in one lift and compacted to the satisfaction of the Engineer by tracking or tamping with a loader, bulldozer, or other equipment approved by the Engineer with care taken not to damage the filter geotextile.

6.8 CRUSHED ROCK UNDER STRUCTURES

Crushed rock meeting the requirements for IDOT CA-6 shall be placed and compacted under structures as shown on the drawings. The rock may be placed in a 12-in. thick layer if it can be compacted with a large self-propelled roller. If such compaction is not

[4] Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction, Adopted January 1, 2002, and Supplemental Specifications and Recurring Special Provisions adopted March 1, 2005.

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possible, the material shall be placed in 6-in. thick layers and compacted with other equipment to the satisfaction of the Engineer.

Contractor shall be responsible for dust control in all construction areas.

Payment for earthwork shall be as indicated on the Bid Form and as specified in this section.

6.9 DEFINITIONS

Excavation: Work done in obtaining material for dikes, liners, or fills.

Channel Excavation: The removal and satisfactory disposal or reuse of all materials encountered in the construction of ditches, stream channels, or swales.

Clay: Soils meeting the classifications of ASTM D 2487 for CL, CH and combination thereof.

Clearing: The removal and disposal of all obstructions such as fences, walls, foundations, buildings, trees, stumps, brush, accumulations of rubbish of whatever nature, and existing structures.

Construction Inspector: The Owner's on-site representative.

Contractor: The party or parties proposing to provide all labor, equipment and materials required to perform the work specified herein or on the plans.

Crushed Gravel: Fractured particles resulting from the crushing of gravel which, prior to crushing, would have been retained on a screen with an opening 1.5 times as large as the maximum size of the resulting crushed material.

Crushed Stone: Angular fragments resulting from the mechanical crushing of granite, limestone, or dolomite from undisturbed, consolidated deposits: (Dolomite shall be a carbonate rock containing 11.0% or more magnesium oxide (MgO). Limestone shall be a carbonate rock containing less than 11.0% magnesium oxide).

Dike: Consists of the construction of fill areas by hauling, depositing, placing and compacting the specified material above the natural surface to a specified grade line.

Engineer: The Owner's engineer which may be Dynegy Midwest Generation or their designated representative.

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Footing Excavation: See Structure Excavation.

Gravel: Coarse, granular, unconsolidated material resulting from the reduction of rock by the action of the elements and having subangular to rounded surfaces conforming to the definitions set forth in the Unified Soil Classification System.

Inorganic Silt: Fine-grained soil possessing little or no plasticity or cohesion conforming to the definitions set forth in the Unified Classification System for ML.

Owner: Dynegy Midwest Generation.

Pipe Excavation: The excavation, removal and satisfactory disposal or reuse of all materials encountered constructing a trench for installation of the specified pipe.

Porous Backfill: Fine aggregate (clean sand) placed and compacted in excavations, around structures or other items as indicated in the plans and specifications.

Rock: Natural aggregate of mineral grains connected by strong and permanent cohesive forces.

Sand: Fine granular material resulting from the natural disintegration of rock conforming to the gradations set forth in the Unified Soil Classification System.

Soil: Natural aggregate of mineral grains, with or without organic constituents that can be separated by gentle mechanical means such as agitation in water. Gravel and sand are coarse-grained soils, while silts and clays are fine-grained soils.

Stripping: The excavation, removal and satisfactory disposal (if required) of all materials taken between the original surface and the top of suitable material for the construction of dikes, subgrade, sub-base, shoulders, intersections, ditches, waterways, entrances, approaches and incidental work.

Structure Excavation: Removal of any and all materials encountered during installation of any designated structure and the satisfactory disposal or reuse of all materials.

Unclassified Excavation: The removal of any combination of topsoil, earth, rock, muck or obstacles carried out to the lines and grades specified or shown on the plans without regard to percentage of moisture and type of material found.

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Bottom Ash: The portion of the ash generated during coal combustion formed of angular particles ranging from sand to gravel-size. Bottom ash is free draining and has essentially no cohesion.

Fly Ash: The portion of the ash generated during coal combustion formed of silt-sized particles. Fly ash behaves as a silt soil with no cohesion.

6.10 REFERENCES

The reference to specifications or organizations (such as ASTM) together with any diagrams, drawings or plans shall be considered as part of this specification. In the event of conflict between this specification and the referenced documents, the requirements of this specification shall take precedence. The latest editions of the following specifications, standards, and codes apply:

American Society for Testing and Materials (ASTM)

ASTM D 75: Practice for Sampling Aggregates

ASTM D 420: Recommended Practice for Investigating and Sampling Soil and Rock for Engineering Purposes

ASTM D 421: Method for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants

ASTM D 422: Method for Particle-Size Analysis of Soils

ASTM D 653: Terms and Symbols Relating to Soil and Rock Mechanics

ASTM D 698: Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12- inch Drop

ASTM D 854: Test Method for Specific Gravity of Soils

ASTM D 1140: Test Method for Amount of Material in Soils Finer than the No. 200 (0.074-mm) Sieve

ASTM D 1452: Practice for Soil Investigation and Sampling by Auger Borings

ASTM D 1556: Test Method for Density of Soil in Place by the Sand-Cone Method

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ASTM D 2168: Methods for Calibration of Laboratory Mechanical-Rammer Soil Compactors

ASTM D 2216: Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures

ASTM D 2217: Method for Wet Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants

ASTM D 2487: Test Method for Classification of Soils for Engineering Purposes

ASTM D 2922: Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017: Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3740: Practice for the Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM D 4220: Practices for Preserving and Transporting Soil Samples

ASTM D 4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM C 29: Test Method for Unit Weight and Voids in Aggregate

ASTM C 127: Test Method for Specific Gravity and Absorption of Coarse Aggregate

ASTM C 128: Test Method for Specific Gravity and Absorption of Fine Aggregate

ASTM C 136: Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C 566: Test Method for Total Moisture Content of Aggregate by Drying

ASTM C 702: Methods for Reducing Field Samples of Aggregate to Testing Size

ASTM D 75: Practice for Sampling Aggregates

ASTM E 11: Specification for Wire-Cloth Sieves for Testing Purposes

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ASTM D 3665: Practice for Random Sampling of Construction Materials

Standard Specifications for Road and Bridge Construction - Illinois Department of Transportation (IDOT)

6.11 MATERIALS

6.11.1 The clay liner shall be constructed of impervious fill with a permeability of not more 1.0 x 10^{-7} cm/sec as placed and compacted.

6.11.2 Additional soil tests may be made by the Engineer to confirm that actual materials used meet the permeability requirements. If the soil proves unsatisfactory, one or more of the following measures shall be taken:

6.11.3 The unsatisfactory material shall not be used in the liner, but may be used in other portions of the dike as shown on the Drawings provided that its properties meet the requirements for those portions of the dike.

6.11.4 With the approval of the Engineer, the compaction and/or moisture content requirements for the clay liner may be adjusted in some cases to reduce the permeability and allow its use in the liner.

6.11.5 The type of material and gradation to be used at a particular location will be as designated in this section, other portions of the specifications, and on the plans for the project.

6.11.6 Unsatisfactory material used in any portion of the dike (or other parts of this work) shall be removed and replaced at the Contractor's expense.

6.11.7 In most instances, coarse-grained material (gravels, crushed stone, sand) will be designated by an IDOT gradation. Materials with these gradations are readily available statewide. The drainage blanket shall be constructed from an on-site source of bottom ash as discussed in this section.

6.11.8 Fine-grained materials (clay, silty clay) will be designated by a Unified Soil System Classification Symbol (ASTM D 2487).

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6.12 CONSTRUCTION REQUIREMENTS

6.12.1 Unless noted otherwise below, compaction requirements for all phases of the work shall be at least 95% of the maximum dry density and within -2% to +3% of the optimum moisture content as determined by ASTM D 698 (commonly referred to as the Standard Proctor test).

The clay liner shall be compacted to at least 95% of the maximum dry density at a moisture content between 0% and +3% of optimum moisture content as determined by ASTM D 698.

6.12.2 Compaction shall be obtained by mechanical means in a timely manner so as not to delay construction. Loose lift thickness may vary depending upon the condition of the material and equipment used, but shall not exceed 8 inches unless expressly allowed by this specification. Each lift may be tested by the Engineer or an outside agency.

6.12.3 Material placed that does not meet the minimum compaction requirements shall be reworked as necessary to obtain the specified compaction at no extra cost to the Owner. Reworking may include removal, rehandling, reconditioning (including drying or adding water), re-compacting, or combinations of these procedures. No further placement of material will be allowed until the compaction requirements are met. If the material becomes unsuitable for use after placement, even if previously compacted to the specified percentage, it shall be modified (or removed and replaced by suitable material) and compacted in accordance with the specifications at no extra cost to the Owner.

6.12.4 No material shall be placed on wet or frozen subgrade.

6.12.5 The Contractor shall maintain his work in such a manner to prevent ponding of water in the project area. In foundation excavations where water collects the Contractor shall pump as required to keep the excavation free of water. A layer of oversize rock (4 inches ±) covered by a layer of crushed stone (IDOT CA-6 or CA-10) or a mud mat shall be placed to allow work to proceed in the excavation without contamination by mud or water.

6.12.6 Erosion control is the responsibility of the Contractor.

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6.12.12 The Contractor shall notify the Engineer two days in advance of beginning or resuming work.

6.12.13 Unless shown differently on the Drawings or called for in these Specifications, trenches for pipe installation shall be excavated at least 18 inches wider than the outside diameter of the pipe in order to permit thorough tamping of the backfill against the pipe. Where a firm foundation is not encountered at the grade established all such unsuitable soil shall be removed for the width of the trench and replaced with well-compacted bedding material or suitable compacted aggregate. In areas requiring impervious backfill, the trench bottom shall be shaped to conform to the pipe's shape in lieu of bedding. Alternatively, the pipe trench can be backfilled with "flowable fill." Flowable fill shall be a flowable, hand-excavatable mixture of cement, pozzolan, coarse and fine aggregate, and water mixed in accordance with ASTM C 94. Contractor shall submit details for approval if he intends to use flowable fill, including mix proportions, entrained air, density range, slump, and compressive strength at 28 days.

6.12.14 Maintain access to the project site at all times. If the work is being performed at an existing facility the Contractor shall make the necessary arrangements to maintain access to vital areas.

6.12.15 Various portions of the work will require testing by the Engineer or an outside designated testing agency. The Contractor will cooperate with the testing program and make his work accessible at all times.

6.12.16 If the work generates sufficient dust to cause complaints to be received by the Owner, the Contractor shall remedy the situation to the satisfaction of the Owner at no cost to the Owner.

6.12.17 All holes, ruts, soft areas, and other defects shall be corrected. In no case shall the surface course, base course, or other items be placed on soft or unstable material or over areas that are not properly drained.

6.12.18 In cut sections where excessively wet soil is encountered, the Contractor will be required to dry the soil and to obtain compaction of the material in accordance with the requirements of these specifications.

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6.12.19 The subgrade shall be constructed so that after being compacted it will conform to the alignment, grade, and cross section shown on the Drawings. Ruts in the finished subgrade of one inch or more in depth shall be removed from the work or the rutting shall otherwise be prevented. Rutted areas shall be graded and re-rolled with a smooth-wheeled roller.

6.12.20 A smooth surface is desired at the termination point of each type of material used whether it is virgin subgrade, dike material, crushed stone, or other construction materials. When a sheepsfoot roller is used, the area must be leveled at the finished grade. The interfaces between continuing layers of dike are not to be leveled and are expected to exhibit a normal amount of "fluff" associated with an ongoing fill operation.

6.12.21 Traffic control, including provisions for the necessary barricades, flagmen and other items, is the responsibility of the Contractor.

6.12.22 Earthwork operations shall comply with the following requirements:

6.12.23 Before any dike material is placed, all clearing and stripping over the entire area shall be performed. The top six inches of the exposed surface shall be disced, and then compacted to meet the requirements of this specification. When construction is resumed after any freezing weather the top eight inches of all partially completed dikes will be reworked and compacted to meet the requirements of this specification prior to placing more fill.

6.12.24 Dike material will be as specified in Section 6.1 of this specification, other portions of the specifications, or on the Drawings for the project. If required, the material shall be disced sufficiently to break down oversize clods, mix the material, secure a uniform moisture content, and insure uniform density and compaction. Each layer of material shall extend the entire length of dike, if possible, and shall be leveled when placed. Fill around structures is not to be placed until the concrete has attained its specified strength.

6.12.25 All irregularities in the final soil cover surface shall be filled or smoothed out before the seedbed is prepared. If the existing surface has become hardened or crusted it shall be disced or raked until broken up. All unsuitable debris and stones larger than 2 inches in diameter shall be removed from the area.

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6.12.26 Road surfaces shall consist of crushed rock aggregate shown on the plans. The aggregate shall be deposited full-lane width directly on the subgrade or previous layer of compacted base course in such a way to prevent segregation and require a minimum amount of blade work. Immediately after placement of the material it shall be compacted by a rubber-tired roller or vibratory smooth steel drum roller to the requirements of IDOT Section 351 (Type B base course). If any subgrade material is worked into the base material during the operations affected base material shall be removed and replaced with new aggregate at no cost to the Owner.

6.13 INSPECTION BY OWNER

6.13.1 The Owner is responsible for testing the project materials and results of the work performed at regular intervals. Materials that fail to meet the specified requirements shall be reworked or replaced at the Contractor's expense.

6.13.2 The Contractor shall cooperate with the Owner at all times to provide access to the materials and site for testing purposes.

6.14 MEASUREMENT

6.14.1 The Owner reserves the right to increase or decrease quantities, as required, with no increase in the unit price.

6.14.2 Items measured in units of weight may be paid for on a dry-weight basis at the discretion of the Engineer if the moisture content is found to be excessive. The bid units will not be affected unless the moisture content of coarse-grained soils exceeds 12%.

6.14.3 Stripping, clearing and grubbing will be measured in acres.

6.14.4 Pipe excavation and furnishing, placing, and compacting bedding will not be measured for payment and are to be included in the bid price for the pipe.

6.14.5 Cross section measurements and the average end area method shall be used to determine volumes of excavations and required material for dikes unless otherwise approved by the Owner.

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6.14.6 Borrow material and dike quantities shall be in net cubic yards of material moved and placed. The plan quantities will be used for bidding purposes. If there is a discrepancy between the successful bidder's take off quantities of more than plus or minus 5% of the plan quantities, the Contractor shall notify the Owner and Engineer in writing prior to starting work. The Owner will make arrangements to cross-section the project areas before and after earthwork is done to determine the amount of material moved in accordance with these specifications.

In determining the volumes, no allowance will be made for settlement, consolidation, or similar factors. Volume for Dike Embankment (Structural Fill) will be based on the before and after topographies of the completed embankment. Volume for Excavation and Disposal of Excess Cut will based on the before and after topographies of the borrow areas within the pond.

The following items will be measured in cubic yards:

Dike Embankment (Structural Fill)

Excavation and Disposal of Excess Cut

Soil cover

Clay Liner

Drainage Layer

Crushed Gravel

END OF SECTION SIX

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17.8.2 Resin

Resin shall be new, first quality, compounded and manufactured specifically for producing geomembrane.

Natural resin (without carbon black) shall meet the following minimum requirements:

Property	Test Method	HDPE	LLDPE
Density [g/cm^3]	ASTM D 1505	0.932	0.915
Melt Flow Index [g/10 min.]	ASTM D 1238 (190/2.16)	≤ 1.0	≤ 1.0
OIT [minutes]	ASTM D 3895 (1 atm/200°C)	100	100

17.8.3 Geomembrane Rolls

Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.

Geomembrane shall be free of holes, pinholes as verified by on-line electrical detection, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating roll number, thickness, length, width and MANUFACTURER.

All liner sheets produced at the factory shall be inspected prior to shipment for compliance with the physical property requirements listed herein, and be tested by an acceptable method of inspecting for pinholes. If pinholes are located,

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identified and indicated during manufacturing, these pinholes may be corrected during installation.

17.8.4 The geomembrane liner shall be 60-mil, smooth HDPE meeting the requirements shown in the following table:

Property	Test Method[1]	
Thickness, mil (mm)	ASTM D 5199	
Minimum Average		60 (1.5)
Lowest Individual Reading		54 (1.4)
Density, g/cm^3	ASTM D 1505	0.94
Carbon Black Content, %	ASTM D 1603, mod.	2.0
Carbon Black Dispersion	ASTM D 5596	*Note 2*
Tensile Properties: *(each direction)*	ASTM D 6693	
Length at Yield, lb/in (kN/m)		130 (23)
Length at Break, lb/in (kN/m)		243 (43)
Elongation at Yield, %	(1.3" gauge length)	13
Elongation at Break, %	(2.0" gauge length)	700
Tear Resistance, lb (N)	ASTM D 1004	42 (187)
Puncture Resistance, lb (N)	ASTM D 4833	119 (530)
Notched Constant Tensile Load, hours	ASTM D 5397, app.	400
Oxidative Induction Time, min.	ASTM D 3895	100

ne test procedures have been modified for application to geosynthetics. All procedures and values are subject to change without prior notification.
ily near spherical agglomerates are considered. 9 of 10 views shall be Category 1 or 2. No more than one view Category 3.

17.8.5 Extrudate Rod or Bead

1. Extrudate material shall be made from same type resin as the geomembrane.
2. Additives shall be thoroughly dispersed.
3. Materials shall be free of contamination by moisture or foreign matter.

17.9 EQUIPMENT

17.9.1 Welding equipment and accessories shall meet the following requirements:

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JPK
CS921004

Joe K.

ILLINOIS POWER

SPECIFICATIONS FOR NEW ASH IMPOUNDMENT FACILITY

WOOD RIVER POWER PLANT
W.O. 26254

JUNE, 1997

APPROVED FOR CONSTRUCTION

Civil/Structural Engineering
Illinois Power Company
500 South 27th Street
Decatur, Illinois 62525

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TABLE OF CONTENTS

The following data, attached hereto, are a part of these specifications:

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SECTION II
Description of Project

Description of Project

This project consists of shaping the bottom of the existing polishing ponds at the Wood River Power Station, installing an embankment on the inside of the ponds and lining the facility with a leachate collection system (LCS). The LCS consists of one foot of clay above an eight inch layer of drainage rock and pipe, above a two foot layer of clay. On the side slopes, the rock layer is replaced by a geocomposite drainage layer. The leachate layer will collect seepage and transport the fluid to a sump that will pump the leachate back into the ponds.

The personnel at Wood River Power Station are performing some of the initial work in the ponds. The ponds have been de-watered, and the ash and sludge material at the bottom is being removed. The exact starting configuration of the ponds will not be know until mobilization of the Contractor.

Project Location

Illinois Power - Wood River Power Station
#1 Chessen Lane,
Alton, Illinois,
Contacts:
Mr. Jeff Lamb, Chief Civil Engineer - Decatur
Phone: 217-424-6762
Mr. Joe Mansker, Director, Tech and Cust Support - Wood River
Phone: 618-462-9251, X308
(See map, next Section)

Construction Schedule

The Contractor shall submit a detailed Schedule and Plan of Work for the project. A schedule form is included in the specifications, but the Contractor is encouraged to modify the tasks or sequencing to reflect a more detailed and accurate schedule. The project Schedule and Plan of Work will be very critical to the success of the project and will be accounted for with as much weight as the rate schedule. Therefore, no bids will be reviewed that lack a detailed project Schedule.

Rate Schedules and Plan of Work will be due on May 22, 1997 at 2:00 p.m. Bids may be faxed to 217-424-7560, attention Joe Kimlinger.

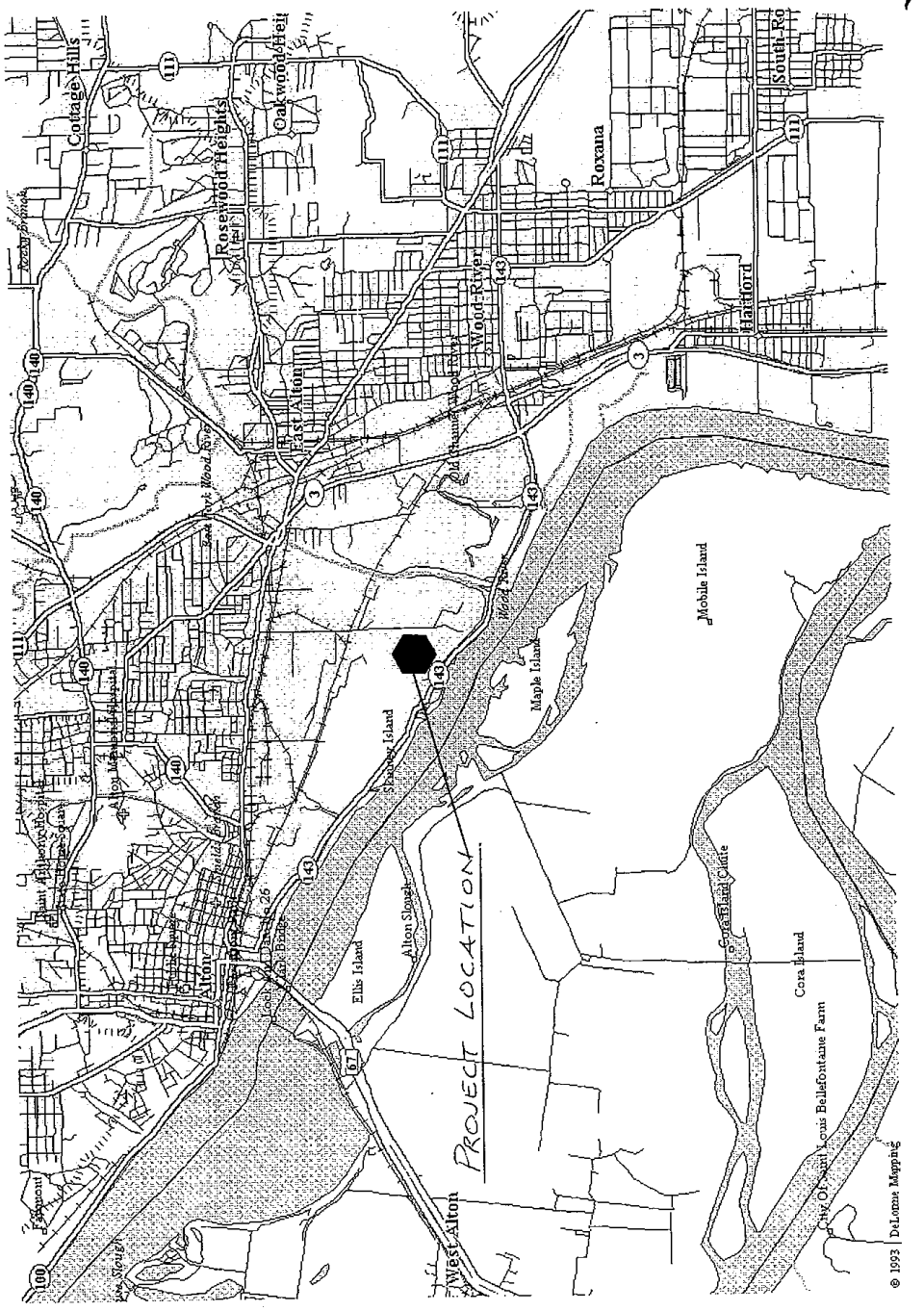
A preconstruction meeting will be held prior to starting work, to coordinate construction activities with plant operations and personnel. Tentative date for this meeting is June 1, 1997. The project shall be complete by September 1, 1997. The contractor shall supply the necessary manpower and equipment to meet this date.

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SECTION III

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SECTION IV
Scope of Work

The overall goal for this Power Station is to have a operating, environmentally sound ash impoundment facility. Phase I, will consist of shaping and lining the polishing pond, that is currently ponds #3 and #4, in the existing system. Phase II, which will be bid at a later date will consist of shaping and lining pond #2. The two maps following this section, consist of the existing pond numbering system, and the new number system. Pond #2 details will be similar to those for pond #3. Construction materials consist of off-site embankment material, off-site clay liner material, stone rip rap, crushed rock road surface, HDPE drainage pipe, drainage rock, non-woven geotextile, and a geocomposite/geonet drainage layer. HDPE pipe, and culverts are also part of this project. A sump system will be required consisting of two pumps and ancillary equipment that will be used to pump the leachate back into the ponds. Other materials will be required, and will be listed in the specifications and/or shown on the drawings.

The rock roadway on the existing dikes, and the riprap slope protection will be stripped and stockpiled. The entire subgrade will be shaped in the project area, then will be compacted to receive embankment and final grading. Once the sides and bottom are shaped and graded correctly, a two foot layer of clay will be installed on the bottom and sides. This clay must be compacted to meet the requirements in the earthwork section of this specification, particularly the permeability requirement of less than 1×10^{-7} cm/sec.

When that is finished the leachate drainage layers will be installed. On the bottom, that will consist of an eight inch layer of drainage rock, with perforated collection pipes in all the valleys. The drainage rock will be crushed rhyolite rock, as used in the railroad industry. A non-woven geotextile will be placed both above and below the drainage rock, to separate the rock from the clay material. The outside slopes of the pond will have a geocomposite drainage layer installed on top of the clay. The geocomposite drain will consist of a geonet bonded to two layers of non-woven geotextile. A one foot clay layer will then be installed on both of the drainage layers. The installation of this top foot of clay will be more critical than the bottom layer since the integrity of the drainage layers below must be maintained.

As stated above, a sump will be required to collect the leachate and pump it back into the ponds. The system will have two pumps, that will alternate operation. The associated wiring and controls shall allow one pump to operate alone, in the event that one pump fails. Power to the sump will be provided by Illinois Power.

Riprap slope protection (RR4) will be placed along the interior slope of the embankment. Riprap will also be required at the discharge end of the outlet structure, to improve the performance of that area.

Drawings are based on aerial surveys dated January, 1989. Continued plant operations (including current work in this area, as well as ash mining) have altered some of the elevations. Construction will meet existing conditions, and continue to the planned elevations and grades. Due to the time frame of this project, the Company and the Contractor will agree to plan quantities, which will be used for payment. Extra work authorizations, or change

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orders may be written to modify the material quantities used for payment. Equipment and labor will be paid on a per hour basis. Material will be paid on a delivered price to the site.

The Contractor will be required to obtain all embankment material, as well as the clay liner material. IP will test the material, but the Contractor will have the final responsibility to make sure the material meets the specifications, especially the stringent compacted clay liner specifications.

The Contractor shall note that the City of Alton has a force main that passes through this site. The Contractor is responsible for protecting the force main and any damages that result from construction activities.

The Contractor shall control and eliminate all fugitive dust at the site.

The Contractor shall control and eliminate all erosion at the site.

Exterior slope faces and all other disturbed areas outside of the ponds, will be seeded in accordance with this specification.

The top of the dikes and all access areas will be rocked with CA-6 rock and compacted.

It is assumed that the fence on the north and east edges of the construction area will NOT be in the way of construction activities. If this is not the case, the Contractor shall discuss methods of removing and storing the fencing material, with the Company's On-Site Representative. Illinois Power will arrange for the replacement of the fence if it is removed.

Piping work will be performed along the west dike of the construction area. It will consist of putting a new outfall pipe from Pond #1 into Pond #3. This pipe will be made of HDPE and CMP, as shown on the drawings.

Piping work will be performed between Pond #2 and Pond #3. This will consist of installing a 24" HDPE culvert, with an access manhole. A 24" butterfly valve will be required just upstream of the manhole. This will act as a back flow prevention device if water is put into Pond #3 from Pond #1, and Pond #2 must remain dry.

The Contractor will also be responsible for reworking the outfall structure. The removal of the structure and all associated equipment will have to be done before any grading can be done. The contractor shall decide, with the assistance of the On-Site Representative, how much of the 24" RCCP shall be removed into the south berm. The remaining piping downstream will remain as part of the total outfall system. Once the liner has been installed, the Contractor will build a foundations to reinstall the existing catwalk to the outfall structure.

Illinois Power has a pumping system in operation to pump effluent from pond #2 to the outfall manhole on the east end of the construction site. This system must remain in operation at all times during this project. The Contractor shall immediately repair, at their expense any damage to this pumping system. The pipe is laid on the north and east side of the existing

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dikes that constitute the construction site. This pipe is not shown on the cross sections, since it is a temporary installation.

All waste material from the site shall be legally disposed of by the Contractor, in an environmentally safe manner.

The Company will provide a reasonable number of horizontal and vertical control points for the project. The Contractor is responsible for day to day staking and layout work. The Contractor shall use the more detailed drawings to determine the location, elevation, and orientation of the facility's components.

Access to the Company's equipment, material, and property shall be maintained at all times. Interference with daily operations shall be minimized.

The Contractor shall obtain all permits (other than those listed in the Permit section of these specifications), licenses, and required documents, to perform the work. All costs resulting from the compliance with these documents shall be retained and submitted for payment.

All costs that the contractor feels he may incur in performing this work shall be covered in their rate schedule. Any rate that is not included in the bid, will be negotiable, on site. All costs related to this job must be documented and submitted for payment. No costs will be paid without proper documentation. Where possible, the On-Site Representative shall sign the paperwork associate with all costs.

Actual progress of this project will be compared to the Plan of Work submitted by the Contractor with their rate schedule, at the beginning of the project. Lack of sufficient progress, at any time, will be deemed reason for termination.

The Contractor shall make himself aware of the local load limits and abide by them. Any improvements to county, city or township roads, or costs associated with such work, that is required will be borne by the Contractor.

The Contractor will be required to obtain approval from the On-Site Representative before any work is done. This is due to the fast nature of the project, and the fact that some information is given for reference, but may change. This approval also pertains to the mobilization and demobilization of equipment.

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SECTION VI
Specifications for Earthwork and Related Operations

Portions of this project require excavating and backfilling of soil and other materials. This work is governed by the following Specifications for Earthwork and Related Operations (6-7.1 thru 6-7.13), and as amended below.

Contractors will be responsible for ensuring that all excavations meet the applicable requirements of OSHA. Non-compliance with these regulations will not be tolerated.

Embankment material will be required from off-site to construct the shape of the sides of the ponds being lined. This material should be a clay material either CL or CL-CH, compacted to 95% of the maximum dry density as determined by (ASTM D698), but does not need to meet the permeability requirements of the compacted clay liner.

The rock drive surfaces shall be removed from the tops of the dikes, and stockpiled. All existing embankment that will come in contact with new embankment material shall be scarified prior to placement of any new material, and compacted to 95% of the maximum dry density as determined by (ASTM D698).

The compacted clay liner must be constructed out of a CL or CL-CH material. The clay must be compacted to 95% of the maximum dry density as determined by (ASTM D698), or better, depending on the energy needed to attain a permeability of $1X10^{-7}$, or less. This should be attained at a moisture content between -1% to +3% of the optimum moisture content. Illinois Power will check the borrow site that is proposed from the Contractor. We will investigate for material quality and quantity. However, this does not relieve the Contractor of their responsibility to install the clay liner such that it meets the above permeability requirements. The Contractor shall obtain the clay liner material from a single source.

Low ground pressure equipment shall be used on each installation layer above the bottom two foot clay layer. This includes the rock drainage layer and the top one foot clay layer.

The clay payment will be broken up into three separate categories. The first will be the two foot layer at the bottom of the liner. The second is the top one foot layer. We assume that since installation and compaction will be paid on per hour basis, the first two clay prices should be similar. Both of these will be paid by plan quantities for square yards. Payment for the embankment work will be based on an agreed design quantity for cubic yards. The embankment material will be used to put three feet on top of the dikes and also to build the slopes to the 4H:1V slopes.

CA6 crushed rock shall be used for all drive surfaces on the tops of the dikes and the access areas. The rock shall be placed and compacted 6" final depth.

Other materials will be required for the leachate collection system, and are covered in that section of this specification.

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In addition to sections 7.7 and 7.8 of the Specification for Earthwork and Related Operations. It should be noted that the clay liner, the drainage rock layer, the geotextile, the geocomposite drain and the riprap slope protection will be paid in square yards.

Placement of the compacted clay liner shall adhere to the following requirements:

Scarify upper 1 inch of previously placed lifts of clay liner using a scarifier, disc, harrow, or other approved method and maintain moisture content within specified limits to provide a satisfactory bond between lifts.

If previous lift becomes cracked or softened excessively because of moisture changes, scarify full depth of lift and recompact as specified before placing overlying lift.

Place clay layer in uniform lift thicknesses such that the loose lift thickness does not exceed 8 inches, and the compacted lift thickness does not exceed 6 inches.

Control moisture content during placement to prevent excessive wetting or drying.

Compact top surface of final lift of clay liner using a smooth drum roller.

Repair all penetrations in the clay liner including but not limited to: nuclear density test probe holes, sand cone holes, test pit holes, sampling holes, and grade stake holes.

Protect compacted lifts from drying that may cause desiccation cracking, and from wetting that may cause softening.

Seal working surface at end of each day by rolling with steel drum, placing plastic cover, or other approved method.

Minimize time delays between lifts to reduce potential moisture control problems.

Do not route construction traffic over completed lifts.

The clay material shall be placed up-the-slope when working above either of the drainage layer configurations.

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1. SCOPE

1.1. This specification covers the minimum performance requirements, materials, and references necessary to govern earthwork and related operations. Earthwork is the movement of soil, sand, or rock from one location to another, shaping the materials in accordance with the plans and specifications, and achieving the desired physical condition of the materials by various methods.

2. DEFINITIONS

2.1. **Borrow Excavation**: Work done in obtaining material for embankments or fills from a source other than required excavation. Included is the excavating, transporting, placing, and compacting of materials from locations furnished by the Contractor necessary for the construction of embankments, subgrade, shoulders, sub-base, intersections, approaches, entrances, and other items indicated on the plans or noted in the specifications.

2.2. **Channel Excavation**: The removal and satisfactory disposal of all materials encountered in the construction of ditches, stream channels, or swales.

2.3. **Clay**: An aggregate of microscopic and submicroscopic flake-shaped crystalline minerals characterized by the typical colloidal properties of cohesion, plasticity, and the ability to absorb ions conforming to the gradations set forth in the Unified Classification System.

2.4. **Clearing**: The removal and disposal of all obstructions such as fences, walls, foundations, buildings, trees, stumps, brush, accumulations of rubbish of whatever nature, and existing structures.

2.5. **Construction Inspector**: The Owner's on-site representative.

2.6. **Contractor**: The party or parties proposing to provide all labor, equipment and materials required to perform the work specified herein or on the plans.

2.7. **Crushed Gravel**: Fractured particles resulting from the crushing of gravel which, prior to crushing, would have been retained on a screen with

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an opening 1.5 times as large as the maximum size of the resulting crushed material.

2.8. **Crushed Stone**: Angular fragments resulting from the mechanical crushing of granite, limestone, or dolomite from undisturbed, consolidated deposits: (Dolomite shall be a carbonate rock containing 11.0% or more magnesium oxide (MgO). Limestone shall be a carbonate rock containing less than 11.0% magnesium oxide).

2.9. **Engineer**: The Owner's project engineer.

2.10. **Embankment**: Consists of the construction of fill areas (berms, road subgrade) by hauling depositing, placing and compacting the specified material above the natural surface or a specified grade line.

2.11. **Footing Excavation**: See Structure Excavation.

2.12. **Gravel**: Coarse, granular, uncosolidated material resulting from the reduction of rock by the action of the elements and having subangular to rounded surfaces conforming to the gradations set forth in the Unified Classification System.

2.13. **Impervious Backfill**: Fine-grained soils (Silty Clay, CL to CL-CH) placed and compacted in excavations, around structures or other items as indicated in the plans and specifications.

2.14. **Inorganic Silt**: Fine-grained soil possessing little or no plasticity or cohesion conforming to the gradations set forth in the Unified Classification System.

2.15. **Owner**: Illinois Power Company or its designated agent.

2.16. **Pipe Excavation**: The excavation, removal and satisfactory disposal of all materials encountered constructing a trench for installation of the specified pipe.

2.17. **Porous Backfill**: Fine aggregate (clean sand) placed and compacted in excavations, around structures or other items as indicated in the plans and specifications.

2.18. **Rock**: Natural aggregate of mineral grains connected by strong and permanent cohesive forces.

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2.19. **Sand**: Fine granular material resulting from the natural disintegration of rock conforming to the gradations set forth in the Unified Classification System.

2.20. **Soil**: Natural aggregate of mineral grains, with or without organic constituents, that can be separated by gentle mechanical means such as agitation in water. Gravel and sand are coarse-grained soils, while silts and clays are fine-grained soils.

2.21. **Stripping**: The excavation, removal and satisfactory disposal (if required) of all materials taken between the original surface and the top of suitable material for the construction of embankments, subgrade, sub-base, shoulders, intersections, ditches, waterways, entrances, approaches and incidental work.

2.22. **Structure Excavation**: Removal of any and all materials encountered during installation of any designated structure and the satisfactory disposal of all materials.

2.23. **Unclassified Excavation**: The removal of any combination of topsoil, earth, rock, muck or obstacle carried out to the lines and grades specified or shown on the plans without regard to percentage of moisture and type of material found.

3. REFERENCES

3.1. The reference to specifications or organizations (such as ASTM) together with any diagrams, drawings or plans shall be considered as part of this specification. In the event of conflict between this specification and the referenced documents, the requirements of this specification shall take precedence. The latest editions of the following specifications, standards, and codes apply:

3.2. American Society for Testing and Materials (ASTM)

ASTM D75: Practice for Sampling Aggregates

ASTM D420: Recommended Practice for Investigating and Sampling Soil and Rock for Engineering Purposes

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ASTM D421: Method for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants

ASTM D422: Method for Particle-Size Analysis of Soils

ASTM D653: Terms and Symbols Relating to Soil and Rock Mechanics

ASTM D698: Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12- inch Drop

ASTM D854: Test Method for Specific Gravity of Soils

ASTM D1140: Test Method for Amount of Material in Soils Finer than the No. 200 (75- m) Sieve

ASTM D1452: Practice for Soil Investigation and Sampling by Auger Borings

ASTM D1556: Test Method for Density of Soil in Place by the Sand-Cone Method

ASTM D1557: Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10-lb (4.5-kg) Rammer and 18-inch (457-mm) Drop

ASTM D1558: Test Method for Moisture Content Penetration Resistance Relationships of Fine Grained Soils

ASTM D1586: Method for Penetration Test and Split-Barrel Sampling of Soils

ASTM D1587: Practice for Thin-Walled Tube Sampling of Soils

ASTM D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D2168: Methods for Calibration of Laboratory Mechanical-Rammer Soil Compactors

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ASTM D2216: Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures

ASTM D2217: Method for Wet Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants

ASTM D2487: Test Method for Classification of Soils for Engineering Purposes

ASTM D2922: Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

ASTM D3017: Test Method for Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

ASTM D3740: Practice for the Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM D4220: Practices for Preserving and Transporting Soil Samples

ASTM D4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM C29: Test Method for Unit Weight and Voids in Aggregate

ASTM C127: Test Method for Specific Gravity and Absorption of Coarse Aggregate

ASTM C128: Test Method for Specific Gravity and Absorption of Fine Aggregate

ASTM C136: Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C566: Test Method for Total Moisture Content of Aggregate by Drying

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ASTM C702: Methods for Reducing Field Samples of Aggregate to Testing Size

ASTM D75: Practice for Sampling Aggregates

ASTM E11: Specification for Wire-Cloth Sieves for Testing Purposes

ASTM D3665: Practice for Random Sampling of Construction Materials

3.3. Standard Specifications for Road and Bridge Construction - Illinois Department of Transportation (IDOT)

4. MATERIALS

4.1. Acceptability -

4.1.1. Previous testing data will be considered in determining acceptability. No material will be brought to the construction site until it has been tested by the Owner, or the designated testing agency, and found suitable for the intended application. Material hauled to the site prior to the Owner's approval may be rejected, and in such cases must be removed by the Contractor at his own expense.

4.1.2. All material shall come from the same location and exhibit similar characteristics.

4.2. The type of material and gradation to be used at a particular location will be as designated in Part 1 of this section, other portions of the specifications, or on the plans for the project or specific portions thereof.

4.2.1. In most instances coarse grained material (gravels, crushed stone, sand) will be designated by an IDOT gradation. Materials with these gradations are readily available state wide during the construction season.

4.2.2. Fine grained materials (clay, silty clay) will be designated by a Unified System Classification (ASTM D2487). See Figures 1 and 2.

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4.3. Top soil shall be relatively free from large roots, sticks, weeds, brush or stones larger than 1 inch in diameter, or other litter and waste products. Top soil shall be a loamy mixture having the following characteristics:

- At least 90% passing the No. 10 sieve.
- Not less than 1% or more than 10% organic matter.
- Not less than 12% or more than 50% clay.
- No more than 55% sand
- A PH value between five and eight

5. CONSTRUCTION REQUIREMENTS

5.1. Unless otherwise noted, compaction requirements for all phases of the work shall be 95% or greater of the maximum dry density and within ±2% of the optimum moisture content as determined by ASTM D698 (commonly referred to as the Standard Proctor test).

5.2. Compaction shall be obtained by mechanical means in a timely manner so as not to delay construction. Lift thicknesses may vary depending upon the condition of the material and equipment used, but should never exceed six inches. Each lift will be tested by the owner or an outside agency.

5.3. Material placed which does not meet the minimum compaction requirements shall be reworked as necessary to obtain the specified compaction at no extra cost to the Owner. No further placement of material will be allowed until the compaction requirements are met. If the material becomes unsuitable for use after placement, even if previously compacted to the specified percentage, it will be removed and replaced by suitable material which will be compacted in accordance with the specifications at no extra cost to the Owner.

5.4. No placement of material will be allowed on wet or frozen subgrade.

5.5. The Contractor will maintain his work in such a manner to prevent pounding of water in the project area. In excavations where water may collect the Contractor shall establish and maintain pumping capabilities to keep the excavation free of water. This includes a layer of oversize rock (±4") covered by a layer (±2") of crushed stone (CA-6 or CA-10) or a mud mat to allow work to proceed in the excavation without contamination by mud or water.

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5.6. Erosion control is the responsibility of the Contractor.

5.7. Disposal of all unsuitable material in a legal, safe, and satisfactory manner is the responsibility of the Contractor. This includes, but is not limited to , materials resulting from clearing and stripping of a site.

5.8. The Contractor shall be responsible for, and shall take all necessary precautions to preserve and protect, all existing tile drains, sewers, other subsurface drains, underground utilities, above ground utilities, private transmission lines, and appurtenances which may be affected by his operations and shall repair, at his own expense, any and all damages resulting from his actions or negligence.

5.9. The Contractor shall notify the Construction Inspector two days in advance of beginning or resuming work.

5.10. Trenches for pipe installation shall be excavated to an elevation 4 inches below the bottom of the pipe such that the invert of the pipe will be at the depth and grade specified after bedding materials are placed. The trench will be excavated 18 inches wider than the external diameter of the pipe, or more is necessary, to permit through tamping under the haunches and around the pipe. Where a firm foundation is not encountered at the grade established all such unsuitable soil shall be removed for the width of the trench and replaced with well compacted bedding material or suitable compacted aggregate. In areas requiring impervious backfill, the trench bottom will be shaped to conform to the pipe's shape in lieu of bedding. In general, areas subject to traffic, right of ways, public property, load bearing areas and other heavily used areas shall be backfilled with porous backfill compacted to the requirements of 5.1.

5.11. Access to the project site will maintained at all times. If the work is being performed at an existing facility the Contractor shall make the necessary arrangements to maintain access to vital areas.

5.12. Various portions of the work will require testing by I.P. personnel or an outside testing agency. The Contractor will cooperate with the testing program and make his work accessible at all times.

5.13. Stripping and clearing of the borrow site is incidental to the contract.

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5.14. The Contractor shall be responsible for acquiring the legal rights to a borrow site and any ramifications resulting from the removal of the material.

5.15. If the work generates sufficient dust to cause complaints to be received by the Owner, the Contractor shall alleviate the situation at no cost to the Owner.

5.16. Unless otherwise specified, the entire subgrade (fill or existing), including substation sites, shall meet the compaction requirements stated in Section 5.1. All holes, ruts, soft places, and other defects shall be corrected. In no case shall the surface course, base course, or other items be placed on soft or unstable material or over areas that are not properly drained.

5.16.1. In cut sections where excessively wet soil is encountered the Contractor will be required to make the following efforts to dry the soil and to obtain compaction of the material in accordance with the requirements of 5.1:

5.16.1.1. Cut ditches shown on the plans that drain the area to grade at least two weeks prior to starting work on the subgrade.

5.16.1.2. Air dry the top 8 inches of subgrade, including at least two eight-inch depth processings utilizing discs or tillers each day for three consecutive good drying days.

5.16.1.3. Recompact the layer processed in the above paragraphs to achieve compaction results stated in 5.1. When the above work has failed to produce satisfactory work, contact the Engineer to review the circumstances.

5.16.2. The subgrade shall be constructed so that after being compacted it will conform to the alignment, grade, and cross section shown on the plans. Equipment of such weight or use in such a way as to cause a rut in the finished subgrade of one inch or more in depth shall be removed from the work or the rutting shall otherwise be prevented. Rutted areas shall be graded and rerolled with a smooth-wheeled roller.

5.17. A smooth surface is desired at the termination point of each type of material used whether it is virgin subgrade, embankment material, crushed stone, or other construction materials. When a sheepsfoot roller is used,

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the area must be leveled at the finished grade. The interface between continuing layers of embankment are not to be leveled and are expected to exhibit a normal amount of "fluff" associated with an ongoing fill operation.

5.18. Unless specifically called out in the plans or specifications no sheet piling will be required. If, as construction proceeds, it becomes apparent sheet piling or a larger area will be needed for excavation, contact the Engineer to review the situation and determine how to proceed.

5.19. Traffic control, including provisions for the necessary barricades, flagmen and other items, is the responsibility of the Contractor.

5.20. Embankment operations shall comply with the following requirements:

5.20.1. Before any embankment is placed, all clearing and stripping over the entire area shall be performed. The top six inches of the exposed surface shall be disced, and then compacted to meet the requirements of 5.1. When construction is resumed after any freezing weather the top eight inches of all partially completed embankments will be reworked and compacted to meet the requirements of 5.1 prior to placing more fill.

5.20.2. Embankment material will be as specified in Part 1 of this section, other portions of the specifications, or on the plans for the project or specific portions thereof. If required, the material shall be disced sufficiently to break down oversize clods, mix the material, secure a uniform moisture content, and insure uniform density and compaction. Each layer of material shall extend the entire length and width of embankment, if possible, and shall be leveled when placed. Embankment around structures is not to be placed until the concrete has attained its specified strength. Any rock larger than six inches in diameter will be removed from the fill.

5.20.3. If an embankment is to be constructed on an existing slope the existing slope shall have steps cut into it prior to starting construction of the embankment.

5.21. Topsoil shall not be placed until the area to be covered has been shaped, trimmed, and finished. All irregularities in the surface shall be filled or smoothed out before the top soil is placed. If the existing surface has become hardened or crusted it shall be disced or raked until broken up to

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provide a bond with the top soil. One rolling by a smooth drum of the top soil surface will be required. All unsuitable debris and stones larger than three inches in diameter shall be removed from the area.

5.22. Base course shall consist of crushed stone aggregate as specified in Part 1 of this section, other portions of the specifications, or on the plans for the project or specific portions thereof. The aggregate shall be deposited full-lane width directly on the subgrade, geotextile fabric (if specified), or previous layer of compacted base course in such a way to prevent segregation and require a minimum amount of blade work. Immediately after placement of the material it shall be compacted by a rubber tired roller or vibratory smooth steel drum machine to the requirements of 5.1. If any subgrade material is worked into the base material during the operations all granular material affected will be removed and replaced with new aggregate at no cost to the owner.

6. INSPECTION BY OWNER

6.1. The Owner is responsible for testing the project materials and results of the work performed at regular intervals.

6.2. The Contractor will cooperate with the Owner at all times to provide access to the materials and site for testing purposes.

6.3. The Contractor shall submit the following information for each material within two weeks of the contract award:

- Supplier's Name, Address and Telephone Number.
- Pit/Facility Name, Address and Telephone Number.
- Person in Charge at Pit/Facility.
- Map, with Directions, Indicating Pit/Facility Location.

7. MEASUREMENT

7.1. The right is reserved to increase or decrease quantities, as required, with no increase in the unit price.

7.2. Items measured in units of weight may be paid for on a dry-weight basis at the discretion of the Engineer if the moisture content is found to be excessive. The bid units will not be affected unless the moisture content of coarse grained soils exceeds 12%, or 20% for fine grained soils.

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7.3. Clearing will not be measured for payment and is incidental to the contract.

7.4. Pipe excavation and furnishing, placing, and compacting bedding will not be measured for payment and are to be included in the bid price per lineal foot of the pipe specified.

7.5. Cross section measurements and the average end area method shall be used to determine volumes of excavations or required material for embankments.

7.6. Embankment quantities shall be cubic yards of compacted material at the project site. The plan quantities will be used for bidding purposes. If there is a discrepancy between the successful bidder's take off quantities of more than plus 5% the Contractor shall notify the Engineer in writing prior to starting work. Arrangements will be made to cross section the project area after the embankment work is completed and the volume determined in accordance with these specifications. If the Contractor's quantities are less than 105% of the estimated contract quantities he shall be paid the contract quantities when the project is constructed to the lines and grades shown in the plans and specifications.

7.7. The following items will be measured in cubic yards:

- Embankment
- Channel Excavation
- Structure Excavation
- Unclassified Excavation

7.8. The following items will be measured in tons:

- Sand
- Gravel
- Crushed Gravel
- Crushed Stone Aggregate

7.9. Impervious backfill will not be measured for payment and will be considered incidental to the contract.

7.10. Porous backfill will be measured in tons of the specified material.

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7.11. Stripping will be measured in cubic yards. The average depth of material to be removed and use of this material will be as noted in the specifications or on the plans.

7.12. Top soil will be measured in square yards and include furnishing, excavating, transporting, placing, and grading the material as indicated in the plans and specifications. Depth of top soil will be 4 inches.

7.13. Geotextile fabric will be measured in square yards, not including laps or portions anchored in trenches.

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TABLE 1 Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50 % retained on No. 200 sieve	Gravels More than 50 % of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5 % fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12 % fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50 % or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5 % fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand[I]
		Sands with Fines More than 12 % fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50 % or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12 % fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12 % fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15 % sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15 % gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30 % plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

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FIGURE 1

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ASTM D 2487

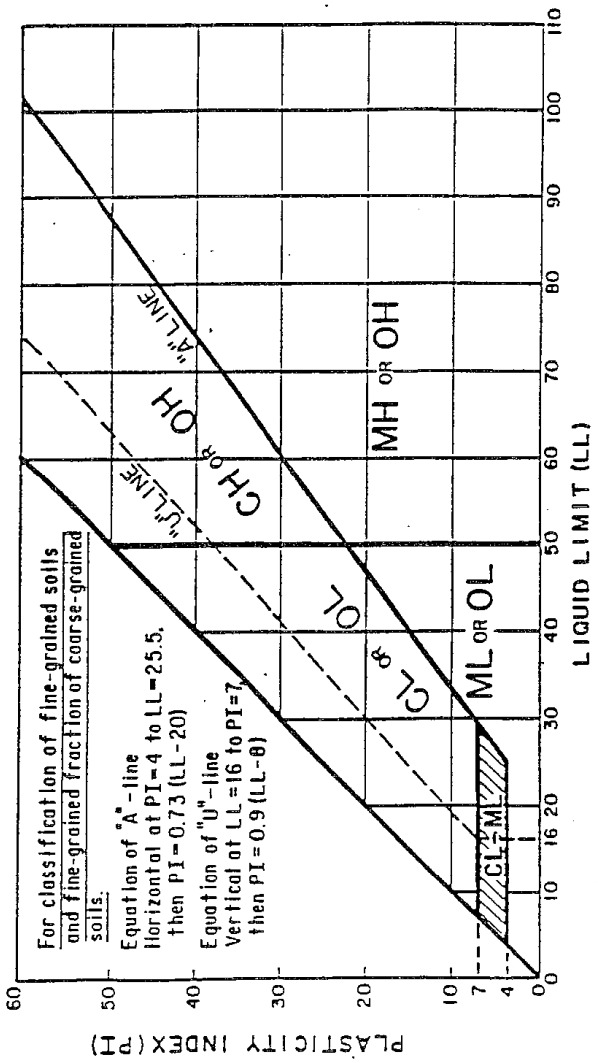


FIGURE 2 WR182

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SECTION 02715
LEACHATE COLLECTION GEOTEXTILES, GEOCOMPOSITES, AND GEOPIPES

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2.1 GEOPIPE

A. Leachate collection system pipe shall conform to the following minimum material specifications for HDPE Pipe:

Property	ASTM Reference	Nominal Value	Unit
Density (pipe)	D 1505	0.955	g/cm^3
Density (natural base resin)	D 1505	0.945	g/cm^3
Melt Index, condition E	D 1238	0.1-0.2	g/10 min.
Melting Point (Vicat Softening Temperature)	D 1525	255	°F
Brittleness Temperature	D 746	<-180	°F
Thermal Expansion	D 696	$9X10^{-5}$	in/in/°F
Thermal Conductivity	C 177	2.7	$Btu\text{-}in/ft^2/hr/°F$
Tensile Strength, yield (2.0 in/min.)	D 638	>3200	psi
Tensile Strength, ultimate (2.0 in/min.)	D 638	≥5000	psi
Elongation (2.0 in/min.)	D 638	≥800	percent
Modulus of Elasticity	D 638	110,000	psi
Flexural Modulus	D 3350	125,000	psi
Long Term Hydrostatic Strength (LTHS)	D 2837	1600	psi
Hydrostatic Design Basis (HDB)	D 2837	1600	psi
Hardness - Shore D	D 2240	66	--
Environmental Stress Crack Resistance (ESCR), condition C	D 1693	>5000	hrs.

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B. HDPE Pipe shall meet the following minimum requirements:

Specified Size (in.)	Min ID (in.)	Max SDR*
4	3.6	17

* SDR = Standard Dimension Ratio, = Pipe OD/Pipe Thickness.

C. Perforated HDPE shall have holes as shown on the Drawings.

2.2 SEPARATION FILTER GEOTEXTILE FABRICS

A. The geotextile separation and filter fabrics shall be non-woven sheets formed of thermally bonded or needle punched continuous filaments of preferentially orientated isotactic polypropylene.

B. The fabric shall be a minimum of 12 feet wide and free of defects or flaws which significantly affect its properties and shall meet the following requirements:

Property	ASTM Test Method	Required Valves	
		Filter Fabric	Geocomposite Fraction Fabric
Weight	D 3776-84	8 oz/yd^2	8 oz/yd^2
Grab Strength	D 4632-91	200 lbs.	200 lbs.
Puncture Resistance	D 4833	≥ 100 lb.	≥ 100 lb.
Mullen Burst Strength	D 3786	≥ 380 psi	≥ 380 psi
Apparent opening size (A.O.S.)	D 4751	100 (U. S. Sieve) ≤ 0.150 mm	100 (U. S. Sieve) ≤ 0.150 mm

2.3 GEONET

A. The geonet shall be profiled mesh formed by extruding two sets of HDPE strands together.

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B. Minimum 7 feet wide, free of defects or flaws which significantly affect its properties, shall meet the following requirements:

Property	ASTM Method	Required Value
Carbon Black Content	D 1603	2 to 3%
Nominal Thickness	D 751	≥ 0.16 inches
Density	D 1505	≥ 0.940
Nominal Transmissivity*	D 4716	≥ 1×10^{-3} m^2/sec

* 14.5 psi confining pressure test set up with: Plate/8 oz. geotextile; geonet; 8 oz geotextile/plate at a gradient of 0.1.

2.4 GEOCOMPOSITE

A. The geocomposite on the slopes in the leachate collection system of the ponds shall be a geonet bonded between the 8 oz. nonwoven geotextiles.

B. The geonet/geotextile components of the geocomposite shall meet all of the material properties required for the separate components. Refer to paragraph 2.2 and 2.3. In addition to these requirements the geonet/geotextile composite shall meet the following:

Property	ASTM Method	Specification
Peel Adhesion	F-904	550 g/in minimum

PART 3 EXECUTION

3.1 PREPARATION

A. Verify all lines and grades of field conditions are as shown on the Drawings.

B. Verify that all surfaces have been properly prepared prior to installation of the leachate collection and leachate detection system.

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SECTION XIII
Soil Boring Information

The following information is provided for the Contractors benefit. Additional information may be available at the Contractor's request.

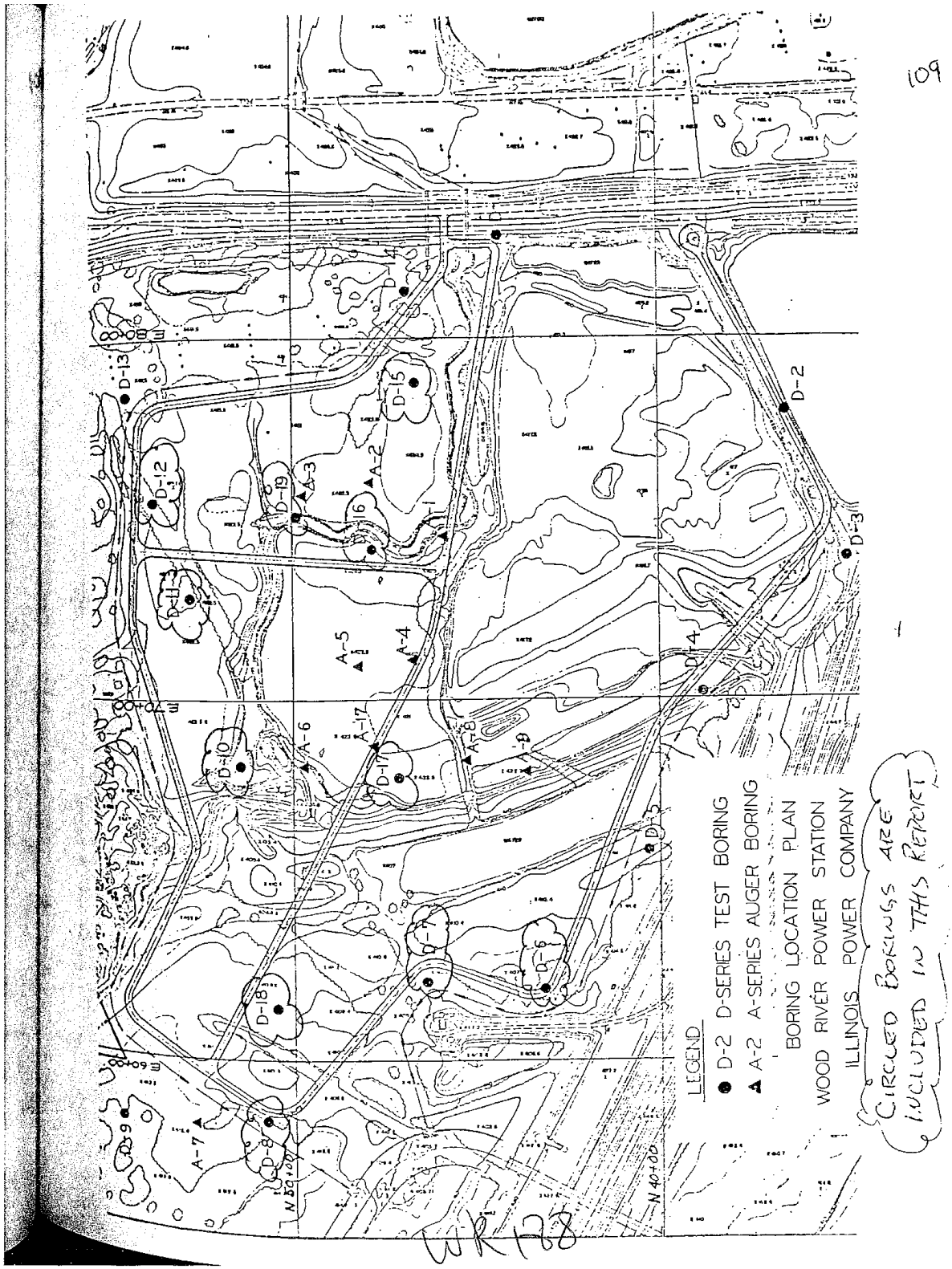
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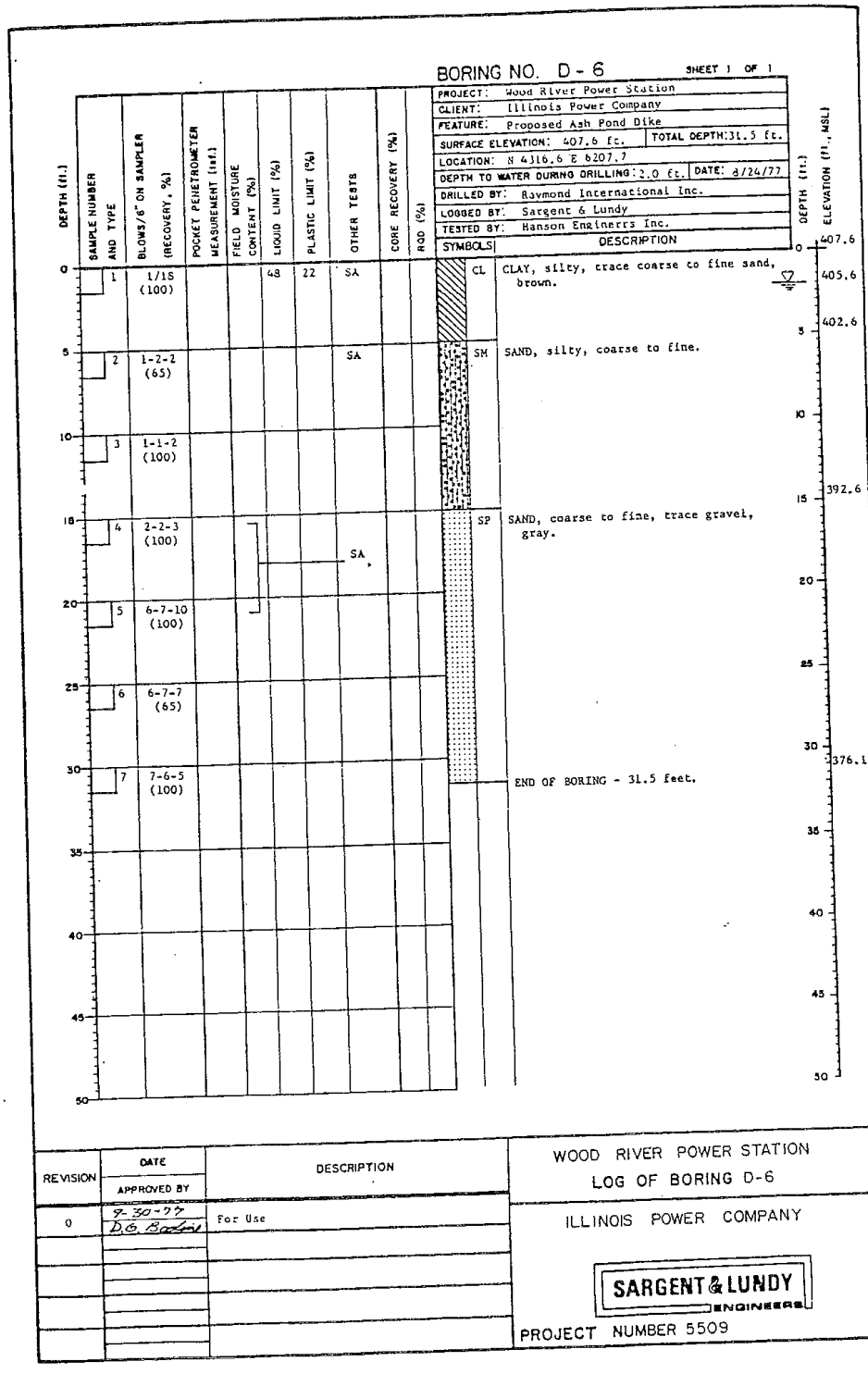
Plant Soil Borings
(Used for native soils)

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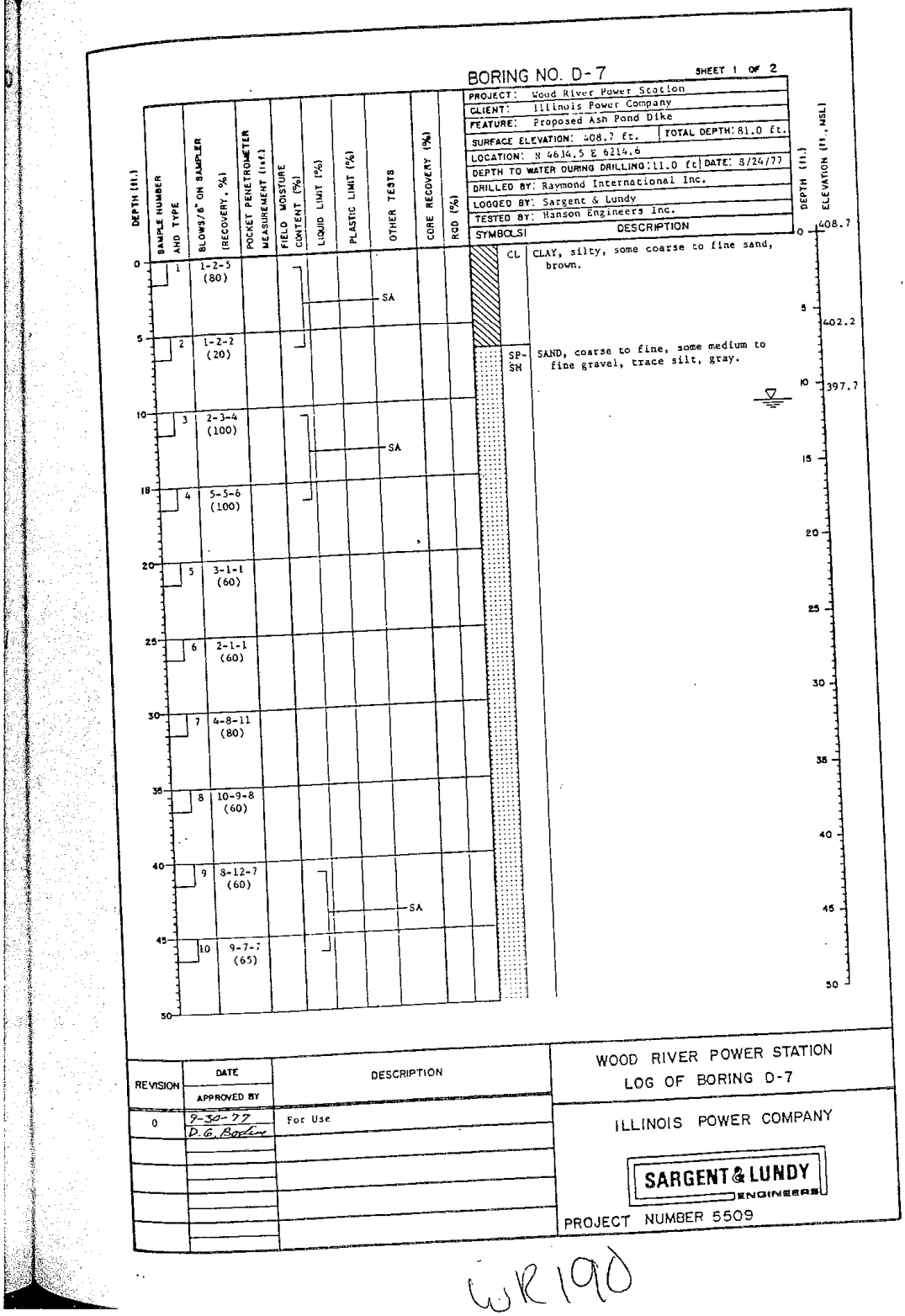

LEGEND
D-2 D-SERIES TEST BORING
A-2 A-SERIES AUGER BORING
BORING LOCATION PLAN
WOOD RIVER POWER STATION
ILLINOIS POWER COMPANY
CIRCLED BORINGS ARE INCLUDED IN THIS REPORT
109
E 80+00
E 70+00
N 50+00
N 40+00
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-13
D-15
D-18
D-19
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-17

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BORING NO. D - 6
SHEET 1 OF 1
PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 407.6 ft.
TOTAL DEPTH: 31.5 ft.
LOCATION: N 4316.6 E 6207.7
DEPTH TO WATER DURING DRILLING: 2.0 ft.
DATE: 8/24/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.
DEPTH (ft.)
SAMPLE NUMBER AND TYPE
BLOWS/6" ON SAMPLER (RECOVERY, %)
POCKET PENETROMETER MEASUREMENT (tsf.)
FIELD MOISTURE CONTENT (%)
LIQUID LIMIT (%)
PLASTIC LIMIT (%)
OTHER TESTS
CORE RECOVERY (%)
RQD (%)
SYMBOLS
DESCRIPTION
ELEVATION (ft., MSL)
1 1/15 (100) 48 22 SA CL CLAY, silty, trace coarse to fine sand, brown. 405.6
2 1-2-2 (65) SA SM SAND, silty, coarse to fine. 402.6
3 1-1-2 (100) 392.6
4 2-2-3 (100) SA SP SAND, coarse to fine, trace gravel, gray.
5 6-7-10 (100)
6 6-7-7 (65)
7 7-6-5 (100) END OF BORING - 31.5 feet. 376.1
REVISION
DATE
APPROVED BY
DESCRIPTION
0 9-30-77 D.C. Backus For Use
WOOD RIVER POWER STATION
LOG OF BORING D-6
ILLINOIS POWER COMPANY
SARGENT & LUNDY ENGINEERS
PROJECT NUMBER 5509

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BORING NO. D-7 SHEET 1 OF 2

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 408.7 ft. TOTAL DEPTH: 81.0 ft.
LOCATION: N 4634.5 E 6214.6
DEPTH TO WATER DURING DRILLING: 11.0 ft DATE: 8/24/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., NSL)
0	1	1-2-5 (80)					SA			CL	CLAY, silty, some coarse to fine sand, brown.	0	408.7
5	2	1-2-2 (20)								SP-SM	SAND, coarse to fine, some medium to fine gravel, trace silt, gray.	5	402.2
10	3	2-3-4 (100)					SA					10	397.7
15	4	5-5-6 (100)										15	
20	5	3-1-1 (60)										20	
25	6	2-1-1 (60)										25	
30	7	4-8-11 (80)										30	
35	8	10-9-8 (60)										35	
40	9	8-12-7 (60)					SA					40	
45	10	9-7-7 (65)										45	
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 D.G. Bodin	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

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BORING NO. D-7 (cont'd) SHEET 2 OF 2

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
50	11	7-12-10 (80)									- grades to and medium to fine gravel, trace silt, gray.		358.7
55	12	7-6-6 (85)					SA						
60	13	9-8-9 (100)											
65	14	8-8-9 (85)											
70	15	6-7-9 (100)											
75	16	R 0											
80											END OF BORING - 81.0 feet. Refusal - Rock		321.7
85													

REVISION	DATE / APPROVED BY	DESCRIPTION
0	8-30-77 D.C. Bockel	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7 (cont'd)

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 191

DRAFT

113

BORING NO. D-8

SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION: 412.2 ft.	TOTAL DEPTH: 36.5 ft.
LOCATION: N 5087.9 E 5837.8	
DEPTH TO WATER DURING DRILLING: 20.0 ft.	DATE: 8/25/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-3-3 (50)								OL	SILT, clayey, with organics, brown.	0	412.2
										CL	CLAY, silty, brown.		410.2
5	2	4-5-7 (80)			43	22	SA					5	
10	3	7-8-9 (100)								SP	SAND, coarse to fine, trace fine gravel, brown.	10	402.2
											- grades to gray.		
15	4	4-7-8 (100)					SA					15	
20	5	3-9-10 (100)										20	392.2
											- grade to trace coarse to fine gravel.		
25	6	11-12-14 (100)										25	
30	7	7-7-8 (100)					SA					30	
35	8	11-12-13 (100)									END OF BORING - 36.5 feet.	35	375.7
40												40	
45												45	
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	4-30-77 / D.G.Bell	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-8

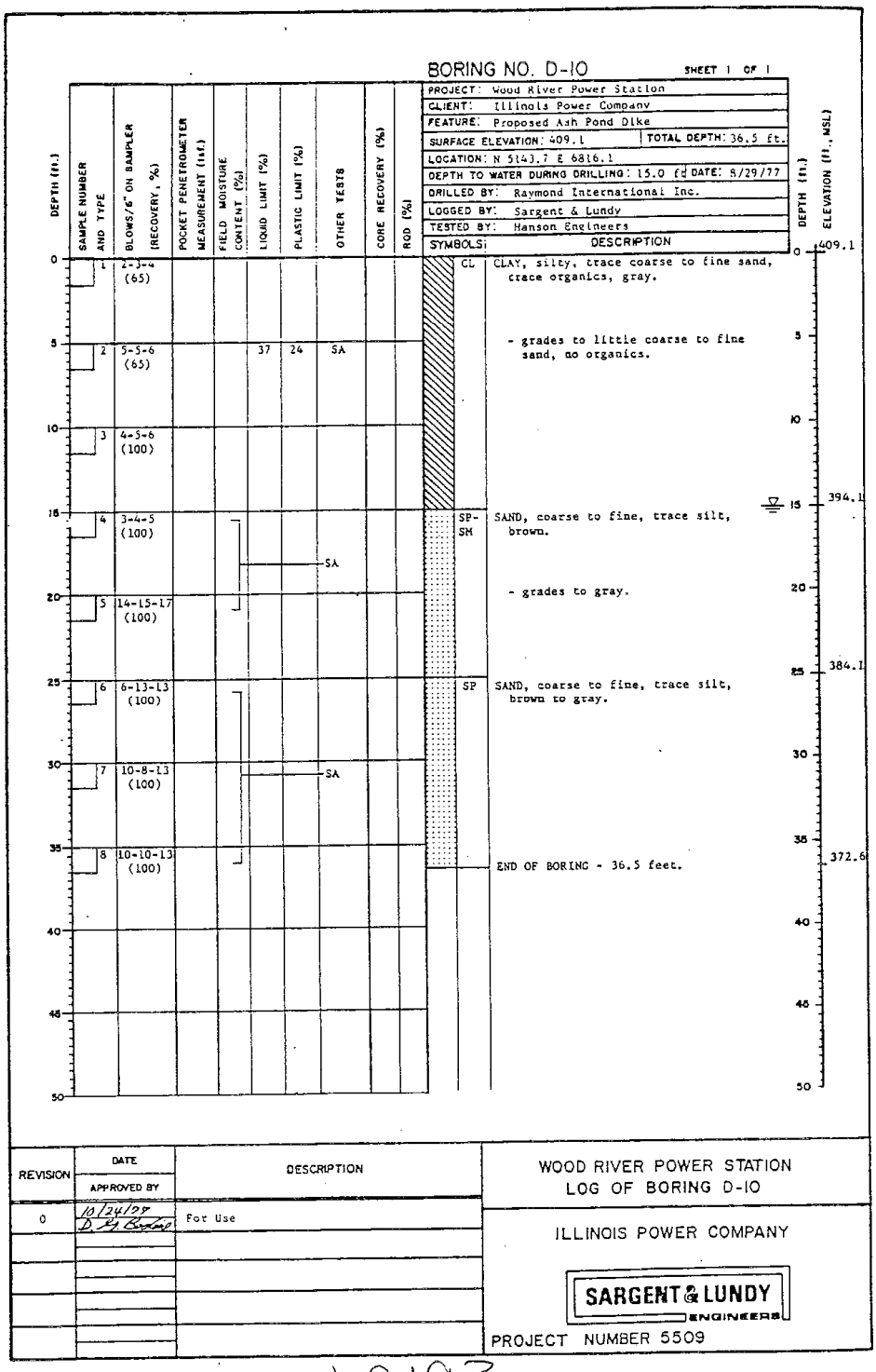
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR192

DRAFT



BORING NO. D-10 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 409.1 TOTAL DEPTH: 36.5 ft.
LOCATION: N 5143.7 E 6816.1
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 8/29/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers
SYMBOLS: DESCRIPTION

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)		DESCRIPTION
0	1	2-3-4 (65)								CL	CLAY, silty, trace coarse to fine sand, trace organics, gray.
5	2	5-5-6 (65)			37	24	SA				- grades to little coarse to fine sand, no organics.
10	3	4-5-6 (100)									
15	4	3-4-5 (100)					SA			SP-SM	SAND, coarse to fine, trace silt, brown.
20	5	14-15-17 (100)									- grades to gray.
25	6	6-13-13 (100)								SP	SAND, coarse to fine, trace silt, brown to gray.
30	7	10-8-13 (100)					SA				
35	8	10-10-13 (100)									END OF BORING - 36.5 feet.
40											
45											
50											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 409.1; 15 / 394.1; 25 / 384.1; 35 / 372.6

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/78 D. H. Bolin	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-10

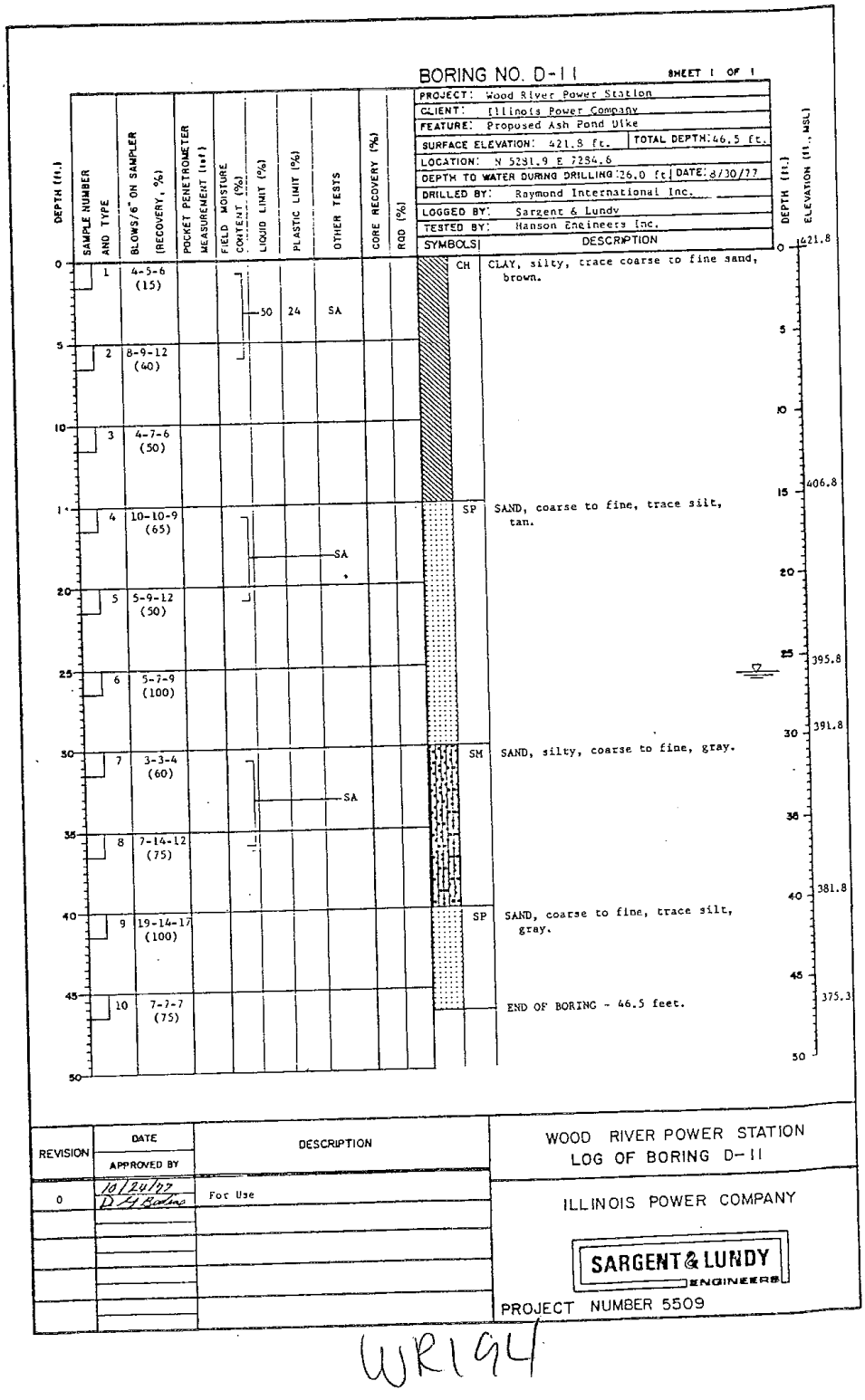
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

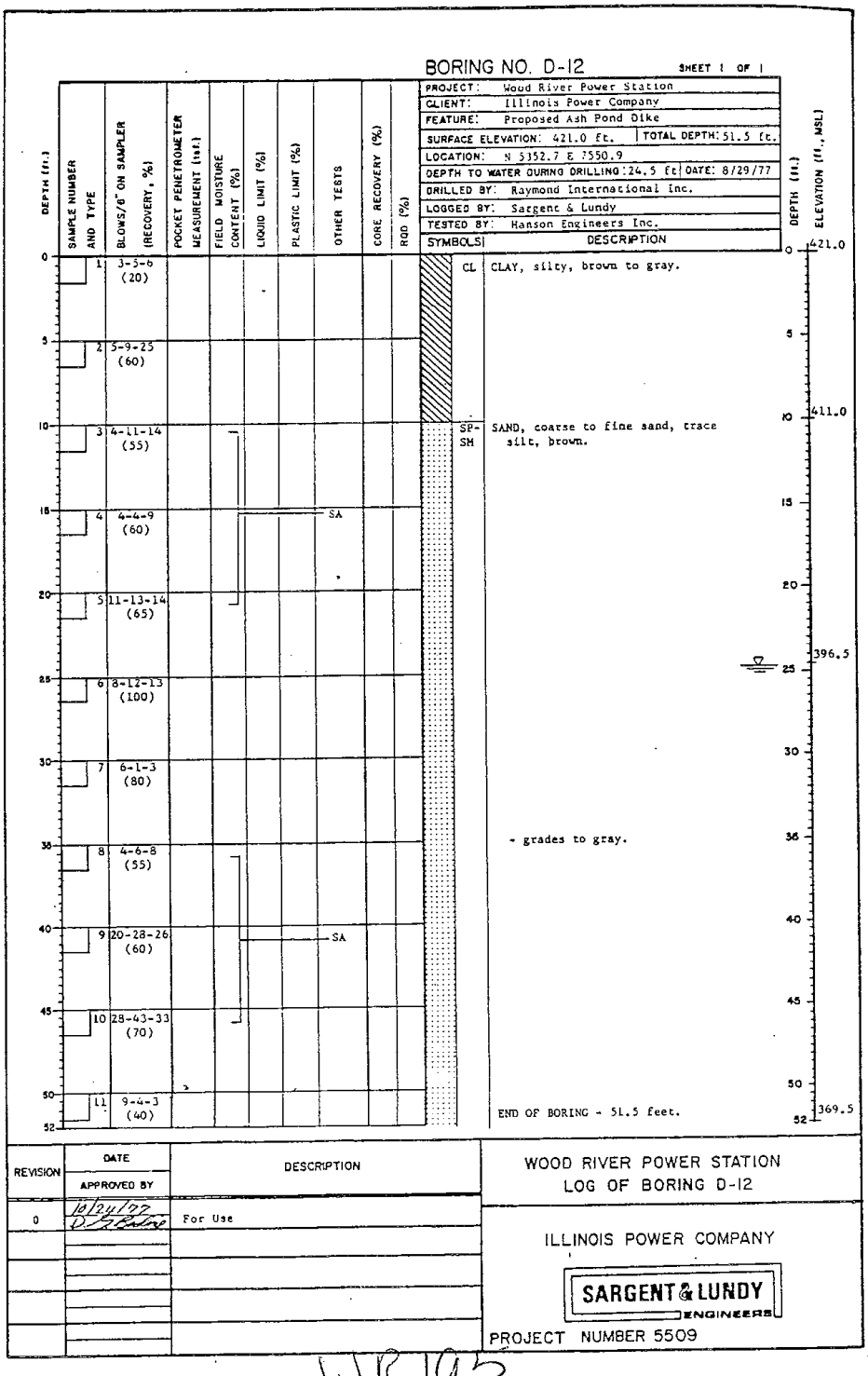
WR193

DRAFT


BORING NO. D-11
SHEET 1 OF 1
PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 421.8 ft.
TOTAL DEPTH: 46.5 ft.
LOCATION: N 5281.9 E 7234.6
DEPTH TO WATER DURING DRILLING: 26.0 ft
DATE: 8/30/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.
SYMBOLS
DESCRIPTION
DEPTH (ft.)
SAMPLE NUMBER AND TYPE
BLOWS/6" ON SAMPLER (RECOVERY, %)
POCKET PENETROMETER MEASUREMENT (tsf)
FIELD MOISTURE CONTENT (%)
LIQUID LIMIT (%)
PLASTIC LIMIT (%)
OTHER TESTS
CORE RECOVERY (%)
ROD (%)
ELEVATION (ft. MSL)
1 4-5-6 (15) 50 24 SA
2 8-9-12 (40)
3 4-7-6 (50)
4 10-10-9 (65) SA
5 5-9-12 (50)
6 5-7-9 (100)
7 3-3-4 (60) SA
8 7-14-12 (75)
9 19-14-17 (100)
10 7-7-7 (75)
CH CLAY, silty, trace coarse to fine sand, brown.
SP SAND, coarse to fine, trace silt, tan.
SM SAND, silty, coarse to fine, gray.
SP SAND, coarse to fine, trace silt, gray.
END OF BORING - 46.5 feet.
421.8
406.8
395.8
391.8
381.8
375.3
REVISION
DATE
APPROVED BY
DESCRIPTION
0
10/24/77
For Use
WOOD RIVER POWER STATION
LOG OF BORING D-11
ILLINOIS POWER COMPANY
SARGENT & LUNDY
ENGINEERS
PROJECT NUMBER 5509

WR194

DRAFT



BORING NO. D-12 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	421.0 ft. — TOTAL DEPTH: 51.5 ft.
LOCATION:	N 5352.7 E 7550.9
DEPTH TO WATER DURING DRILLING:	24.5 ft — DATE: 8/29/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	3-3-6 (20)								CL	CLAY, silty, brown to gray.
5	2	5-9-25 (60)									
10	3	4-11-14 (55)								SP-SM	SAND, coarse to fine sand, trace silt, brown.
15	4	4-4-9 (60)					SA				
20	5	11-13-14 (65)									
25	6	8-12-13 (100)									
30	7	6-1-3 (80)									
35	8	4-6-8 (55)									- grades to gray.
40	9	20-28-26 (60)					SA				
45	10	28-43-33 (70)									
50	11	9-4-3 (40)									END OF BORING - 51.5 feet.
52											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 — 421.0; 10 — 411.0; 25 — 396.5; 52 — 369.5

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.J. Bolze	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-12

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR195

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BORING NO. D-15

SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	422.5 ft. TOTAL DEPTH: 46.5 ft.
LOCATION:	N 4666.0 E 7887.3
DEPTH TO WATER DURING DRILLING:	15.0 ft DATE: 9/1/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-5-5 (60)			33	21	SA			CL	CLAY, silty, little coarse to fine sand, brown.	0	422.5
5	2	3-3-5 (80)										5	
10	3	1-3-2 (75)									- grades to gray.	10	
15	4 S1	3/12-2/6 (80) (100)		70.0	95	34	SA, U			CH	CLAY, silty, gray.	15	407.5
20	5	1-2-2 (85)										20	
25	6	2-2-2 (100)									- grades to trace medium to fine sand.	25	
30	7	1-1-1 (100)			86	26	SA					30	
35	8	3/12-2/6 (100)										35	
40	9	3-5-10 (85)					SA			SM	SAND, silty, coarse to fine, gray.	40	382.5
45	10	2-4-3 (80)									END OF BORING - 46.5 feet.	45	376.0
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/78 D.F. Barker	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-15

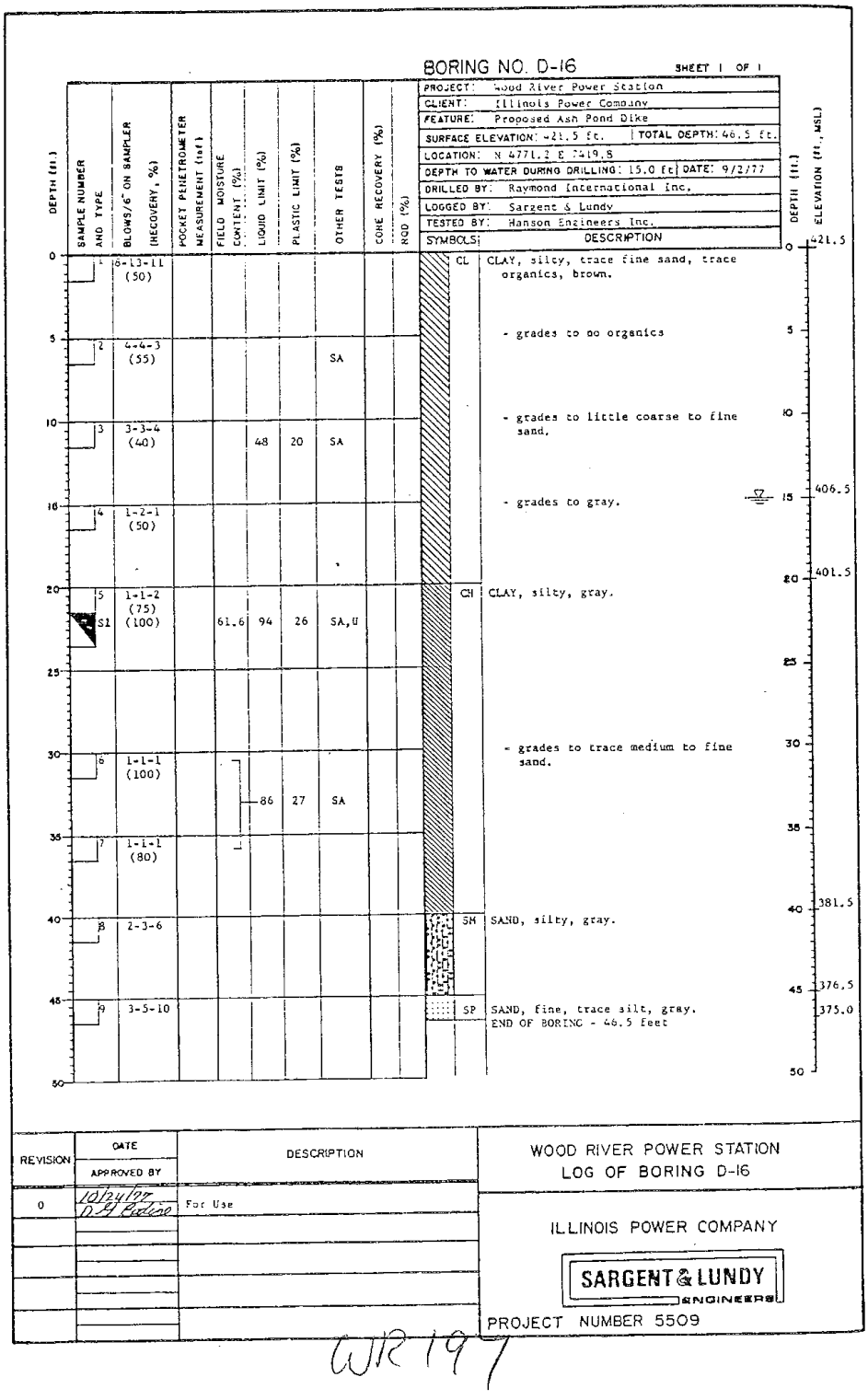
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 196

DRAFT



BORING NO. D-16 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	421.5 ft. TOTAL DEPTH: 46.5 ft.
LOCATION:	N 4771.2 E 7519.8
DEPTH TO WATER DURING DRILLING:	15.0 ft DATE: 9/2/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT, (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	6-13-11 (50)								CL	CLAY, silty, trace fine sand, trace organics, brown.	0	421.5
5	2	4-4-3 (55)					SA				- grades to no organics	5	
10	3	3-3-4 (40)			48	20	SA				- grades to little coarse to fine sand.	10	
15	4	1-2-1 (50)									- grades to gray. ▽	15	406.5
20	5 S1	1-1-2 (75) (100)		61.6	94	26	SA,U			CH	CLAY, silty, gray.	20	401.5
25												25	
30	6	1-1-1 (100)			86	27	SA				- grades to trace medium to fine sand.	30	
35	7	1-1-1 (80)										35	
40	8	2-3-6								SM	SAND, silty, gray.	40	381.5
45	9	3-5-10								SP	SAND, fine, trace silt, gray. END OF BORING - 46.5 feet	45	376.5 375.0
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/07 D.A. Fabian	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-16

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 197

DRAFT

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BORING NO. D-17 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 420.7 ft. TOTAL DEPTH: 41.5 ft.
LOCATION: N 4697.2 E 6791.2
DEPTH TO WATER DURING DRILLING: 16.5 ft DATE: 3/22/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION
0	1	3-4-7 (100)								ML	SILT, clayey, trace organics.
5	2	3-3-4 (80)									- grades to no organics, trace fine sand.
10	ST	(100)		26.5	32	24	SA,U				
15	3	2-2-2 (85)									
20	ST	(100)		62.9	93	32	SA,U			CH	CLAY, silty, gray.
25	4	1-1-1 (100)									- grades to trace fine sand.
30	ST	(100)		38.4	90	31	SA,U				
35	5	4-6-7 (100)					SA			SP	SAND, coarse to fine, trace silt, gray.
40	6	6-8-6 (100)									END OF BORING - 41.5 feet.
45											
50											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 420.7; 15 / 404.2; 20 / 400.7; 35 / 385.7; 40 / 379.2

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/20/77 D.A. Bonnet	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-17

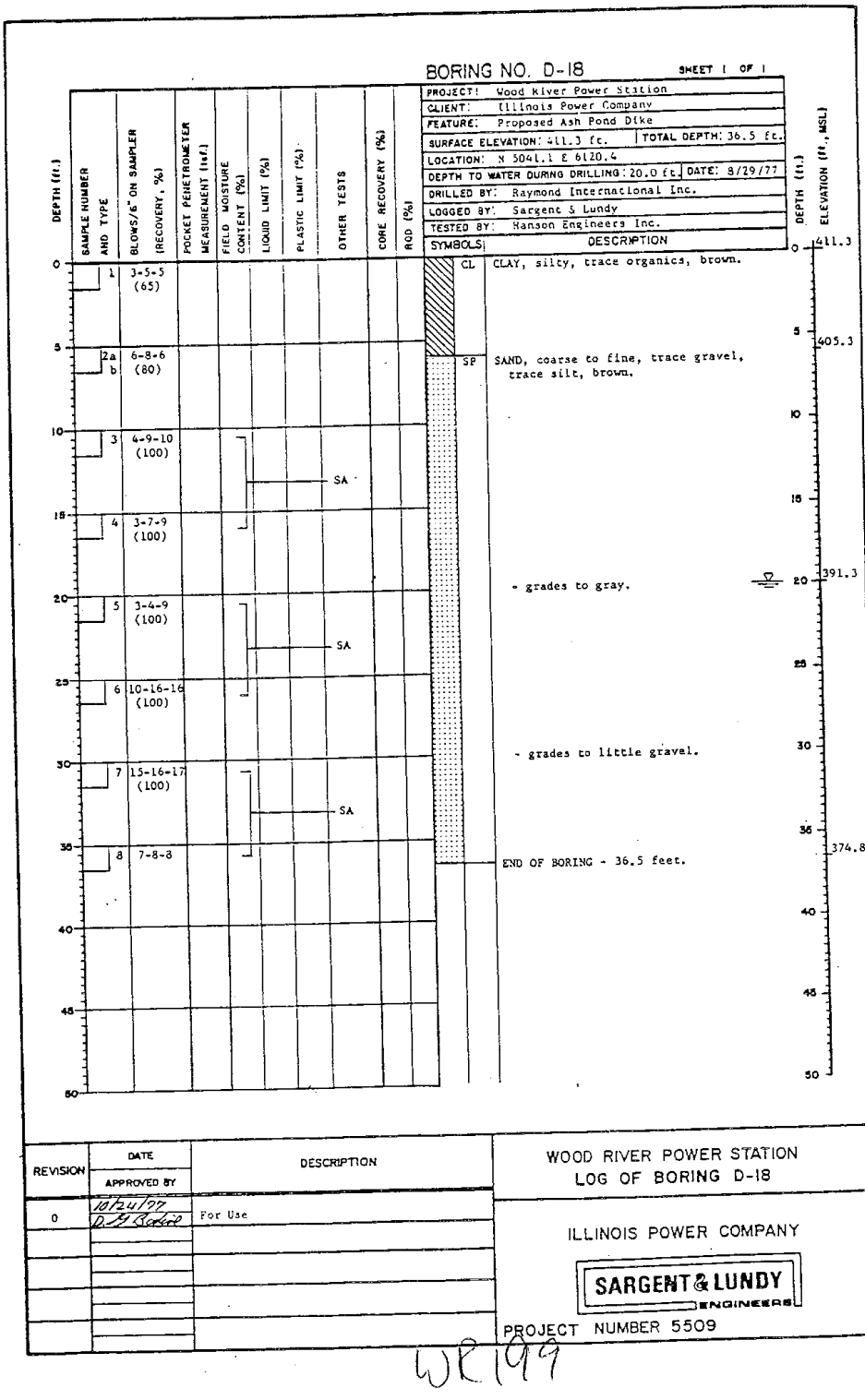
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR198

DRAFT



BORING NO. D-18 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 411.3 ft. TOTAL DEPTH: 36.5 ft.
LOCATION: N 5041.1 E 6120.4
DEPTH TO WATER DURING DRILLING: 20.0 ft. DATE: 8/29/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-5-5 (65)	CL	CLAY, silty, trace organics, brown.	0	411.3
5	2a b	6-8-6 (80)	SP	SAND, coarse to fine, trace gravel, trace silt, brown.	5	405.3
10	3	4-9-10 (100)	SA		10	
15	4	3-7-9 (100)			15	
20	5	3-4-9 (100)	SA	- grades to gray.	20	391.3
25	6	10-16-16 (100)			25	
30	7	15-16-17 (100)	SA	- grades to little gravel.	30	
35	8	7-8-8		END OF BORING - 36.5 feet.	35	374.8
40					40	
45					45	
50					50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.F. Baker	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-18

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 199

DRAFT

BORING NO. D-19

SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION: 419.0 ft.	TOTAL DEPTH: 46.5 ft.
LOCATION:	N 4994.0 E 7520.1
DEPTH TO WATER DURING DRILLING: 13.0 ft.	DATE: 9/2/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	4-4-6 (50)								OL	SILT, clayey organic with wood fragments, brown.
5	2	3-3-5 (60)								ML	SILT, sandy, brown.
10	3	2-2-2 (65)								ML-CL	SILT, clayey, sandy brown.
15	4	3/12-2/6								ML	SILT, sandy, brown.
20	5	1-1-1 (100)			72	26	SA			CH	CLAY, silty, gray.
25	ST	(100)		62.0	92	31	SA,U				
30	6	1-1-1 (100)									
35	7	1/12-1/6 (100)									
40	8	1/6-3/12 (100)			87	28	SA				
45	9	2-1-2 (100)									END OF BORING - 46.5 feet.
50											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 419.0; 5 / 414.0; 10 / 409.0; 15 / 406.0; 15 / 404.0; 20 / 399.0; 45 / 372.5; 50

REVISION	DATE APPROVED BY	DESCRIPTION
0	10/21/77 D.J. Boden	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-19

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR200

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WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 D-SERIES BORINGS

Boring No. / Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
D-15, ST-1	16.5-18.5	100	100	100	100	95.0	34.0	61.0	CH	70.0	56.9	620
Combined D-15, SS-1 SS-2	0-1.5 5-6.5	100	100	98	85	33.0	20.8	12.2	CL	-	-	-
Combined D-15, SS-6 SS-7 SS-8	25-26.5 30-31.5 35-36.5	100	100	99	96	85.0	26.0	59.0	CH	-	-	-
Combined D-15, SS-9 SS-10	40-41.5 45-46.5	100	100	99	35	-	-	-	SM	-	-	-
D-16, SS-2	5-6.5	100	100	100	92	-	-	-	CL	-	-	-
D-16, SS-3	10-11.5	100	100	97	86	48.0	20.2	27.8	CL	-	-	-
D-16, ST-1	21.5-23.5	100	100	100	100	94.0	26.3	67.7	CH	61.6	61.8	780
Combined D-16, SS-6 SS-7	30-31.5 35-36.5	100	100	99	98	86.2	27.3	58.9	CH	-	-	-
D-17, ST-1	10-12	100	100	100	98	31.7	23.8	7.9	ML	26.5	92.7	1010
D-17, ST-2	20-22	100	100	100	100	93.0	32.0	61.0	CH	62.9	58.7	1500
D-17, ST-3	30-32	100	100	100	98	90.0	30.7	59.3	CH	38.4	72.9	1500
Combined D-17, SS-5 SS-6	35-36.5 40-41.5	100	100	92	4	-	-	-	SP	-	-	-

See Page 8 of 8 for Notes

WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 B-SERIES BORINGS

Boring No. / Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
Combined D-18, SS-3 SS-4	10-11.5 15-16.5	100	97	87	4	-	-	-	SP	-	-	-
Combined D-18, SS-5 SS-6	20-21.5 25-26.5	100	98	50	3	-	-	-	SP	-	-	-
Combined D-18, SS-7 SS-8	30-31.5 35-36.5	100	87	40	4	-	-	-	SP	-	-	-
D-19, SS-5	20-21.5	100	100	100	100	72.2	26.0	46.2	CH	-	-	-
Combined D-19, SS-7 SS-8 SS-9	35-36.5 40-41.5 45-46.5	100	100	100	100	86.8	28.2	58.6	CH	-	-	-
D-19, ST-1	25-27	100	100	100	100	92.0	31.4	60.6	CH	62.0	59.7	840

NOTES:

(1) Particle-Size Analysis of Soils, ASTM Test Designation D422. Only Selected Particles Sizes Reported.

(2) Atterberg Limit Tests, ASTM Test Designations D423 and D424.

(3) Field Water Content, ASTM Test Designation D2216.

(4) Dry Density Calculated From Shelby Tube Sample.

(5) Unconfined Compressive Strength of Cohesive Soils, ASTM Test Designation D2166.

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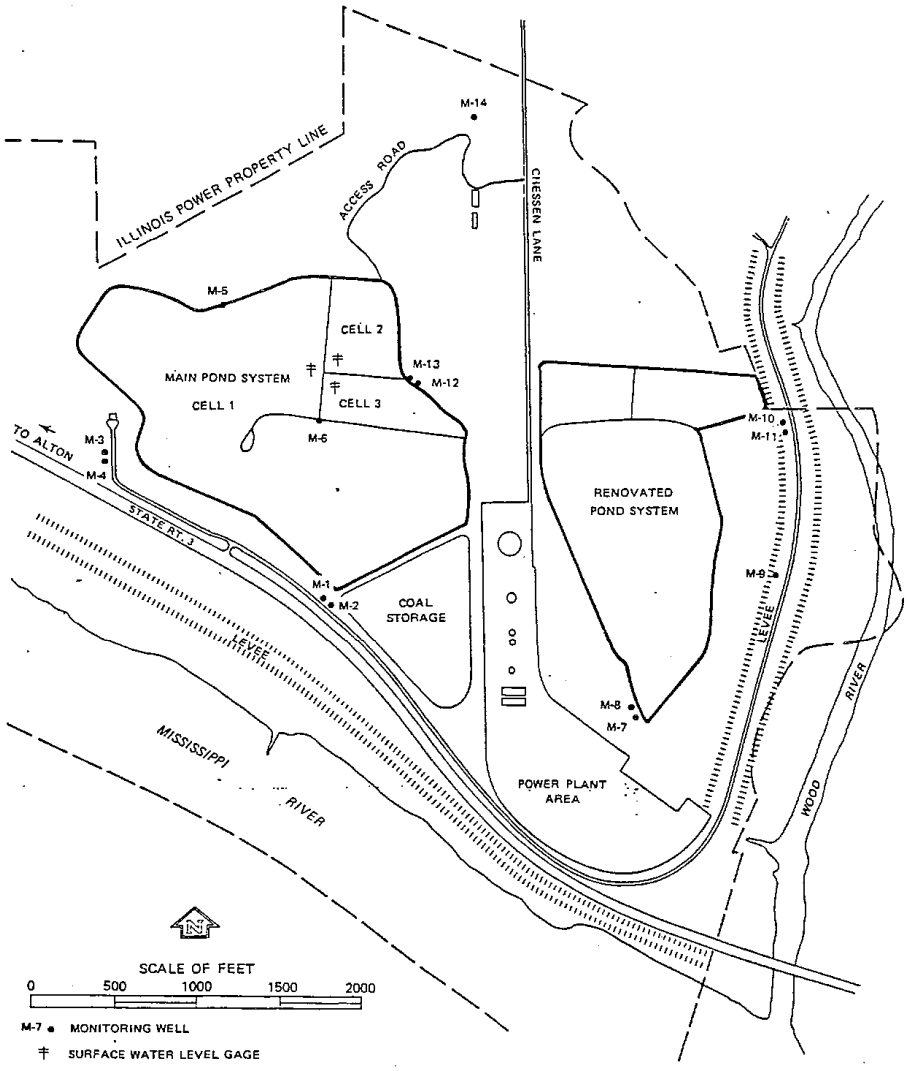


Figure 1. Locations of the monitoring wells and staff gages at the Wood River Power Station

WR203

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RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River
Power Plant Monitoring Wells
JOB NO. 83-1344

BORING M-5
SHEET 1 OF 1

WR0904

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL Classification) Soil Classification System Unified Surface Elevation —	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf SV△ QP/□ PL NMC Rock Quality Designation
5	1	SS	18/16		Dark Gray CLAY, with Silt	5-7-10		
10	2	SS	18/14		Brown Silty CLAY, Trace Fine Sand	4-5-6		
15	3	SS	18/10		Brown Fine SAND, Dry	5-6-6		
20	4	SS	18/12		Brown Fine Silty SAND	2-3-8		
25	5	SS	18/10		Brown Fine to Medium SAND	6-8-11		
30	6	SS	18/12			6-8-11		

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RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344

BORING M-6
SHEET 1 OF 2

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DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System Unified. Surface Elevation —	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf SV△ QP/:□ QU/:○ 0 ½ 1 1½ 2 2½; PL + NMC • LL x; 0 50 100; Rock Quality Designation 0 50 100
5	1	SS	18/16		Brown Silty CLAY	4-5-6		
10	2	SS	18/18		Gray Silty CLAY	3-5-9		
15	3	SS	18/14		Gray Silty CLAY, Trace Silt, Organics, Fine Sand	3-4-6		
20	4	SS	18/14			1-1-1		
25	5	SS	18/18		Gray CLAY	WH-WH-1		
30	6	SS	18/18			WH-1-1		
35	7	SS	18/10		Gray Fine SAND, Trace Silt	3-9-15		

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at — Feet
___ Hours after completion ___ Feet
___ after completion ___ Feet
___ after completion ___ Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

John Mathes & Associates, Inc.

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RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344
BORING M-6
SHEET 2 OF 2

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System Unified; Surface Elevation –	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf SV△ QP/½□ Q 0 ½ 1 1½ 2; PL NMC; 0 50; Rock Quality Designa 0 50
					Gray Fine SAND, Trace Silt			
40	8	SS	18/18		Gray Fine to Medium SAND			
					TOB			
45								
50								
55								
60								
65								
70								

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at –
___ Hours after completion –
___ after completion –
___ after completion –

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLO for abbreviations, explanations, and qualifications relative to this log.

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John Mathes & Associates, Inc.

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ILLINOIS POWER

JPK
CS921004

JOE K.

SPECIFICATIONS FOR NEW ASH IMPOUNDMENT FACILITY

PHASE II, POND #2

WOOD RIVER POWER STATION

APRIL, 1998

W.O. 26901/66901

Z80012

Approved
FOR CONSTRUCTION
ISSUED BY JPKimlinger
DATE MAY 1, 1998

Civil/Structural Engineering
Engineering and Tech. Services
Illinois Power Company
500 South 27th Street
Decatur, Illinois 62525

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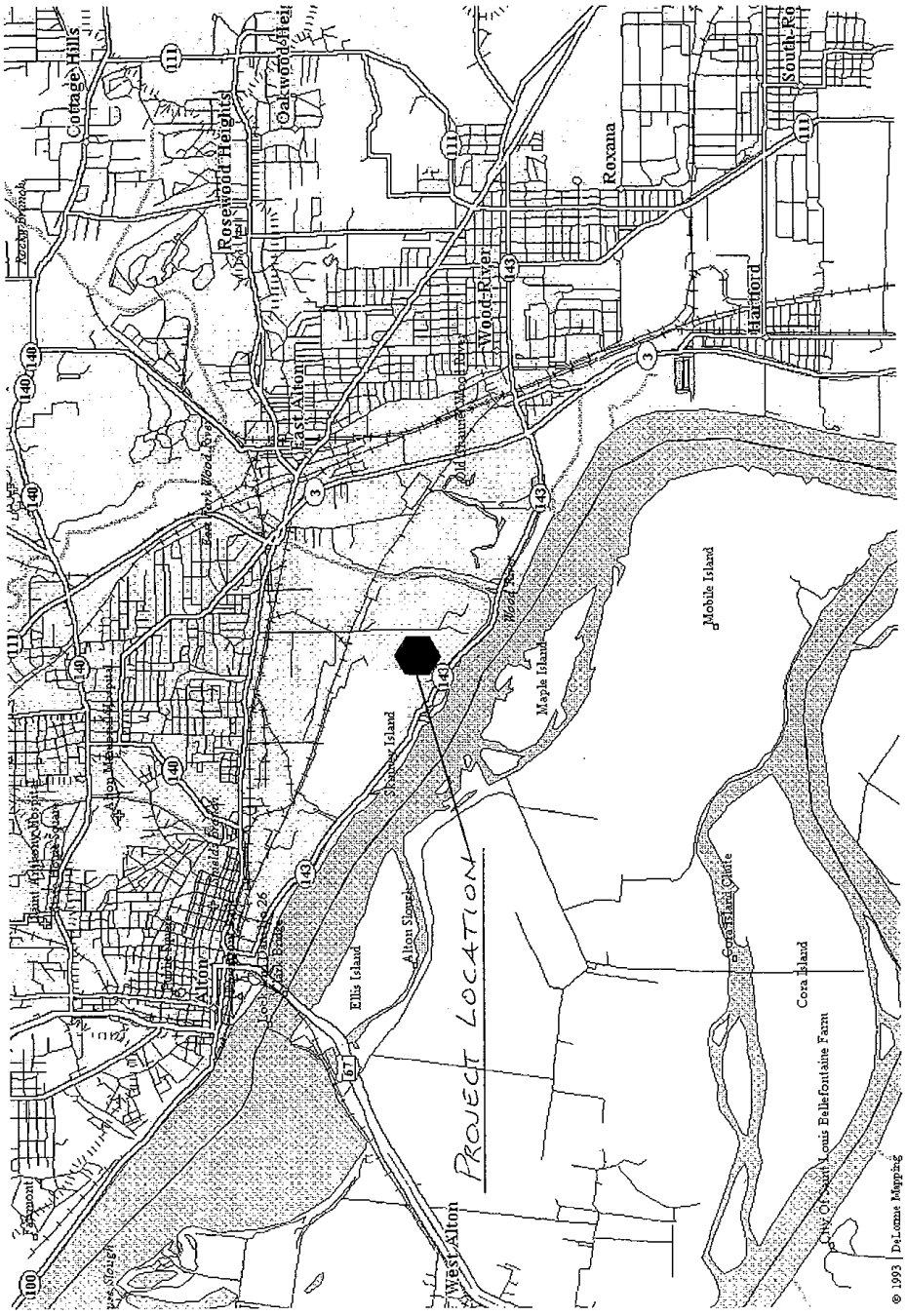
The following data, attached hereto, are a part of these specifications:

Specification Section Number and Name		
	Table of Contents	
Section I	Drawing List	
Section II	Description of Project	
Section III	Location Map	
Section IV	Scope of Work	
Section V	General Conditions for Construction Projects	
Section VI	Site and Access Issues	
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SECTION III

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SECTION IV
Scope of Work

1. The overall goal for this Power Station is to have a operating, environmentally sound ash impoundment facility. Phase I, consisted of shaping and lining the polishing pond (pond #3). This current phase, Phase II, will consist of shaping and lining pond #2. Construction materials consist of off-site embankment material, off-site clay liner material, a polypropylene membrane, crushed rock road surface, and HDPE ash pipe. Other materials will be required, and will be listed in the specifications and/or shown on the drawings.

2. The ash in the project location, as delineated on the applicable drawing, must be removed before subgrade stabilization and embankment construction can begin. The project site will be surveyed immediately before the Contractor begins work. It will again be surveyed upon completion of ash removal, to determine the quantity of ash that was moved out of the project area. Note on the drawing titled "Ash Removal, Baseline and Survey Layout" the limits of ash removal are shown. Ash and unstable subgrade will be removed until the subgrade is deemed stable by the On-Site Representative and the Company's Tester. Only the area inside of this boundary will be used to pay ash quantity. Ash may be moved to other locations inside of pond #2, but outside of the ash removal boundary. If unstable soil material needs to be removed, it will be paid under the same price item as ash removal, but the material shall be hauled and spread in the old borrow area north of pond #3. The pay unit for ash removal will be called 'Unclassified Excavation'. Replacement of the removed material will be done with compacted embankment material and/or subgrade stabilization material as discussed in this specification. Prices for replaced material will be as shown in the bid submittal for embankment and subgrade stabilization.

3. The existing riprap slope protection in the project area, will be stripped and stockpiled. Only riprap on the south side of the project site will need to be removed. The rock roadway on the existing dikes may also be stripped and stockpiled at the discretion of the On-Site Representative. Only the north road will be stripped to suitable subgrade. The berm between ponds #2 and #3 will remain.

4. The entire subgrade will be shaped in the project area, then will be compacted to receive embankment and final grading. The second survey taken to determine ash quantities will be compared to the final design drawings to calculate the on-site embankment quantities. An 80% shrinkage factor will be used. Subgrade stabilization may be required, and will be done in accordance with the Earthwork and Related Operations Section of these specifications. Subgrade stabilization will consist of over excavation of the bottom by two feet and filling the area with riprap that has been removed from the side slopes of the existing pond. The remaining fill material will be off-site embankment. The site will be surveyed after all embankment has been

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complete. The quantity of fill will be calculated, and the on-site quantity removed to determine the total off-site embankment installed.

5. Once the sides and bottom are shaped and graded correctly, a one foot layer of clay will be installed on the bottom and sides. This clay must be compacted to meet the requirements in the earthwork section of this specification, particularly the permeability requirement of less than 1 X 10^{-7} cm/sec and 95% of the maximum dry density as determined by (ASTM D698) commonly referred to as the Standard Proctor.

6. When the clay layer is finished, a polypropylene membrane will be installed. This membrane will cover the entire bottom and side slopes and will be trenched into the top of the embankment for stability. See the Specification for the Polypropylene Membrane Section of these specifications. Double thickness of polypropylene will be required in all areas where work is to be done on top of the liner.

7. An internal dike will be installed on top of the polypropylene membrane to divert water flow inside the pond. This dike, as shown on the attached drawings, will be constructed with sand and embankment material. It will be blanketed with revetment for slope protection.

8. Revetment will also be installed in the location shown on the drawings for protection of the liner. A concrete pad will be installed for use as a boat ramp.

9. Exterior slope faces and all other disturbed areas outside of the ponds, will be seeded in accordance with this specification. Riprap will be replaced on existing slopes that are disturbed during construction. All other exterior areas of new embankments will be seeded.

10. The top of the dikes and all access areas will be rocked with six inches of compacted CA-6 rock as shown on the drawings.

11. New ash sluice lines will be installed to the new lined Pond #2. The pipe location is shown on the applicable drawing.

12. Some piping work will also be required for the discharge line between pond #2 and pond #3. Currently there is a manhole on the west side of the dike between the two ponds that has a 24" HDPE culvert entering it on both sides. On the west side, there is a 24" butterfly valve with a valve stem and riser that rises out of the ground. The piping that continues to the west will connect to a concrete thrust block, and join into the riser structure that will be the outfall for pond #2. The two manholes that are in this location, as well as the valve riser will be raised to the level shown on the drawings facilitate the raising of the dikes.

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13. A 12" emergency overflow pipe will be installed in the north dike of the new pond. The pipe will be owner supplied from material available on site. A 12" sleeve will be installed in the west embankment of the pond, at a location determined by the Wood River Coal Yard Team Leader. The flow line shall be at 433.5.

14. The contractor will be responsible for installing the foundations for the floating bridge that is currently being used in pond #1. The foundations will include the connection of the walkway to the shore, and two piers that prevent lateral movement of the bridge. The Contractor will relocate the floating bridge to the new location when the pond is filled. The Contractor will be responsible for installing cables from the two piers to the bridge.

15. Drawings are a compilation of survey data from multiple sources. Some areas are based on aerial surveys dated January, 1989, and other areas have been surveyed by Illinois Power crews. Continued plant operations (including current work in this area, as well as ash mining) may have altered some of the elevations. The Contractor shall notify the Company's On-Site Representative if they feel that the contours shown on the drawings are significantly incorrect as to affect the cost of the work.

16. The Contractor will be required to obtain all off -site embankment material, as well as the clay liner material. Illinois Power will test the material, but the Contractor will have the final responsibility to make sure the material meets the specifications. Illinois Power would prefer to have both the embankment and liner material come from the same source. This is not, however, a requirement.

17. It is assumed that the fence on the north and east edges of the construction area will NOT be in the way of construction activities. If this is not the case, the Contractor shall discuss methods of removing and storing the fencing material, with the Company's On-Site Representative. Illinois Power will arrange for the replacement of the fence if removal is required.

18. The Contractor shall note that the City of Alton has a force main that passes through this site. The Contractor is responsible for protecting the force main and repairing damages that result from construction activities.

19. The Contractor shall control and eliminate all fugitive dust at the site.

20. The Contractor shall control and eliminate all erosion at the site.

21. Illinois Power has miscellaneous pumping systems in operation in the construction area. These systems must remain in operation at all times during this project. The

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Contractor shall immediately repair, at their expense, any damage incurred to these pumping systems, due to the Contractors activities.

22. All waste material from the site shall be legally disposed of by the Contractor, in an environmentally safe manner.

23. The Company will provide a reasonable number of horizontal and vertical control points for the project. The Contractor is responsible for day to day staking and layout work.

24. Access to the Company's equipment, material, and property shall be maintained at all times. Interference with daily operations shall be minimized.

25. The Contractor shall obtain all permits (other than those listed in the Permit section of this specifications), licenses, and required documents, to perform the work. All costs resulting from the procurement of any permits shall be borne by the Contractor.

26. The Contractor shall make himself aware of the local load limits and abide by them. Any improvements, or repairs, to State, County, City or Township roads, or costs associated with such work, that is required, will be borne by the Contractor.

END OF SECTION

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SECTION VII
Specifications for Earthwork and Related Operations

1. SCOPE

a) This specification covers the minimum performance requirements, materials, and references necessary to govern earthwork and related operations. Earthwork is the movement of soil, sand, or rock from one location to another, shaping the materials in accordance with the plans and specifications, and achieving the desired physical condition of the materials by various methods.

b) Removal of ash in the project location will be required in this project, before subgrade stabilization and embankment construction can begin. Ash removal will be paid under Unclassified Excavation. Removal of ash will consist of excavating the material and moving it, in pond #2, but outside of the ash removal area shown on the drawings. This can be done by bulldozer pushing, or using an excavator to load it into a truck and dump it in another location of pond #2. Unstable subgrade will also be removed, but placed in the old borrow area north of pond #3. Replacement of the removed material will be replaced with compacted embankment material and/or subgrade stabilization material as discussed in this section.

c) The Contractor will be required to compact the exposed subgrade once the unstable ash and earth are removed. The subgrade material will be compacted to a minimum of 95% of the maximum dry density as determined by (ASTM D698). If it is determined by On-Site inspection that the compacted subgrade is not suitable for placement of the embankment or compacted clay liner, additional stabilization will be required. Stabilization will consist of over excavation of the bottom by 2 feet and filling with RR4 riprap. Riprap that is removed from the side slopes shall be used for this purpose, until the supply is exhausted. See the section in these specifications for the riprap requirements, if riprap must be purchased. This over excavation can also be used to build trenches and run water to a single temporary sump for pumping.

d) Embankment construction will consist of installing embankment up to the bottom of the pond liner, based on the attached drawings. Embankment material shall be as described in part 4 of this section. See the drawings for the location of proposed embankment.

e) Compacted clay liner will consist of installing compacted clay per the attached drawings, and the specifications for clay liner material in this section.

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f) Rock roads, consisting of compacted CA-6 crushed rock will be as specified in this Section.

2. DEFINITIONS

a) **Borrow Excavation**: Work done in obtaining material for embankments or fills from a source other than required excavation. Included is the excavating, transporting, placing, and compacting of materials from locations furnished by the Contractor necessary for the construction of embankments, subgrade, shoulders, sub-base, intersections, approaches, entrances, and other items indicated on the plans or noted in the specifications.

b) **Channel Excavation**: The removal and satisfactory disposal of all materials encountered in the construction of ditches, stream channels, or swales.

c) **Clay**: An aggregate of microscopic and sub-microscopic flake-shaped crystalline minerals characterized by the typical colloidal properties of cohesion, plasticity, and the ability to absorb ions conforming to the gradations set forth in the Unified Classification System.

d) **Clearing**: The removal and disposal of all obstructions such as fences, walls, foundations, buildings, trees, stumps, brush, accumulations of rubbish of whatever nature, and existing structures.

e) **Construction Inspector**: The Owner's on-site representative.

f) **Contractor**: The party or parties proposing to provide all labor, equipment and materials required to perform the work specified herein or on the plans.

g) **Crushed Gravel**: Fractured particles resulting from the crushing of gravel which, prior to crushing, would have been retained on a screen with an opening 1.5 times as large as the maximum size of the resulting crushed material.

h) **Crushed Stone**: Angular fragments resulting from the mechanical crushing of granite, limestone, or dolomite from undisturbed, consolidated deposits: (Dolomite shall be a carbonate rock containing 11.0% or more magnesium oxide (MgO). Limestone shall be a carbonate rock containing less than 11.0% magnesium oxide).

i) **Engineer**: The Owner's project engineer.

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j) **Embankment**: Consists of the construction of fill areas (berms, road subgrade) by hauling depositing, placing and compacting the specified material above the natural surface or a specified grade line.

k) **Footing Excavation**: See Structure Excavation.

l) **Gravel**: Coarse, granular, uncosolidated material resulting from the reduction of rock by the action of the elements and having subangular to rounded surfaces conforming to the gradations set forth in the Unified Classification System.

m) **Impervious Backfill**: Fine-grained soils (Silty Clay, CL to CL-CH) placed and compacted in excavations, around structures or other items as indicated in the plans and specifications.

n) **Inorganic Silt**: Fine-grained soil possessing little or no plasticity or cohesion conforming to the gradations set forth in the Unified Classification System.

o) **Owner**: Illinois Power Company or its designated agent.

p) **Pipe Excavation**: The excavation, removal and satisfactory disposal of all materials encountered constructing a trench for installation of the specified pipe.

q) **Porous Backfill**: Fine aggregate (clean sand) placed and compacted in excavations, around structures or other items as indicated in the plans and specifications.

r) **Rock**: Natural aggregate of mineral grains connected by strong and permanent cohesive forces.

s) **Sand**: Fine granular material resulting from the natural disintegration of rock conforming to the gradations set forth in the Unified Classification System.

t) **Soil**: Natural aggregate of mineral grains, with or without organic constituents, that can be separated by gentle mechanical means such as agitation in water. Gravel and sand are coarse-grained soils, while silts and clays are fine-grained soils.

u) **Stripping**: The excavation, removal and satisfactory disposal (if required) of all materials taken between the original surface and the top of suitable material for the construction of embankments, subgrade, sub-base, shoulders, intersections, ditches, waterways, entrances, approaches and incidental work.

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v) **Structure Excavation**: Removal of any and all materials encountered during installation of any designated structure and the satisfactory disposal of all materials.

w) **Unclassified Excavation**: The removal of any combination of topsoil, earth, rock, muck or obstacle carried out to the lines and grades specified or shown on the plans without regard to percentage of moisture and type of material found.

3. REFERENCES

a) The reference to specifications or organizations (such as ASTM) together with any diagrams, drawings or plans shall be considered as part of this specification. In the event of conflict between this specification and the referenced documents, the requirements of this specification shall take precedence. The latest editions of the following specifications, standards, and codes apply:

b) American Society for Testing and Materials (ASTM)

ASTM D75:	Practice for Sampling Aggregates
ASTM D420:	Recommended Practice for Investigating and Sampling Soil and Rock for Engineering Purposes
ASTM D421:	Method for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants
ASTM D422:	Method for Particle-Size Analysis of Soils
ASTM D653:	Terms and Symbols Relating to Soil and Rock Mechanics
ASTM D698:	Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49 kg) Rammer and 12- inch Drop
ASTM D854:	Test Method for Specific Gravity of Soils
ASTM D1140:	Test Method for Amount of Material in Soils Finer than the No. 200 (75- m) Sieve

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ASTM D1452: Practice for Soil Investigation and Sampling by Auger Borings

ASTM D1556: Test Method for Density of Soil in Place by the Sand-Cone Method

ASTM D1557: Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10-lb (4.5-kg) Rammer and 18-inch (457-mm) Drop

ASTM D1558: Test Method for Moisture Content Penetration Resistance Relationships of Fine Grained Soils

ASTM D1586: Method for Penetration Test and Split-Barrel Sampling of Soils

ASTM D1587: Practice for Thin-Walled Tube Sampling of Soils

ASTM D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

ASTM D2168: Methods for Calibration of Laboratory Mechanical-Rammer Soil Compactors

ASTM D2216: Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures

ASTM D2217: Method for Wet Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants

ASTM D2487: Test Method for Classification of Soils for Engineering Purposes

ASTM D2922: Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

ASTM D3017: Test Method for Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)

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ASTM D3740: Practice for the Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM D4220: Practices for Preserving and Transporting Soil Samples

ASTM D4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM C29: Test Method for Unit Weight and Voids in Aggregate

ASTM C127: Test Method for Specific Gravity and Absorption of Coarse Aggregate

ASTM C128: Test Method for Specific Gravity and Absorption of Fine Aggregate

ASTM C136: Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C566: Test Method for Total Moisture Content of Aggregate by Drying

ASTM C702: Methods for Reducing Field Samples of Aggregate to Testing Size

ASTM D75: Practice for Sampling Aggregates

ASTM E11: Specification for Wire-Cloth Sieves for Testing Purposes

ASTM D3665: Practice for Random Sampling of Construction Materials

c) Standard Specifications for Road and Bridge Construction - Illinois Department of Transportation (IDOT)

4. MATERIALS

a) Acceptability -

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i) Previous testing data will be considered in determining acceptability. No material will be brought to the construction site until it has been tested by the Owner, or the designated testing agency, and found suitable for the intended application. Material hauled to the site prior to the Owner's approval may be rejected, and in such cases must be removed by the Contractor at his own expense.

ii) All material shall come from the same location and exhibit similar characteristics, to the maximum extent possible. Illinois Power requests that the embankment and compacted clay liner material come from the same location, but it is not a requirement.

b) The type of material and gradation to be used at a particular location will be as designated in Part 1 of this section, other portions of the specifications, or on the plans for the project or specific portions thereof.

i) In most instances coarse grained material (gravels, crushed stone, sand) will be designated by an IDOT gradation. Materials with these gradations are readily available state wide during the construction season.

ii) Fine grained materials (clay, silty clay) will be designated by a Unified System Classification (ASTM D2487).

c) Embankment

i) Embankment material will be required from off-site to construct the shape of the sides and bottom of the pond being lined. This material should be a clay material either CL or CL-CH, compacted to 95% of the maximum dry density as determined by (ASTM D698), but does not need to meet the permeability requirements of the compacted clay liner.

d) Compacted Clay Liner

i) The compacted clay liner must be constructed out of a CL or CL-CH material. The clay must be compacted to 95% of the maximum dry density as determined by (ASTM D698), or better, depending on the energy needed to attain a permeability of $1X10^{-7}$, or less. This should be attained at a moisture content between -1% to +3% of the optimum moisture content. Illinois Power will check the borrow site that is proposed from the Contractor. We will investigate for material quality and quantity. However, this does not relieve the Contractor of their

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responsibility to install the clay liner such that it meets the above permeability requirements. The Contractor shall obtain the clay liner material from a single source.

e) Rock Drives

i) CA6 crushed rock shall be used for all drive surfaces on the tops of the dikes and the access areas. The rock shall be placed and compacted 6" final depth.

f) 8 oz. Geotextile

i) The following minimum average roll values (MARV) shall be used for the specification of the geotextile.

Property	Test Procedure	Value for 8 oz. fabric
Nominal Weight (oz/yd^2)	---	8.0
Tensile Strength (lbs)	ASTM D-4632	200
Elongation (%)	ASTM D-4632	50
Puncture Strength (lbs)	ASTM D-4833	100
Mullen Burst Strength (lbs)	ASTM D-3786	350
Trapezoidal Tear (lbs)	ASTM D-4533	75

1. CONSTRUCTION REQUIREMENTS

a) Placement of the compacted clay liner shall adhere to the following requirements:

i) Scarify upper 1 inch of previously placed lifts of clay liner using a scarifier, disc, harrow, or other approved method and maintain moisture content within specified limits to provide a satisfactory bond between lifts.

ii) If previous lift becomes cracked or softened excessively because of moisture changes, scarify full depth of lift and re-compact as specified before placing overlying lift.

iii) **Place clay layer in uniform lift thicknesses such that the loose lift thickness does not exceed 8 inches, and the compacted lift thickness does not exceed 6 inches.**

iv) Control moisture content during placement to prevent excessive wetting or drying.

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v) Compact top surface of final lift of clay liner using a smooth drum roller. This is especially critical in areas under the geocomposites and geotextiles. However rolling is not to be done between the embankment and compacted clay liner layers.

vi) Repair all penetrations in the clay liner including but not limited to: nuclear density test probe holes, sand cone holes, test pit holes, sampling holes, and grade stake holes. This shall be done by completely filling the holes with bentonite pellets. The pellets shall be compacted by rodding or other means and the top of the hole shall be sealed with a thin layer of compacted clay (approximately 1" thick).

vii) Protect compacted lifts from drying that may cause desiccation cracking, and from wetting that may cause softening. Spraying water on the surface with a balloon tire farm-type sprayer works very well for this purpose. Both the bottom and the sides must be kept moist.

viii) Seal working surface at end of each day by rolling with steel drum, placing plastic cover, or other approved method.

ix) Minimize time delays between lifts to reduce potential moisture control problems.

x) Do not route construction traffic over completed lifts.

xi) The clay material shall be placed up-the-slope when working on the side slopes.

xii) All final layers shall be motor graded for setting elevation, prior to smooth drum rolling.

b) Unless otherwise noted, compaction requirements for all phases of the work shall be 95% or greater of the maximum dry density and within ±2% of the optimum moisture content as determined by ASTM D698 (commonly referred to as the Standard Proctor test).

c) Compaction shall be obtained by mechanical means in a timely manner so as not to delay construction. Lift thickness may vary depending upon the condition of the material and equipment used, but should never exceed six inches. Each lift will be tested by the owner or an outside agency.

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d) Material placed which does not meet the minimum compaction requirements shall be reworked as necessary to obtain the specified compaction at no extra cost to the Owner. No further placement of material will be allowed until the compaction requirements are met. If the material becomes unsuitable for use after placement, even if previously compacted to the specified percentage, it will be removed and replaced by suitable material which will be compacted in accordance with the specifications at no extra cost to the Owner.

e) No placement of material will be allowed on wet or frozen subgrade.

f) All existing embankment that will come in contact with new embankment material shall be scarified prior to placement of any new material, and compacted to 95% of the maximum dry density as determined by (ASTM D698). This includes the exposed subgrade after unstable ash and earth are removed.

g) The Contractor will maintain his work in such a manner to prevent ponding of water in the project area. In excavations where water may collect the Contractor shall establish and maintain pumping capabilities to keep the excavation free of water. This includes a layer of oversize rock (±4") covered by a layer (±2") of crushed stone (CA-6 or CA-10) or a mud mat to allow work to proceed in the excavation without contamination by mud or water.

h) Erosion control is the responsibility of the Contractor.

i) Disposal of all unsuitable material in a legal, safe, and satisfactory manner is the responsibility of the Contractor. This includes, but is not limited to , materials resulting from clearing and stripping of a site.

j) The Contractor shall be responsible for, and shall take all necessary precautions to preserve and protect, all existing tile drains, sewers, other subsurface drains, underground utilities, above ground utilities, private transmission lines, and appurtenances which may be affected by his operations and shall repair, at his own expense, any and all damages resulting from his actions or negligence.

k) The Contractor shall notify the Construction Inspector two days in advance of beginning or resuming work.

l) Trenches for pipe installation shall be excavated to an elevation 4 inches below the bottom of the pipe such that the invert of the pipe will be at the depth and grade specified after bedding materials are placed. The trench will be excavated 18 inches wider than the external diameter of the pipe, or more is

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necessary, to permit through tamping under the haunches and around the pipe. Where a firm foundation is not encountered at the grade established all such unsuitable soil shall be removed for the width of the trench and replaced with well compacted bedding material or suitable compacted aggregate. In areas requiring impervious backfill, the trench bottom will be shaped to conform to the pipe's shape in lieu of bedding. In general, areas subject to traffic, right of ways, public property, load bearing areas and other heavily used areas shall be backfilled with porous backfill compacted to the requirements of 5.b.

m) Contractors will be responsible for ensuring that all excavations meet the applicable requirements of OSHA. Non-compliance with these regulations will not be tolerated.

n) Access to the project site will maintained at all times. If the work is being performed at an existing facility the Contractor shall make the necessary arrangements to maintain access to vital areas.

o) Various portions of the work will require testing by the Owner or an outside testing agency. The Contractor will cooperate with the testing program and make his work accessible at all times.

p) Stripping and clearing of the borrow site is incidental to the contract.

q) The Contractor shall be responsible for acquiring the legal rights to a borrow site and any ramifications resulting from the removal of the material.

r) If the work generates sufficient dust to cause complaints to be received by the Owner, the Contractor shall alleviate the situation at no cost to the Owner.

s) Unless otherwise specified, the entire subgrade (fill or existing), including substation sites, shall meet the compaction requirements stated in Section 5.b. All holes, ruts, soft places, and other defects shall be corrected. In no case shall the surface course, base course, or other items be placed on soft or unstable material or over areas that are not properly drained.

i) In cut sections where excessively wet soil is encountered the Contractor will be required to make the following efforts to dry the soil and to obtain compaction of the material in accordance with the requirements of 5.b:

a) Cut ditches shown on the plans that drain the area to grade at least two weeks prior to starting work on the subgrade.

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b) Air dry the top 8 inches of subgrade, including at least two eight-inch depth processings utilizing discs or tillers each day for three consecutive good drying days.

c) Re-compact the layer processed in the above paragraphs to achieve compaction results stated in 5.b. When the above work has failed to produce satisfactory work, contact the Engineer to review the circumstances.

ii) The subgrade shall be constructed so that after being compacted it will conform to the alignment, grade, and cross section shown on the plans. Equipment of such weight or use in such a way as to cause a rut in the finished subgrade of one inch or more in depth shall be removed from the work or the rutting shall otherwise be prevented. Rutted areas shall be graded and re-rolled with a smooth-wheeled roller.

t) A smooth surface is desired at the termination point of each type of material used whether it is virgin subgrade, embankment material, crushed stone, or other construction materials. When a sheepsfoot roller is used, the area must be leveled at the finished grade. The interface between continuing layers of embankment are not to be leveled and are expected to exhibit a normal amount of "fluff" associated with an ongoing fill operation.

u) Unless specifically called out in the plans or specifications no sheet piling will be required. If, as construction proceeds, it becomes apparent sheet piling or a larger area will be needed for excavation, contact the Engineer to review the situation and determine how to proceed.

v) Traffic control, including provisions for the necessary barricades, flagmen and other items, is the responsibility of the Contractor.

w) Embankment operations shall comply with the following requirements:

i) Before any embankment is placed, all clearing and stripping over the entire area shall be performed. The top six inches of the exposed surface shall be disced, and then compacted to meet the requirements of 5.b. When construction is resumed after any freezing weather the top eight inches of all partially completed embankments will be reworked and compacted to meet the requirements of 5.b prior to placing more fill.

ii) Embankment material will be as specified in Part 1 of this section, other portions of the specifications, or on the plans for the project or

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specific portions thereof. If required, the material shall be disced sufficiently to break down oversize clods, mix the material, secure a uniform moisture content, and insure uniform density and compaction. Each layer of material shall extend the entire length and width of embankment, if possible, and shall be leveled when placed. Embankment around structures is not to be placed until the concrete has attained its specified strength. Any rock larger than six inches in diameter will be removed from the fill.

iii) If an embankment is to be constructed on an existing slope the existing slope shall have steps cut into it prior to starting construction of the embankment.

x) Topsoil shall not be placed until the area to be covered has been shaped, trimmed, and finished. All irregularities in the surface shall be filled or smoothed out before the top soil is placed. If the existing surface has become hardened or crusted it shall be disced or raked until broken up to provide a bond with the top soil. One rolling by a smooth drum of the top soil surface will be required. All unsuitable debris and stones larger than three inches in diameter shall be removed from the area.

y) Base course shall consist of crushed stone aggregate as specified in Part 1 of this section, other portions of the specifications, or on the plans for the project or specific portions thereof. The aggregate shall be deposited full-lane width directly on the subgrade, geotextile fabric (if specified), or previous layer of compacted base course in such a way to prevent segregation and require a minimum amount of blade work. Immediately after placement of the material it shall be compacted by a rubber tired roller or vibratory smooth steel drum machine to the requirements of 5.1. If any subgrade material is worked into the base material during the operations all granular material affected will be removed and replaced with new aggregate at no cost to the owner.

2. INSPECTION BY OWNER

a) The Owner is responsible for testing the project materials and results of the work performed at regular intervals.

b) The Contractor will cooperate with the Owner at all times to provide access to the materials and site for testing purposes.

c) The Contractor shall submit the following information for each material within two weeks of the contract award:

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Supplier's Name, Address and Telephone Number.
Pit/Facility Name, Address and Telephone Number.
Person in Charge at Pit/Facility.
Map, with Directions, Indicating Pit/Facility Location.

3. MEASUREMENT

a) The right is reserved to increase or decrease quantities, as required, with no increase in the unit price.

b) Items measured in units of weight may be paid for on a dry-weight basis at the discretion of the Engineer if the moisture content is found to be excessive. The bid units will not be affected unless the moisture content of coarse grained soils exceeds 12%, or 20% for fine grained soils.

c) Clearing will not be measured for payment and is incidental to the contract.

d) Pipe excavation and furnishing, placing, and compacting bedding will not be measured for payment and are to be included in the bid price per lineal foot of the pipe specified.

e) Cross section measurements and the average end area method shall be used to determine volumes of excavations or required material for embankments.

f) Embankment quantities shall be cubic yards of compacted material at the project site. The plan quantities will be used for bidding purposes. If there is a discrepancy between the successful bidder's take off quantities of more than plus 5% the Contractor shall notify the Engineer in writing prior to starting work. Arrangements will be made to cross section the project area after the embankment work is completed and the volume determined in accordance with these specifications. If the Contractor's quantities are less than 105% of the estimated contract quantities he shall be paid the contract quantities when the project is constructed to the lines and grades shown in the plans and specifications.

g) The following items will be measured in cubic yards:

Embankment
Channel Excavation
Structure Excavation
Unclassified Excavation
Compacted Clay Liner

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h) The following items will be measured in tons:

Sand
Gravel
Crushed Gravel
Crushed Stone Aggregate

i) The following items will be measured in square yards:

Subgrade Stabilization
Geotextile/Geomembrane

j) Impervious backfill will not be measured for payment and will be considered incidental to the contract.

k) Porous backfill will be measured in tons of the specified material.

l) Stripping will be measured in cubic yards. The average depth of material to be removed and use of this material will be as noted in the specifications or on the plans.

END OF SECTION

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SECTION X
Specification for the Polypropylene Membrane

1. General

a) Scope of Work

i) The work covered by these specifications consists of installing a 45-mil thick fabric reinforced Polypropylene (PP) geomembrane, in the areas shown on the project drawings. All work shall be done in strict accordance with the project drawings, these specifications and the Fabricator's approved shop drawings. The membrane will be installed in a double layer, in areas where work will be done in the pond after the liner is installed (i.e. under concrete, revetment and the interior dike).

ii) Sufficient material shall be furnished to cover all areas as shown on the drawings including seam areas, anchor trenches and appurtenances as required. The Fabricator/Installer of the liner shall allow for any anticipated or planned shrinkage or wrinkles in the field panels, installing the membrane free of stress or tension.

iii) Payment shall be made on the basis of net area covered in acres. No allowance will be made for anchor trenches, seams, penetrations, or repairs when computing the area for purposes of payment. Area will be measured on the slope (actual surface) as opposed to plan area.

b) Manufacturer/Fabricator/Installer Information

i) The following shall be the minimum information submitted at the time of the bid, relating to the PP Manufacturer, proposed fabricator and installer: name, address, phone, fax. A summary of relevant experience of the fabricator and installer will be provided if requested by the Owner.

c) Products

i) The geomembrane material shall be a 45-mil thick, scrim-reinforced Polypropylene as manufactured by Cooley Engineered Membranes, JP Steven, or an approved equal. The geomembrane shall be manufactured by the extrusion/calendering process, consisting of first quality ingredients, suitably compounded of which PP is the principal resin. The finished compound shall be uniform in color, thickness, size, and surface texture.

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ii) The finished membrane shall consist of two (2) plies of Polypropylene (PP) laminated over one (1) ply of reinforcing scrim. The reinforcing scrim shall be a 9 x 9 - 1000 denier polyester fabric to create an open-type weave that permits strike-through of the PP.

iii) The PP shall fully encapsulate the scrim and shall extend a minimum of 1/8" beyond the reinforcing scrim roll edges. Exposed fabric along the longitudinal edges of the toll stock shall not be permitted. The finished membrane shall meet or exceed the "physical properties" values as shown on the following table:

45-Mil Polypropylene Geomembrane
Physical Properties

Property	Test Method	Values
Gauge, nominal (mils)	ASTM-D751	45 ± 10 %
Plies reinforcing	--	1
Fabric breaking strength (Min.)	ASTM-D751, Method A	250 lbs
Tear strength (Min.)	ASTM-D751, tongue tear	100 lbs
Low temperature	ASTM-D2136, 1/8" mandrel, 4 hours	-65°F
Dimensional stability (% change, Max.)	ASTM-D1204, 180°F/1hour	1%
Hydrostatic resistance (Min.)	ASTM-D751, Method A	350 psi
Ply adhesion (Min.)	ASTM-D413	20 lbs/in
Puncture resistance	FTM-101B, Method 2031	250 lbs
Water absorption (Max. % weight change)	ASTM-D471	<1%
UV resistance	ASTM-G-26, xenon arc @ 80°C	Pass @ 12,000 hours +
Resistance to soil burial (% tensile retention)	ASTM-D3083 (Part 9.5)	90% Min.

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a) Submittals

i) The PP roll goods shall be factory fabricated into large panels. The Fabricator shall furnish a proposed geomembrane panel layout to be approved in writing by the Engineer prior to material shipment. The drawings shall show: the direction of factory seams, the size of panels and the location of field seams, consistent with the requirements of the project drawings. These details shall include the recommended termination and penetration details of the geomembrane. Except for special requirements due to configuration and/or terminating the geomembrane, maximum use of large size panels shall be made to reduce field seaming to a minimum.

ii) If membrane can be supplied in various colors at no additional cost, supply samples of each color available for use of Owner in selecting color. If only one color is available at bid price, state color on submittal.

b) Factory Fabrication

i) The Fabricator shall be an experienced firm customarily engaged in factory-fabricating individual widths of scrim-reinforced geomembranes roll stock into large panels. The fabricator shall have experience in fabricating a minimum of 5,000,000 square feet of geomembranes by thermal fusion methods.

ii) Prior to factory seaming, all roll goods shall be inspected. All factory seams shall be made by thermal fusion methods. All factory seams shall have a minimum scrim-to-scrim overlap on one and one-fourth inches (1 ¼") when fabricated. All seams shall be made by thermal fusion methods. All factory seams shall be made so that thermal bond extends fully to the top edge of the sheet so that no loose edges are preset on the top side of the panel.

c) Inspection and Testing of Factory Seams

i) All sheets and seams shall be 100% visually inspected during fabrication. No defective seams or exposed scrim will be allowed. All exposed scrim edges shall be sealed with an approved PP edge caulk or capped with a strip of PP. All indicated repairs shall be made by the geomembrane Fabricator before the panels are packaged for shipment.

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ii) In addition to visual inspection, a 48 inch (1.2M) sample shall be taken from each factory seam welding unit used in this work at the beginning of every work shift and every four hours of production thereafter. Samples shall be non-destructive, not requiring patching of fabricated panels. Test specimens shall be cut at quarter points from each 48 inch seam sample (a total of three places) and tested for seam strength and peel adhesion. The shear seam strength shall be tested in accordance with the ASTM D413 as modified in Annex A of ANSI/NSF 54.

iii) A log shall be maintained showing the date, time, panel number and test results. Failure of the material and/or seams to meet all requirements of these specifications may be cause for rejection of the PP material and/or seams as appropriate. The Fabricator shall provide the test results to the Engineer.

iv) Prior to installation of the PP panels, the Fabricator/Installer shall provide the Engineer with the following certification and test reports:

a) Written certification that the material meets all of the requirements of this specification.

b) Written certification that the factory seams were inspected and tested in accordance with this specification.

d) PP Panel Packaging and Storage

i) Each factory fabricated panel shall be rolled and/or accordion-folded and placed onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each panel shall be given prominent and unique identifying markings indicting the proper direction of unrolling and/or unfolding to facilitate layout and position in the field. The panels shall be suitably packaged, enclosed and protected to prevent damage during shipment and each package shall be prominently marked in the same fashion as the panels within. Until needed, packaged factory fabricated panels shall be stored in their original unopened containers in a dry area, and protected from the direct heat of the sun, where possible. Pallets shall not be stacked.

2. Polypropylene (PP) Installation and Seaming

a) Subgrade Preparation

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i) The surfaces on which the lining is to be placed shall be maintained in a firm, clean, dry and smooth condition during the lining installation. All surfaces shall be compacted and smooth graded with anchor trenches provided as required and detailed. All surfaces to be lined shall be free of rocks, roots, gravel, grade stakes or debris that may puncture the geomembrane. The subgrade shall be compacted to a minimum of 95% of the dry density as determined by ASTM D698 - Standard Proctor Method. Geotextiles may be used as a cushioning agent. All vegetation, if present, shall be removed.

ii) Immediately prior to the installation of the PP geomembrane, a complete and detailed inspection of the area shall be performed by the Engineer, On-Site Representative, Contractor and the Geomembrane Installer to determine acceptance of the finished subgrade and elevations. Any erosion or other damage to the base material which has occurred since placement shall be corrected by the Earthwork Contractor.

b) PP Geomembrane Installation

i) The surface shall be prepared in accordance with the requirements as specified in the drawings or specification documents. The surface must be acceptable to the installation contractor and the recommendations of the liner manufacturer.

ii) The geomembrane shall be placed over the prepared surfaces in such a manner as to insure minimum handling and in accordance with the approved shop drawings. The lining shall be sealed to all concrete structures and other openings in accordance with details shown 0n the plans and shop drawings. The geomembrane lining shall be closely fitted and sealed around all inlets, outlets and other projections through the lining, using prefabricated fittings where possible as shown in the construction details. Liner sheets, damaged from any cause, shall be repaired or covered with additional sheeting. Only those sheets of lining material which can be anchored and seamed together the same day shall be unpackaged and placed into position. In areas that high wind is prevalent, the lining installation should begin on the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags sufficient to hold it down during high winds. The leading edges of the liner material left exposed after the day's work shall be anchored to prevent damage or displacement due to wind.

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iii) Materials, equipment or other items shall not be dragged across the surface of the PP liner or be allowed to slide down slopes on the lining. All parties walking or working on the PP lining material shall wear soft-sole shoes.

c) Field Seams

i) Lap joints shall be used to seal factory fabricated sheets together in the field. The lap joint shall be formed by lapping the edges of the sheets four (4) inches. The contact surfaces of the sheets shall be wiped clean of all dirt, dust, moisture and other foreign matter. A minimum one and one half inch (1 ½") bond shall apply to all field seams.

ii) Extreme care should be taken throughout the work to avoid fishmouths, wrinkles, folds or pleats in the seam area. Where fishmouths do occur, they should be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any necessary repairs to the PP geomembrane shall be done using an additional piece of the specified PP sheeting applied as stated in Section 2.4.2 and 2.4.3 of this specification. All patching material shall have rounded edges.

iii) Cleanup within the lining compound shall be an ongoing responsibility of the Lining Contractor. Particular care should be taken to ensure that no stones, scrap material, trash, tools or other unwanted items are trapped beneath the geomembrane liner.

iv) All field seams shall be made utilizing hot air or hot wedge welding techniques as outlines in sections 7 and 8 of the EPA Technical Guidance Document: "Inspection Techniques for the Fabrication of Geomembrane Field Seams".

d) Inspection, Testing, and Repair of PP Field Seams

i) Upon completion of the liner installation, all seams shall be visually inspected for compliance with these specifications. In addition to visual inspection, all field seams shall be checked using an air lance nozzle directed on the upper edge and surface to detect any loose edges or riffles indicating unbonded areas within the seam (per ASTM D4437).

ii) All field seams, on completion of the work shall be tightly bonded. Any geomembrane surface showing injury due to scuffing, penetration by foreign object, or distress from other causes shall be replaced or

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repaired. All exposed scrim edges shall be sealed with an approved Polypropylene edge sealant, heat sealed, or capped with a strip of polypropylene. No exposed scrim will be allowed

iii) Any repairs made to the liner shall be made with PP lining material. Patches shall be cut with rounded corners and shall extend a minimum of four (4) inches in each direction from the damaged area. The entire surface of the patch shall be bonded to the PP lining material. If reinforced patches are used, the cut edges of the patch should be coated with an approved Polypropylene edge sealant.

iv) Destructive test seams are to be made by each seaming crew, at the beginning of the seaming process, and every four (4) hours thereafter, or every time equipment is changed. These seams are to be made of like materials provided for the purpose of testing and not cut from the seamed panels. Each seaming crew and the materials they are using must be traceable and identifiable to their test seams. The samples shall be numbered, dated and identified as to the personnel making the seam, and location made by appropriate notes on a print of the panel layout for the project. The completed field seam sample shall measure not less than 14 inches in width and 24 inches in length.

v) The field test seams are to be tested for seam strength and peel adhesion. Seam shear strength shall be tested in accordance with the ASTM D413 as modified in Annex A of ANSI/NSF 54.

vi) If a test seam fails to meet the field seam design specification, then additional test seam samples will have to be made by the same seaming crew, using the same tools, equipment and seaming materials and re-tested.

vii) The membrane installer shall be responsible for arranging for testing of the field seam samples. The cost of testing shall be included in the unit price for the membrane. All testing procedures and equipment shall be approved by the Engineer or On-Site Representative. All test results shall be documented and sent to the Engineer.

e) Warranty

i) The Geomembrane Manufacturer shall confirm in writing, that the material to be furnished will be free of defects in materials and workmanship at the time of sale, and against deterioration due to the effects of ozone, ultraviolet or other normal weathering on a pro-rata

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basis for up to 20 years from the date of completed installation. The PP Geomembrane Manufacturer shall furnish a sample warranty for review and approval prior to shipment.

END OF SECTION

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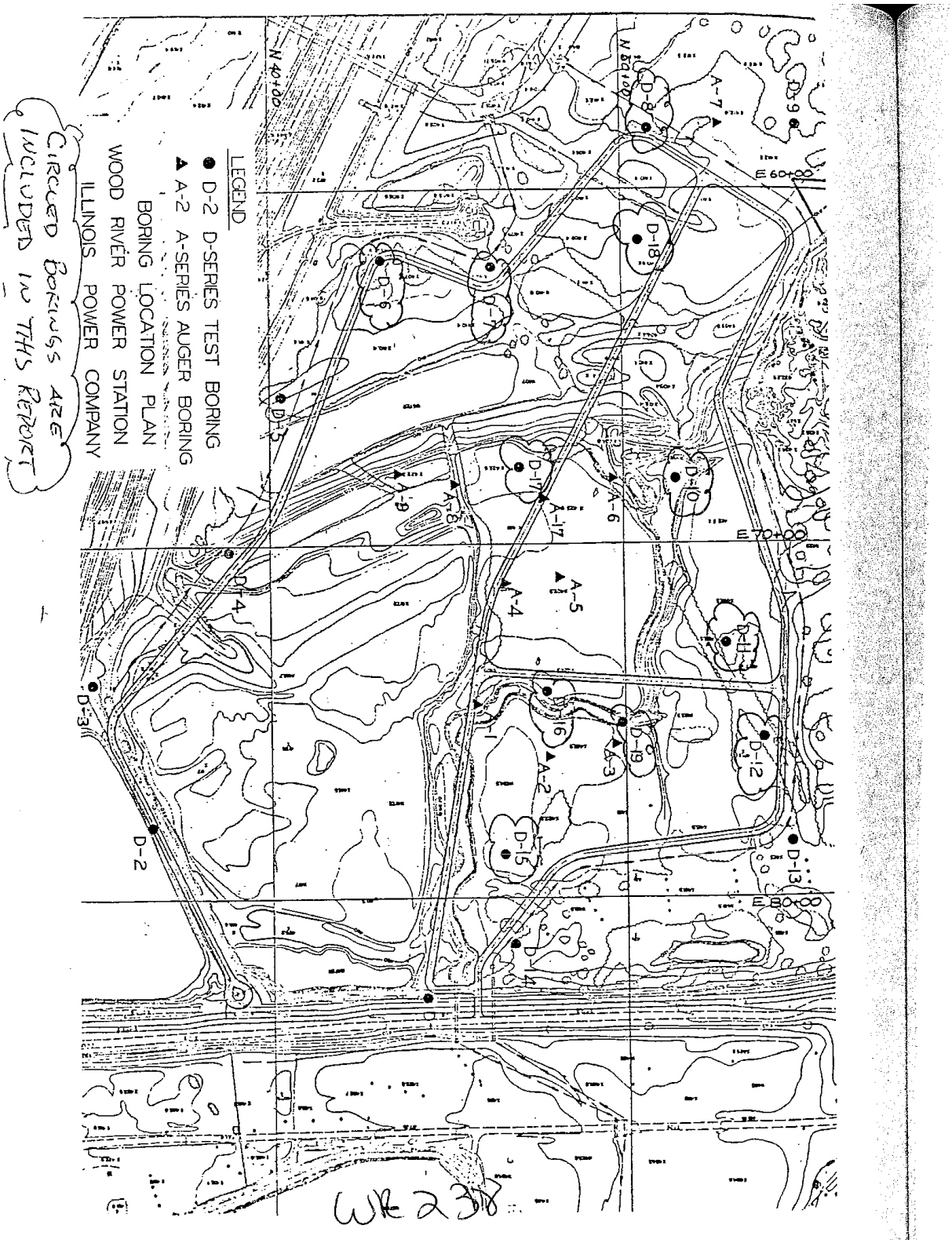
SECTION XIV
Soil Boring Information

1. GENERAL

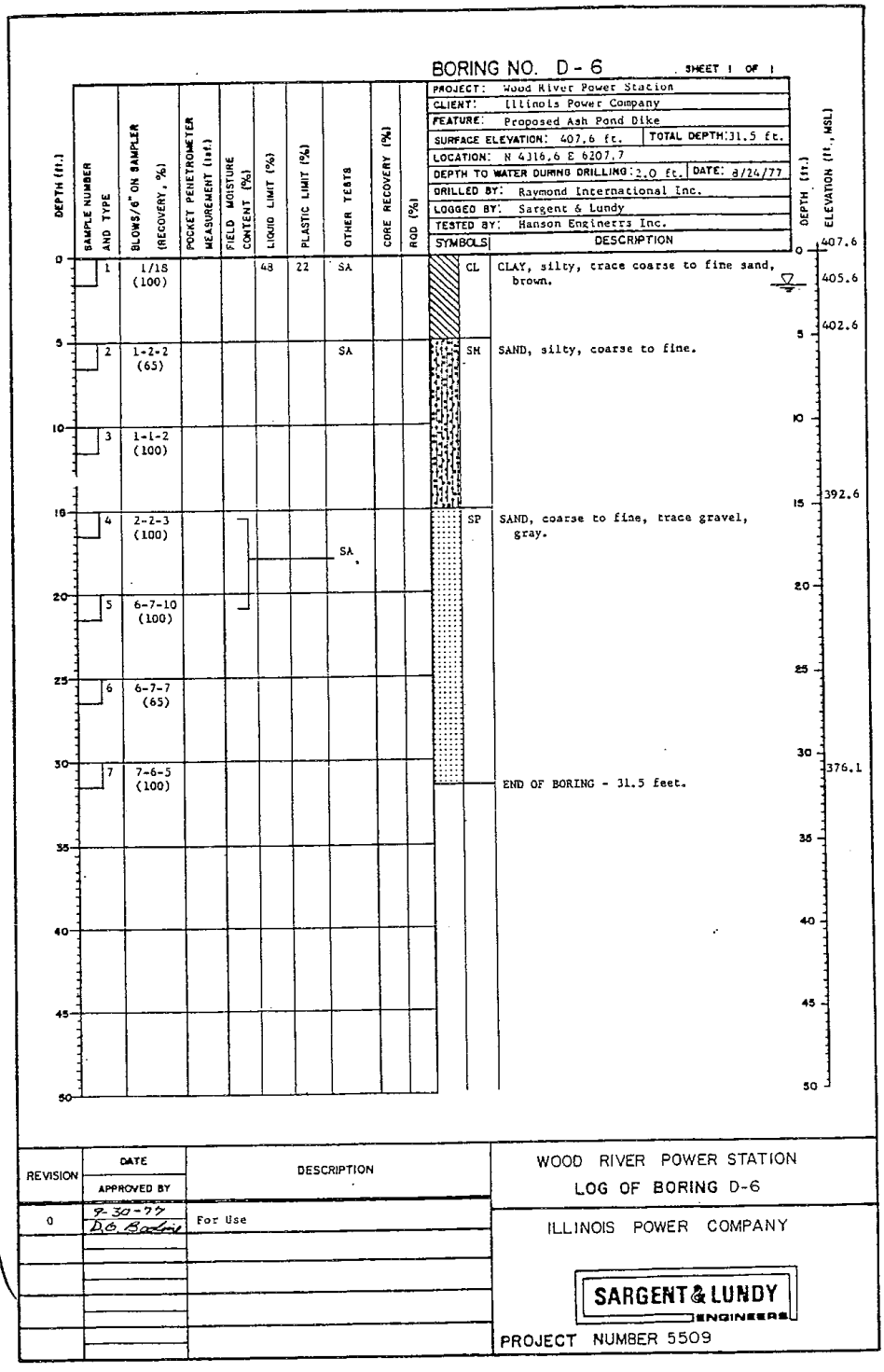
a) The following information is provided for the Contractors benefit. Additional information may be available at the Contractor's request.

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LEGEND
D-2 D-SERIES TEST BORING
A-2 A-SERIES AUGER BORING
BORING LOCATION PLAN
WOOD RIVER POWER STATION
ILLINOIS POWER COMPANY
CIRCLED BORINGS ARE INCLUDED IN THIS REPORT
N 40+00
N 50+00
E 60+00
E 70+00
E 80+00
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-13
D-14
D-15
D-16
D-17
D-18
D-19
A-1
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
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BORING NO. D - 6 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION: 407.6 ft.	TOTAL DEPTH: 31.5 ft.
LOCATION:	N 4316.6 E 6207.7
DEPTH TO WATER DURING DRILLING: 2.0 ft.	DATE: 8/24/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
1	1/18 (100)	48	22	SA	CL	CLAY, silty, trace coarse to fine sand, brown.	0	407.6
2	1-2-2 (65)			SA	SM	SAND, silty, coarse to fine.	5	405.6
3	1-1-2 (100)						10	402.6
4	2-2-3 (100)			SA	SP	SAND, coarse to fine, trace gravel, gray.	15	392.6
5	6-7-10 (100)						20	
6	6-7-7 (65)						25	
7	7-6-5 (100)					END OF BORING - 31.5 feet.	30	376.1
							35	
							40	
							45	
							50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 D.G. Barker	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-6

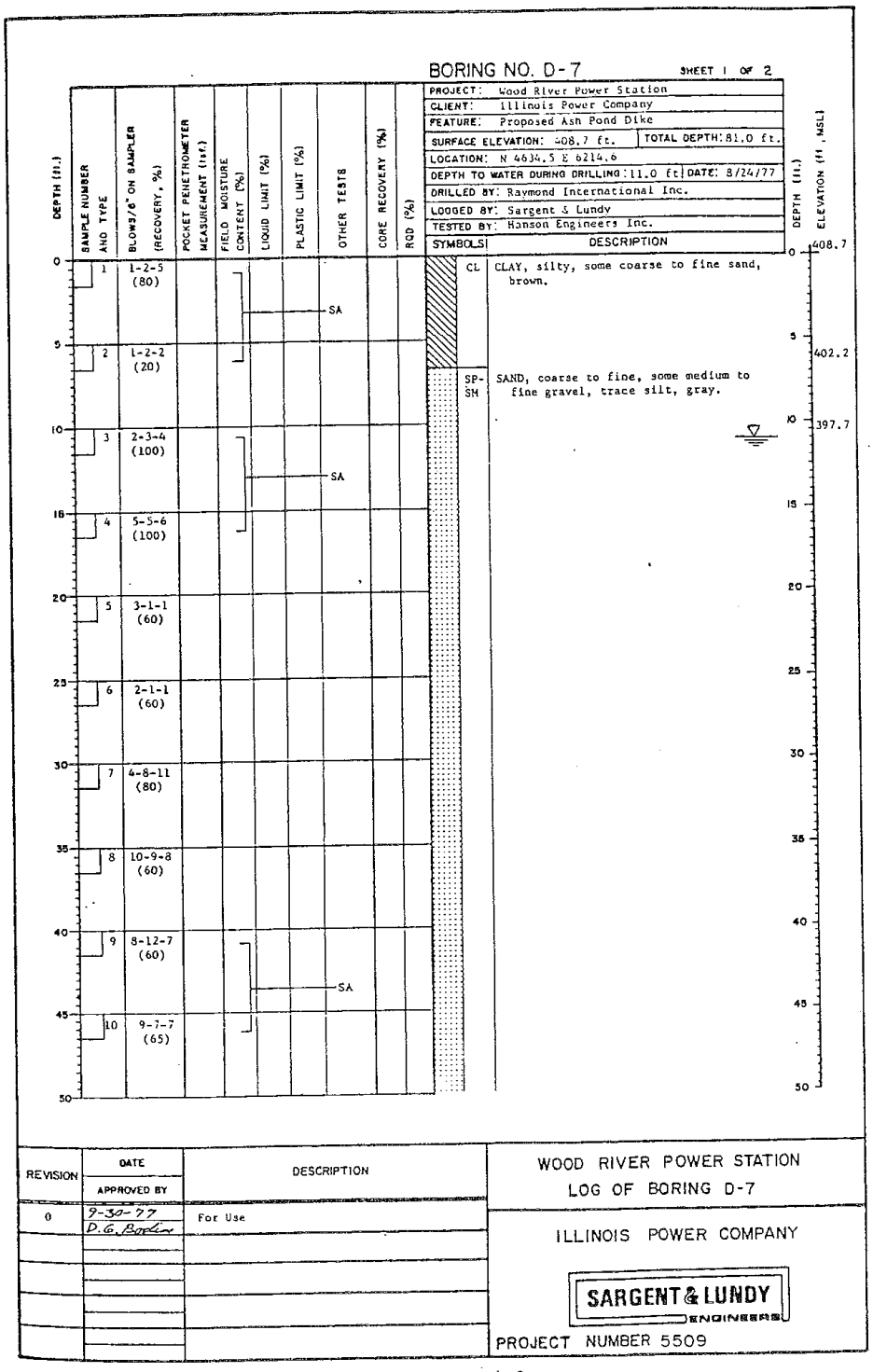
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

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BORING NO. D-7 SHEET 1 OF 2

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	408.7 ft. — TOTAL DEPTH: 81.0 ft.
LOCATION:	N 4634.5 E 6214.6
DEPTH TO WATER DURING DRILLING:	11.0 ft — DATE: 8/24/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION
0	1	1-2-5 (80)					SA			CL	CLAY, silty, some coarse to fine sand, brown.
5	2	1-2-2 (20)								SP-SM	SAND, coarse to fine, some medium to fine gravel, trace silt, gray.
10	3	2-3-4 (100)					SA				
15	4	5-5-6 (100)									
20	5	3-1-1 (60)									
25	6	2-1-1 (60)									
30	7	4-8-11 (80)									
35	8	10-9-8 (60)									
40	9	8-12-7 (60)					SA				
45	10	9-7-7 (65)									
50											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 408.7; 5 / 402.2; 10 / 397.7; 15; 20; 25; 30; 35; 40; 45; 50

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 / D.G. Bodine	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7

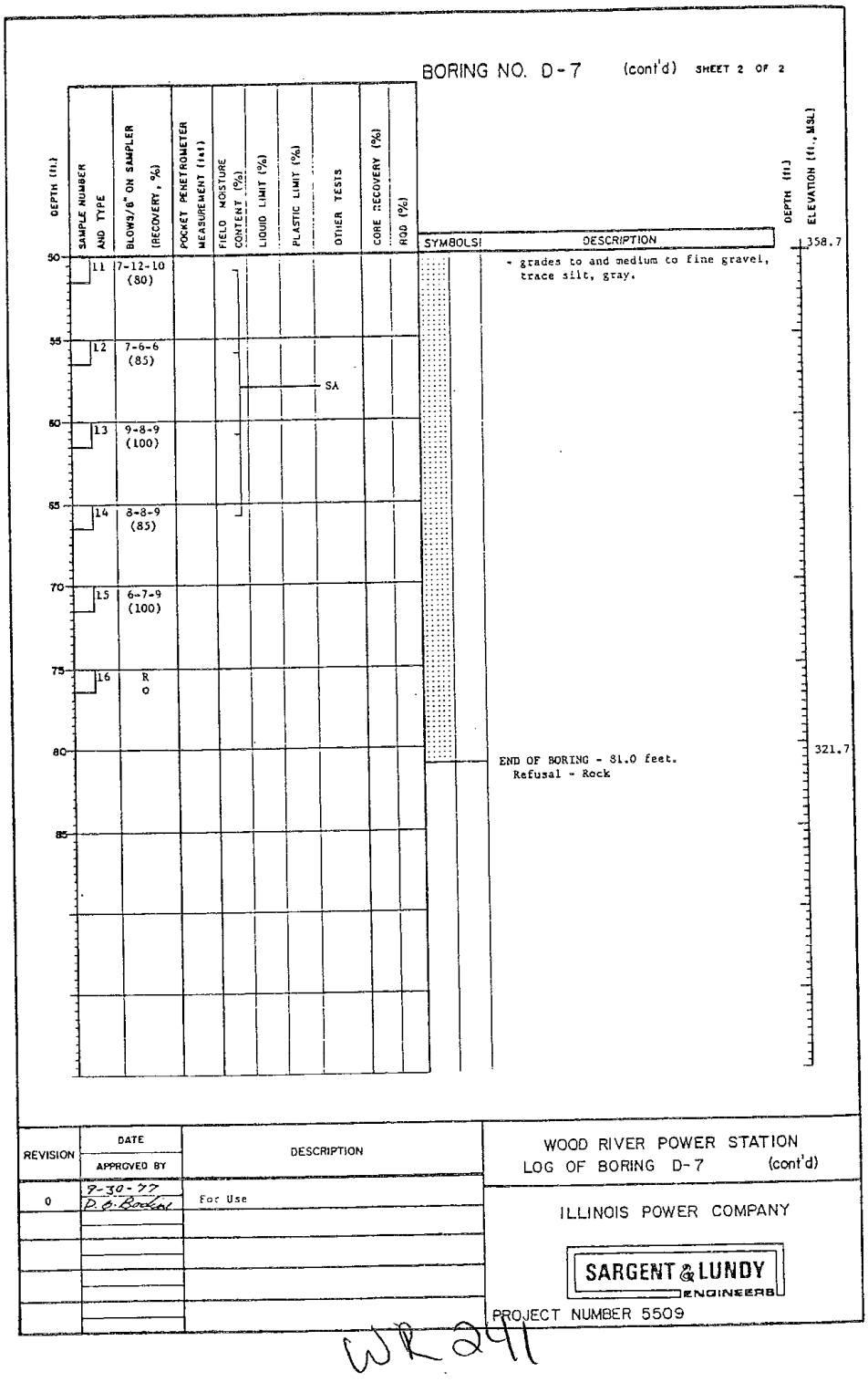
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

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BORING NO. D-7 (cont'd) SHEET 2 OF 2

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
50	11	7-12-10 (80)									- grades to and medium to fine gravel, trace silt, gray.		358.7
55	12	7-6-6 (85)					SA						
60	13	9-8-9 (100)											
65	14	8-8-9 (85)											
70	15	6-7-9 (100)											
75	16	R O											
80											END OF BORING - 81.0 feet. Refusal - Rock		321.7
85													

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 D.O. Rockel	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7 (cont'd)

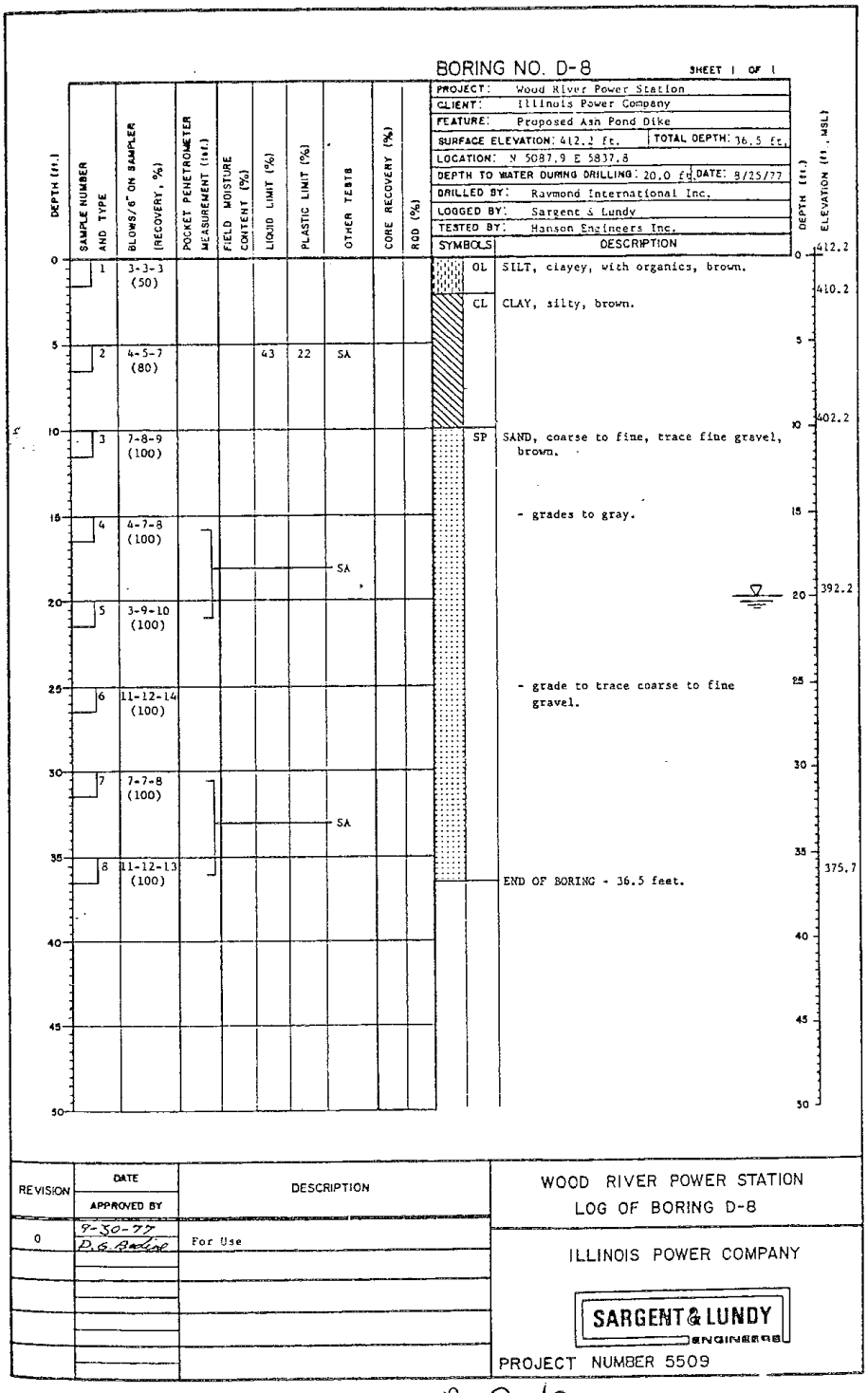
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

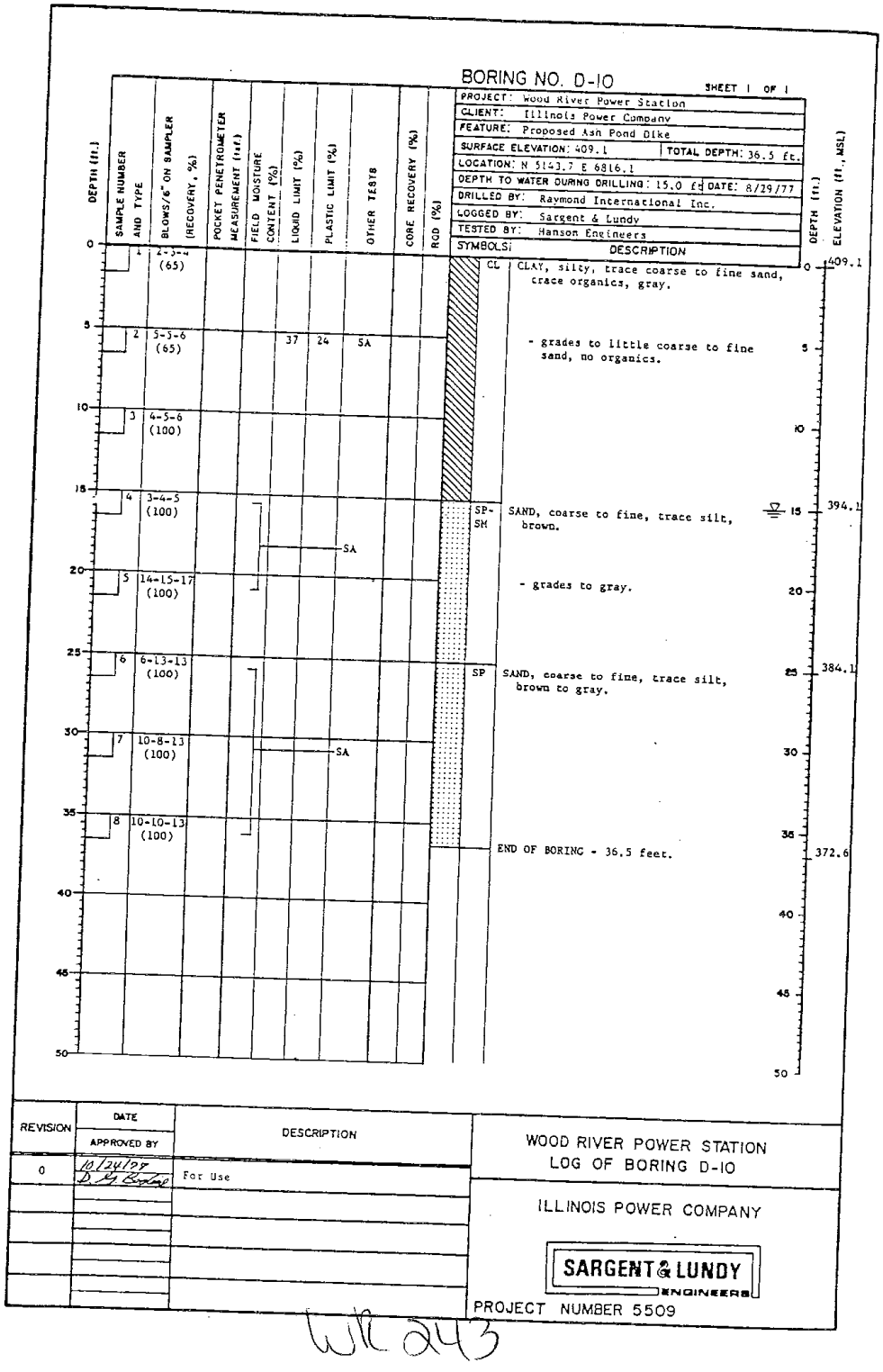
PROJECT NUMBER 5509

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BORING NO. D-8
SHEET 1 OF 1
PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 412.2 ft. TOTAL DEPTH: 36.5 ft.
LOCATION: N 5087.9 E 5837.8
DEPTH TO WATER DURING DRILLING: 20.0 ft. DATE: 9/25/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.
SYMBOLS
DESCRIPTION
DEPTH (ft.)
SAMPLE NUMBER AND TYPE
BLOWS/6" ON SAMPLER (RECOVERY, %)
POCKET PENETROMETER MEASUREMENT (tsf)
FIELD MOISTURE CONTENT (%)
LIQUID LIMIT (%)
PLASTIC LIMIT (%)
OTHER TESTS
CORE RECOVERY (%)
RQD (%)
ELEVATION (ft., MSL)
1 3-3-3 (50)
2 4-5-7 (80) 43 22 SA
3 7-8-9 (100)
4 4-7-8 (100) SA
5 3-9-10 (100)
6 11-12-14 (100)
7 7-7-8 (100) SA
8 11-12-13 (100)
OL SILT, clayey, with organics, brown.
CL CLAY, silty, brown.
SP SAND, coarse to fine, trace fine gravel, brown.
- grades to gray.
- grade to trace coarse to fine gravel.
END OF BORING - 36.5 feet.
412.2
410.2
402.2
392.2
375.7
REVISION
DATE
APPROVED BY
DESCRIPTION
0
9-30-77
D.G. Ratliff
For Use
WOOD RIVER POWER STATION
LOG OF BORING D-8
ILLINOIS POWER COMPANY
SARGENT & LUNDY ENGINEERS
PROJECT NUMBER 5509

WR242



BORING NO. D-10 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 409.1 TOTAL DEPTH: 36.5 ft.
LOCATION: N 5143.7 E 6816.1
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 8/29/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	2-3-4 (65)	CL	CLAY, silty, trace coarse to fine sand, trace organics, gray.	0	409.1
5	2	5-5-6 (65)		- grades to little coarse to fine sand, no organics.	5	
10	3	4-5-6 (100)			10	
15	4	3-4-5 (100)	SP-SM	SAND, coarse to fine, trace silt, brown.	15 ▽	394.1
20	5	14-15-17 (100)		- grades to gray.	20	
25	6	6-13-13 (100)	SP	SAND, coarse to fine, trace silt, brown to gray.	25	384.1
30	7	10-8-13 (100)			30	
35	8	10-10-13 (100)		END OF BORING - 36.5 feet.	35	372.6
40					40	
45					45	
50					50	

Moisture: FIELD MOISTURE CONTENT (%) — 37 (LIQUID LIMIT (%)), 24 (PLASTIC LIMIT (%)), SA (OTHER TESTS)

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/07 D.M. Gosline	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-10

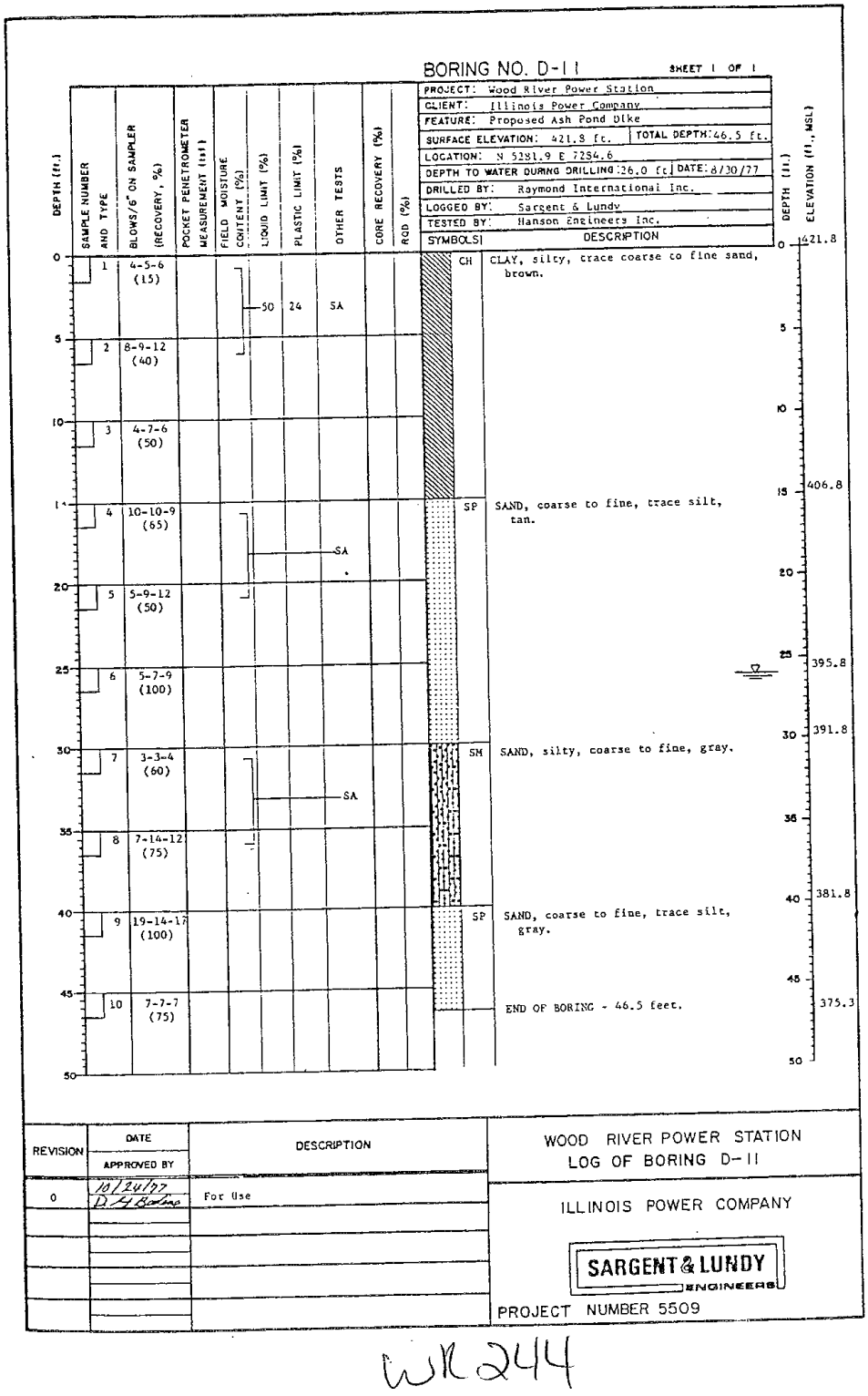
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 243

DRAFT



BORING NO. D-11 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 421.8 ft. TOTAL DEPTH: 46.5 ft.
LOCATION: N 5281.9 E 7254.6
DEPTH TO WATER DURING DRILLING: 26.0 ft. DATE: 8/30/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	4-5-6 (15)			50	24	SA			CH	CLAY, silty, trace coarse to fine sand, brown.
5	2	8-9-12 (40)									
10	3	4-7-6 (50)									
15	4	10-10-9 (65)					SA			SP	SAND, coarse to fine, trace silt, tan.
20	5	5-9-12 (50)									
25	6	5-7-9 (100)									
30	7	3-3-4 (60)					SA			SM	SAND, silty, coarse to fine, gray.
35	8	7-14-12 (75)									
40	9	19-14-17 (100)								SP	SAND, coarse to fine, trace silt, gray.
45	10	7-7-7 (75)									END OF BORING - 46.5 feet.
50											

DEPTH (ft.) ELEVATION (ft., MSL)
0 421.8
15 406.8
25 395.8
30 391.8
40 381.8
45 375.3
50

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.H.Boling	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-11

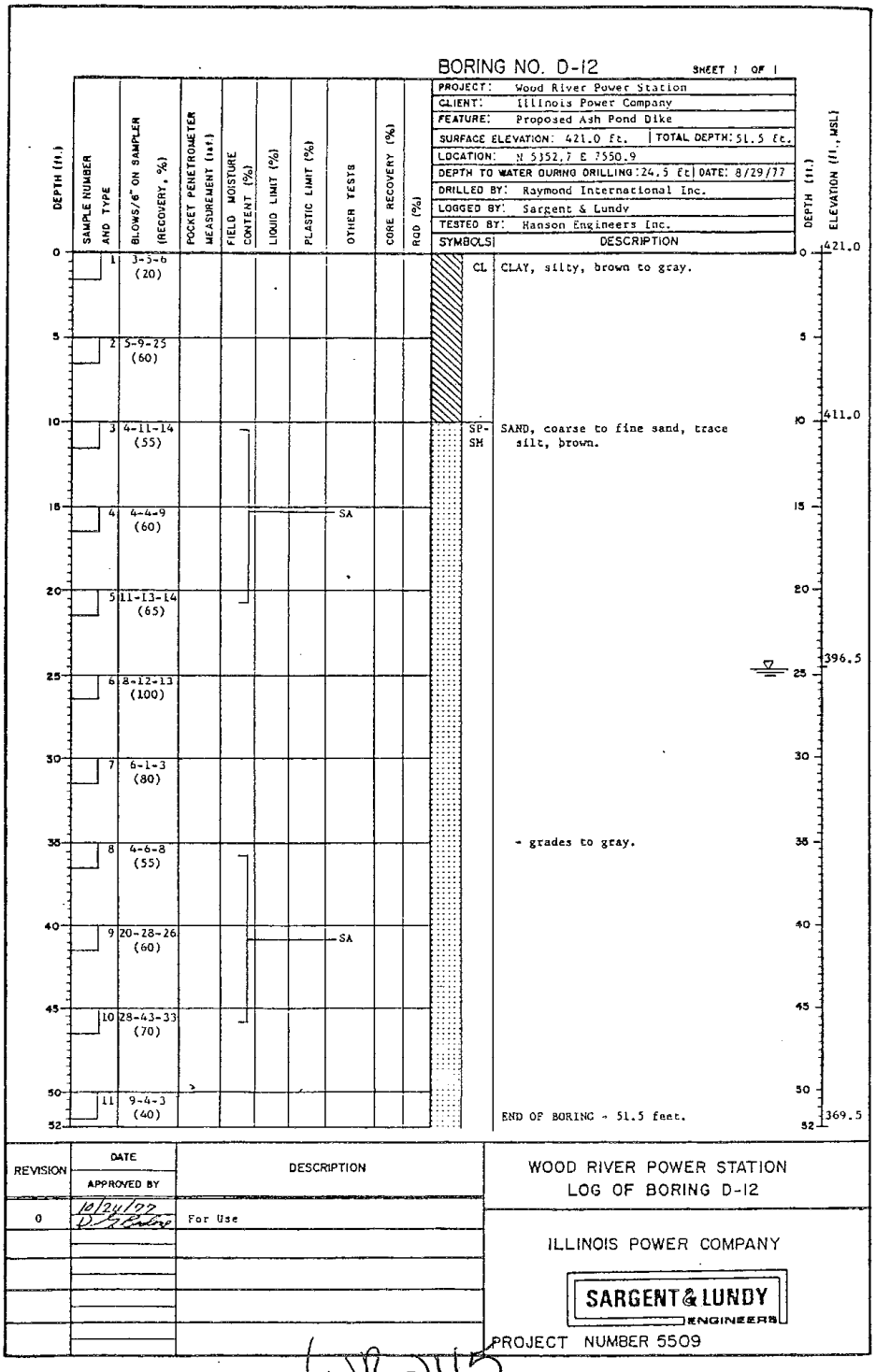
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 244

DRAFT



BORING NO. D-12 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	421.0 ft. — TOTAL DEPTH: 51.5 ft.
LOCATION:	N 5352.7 E 7550.9
DEPTH TO WATER DURING DRILLING:	24.5 ft — DATE: 8/29/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-3-6 (20)								CL	CLAY, silty, brown to gray.	0	421.0
5	2	5-9-25 (60)										5	
10	3	4-11-14 (55)								SP-SM	SAND, coarse to fine sand, trace silt, brown.	10	411.0
15	4	4-4-9 (60)					SA					15	
20	5	11-13-14 (65)										20	
25	6	8-12-13 (100)										25	396.5
30	7	6-1-3 (80)										30	
35	8	4-6-8 (55)									- grades to gray.	35	
40	9	20-28-26 (60)					SA					40	
45	10	28-43-33 (70)										45	
50	11	9-4-3 (40)									END OF BORING - 51.5 feet.	50	369.5
52												52	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	12/24/07	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-12

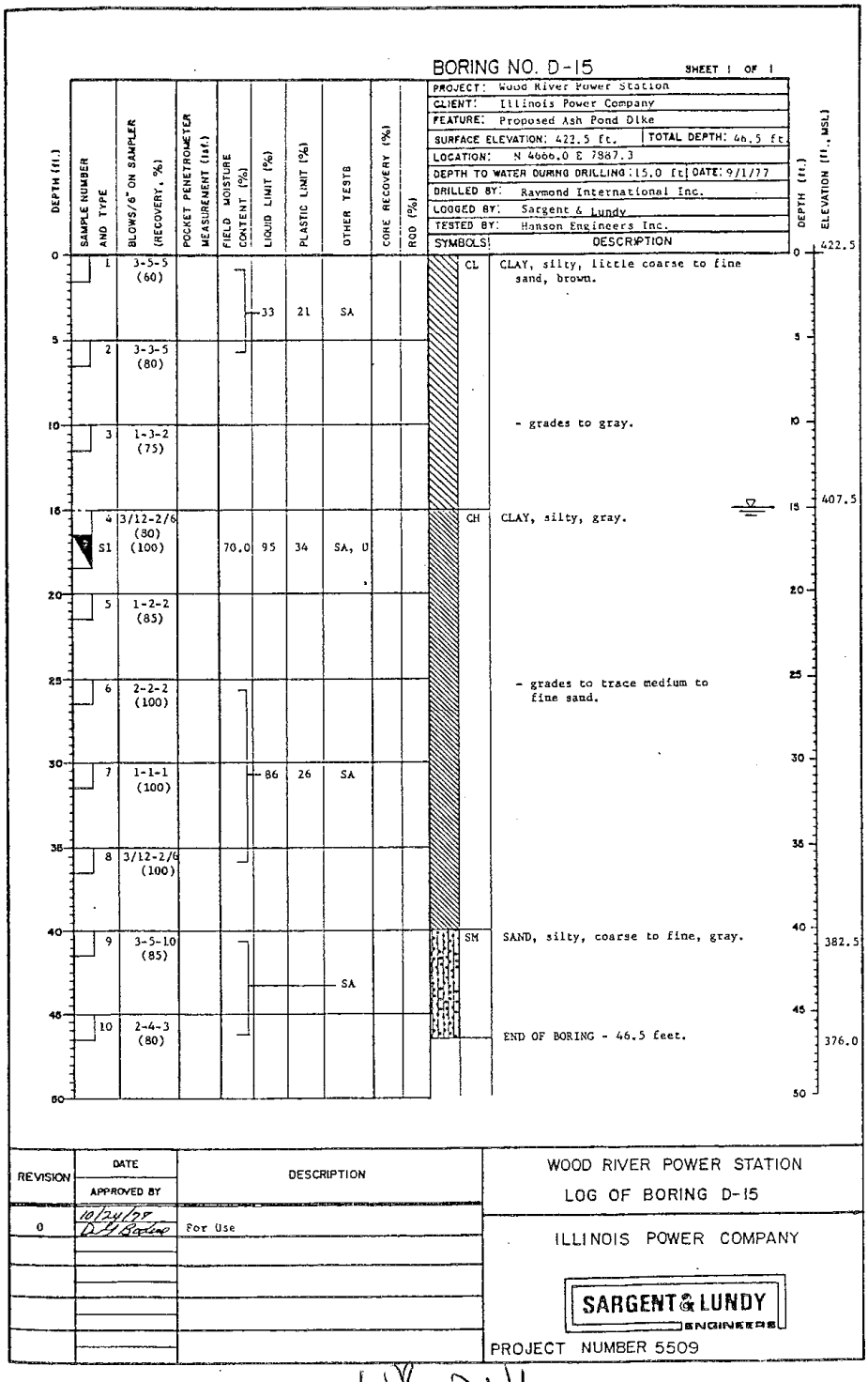
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 245

DRAFT



BORING NO. D-15 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 422.5 ft. TOTAL DEPTH: 46.5 ft.
LOCATION: N 4666.0 E 7887.3
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 9/1/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-5-5 (60)			33	21	SA			CL	CLAY, silty, little coarse to fine sand, brown.	0	422.5
5	2	3-3-5 (80)										5	
10	3	1-3-2 (75)									- grades to gray.	10	
15	4 S1	3/12-2/6 (80) (100)		70.0	95	34	SA, U			CH	CLAY, silty, gray. ▽	15	407.5
20	5	1-2-2 (85)										20	
25	6	2-2-2 (100)									- grades to trace medium to fine sand.	25	
30	7	1-1-1 (100)			86	26	SA					30	
35	8	3/12-2/6 (100)										35	
40	9	3-5-10 (85)					SA			SM	SAND, silty, coarse to fine, gray.	40	382.5
45	10	2-4-3 (80)									END OF BORING - 46.5 feet.	45	376.0
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/78 D.T. Baker	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-15

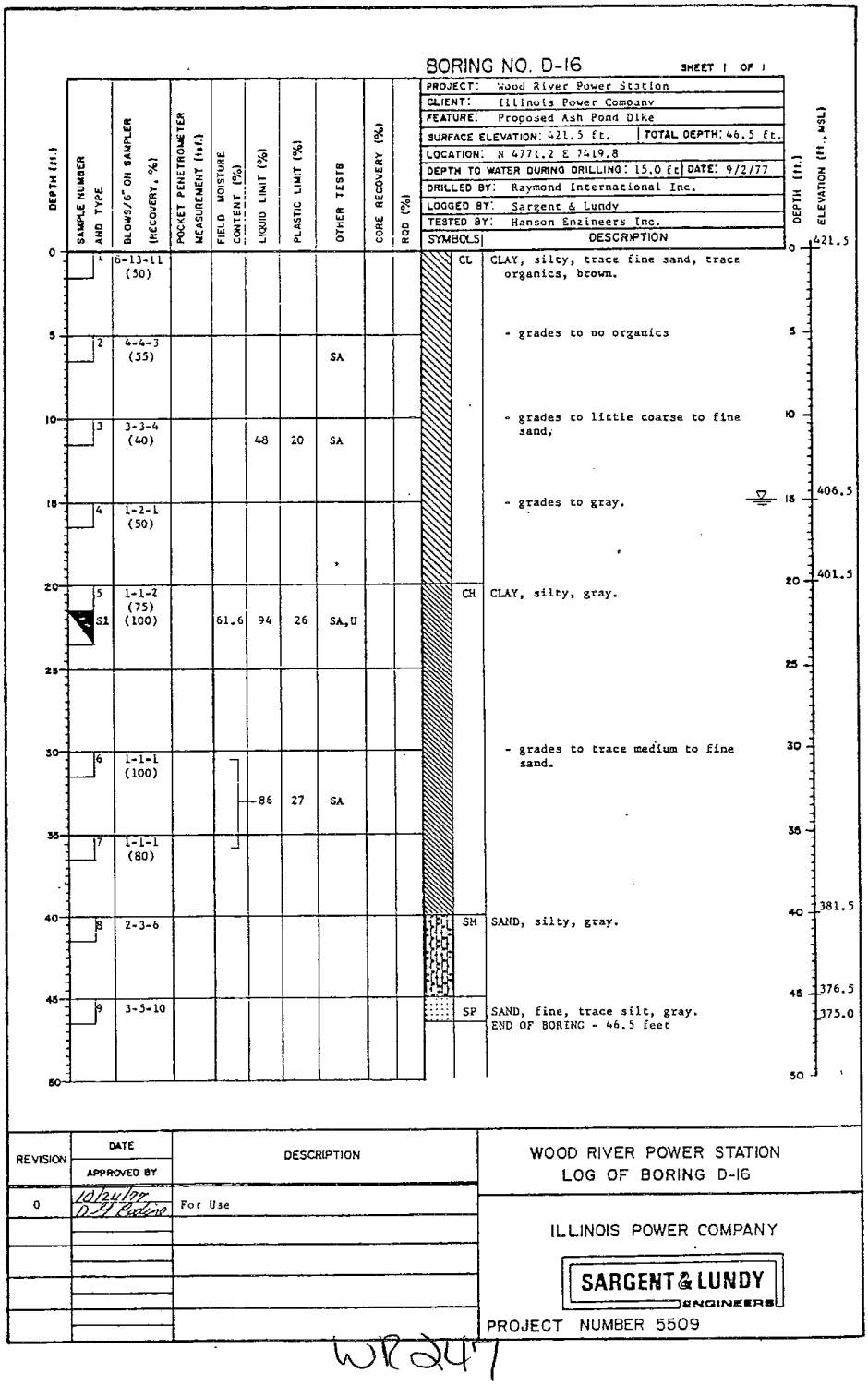
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WK 246

DRAFT



BORING NO. D-16 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 421.5 ft. TOTAL DEPTH: 46.5 ft.
LOCATION: N 4771.2 E 7419.8
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 9/2/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	8-13-11 (50)								CL	CLAY, silty, trace fine sand, trace organics, brown.
5	2	4-4-3 (55)					SA				- grades to no organics
10	3	3-3-4 (40)			48	20	SA				- grades to little coarse to fine sand,
15	4	1-2-1 (50)									- grades to gray.
20	5 S1	1-1-2 (75) (100)		61.6	94	26	SA,U			CH	CLAY, silty, gray.
30	6	1-1-1 (100)			86	27	SA				- grades to trace medium to fine sand.
35	7	1-1-1 (80)									
40	8	2-3-6								SM	SAND, silty, gray.
45	9	3-5-10								SP	SAND, fine, trace silt, gray. END OF BORING - 46.5 feet
50											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	421.5
15	406.5
20	401.5
40	381.5
45	376.5
50	375.0

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/07 D.J. Bedno	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-16

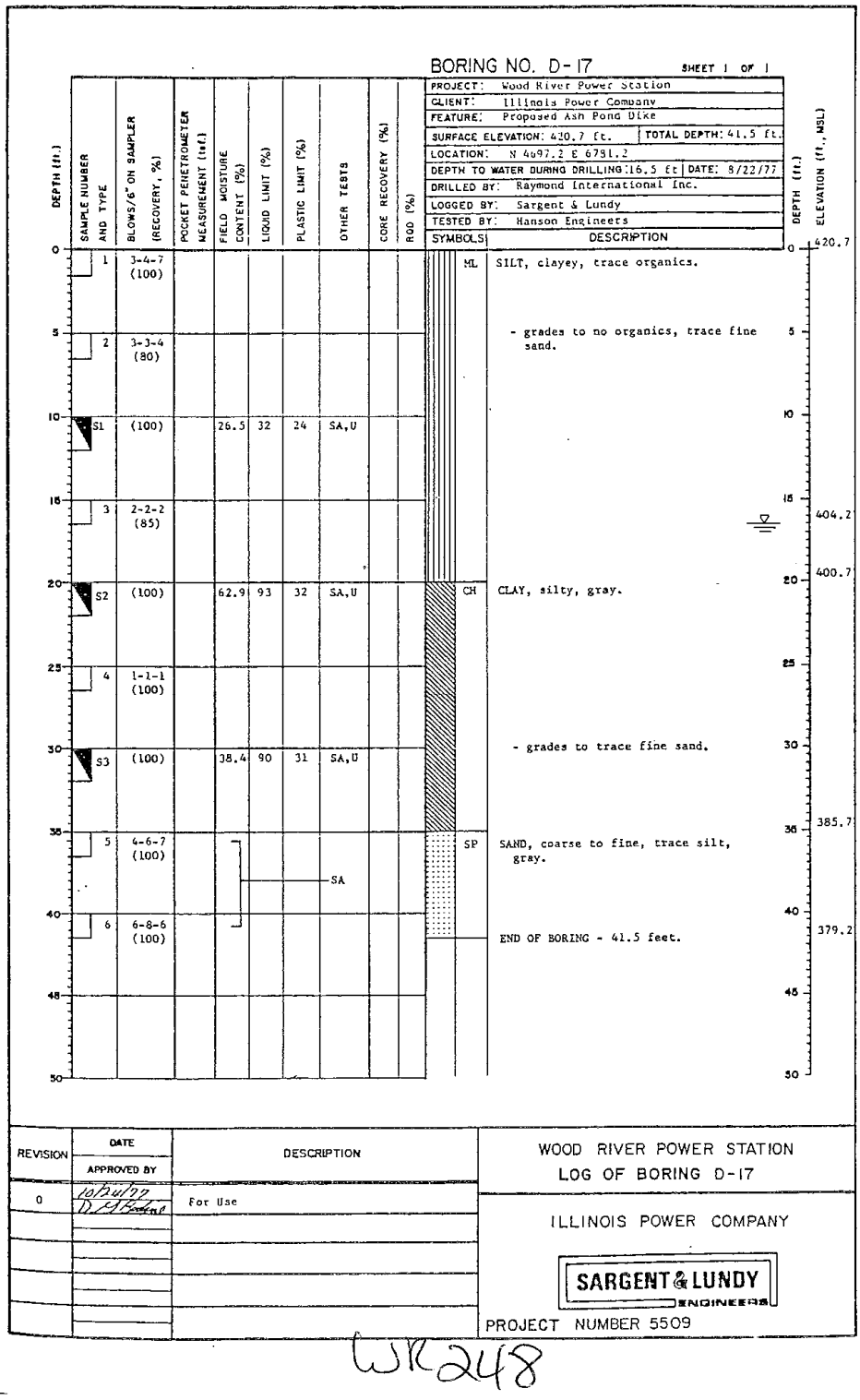
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR247

DRAFT



BORING NO. D-17 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION: 420.7 ft.	TOTAL DEPTH: 41.5 ft.
LOCATION:	N 4697.2 E 6791.2
DEPTH TO WATER DURING DRILLING: 16.5 ft	DATE: 8/22/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	3-4-7 (100)								ML	SILT, clayey, trace organics.
5	2	3-3-4 (80)									- grades to no organics, trace fine sand.
10	S1	(100)		26.5	32	24	SA,U				
15	3	2-2-2 (85)									
20	S2	(100)		62.9	93	32	SA,U			CH	CLAY, silty, gray.
25	4	1-1-1 (100)									
30	S3	(100)		38.4	90	31	SA,U				- grades to trace fine sand.
35	5	4-6-7 (100)					SA			SP	SAND, coarse to fine, trace silt, gray.
40	6	6-8-6 (100)									END OF BORING - 41.5 feet.
45											
50											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	420.7
15	404.2
20	400.7
35	385.7
40	379.2
50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.E. Bolland	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-17

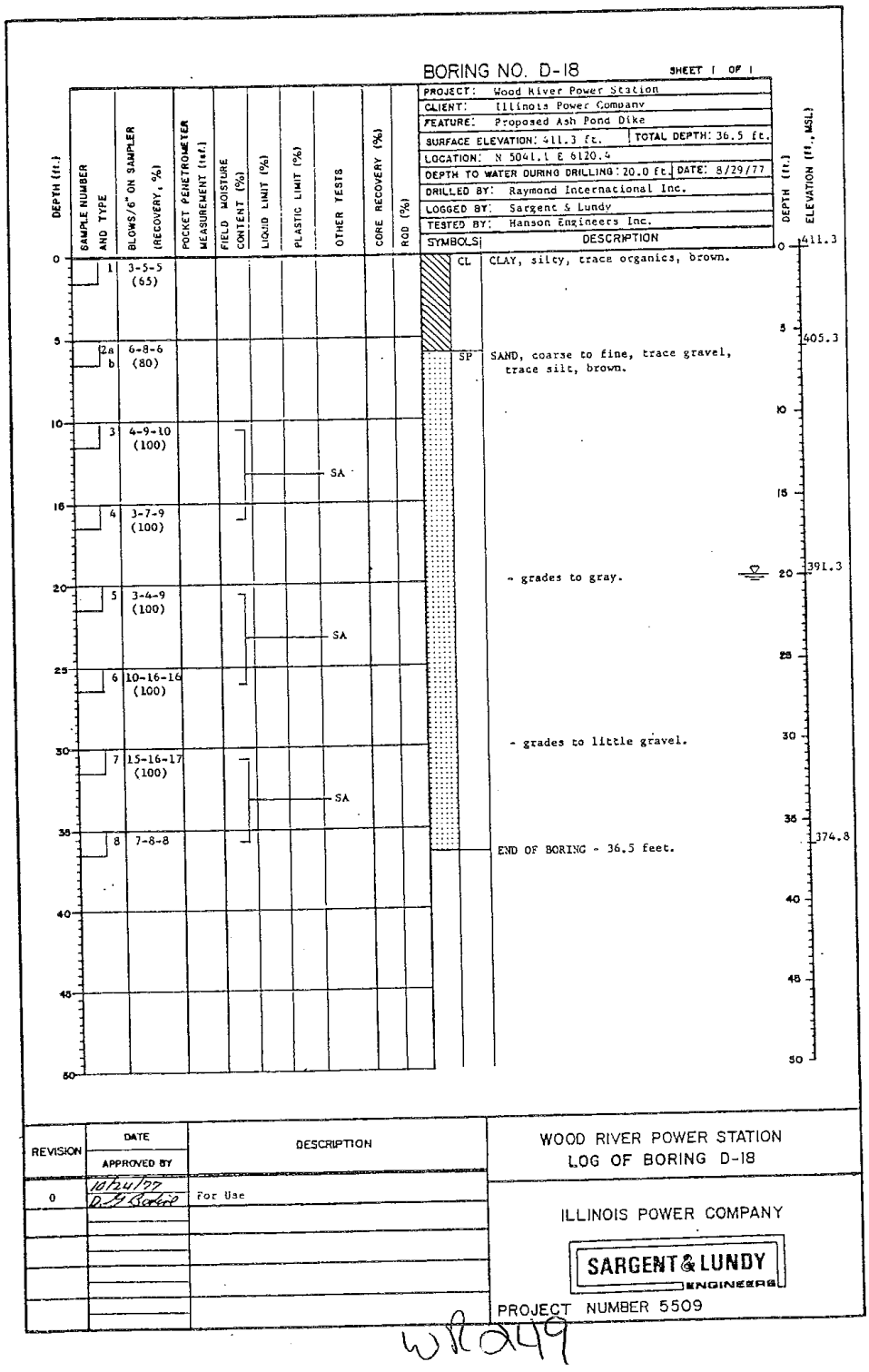
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 248

DRAFT



BORING NO. D-18 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 411.3 ft. TOTAL DEPTH: 36.5 ft.
LOCATION: N 5041.1 E 6120.4
DEPTH TO WATER DURING DRILLING: 20.0 ft. DATE: 8/29/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	3-5-5 (65)								CL	CLAY, silty, trace organics, brown.
5	2a b	6-8-6 (80)								SP	SAND, coarse to fine, trace gravel, trace silt, brown.
10	3	4-9-10 (100)					SA				
15	4	3-7-9 (100)									- grades to gray.
20	5	3-4-9 (100)					SA				
25	6	10-16-16 (100)									- grades to little gravel.
30	7	15-16-17 (100)					SA				
35	8	7-8-8									END OF BORING - 36.5 feet.
40											
45											
50											

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 411.3; 5 / 405.3; 20 / 391.3; 35 / 374.8

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.J. Bobik	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-18

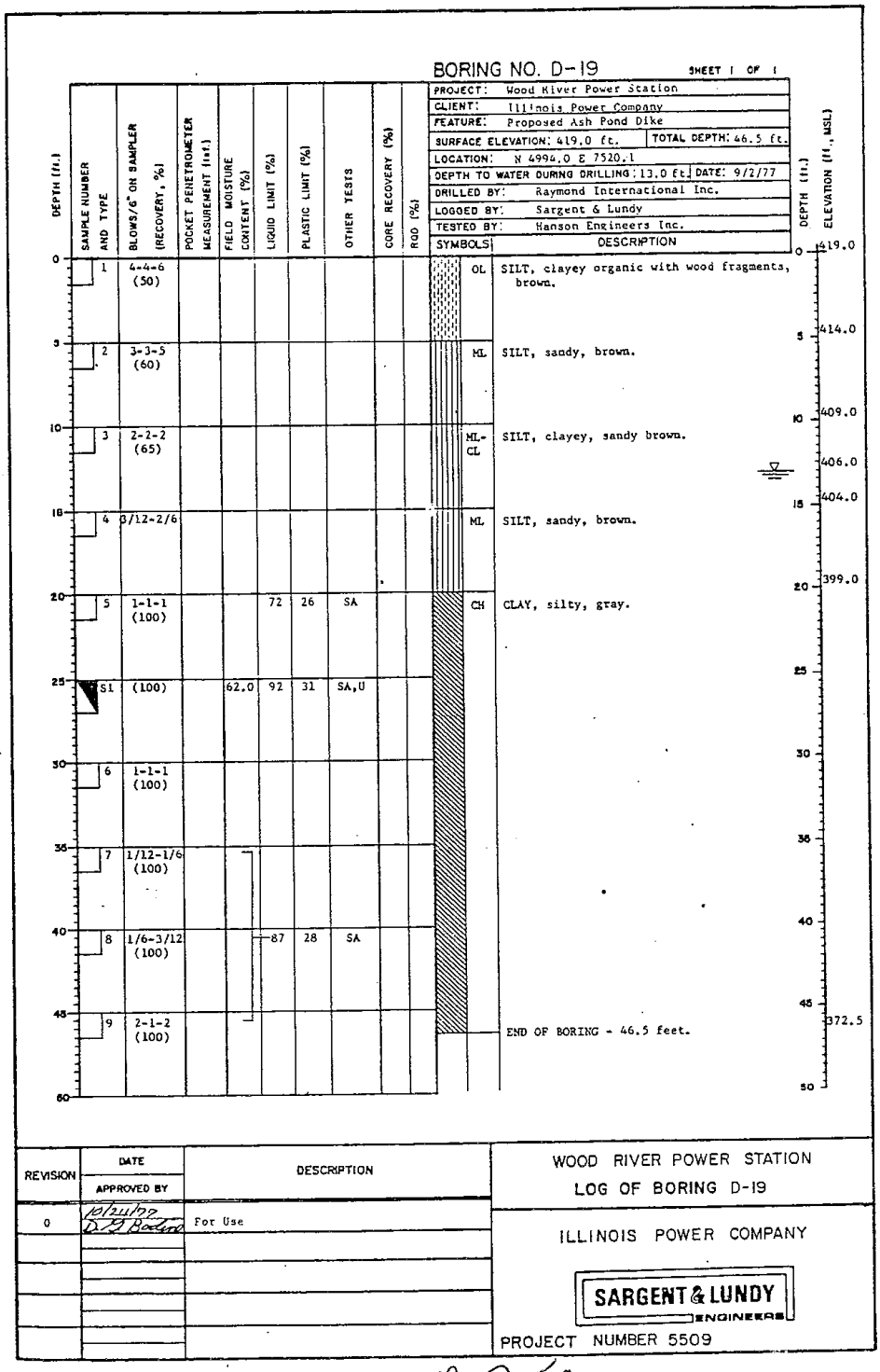
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR249

DRAFT



BORING NO. D-19 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 419.0 ft. TOTAL DEPTH: 46.5 ft.
LOCATION: N 4994.0 E 7520.1
DEPTH TO WATER DURING DRILLING: 13.0 ft. DATE: 9/2/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	4-4-6 (50)								OL	SILT, clayey organic with wood fragments, brown.
5	2	3-3-5 (60)								ML	SILT, sandy, brown.
10	3	2-2-2 (65)								ML-CL	SILT, clayey, sandy brown.
15	4	3/12-2/6								ML	SILT, sandy, brown.
20	5	1-1-1 (100)			72	26	SA			CH	CLAY, silty, gray.
25	S1	(100)		62.0	92	31	SA,U				
30	6	1-1-1 (100)									
35	7	1/12-1/6 (100)									
40	8	1/6-3/12 (100)			87	28	SA				
45	9	2-1-2 (100)									END OF BORING - 46.5 feet.
60											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	419.0
5	414.0
10	409.0
15	404.0
20	399.0
25	
30	
35	
40	
45	372.5
50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/21/77 D.J. Bedard	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-19

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 250

WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 D-SERIES BORINGS

Boring No. / Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
D-15, ST-1	16.5-18.5	100	100	100	100	95.0	34.0	61.0	CH	70.0	56.9	620
Combined D-15, SS-1 SS-2	0-1.5 5-6.5	100	100	98	85	33.0	20.8	12.2	CL	-	-	-
Combined D-15, SS-6 SS-7 SS-8	25-26.5 30-31.5 35-36.5	100	100	99	96	85.0	26.0	59.0	CH	-	-	-
Combined D-15, SS-9 SS-10	40-41.5 45-46.5	100	100	99	35	-	-	-	SM	-	-	-
D-16, SS-2	5-6.5	100	100	100	92	-	-	-	CL	-	-	-
D-16, SS-3	10-11.5	100	100	97	86	48.0	20.2	27.8	CL	-	-	-
D-16, ST-1	21.5-23.5	100	100	100	100	94.0	26.3	67.7	CH	61.6	61.8	780
Combined D-16, SS-6 SS-7	30-31.5 35-36.5	100	100	99	98	86.2	27.3	58.9	CH	-	-	-
D-17, ST-1	10-12	100	100	100	98	31.7	23.8	7.9	ML	26.5	92.7	1010
D-17, ST-2	20-22	100	100	100	100	93.0	32.0	61.0	CH	62.9	58.7	1500
D-17, ST-3	30-32	100	100	100	98	90.0	30.7	59.3	CH	38.4	72.9	1500
Combined D-17, SS-5 SS-6	35-36.5 40-41.5	100	100	92	4	-	-	-	SP	-	-	-

See Page 8 of 8 for Notes

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WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 D-SERIES BORINGS

Boring No. Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
Combined D-18, SS-3 SS-4	10-11.5 15-16.5	100	97	87	4	-	-	-	SP	-	-	-
Combined D-18, SS-5 SS-6	20-21.5 25-26.5	100	98	50	3	-	-	-	SP	-	-	-
Combined D-18, SS-7 SS-8	30-31.5 35-36.5	100	87	40	4	-	-	-	SP	-	-	-
D-19, SS-5	20-21.5	100	100	100	100	72.2	26.0	46.2	CH	-	-	-
Combined D-19, SS-7 SS-8 SS-9	35-36.5 40-41.5 45-46.5	100	100	100	100	86.8	28.2	58.6	CH	-	-	-
D-19, ST-1	25-27	100	100	100	100	92.0	31.4	60.6	CH	62.0	59.7	840

NOTES:

(1) Particle-Size Analysis of Soils, ASTM Test Designation D422. Only Selected Particles Sizes Reported.

(2) Atterberg Limit Tests, ASTM Test Designations D423 and D424.

(3) Field Water Content, ASTM Test Designation D2216.

(4) Dry Density Calculated From Shelby Tube Sample.

(5) Unconfined Compressive Strength of Cohesive Soils, ASTM Test Designation D2166.

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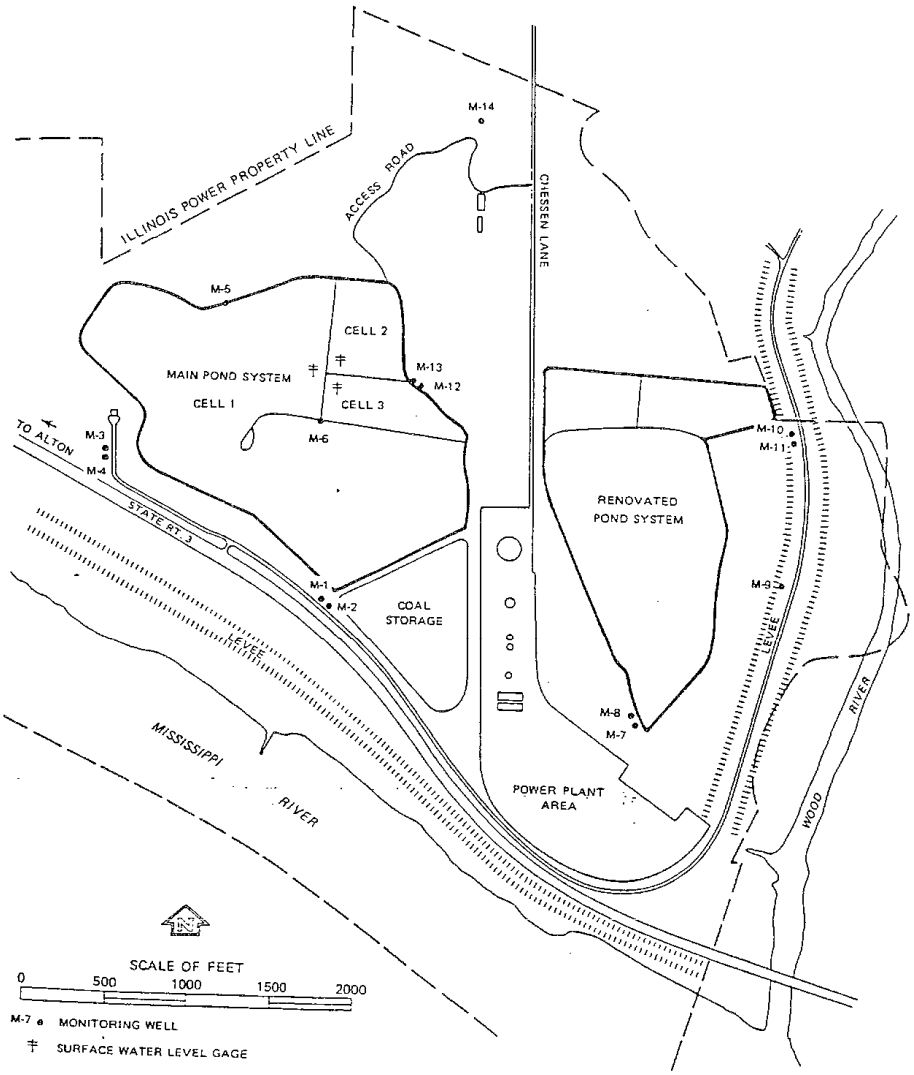


Figure 1. Locations of the monitoring wells and staff gages at the Wood River Power Station

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DRAFT

RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 83-1344
BORING M-5
SHEET 1 OF 1

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL, Classification)	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)
5	1	SS	18/16		Dark Gray CLAY, with Silt	5-7-10	
10	2	SS	18/14		Brown Silty CLAY, Trace Fine Sand	4-5-6	
15	3	SS	18/10		Brown Fine SAND, Dry	5-6-6	
20	4	SS	18/12		Brown Fine Silty SAND	2-3-8	
25	5	SS	18/10		Brown Fine to Medium SAND	6-8-11	
30	6	SS	18/12			6-8-11	
35	7	SS	30/20		36' TOB	6-11-12	

Shear Strength, tsf
SV△ QP/½□ QU/½○
0 ½ 1 1½ 2 2½
PL NMC LL
0 50 100
Rock Quality Designation
0 50 100

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at 19.0 Feet
___ Hours after completion ___ Feet
___ after completion ___ Feet
___ after completion ___ Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

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RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344
BORING M-6
SHEET 1 OF 2

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System Unified. Surface Elevation —	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)
5	1	SS	18/16		Brown Silty CLAY	4-5-6	
10	2	SS	18/18		Gray Silty CLAY	3-5-9	
15	3	SS	18/14		Gray Silty CLAY, Trace Silt, Organics, Fine Sand	3-4-6	
20	4	SS	18/14			1-1-1	
25	5	SS	18/18		Gray CLAY	WH-WH-1	
30	6	SS	18/18			WH-1-1	
35	7	SS	18/10		Gray Fine SAND, Trace Silt	3-9-15	

Shear Strength, tsf
SV△ QP/½□ QU/½○
0 ½ 1 1½ 2 2½
PL + NMC • LL x
0 50 100
Rock Quality Designation
0 50 100

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at — Feet
___ Hours after completion ___ Feet
___ after completion ___ Feet
___ after completion ___ Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

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RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344
BORING M-6
SHEET 2 OF 2

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL, Classification) Soil Classification System: Unified Surface Elevation: -	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf: SV△ QP/₂□ QU/₂ 0 ½ 1 1½ 2; PL NMC L; 0 50; Rock Quality Designation 0 50
					Gray Fine SAND, Trace Silt			
40	8	SS	18/18		Gray Fine to Medium SAND			
					TOB			
45								
50								
55								
60								
65								
70								

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at ___ F
___ Hours after completion ___ F
___ after completion ___ F
___ after completion ___ F

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORAT for abbreviations, explanations, and qualifications relative to this log.

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DAEM

FINAL DESIGN REPORT
VOLUME 1 OF 2

DYNEGY WOOD RIVER EAST ASH POND EXPANSION TO EL. 453

Prepared for

Dynegy Midwest Generation
No. 1 Chessen Lane
Alton, IL 62002

January 25, 2005

URS
21561435.00000

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normal operating pool elevation (432 feet), the flow rate would be 1467 gpm. It would take 1 day to dewater half of the pond's volume. The Emergency Drawdown Systems exceed the requirement of reducing the water level in each pond by half in seven days. If a slower drawdown rate is desired, valves are in place to control the rate through each pipe.

2.4 FREEBOARD DESIGN

IDNR requires a minimum of three feet of freeboard during normal operation. Both the primary and secondary east ash ponds have been designed with three feet of freeboard. During the PMF event, the ponds must have freeboard in excess of the increased water level from this storm event. The water surface of the primary east ash pond and the secondary east ash pond has been calculated to rise approximately 1.5 feet and still meets the freeboard requirements.

The wave run-up analysis used methods outlined by the United States Army Corps of Engineer to determine the minimum amount of freeboard to verify that the dam is safe against overtopping (EM 1110-2-1414 and EM-1110-2-1420). Assuming a 25-year mean wind out of the northwest at 75 mph, the equivalent fetch distance was determined.

During normal operation of the primary east ash pond, the water depth will maintained at four to five feet above the bottom of the pond or the top of the ash. The freeboard will be 10 feet when the pond is initially placed into operation and wave run up will not be an issue. As the pond fills with ash, the water level will rise and reduce the amount of freeboard. The pond will be at the end of its life when the water level is maintained at the top of the outfall structure at El. 450 and the ash will be approximately 2.5 feet below the water surface. If a PMF event would occur near the end of the pond's life, coupled with a 25-year mean wind, then a wave with a height of 1.83 feet could be generated. Under these conditions, this wave would exceed the remaining freeboard of the pond by a few inches. However, the likelihood of the pond being full of ash, the 25-year mean wind event, and the PMF event occurring simultaneously are extremely low. Hence, it is not practical to design for this situation. Therefore, the decision was made to allow 1.5 feet of freeboard with the PMF event, which will contain the wave height for the extreme majority of the time.

The secondary east ash pond has a constant water level and depth. The maximum wave generated would be 1.0 foot. The secondary east ash pond has adequate freeboard. Refer to the Wave Run-up and Setup calculations.

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2.1 MAXIMUM WATER SURFACE BASED ON PROBABLE MAXIMUM FLOOD STORAGE

Since the normal operating water elevation of the ponds is controlled by the discharge from the plant and the ponds are not part of a watershed, we understand that the Illinois Department of Natural Resources (IDNR) does not require a spillway here. Therefore, the maximum water surface cannot be based on spillway design flood peak inflow or the design flood inflow hydrograph as required by Title 17. Alternatively, the maximum water surface is based on the elevation associated with the Probable Maximum Flood (PMF). The PMF is used because it would be the required design parameter for the Total Spillway Design Flood (Title 17 CH I, SEC. 3702) if we were required to have a spillway for a Class I dam.

The PMF was determined from the Probable Maximum Precipitation (PMP) as given in the National Weather Service Hydrometeorological Report Number 51. The PMP for the ponds was determined to be approximately 34.5 inches for the 24-hour event (Figure 20 of Report No. 51). As a result of the PMP, the water level in the primary east ash pond will increase by 1.49 feet due to the discharge rate of the outlet structure. The operating pool elevation of the primary east ash pond will be varied as the settled ash fills the pond. Typically, the water will be maintained at 4 to 5 feet over the ash surface during the primary east ash ponds use. The maximum operating pool elevation will be El. 450 with the top of the berm at El. 453 for the primary east ash pond. The secondary east ash pond will be maintained at El. 432 with a top of berm at El. 435. The PMF would result in an increase of the water surface elevation from El. 450 feet to El. 451.49 in the primary east ash pond and El. 432 to El. 432.5 in the secondary east ash pond, leaving over 1.5 feet of freeboard in each pond.

2.1.1 Rainfall and Distribution

Because the ponds have no contributing drainage area, the drainage basin areas for each pond were assumed to be the same area as the surface area of each pond. The 34.5 inches of rain associated with the PMP was distributed using the Probable Maximum Precipitation method for a synthetic storm as outlined in the HEC-1 Manual. Although the area covered by the ponds is only 0.06 square miles, the distribution was based on an area of 10 square miles, which is the smallest area addressed by the distribution method. Refer to the Storm Distribution for the PMF calculations.

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2.1.2 Rainfall Excess

Since the ponds are not part of a watershed, the only rainfall that would enter the ponds is what falls inside the berm and directly over the water surface. Correspondingly, no infiltration, interception, or depression storage of the rainfall will occur to the runoff before it enters the water body. All rainfall is therefore considered to be rainfall excess.

2.1.3 Unit Hydrograph

A unit hydrograph was not generated for the ponds. Since a watershed is not associated with the ponds, runoff does not drain into them.

2.1.4 Design Storm Inflow Hydrograph

The inflow into the ponds consists of water from the plant discharge and precipitation falling directly on each pond. The design storm inflow hydrograph for the primary east ash pond is based on the plant discharge and the PMF. The secondary east ash pond's inflow is based on the free discharge from the primary east ash pond and the PMF for the secondary east ash pond. The PMF was calculated by multiplying the PMP in inches by the area of each pond to come up with a volume of rain over a corresponding period of time. Refer to the Storm Distribution for the PMF calculations for the design storm inflow hydrographs for the primary east ash pond and the secondary east ash pond.

The design storm inflow hydrograph shows that the PMF would significantly increase the flow into the ponds. No lag time occurs between the rainfall and runoff hydrograph into the ponds since there is no contributing drainage area. The inflow hydrograph for plant pumps and the PMF corresponds to an increase in the water surface elevation of 1.49 feet, which is 1.51 feet below the top of the berm of each pond during maximum operating conditions.

2.1.5 Reservoir Area-Storage–Elevation Data

The Stage Storage Volumes for both Ponds calculations illustrates the storage of each pond associated with various stages. The storage corresponding to each stage was calculated using the average end area method. Both the PMF condition and the maximum operating condition for the

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primary east ash pond and normal operating condition for the secondary east ash pond are shown in graphs in the above-mentioned calculation.

2.1.6 Spillway Discharge-Elevation Data

As mentioned previously, we understand that a spillway is not required as part of the Ash Disposal Pond Expansion. Alternatively, the ponds are designed to store the PMF and release it through outlet structures. The discharge rate of the outlet structure in the primary east ash pond will vary with the depth of ash and water in the pond as shown in the Outlet Structure Discharge calculations. The discharge water elevation will be between 2.5 to 5.0 feet above the ash during the life of the pond. As the ash builds up on the floor of the pond, the water level will be raised. The outlet structure is a 5 feet by 5 feet concrete box, 15 feet tall, with three 12 inch diameter discharge pipes with valves that are spaced 5 feet apart vertically (allows varying water level) and a 30-inch diameter discharge pipe draining to the secondary east ash pond. When the ash builds up to near a discharge pipe elevation, a valve located in the outlet structure will be closed to prevent ash from discharging through the pipe. This first pipe will drain the pond until it is closed to prevent ash in the discharge water, the second and third pipe will then drain the pond in the same manner. Initially, the discharge water will be stored in the pond until it reaches the invert of the first pipe at a depth of 4.0 feet (El. 439.0). The three pipe valves will be left open to allow flow out of the pond through all the pipes if the water level in the pond would rise for any reason. The flow rate of each 12-inch pipe ranges from 0.3 MGD to 9.3 MGD as the depth of water is increased. The only time that all three pipes would be used is if the pond was filled to an elevation greater than 447 feet. This will not occur under normal operation, because it is anticipated that the primary east ash pond will only be operated with a water level a few feet above the ash. However, when the pond is nearly full of ash and all three pipes are closed or other operation such that all valves closed, the water level will be maintained at El. 450 (top of the open outlet structure). The outlet structure is designed for that condition. For the PMF event, with a water level elevation increase of 1.49 feet, it would take approximately 1.5 days for the primary east ash pond to return to the maximum operational pool elevation 450 feet.

The outlet structure in the secondary east ash pond is a 5-foot square structure, 12.5 feet tall, with a four-sided, 90 degree V-notch weir on at the top, a 36-inch discharge pipe, and a 6-inch pipe at the bottom to be used for drawdown purposes only. The weir is used to measure the discharge rate of the secondary east ash pond. The V- notch will be 18 inches deep and the V will be set at elevation 431 feet to maintain a normal pool elevation of 432 feet. The 90-degree V-notch Weir calculations

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show the discharge curve for the secondary east ash pond outlet structure. The rise in the secondary east ash pond due to the PMF will be 6-iches. The water surface would rise from the normal operation level to the top of the discharge structure.

2.1.7 Downstream Tailwater Discharge-Elevation Data

The secondary east ash pond will discharge into a CMP culvert that passes under a railroad bed. There is a drainage ditch that also flows into the CMP, which could have a maximum water elevation of 422 feet under flood conditions. This would cause a tail water of 5 feet on the discharge pipe from the secondary east ash pond. The Emergency Drawdown System in the secondary east ash pond would still be able to discharge to the elevation of 422 feet. This would be 2 feet above the floor of the pond.

2.1.8 Design Storm Outflow Hydrograph

A design storm outflow hydrograph was generated from each outlet structure. The outlet structures were designed to pass the PMF event and still maintain the minimum freeboard required. See the Storm Routing calculations for rate and change in the pond elevation. The primary east ash pond rises 1.49 feet with the PMF event and the plant pumps in operation. The secondary east ash pond has the discharge from the primary east ash pond plus the PMF event. The water surface of the secondary east ash pond will rise approximately 0.5 feet, from elevation 432 feet to 432.5 feet at the top of the outlet structure, when the initial flow from the primary east ash pond enters the pond.

2.2 POTENTIAL UPSTREAM FLOOD HAZARD AREAS

The proposed structure will not dam water from a stream or a river and it does not drain a watershed. The area surrounding the ponds consists of an existing primary east ash pond, the power generation plant and a wastewater treatment plant. Future development in the area may consist of improvements or expansion by Dynegy Midwest Generation.

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2.3 EMERGENCY AND NORMAL DRAWDOWN CAPABILITY

Table 1 summarizes the storage associated with each Pond.

Table 1. Primary east ash pond and Secondary east ash pond Storage at Different Stages

Stage	Primary East Ash Pond Elevation (feet)	Primary East Ash Pond Storage in acre-ft (MGD)	Secondary East Ash Pond Elevation (feet)	Secondary East Ash Pond Storage in acre-ft (MGD)
Maximum Operating Elevation	450	410 (134)		
Normal Operating Conditions			432	13.0 (4.2)
PMF	451.49	457 (149)	432.5	13.7 (4.5)
Berm	453	506 (165)	435	17.7 (5.8)

Under normal operating conditions, the water level will be maintained a few feet above the settled ash in the primary east ash pond. However, the calculations consider the worst-case condition. That is, with the water level at El. 450. The operating water level in the secondary east ash pond will be constant at El. 432.

Under emergency conditions, the ponds were designed to discharge at least 50% of the normal pool storage volume in 7 days, as required by IDNR for a Class I dam. The normal pool storage volume was considered to be at the maximum operating level of El. 450 in the primary east ash pond and at El. 432 in the secondary east ash pond.

Since the Emergency Drawdown Systems do not use pumps and alternatively rely on the head in the Pond, the flow rate through the drawdown pipe will vary depending on the water elevation. The Haestad Methods Culvertmaster computer program was used to determine the pipe size to successfully dewater half the volume in the ponds in seven days. Outlet Structure Discharge calculations show the flow rate depending on the water elevation.

When the primary east ash pond is at the maximum pool elevation, the water discharge rate will be 12,819 gpm. If the Pond starts out at the maximum pool elevation (450 feet), it will take approximately 3.5 days to dewater Emergency Drawdown Plan calculations. The system is capable of dewatering the pond entirely to an elevation of 435 feet. When the secondary east ash pond is at

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normal operating pool elevation (432 feet), the flow rate would be 1467 gpm. It would take 1 day to dewater half of the pond's volume. The Emergency Drawdown Systems exceed the requirement of reducing the water level in each pond by half in seven days. If a slower drawdown rate is desired, valves are in place to control the rate through each pipe.

2.4 FREEBOARD DESIGN

IDNR requires a minimum of three feet of freeboard during normal operation. Both the primary and secondary east ash ponds have been designed with three feet of freeboard. During the PMF event, the ponds must have freeboard in excess of the increased water level from this storm event. The water surface of the primary east ash pond and the secondary east ash pond has been calculated to rise approximately 1.5 feet and still meets the freeboard requirements.

The wave run-up analysis used methods outlined by the United States Army Corps of Engineer to determine the minimum amount of freeboard to verify that the dam is safe against overtopping (EM 1110-2-1414 and EM-1110-2-1420). Assuming a 25-year mean wind out of the northwest at 75 mph, the equivalent fetch distance was determined.

During normal operation of the primary east ash pond, the water depth will maintained at four to five feet above the bottom of the pond or the top of the ash. The freeboard will be 10 feet when the pond is initially placed into operation and wave run up will not be an issue. As the pond fills with ash, the water level will rise and reduce the amount of freeboard. The pond will be at the end of its life when the water level is maintained at the top of the outfall structure at El. 450 and the ash will be approximately 2.5 feet below the water surface. If a PMF event would occur near the end of the pond's life, coupled with a 25-year mean wind, then a wave with a height of 1.83 feet could be generated. Under these conditions, this wave would exceed the remaining freeboard of the pond by a few inches. However, the likelihood of the pond being full of ash, the 25-year mean wind event, and the PMF event occurring simultaneously are extremely low. Hence, it is not practical to design for this situation. Therefore, the decision was made to allow 1.5 feet of freeboard with the PMF event, which will contain the wave height for the extreme majority of the time.

The secondary east ash pond has a constant water level and depth. The maximum wave generated would be 1.0 foot. The secondary east ash pond has adequate freeboard. Refer to the Wave Run-up and Setup calculations.

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2.5 UPSTREAM FACE PROTECTION

The primary east ash pond and secondary east ash pond are earthen embankment ring dams, and therefore do not have a specific upstream face. The interior of each pond will be lined with a 60-mil HDPE liner. This liner will inherently provide protection for the upstream face. The 60-mil HDPE liner will extend from the top of the embankment to the floor and include the floor. The outside 3.5H:1V slope of the embankment will be soil covered with vegetative slope protection.

2.6 DESIGN OF THE ENERGY DISSIPATOR STRUCTURES

An energy dissipation structure is not required for the discharge from the primary to secondary ponds. The invert of the discharge pipe from the primary pond is at the normal water surface elevation of the secondary pond. In addition, each pond is lined with a 60-mil HDPE liner; therefore erosion is not an issue. An energy dissipation structure is not required for the discharge from the secondary east ash pond since it is piped directly into an existing 72-inch diameter CMP culvert which carries the current ash pond discharge ditch under an existing R/R track. The culvert is approximately 150 feet long and discharges to standing water on the other side of the R/R tracks. The existing ditch, embankment and outlet of the 60-inch CMP are lined with 100-lb riprap.

2.7 DAM BREACH WAVE ANALYSIS

Based on a direction given during a preliminary project meeting with the IDNR, we understood that a simple "bathtub" dam-breach analysis would be appropriate for this site. The analyses were performed by applying the volume of water in the pond to the land outside of the ponds to the limits that would contain that volume. Hence, the land around the ponds acts like a "bathtub" holding the water. This analysis shows the water would rise outside the pond to approximately El. 431.1 for the "sunny day" analysis and El. 431.6 for a dam-breach during the PMF. The dam-breach was performed using a three-dimensional computer model, Geo-pack, to determine storage inside and outside the new primary east ash pond. We used a maximum operating pool level of El. 450, with no fly ash in the pond, corresponding to a volume of 410 acre-feet (134 MG) for the "sunny day" analysis. For conditions during the PMF, we used a pool level of El. 451.49 corresponding to a volume of 453 acre-feet (148 MG). The dam breach inundation map can be found in Figure 2.

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In addition, the following parameters were used:

- The culvert under the new railroad tracks would allow the water to freely flow to the north side of the tracks.
- There are culverts under the north-south running R/R tracks on the west side of Chessen Lane which would allow flow to the west into the active pond area. Significant storage volume in that area would reduce the footprint of the flood inundation. However, it was assumed for worst-case analysis that water would not back-flow through these culverts.
- Topography was not available for the new railroad tracks that run east west along the north side of the new ponds.

A summary of the dam breach inundation follows:

- The bulk of the water will spread to the North and West of the ponds. The north limit will be the railroad tracks on the north side of the wastewater treatment plant. The wastewater treatment plant is approximately at elevation 425 feet. There is a berm around the plant with a crest that varies from 430 feet to 431 feet. It could limit the flooding, but is unlikely that it would completely prevent water from entering the treatment plant in the event of a dam breach.
- There are abandoned industrial buildings (formerly BOC gases, now owned by Dynegy) located on a "ridge" at El. 432 to 433 feet just north of the ponds. Some smaller tanks and trailers located at the back of the buildings are at El. 427. Some of these tanks and trailers could be surrounded and possibly inundated.
- Water will spread out on the west side of the pond from the toe of the existing pond berm to the multiple railroad track lines, running north-south on the west side of the fuel tanks, which are approximately at elevation 432 feet. The fuel tanks would be surrounded with water since they are at an elevation of 421 feet. The berm around the fuel tanks is at elevation 430 feet.
- The water would spread along the west side to the south to the low area just to the north of the sub-station and Dynegy power plant. The sub-station and plant are at elevation 433 feet and elevation 434, respectively and should not be affected.

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3.1 GEOTECHNICAL INVESTIGATIONS

This section describes the geotechnical field and laboratory investigation at the site, as well as briefly describes previous investigations performed at the site.

3.1.1 Previous and other Geotechnical Investigations

A geotechnical investigation and recommendations report for a new railway loop which runs along the east and north sides of the existing and proposed east ash pond expansion was prepared by Shively Geotechnical, Inc. in 2003. Twenty-eight (28) borings were advanced in and around the existing east pond area. We used data from 13 of these borings (those very near and within the existing east pond) to supplement this geotechnical investigation.

In addition, we used information from five (5) borings advanced as part of the hydrogeologic investigation and monitoring well installation by Kelron Environmental in 2004.

The boring locations are shown on Sheet P-02 of the Drawings. Detailed boring logs are attached in Appendix A. Summary boring logs presented as cross sections are shown on Sheet D-8 and D-9 of the Drawings.

3.1.2 URS Field Investigation

URS' field investigation consisted of drilling and sampling eight (8) test borings within the existing east ash pond berms and ash disposal area. URS subcontracted with Harriss Drilling Services, Inc. to drill the test borings in 2004 using a CME 45 ATV drill rig. The borings were advanced through surficial materials using hollow stem augers. After a depth of 10 to 15 feet, rotary wash techniques (using bentonite drilling mud) were used to advance the borings. Soil samples were obtained using either a split spoon sampler in conjunction with standard penetration tests (SPT; ASTM D1586) or a 3-inch O.D. thin-walled Shelby tube (ASTM D1587). The boring locations are shown on Sheet P-02 of the Drawings. Detailed boring logs are attached in Appendix A. Summary boring logs presented as cross sections are shown on Sheet D-8 and D-9 of the Drawings.

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In addition to the geotechnical borings, URS subcontracted Kleinfelder, Inc. to perform nine (9) piezocone penetration tests (CPTs). The CPT soundings were performed in accordance with ASTM D5778 using a wireless piezocone penetrometer hydraulically advanced with a CME 45 ATV drill rig. URS utilized the results of the CPT tests to better define subsurface stratigraphy, as well as engineering properties of the various materials. The CPT locations are shown on Sheet P-02 of the Drawings. Detailed CPT logs are attached in Appendix A.

3.1.3 URS Laboratory Testing

URS performed laboratory testing on selected samples of soil and fly ash recovered during the field investigation. The laboratory tests were used to characterize the subsurface materials and to provide engineering parameters for design. Undisturbed and disturbed soil samples were obtained from the geotechnical investigation. The laboratory-testing program consisted of the following tests:

- Water Content
- Atterberg Limits
- Grain Size Analysis
- Unconfined Compress (UC)
- Unconsolidated Undrained Triaxial (UU)
- Consolidated Undrained Triaxial with Pore Pressure Measurements (CU bar)
- Standard Proctor (ASTM D698)
- Direct Shear
- One Dimensional Consolidation
- Constant Head Permeability (ASTM D 5084, ASTM D 2435)

Shear strength of foundation and embankment soil materials were tested in accordance with IDNR Geotechnical Investigation Procedural Guidelines. Appendix B provides the results of the laboratory testing.

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3.2 SUBSURFACE CONDITIONS

Using the previous and recently completed borings, we identified 4 primary strata (including fly ash and bottom ash fill, clay, sand, and limestone bedrock) at the site. The following sections summarize the subsurface materials encountered at the site. Detailed boring logs are provided in Appendix A. Laboratory test results for samples obtained from the borings are provided in Appendix B. Graphic boring logs presented as cross sections are shown on Sheets D-9 and D-9 of the Drawings.

3.2.1 Fly Ash and Bottom Ash Fill

Within the area of the existing east ash pond, we encountered 15 to 25 feet of fly ash and bottom ash fill. Generally, this material is desiccated at the surface and typically is loose to medium dense to a depth of 3 to 5 ft. Below the desiccated layer, the ash becomes very loose to loose. SPT blow counts in this material range from 16 in medium dense material to 0 (i.e. weight of hammer) in the very loose material at depth. Water contents vary from 15% near the surface to 50% with depth (below groundwater). The fly ash and bottom ash tested in the laboratory was classified as ML to SM (silt to silty sand).

3.2.2 Clay

Underlying the fly ash and bottom ash fill is a layer of gray, very soft to medium stiff, low to high plasticity clay. The majority of clay is very soft to soft. The clay was deposited in an alluvial environment and varies in thickness from about 10 to 50 feet. SPT blow counts range from 0 (i.e., weight of hammer) to 10. Unconfined compression (UC) and Unconfined-Unconsolidated (UU) tests indicated undrained shear strengths of 600 to 1100 psf, averaging about 800 psf. Water contents ranged from 23% to 56% (averaging about 26%), liquid limits from 28 to 90, and plasticity indices from 15 to 26. Total unit weights ranged from 103 to 113 pcf. As indicated by the Atterberg Limits, the clay was classified as CL to CH.

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3.2.3 Sand

A layer of gray, loose to dense, fine to medium grained silty sand to sand underlies the clay. SPT blow counts in the sand layer range from 9 to 47 with average of 25. Particle size analysis indicated that the sand be classified as SP to SP-SM (Sand to Silty Sand) according to USCS. This sand continues to limestone bedrock which while not sampled, was indicated at about 120 ft below the ground surface in the area.

3.2.4 Groundwater

Groundwater was encountered in 4 borings at about 5 feet below the surface of the ash (El. 430) within the existing pond area at the time of drilling. We believe the groundwater levels inside the dikes of the existing pond to be artificially high or "perched" due to the relatively high permeability of the ash and lack of drainage within the bermed area. Outside the existing pond, groundwater was encountered in five Kelron Environmental borings at about El. 410. This is more likely the true groundwater level in the area.

3.3 STRUCTURAL STABILITY

3.3.1 Pond Geometry

A number of surrounding features controlled the geometry and size of the proposed pond expansion. Most notably of these constraints is a roadway alignment to the west, flood control embankment to the east, and power distribution lines long the northern eastern and southern portions of the site. Hence, the outer toe was positioned with a 50 ft offset from all constraints. And the berm height was limited to EL 453. A 3.5:1 gradient was used for the outer embankment slopes, while a 3:1 gradient was used for inner embankment slopes along with a 20ft wide crest on the primary pond. The embankment design also includes the at "finger berm" to provide access to power distribution towers located within the existing and proposed pond area. This finger berm has the same slope and offset configuration as the main embankment. The secondary pond was laid out with the same offset from constraints and same slope configuration.

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3.3.2 Slope Stability

Slope stability analysis was conducted on three sections (for calculation purposes, embankment #1, #2, and #3) of the proposed pond expansion using the Geostudio 2004 computer programs (Slope/W and Seep/W modules). The factors of safety values were calculated using Spencer's method of slices. Both static and pseudo-static stability conditions were investigated.

Cross-sections were developed to model the subsurface variation in subsurface conditions across the site. A relatively thin layer of fly ash and thick layer of clay underlie embankment #1 in the Northeastern Section of the proposed berm. In contrast, a relatively thick layer of fly ash and a thin layer of clay underlie Embankment #2 in the Southwestern Section of the proposed berm. The Northwestern Section (Embankment #3) of the proposed berm is located in the area of the old polishing pond. The material in this area is believed to be unsuitable for the berm foundation and is proposed to be removed. Hence, the Northwestern section is modeled with no fly ash under the berm. Four static stress states were modeled for each berm cross section. These scenarios include

a) End of Construction
b) Full Reservoir
c) During operation with 5ft of fly ash
d) During operation with 10ft of fly ash.

Additionally, pseudo-static seismic analyses were run on typical cross-sections, using a variety of different outside slopes to determine the proper slope needed for the desired factor of safety.

Soil properties were estimated using soil boring and piezocone sounding data. All soils strengths were defined by the Mohr-Coulomb strength model. Interface between geomembrane and soil was not included in either static or pseudo-seismic analysis since the geomembrane will be at the surface and will not affect stability. The phreatic surface (or groundwater level) varies in the sections depending on the modeling scenario. The phreatic surface for the end of construction model is located at El 430 or 5 ft below ground surface. The Seep/W computer program was utilized to generate the phreatic surface in the three other stress state models.

Soil Properties Summary				
Soil	Unit Weight	Cohesion	Friction Angle	Permeability

	pcf	psf		cm/s
Fly Ash, Type C (Hardened)	105	3000	20	1.0E-07
Fly Ash, Compacted	85	100	30	2.0E-04
Clay Liner	95	230	19	1.0E-07
Fly Ash, in-situ	75	100	30	2.0E-04
Drainage Blanket	85	25	30	1.8E-03
Natural Clay	115	Varies with Depth	0	1.00E-07

Slope/W was used to evaluate the slope stability of each stress state model using the parameters above. Theses calculations are based on the worst-case conditions. By showing these cases meet the slope stability safety requirements, it can be concluded that all other slope conditions have an adequate factor of safety. The Illinois Department of Natural Resources, Division of Water Resources requirement for minimum safety factors are: End of Construction equal to 1.3, Rapid Drawdown equal to 1.2, Steady State Seepage equal to 1.5. The following are the minimum safety factors, for each static loading scenario.

Summary of Slope Stability Analysis		
Scenario	Slope	FS
10ft of fly ash in pond	inside	2.3 to 15.7
10ft of fly ash in pond	outside	2.0 to 2.0
5ft of fly ash in pond	inside	2.0 to 4.6
5ft of fly ash in pond	outside	2.0 to 2.2
After construction	inside	1.8 to 3.0
After construction	outside	2.0 to 3.3
Full reservoir	outside	2.0

Seismic stability analysis of a typical berm cross-section was conducted. Subsurface conditions were evaluated using Olson and Stark (2002 and 2003) and Seed and Harder (1990) in conjunction with correlated in-situ soil properties. A probability of 10% of exceedance in 50 yrs was used in determining dynamic soil properties.

According to ASCE 7-02 design code, the following design criteria were developed.

- Site Class D
- $F_a = 1.6$

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- $S_s = 0.181g$
- $S_{ms} = 0.289g$
- pga = 0.116g.

Normalizing SPT blow counts for typical in-situ fly ash and using Olson and Stark (2003); cohensionless soils are susceptible to liquefaction regardless of confinement. As a result liquefaction of the fly ash is assumed to occur. Stability analyses were performed using the liquefied shear strength available in in-situ fly ash. The table below summarizes the seismic slope stability cases for the berm as designed.

Summary of Pseudo-Static Loading Analysis

Scenario	Direction of Sliding	D/S Slope Angle	Elev. of Water in Pond	Elev. of Fly Ash in Pond	Seismic Coefficient	FS
Full Liquefaction	D/S	3.5H:1V	452	N/A	-	0.99
Full Liquefaction	D/S	3.5:1V	452	452	-	1.04

Calculations including graphical computer solutions to each of the above scenarios are included in Appendix C of this report. The results show that the facility can safely be constructed as proposed.

3.3.3 Settlement

Settlement analyses were conducted on three sections of the proposed pond expansion. Subsurface cross-sections were developed from boring logs and piezocone soundings. Three section profiles were chosen to model the variation in subsurface conditions at the site. Embankment #1 consists of a thin layer of fly ash underlain by a thick layer of clay. Embankment #2 consists of thick layer of fly ash underlain by a thin layer of clay. Embankment #3 consists of average fly ash and clay thickness encountered. Soil properties were estimated using soil boring data and empirical correlations from piezocone dispersion test. One dimensional settlement analyses were used to determine settlement of foundation materials. Maximum total settlement was estimated to be between 9 and 14 inches underneath the berm center for the three cross-sections. It is anticipated that approximately 8 to 12 inches of the total maximum settlement will occur during construction of the berms. Settlement calculations are located in Appendix C.

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3.4 SEEPAGE

Seepage analysis was conducted on three cross-sections of the proposed pond facility expansion. Each cross-section was analyzed for internal erosion and seepage using the GeoStudio 2004,Version 6.11 computer program (Seep\W module) in combination with manual calculations. The following is a summary of our seepage analysis. Individual computer-generated flow diagrams and manual calculations are located in Appendix C.

Cross-sections were developed in conjunction with stability analyses to model the subsurface variation across the site. Three sections were identified as critical points of interest: Embankment #1- Northeastern Section, Embankment #2 - Southwestern Section, and Embankment #3 - Northwestern Section. The cross-sections were modeled using six hydrologic units; (Hardened) Type C Fly ash, Compacted Clay Liner, Compacted fly ash, In situ Fly ash, Blanket Drain, and Natural Clay.

Table 1: Soil Hydraulic Conductivities

Soil	Permeability cm/s
Fly Ash, Type C (Hardened)	1.0E-07
Fly Ash, Compacted	2.0E-04
Compacted Clay Liner	1.0E-07
Fly Ash, in-situ	2.0E-04
Drainage Blanket	1.8E-03
Natural Clay	1.0E-07

Soil properties were determined using soil boring and piezocone sounding data, laboratory testing, empirical correlations, and design specifications. [NOTE: A geomembrane is specified on the inside (upstream) slope face in the Embankment Specifications. This layer was not included in the seepage analysis thus providing significantly more conservative results.)

Seepage analysis was conducted on three different embankment operational stages. These stages were A) Full Reservoir, B) During Operation with 5ft of fly ash, and C) During Operation with 10ft of fly ash. While the Full Reservoir scenario is not very probable during normal operation of the

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facility (water will be generally maintained at 5 ft above the ash), that scenario provides an upper limit benchmark to the analysis (i.e. worst case scenario).

The seepage lines for the three models indicated above were generated by the Seep/W module of GeoStudio 2004. The generated seepage surfaces vary depending on the modeling scenario (i.e. height of impounded water, thickness of impounded fly ash, etc.). Based on the computer-generated flow diagrams, seepage within the embankment is adequately controlled by the compacted clay liner. Seepage of the embankment is further controlled by placement of a drainage blanket along 1/3 of the downstream embankment base. The addition of the geomembrane will further reduce the amount of seepage through the embankment. As a result, in our opinion, all seepage results are inherently conservative, but nonetheless controlled.

3.5 INTERNAL EROSION

A potential failure mode of an earth embankment is piping. As a result, filter design analysis was conducted on the embankment materials in accordance with USCOE EM 1110-2-2300 (Design of Earth Dams) to ensure the internal erosion stability was suitable. The primary area of interest was the interface between the embankment (compacted fly ash) and the drainage blanket (bottom ash). These materials were determined to be compatible and not at risk for internal erosion. Further details of the internal erosion calculations can be found in the Appendix C.

3.6 CONDUITS

All conduits through the embankments will be solid wall, fully welded, HDPE pipe suitable for and designed for the pressure and loading conditions. Calculations for sizing and loading on the pipe are included in Appendix C.

3.7 CONCRETE DAMS AND STRUCTURES

There will be no concrete dams or structures appurtenant to embankment dams on this project.

3.8 CONCRETE DESIGN

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The concrete structures associated with the ponds include the outfall structures at each pond and the foundations for the outfall walkway structures (see Steel Design, below). The outfall structures will be pre-cast manhole reinforced concrete structures designed by the vendor using the working stress method in accordance with American Concrete Institute (ACI) 318 "Building Code Requirements for Reinforced Concrete." The requirements for the design are listed in the Specifications for Manholes including soil loading and water levels and allowable bearing capacities of the surrounding materials. The foundations for the outfall walkway structures calculations are included with the Steel and Concrete Reinforcing Design calculations for the walkway structure in Appendix C. All reinforced concrete design utilized a 28-day concrete strength of 3,500 psi.

3.9 STEEL DESIGN

The only steel structures associated with the ponds are walkway structures at each pond outfall. These structures will provide maintenance access to the outfall structures, however are independent of outfalls themselves. These steel structures were designed in accordance with the 9th Edition of American Institute of Steel Construction (AISC) specifications (latest Allowable Stress Design method). In addition, concrete foundations to support the structure were designed in accordance with the American Concrete Institute (ACI) 318 "Building Code Requirements for Reinforced Concrete." utilizing a 28-day concrete strength of 3,500 psi as listed in the Specifications for Concrete. The calculations are included in Appendix C.

3.10 SPILLWAYS AND ENERGY DISSIPATORS

As discussed in the Hydrologic and Hydraulic Investigation section above, no spillway will be required for the ponds in addition to the outfall structures. Energy dissipation for these structures is also discussed above in Hydrologic Investigation section above.

3.11 FILTERS AND DRAINS

As discussed in Seepage, above, a filter analysis was completed for the blanket drain (bottom ash is filter compatible with fly ash). Calculations are included in Appendix C.

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3.12 GEOSYNTHETICS

Geotextile filter fabric will be required beneath the riprap at the discharge of a small culvert to the ditch along the toe of the west berm. The culvert will drain the infield area on the west side of the pond. The filter fabric will serve as a separator between the clay soil and gravel bedding. The filter fabric will probably become clogged by clay; therefore, the hydraulic conductivity of the fabric will become essentially the same as the clay. Little drainage will occur across the filter fabric. At the end of the bottom ash blanket drain, a non-woven, needle-punched, polypropylene filter geotextile will be installed to separate the bottom ash from IDOT CA-1 crushed gravel. Geomembrane (60-mil HDPE) liner will be required on the inside slopes and bottom of the pond. While it is anticipated that this liner will be relatively impervious making seepage a non-issue, and calculations for stability and seepage assumed it was not in place, relying solely on the 1 1/2 ft thick clay liner.

3.13 RIP RAP

Rip Rap will be required at the discharge of a small culvert to the ditch along the toe of the west berm. The culvert will drain the infield area on the west side of the pond.

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EAST ASH POND EXPANSION
SITE LOCATION MAP
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0482
PREPARED BY:
MISSISSIPPI RIVER
DYNEGY WOOD RIVER POWER STATION
WOOD RIVER POWER PLANT
EAST ASH POND EXPANSION
PRIMARY POND
SECONDARY POND
EXISTING ASH POND NO. 1
EXISTING ASH POND NO. 2
CHESSEN LANE
WOOD RIVER WASTEWATER TREATMENT PLANT
600'
N

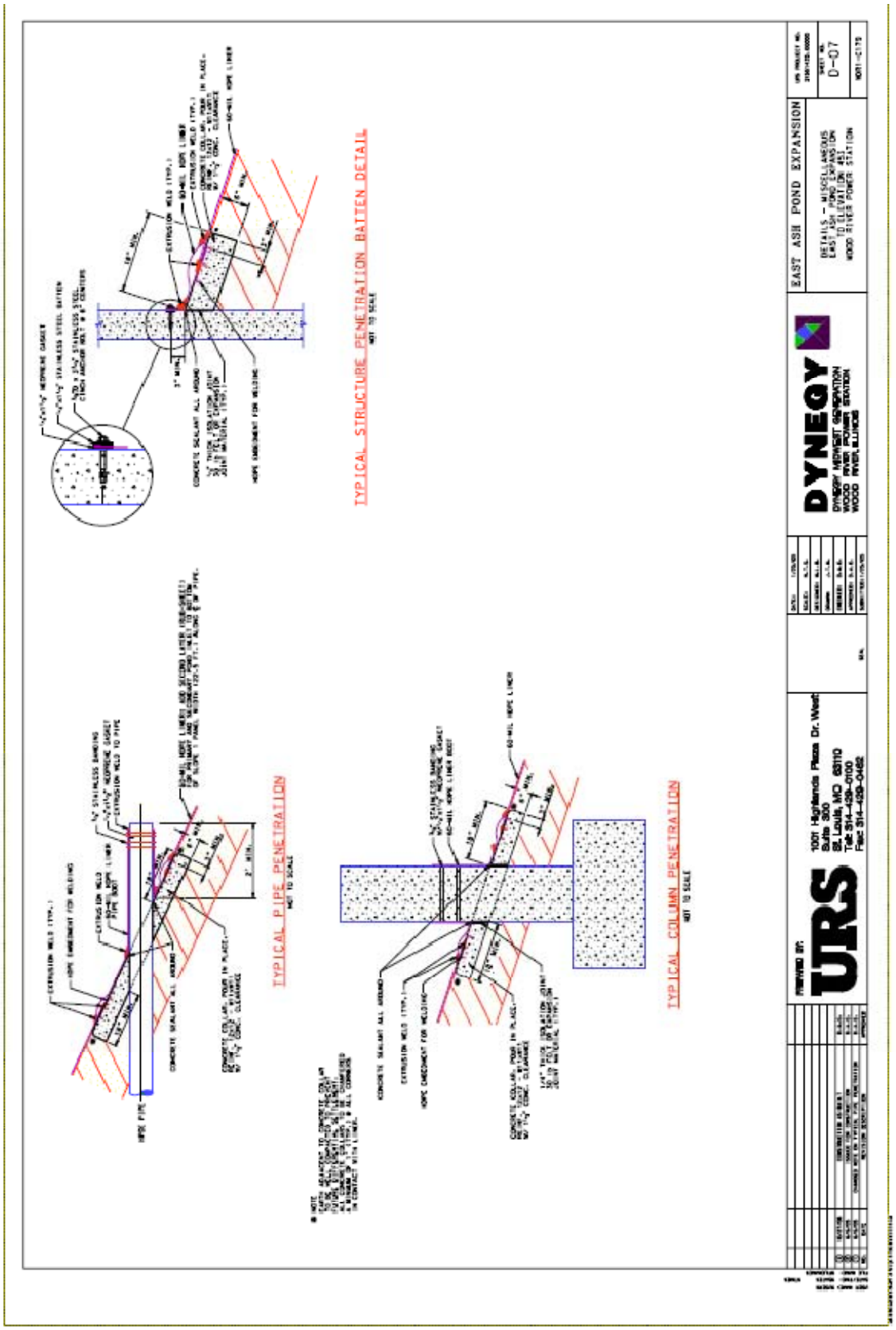
WR 133

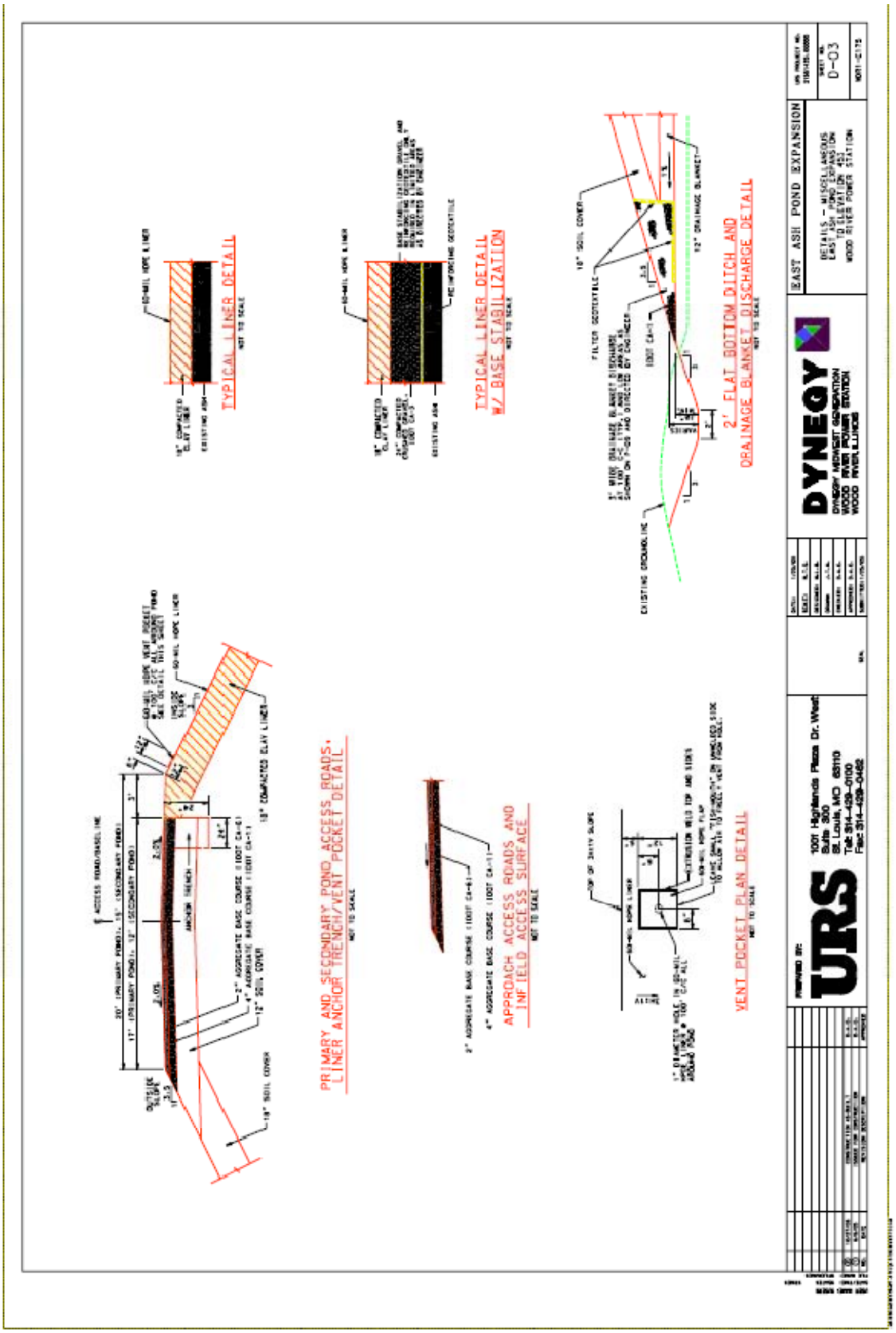
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CWR 134

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TYPICAL STRUCTURE PENETRATION BATTEN DETAIL
NOT TO SCALE
TYPICAL PIPE PENETRATION
NOT TO SCALE
TYPICAL COLUMN PENETRATION
NOT TO SCALE
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
DYNEGY
DYNEGY MIDWEST GENERATION
EAST ASH POND EXPANSION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
EAST ASH POND EXPANSION
DETAILS - MISCELLANEOUS
EAST ASH POND EXPANSION
WOOD RIVER POWER STATION
D-07


TYPICAL LINER DETAIL
TYPICAL LINER DETAIL
W/ BASE STABILIZATION
2' FLAT BOTTOM DITCH AND
DRAINAGE BLANKET DISCHARGE DETAIL
PRIMARY AND SECONDARY POND ACCESS ROADS,
LINER ANCHOR TRENCH/VENT POCKET DETAIL
APPROACH ACCESS ROADS AND
INFIELD ACCESS SURFACE
VENT POCKET PLAN DETAIL
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
EAST ASH POND EXPANSION
DETAILS - MISCELLANEOUS
EAST ASH POND EXPANSION
DJ ELEVATION 452
WOOD RIVER POWER STATION
D-03

DRAFT

INTRODUCTION

This report summarizes the geotechnical, structural, hydrologic and hydraulic analyses for the construction of a lined ash disposal surface impoundment at the Wood River Power Station. The new facility will be constructed to supply at least 4 years of ash disposal capacity. The facility will have a primary cell to collect the ash, and one polishing pond to clarify the effluent. The primary cell will have a maximum storage capacity of 265 acre-feet. The elevation of the top of the impounding embankment will be at 430.0 msl. The minimum bottom elevation of the reservoir will be at 412.0 msl.

The system will be constructed in the same location as part of the existing ash impoundment at Wood River. The new two-pond system will be in the portion of the existing system that is NOT where the 1993 extension was installed. The system will be constructed in two phases. Phase I will be the installation of the lined system in the finishing pond (current location of ponds #3 and #4). Phase II will consist of reclaiming the ash out of pond #2, then shaping and lining that pond. (Note that for purposes of clarity, we refer the pond extension constructed in 1993 to elevation 445.0 as pond #1, the existing three-pond system will therefore be referred to as ponds #2, #3 and #4). The new design will have ponds #3 and #4 becoming one pond. This new pond will be called new pond #3, but descriptions of its location will differentiate between pond #3 and pond #4 (see sketches next two pages for existing and new pond numbering conventions). The embankments on all cells will be raised three feet to facilitate the installation of the new liner, and in the worst case location, the dikes will be completely above the adjacent ground (NW corner of the facility).

Construction will consist of shaping the pond dikes and bottom, and installing a liner, which includes a leachate collection system (LCS). The LCS on the bottom of the ponds will consist of a two foot base of clay, an eight inch rock drainage layer, and a one foot clay cutoff layer. The side slopes will have a geonet drainage system in lieu of the rock drainage layer. This system will be used for the primary pond, as well as the two finishing ponds. Two pumping stations will be used to pump the collected leachate back up into the ponds. The first one will be used for approximately one-half of the primary pond (located in the NW portion of pond #2), and the second to collect from the other half of the primary pond, as well as the polishing pond (located in the SW portion of pond #4). The completed facility with all components including the existing base material, the embankments and the leachate collection system was used in the geotechnical and structural analysis.

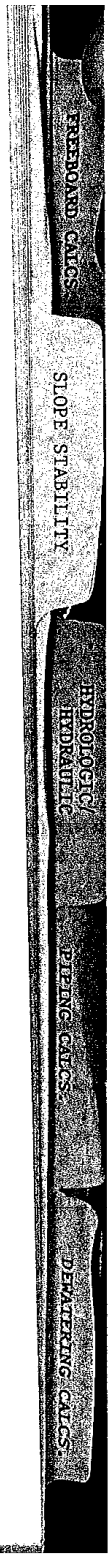
This report includes the following items:

- Soil reports for on-site material and proposed borrow materials
- Slope stability analysis using Spencer's method of slices
- Hydrologic/Hydraulic calculations
- Calculations of discharge piping
- Dewatering calculations
- Freeboard calculations
- Energy dissipation calculations for the final discharge and slopes.
- Concrete and steel calculations for the inlet and discharge structures.
- Leachate collection system calculations, including pumping stations.
- USGS Map of the project site and surrounding area

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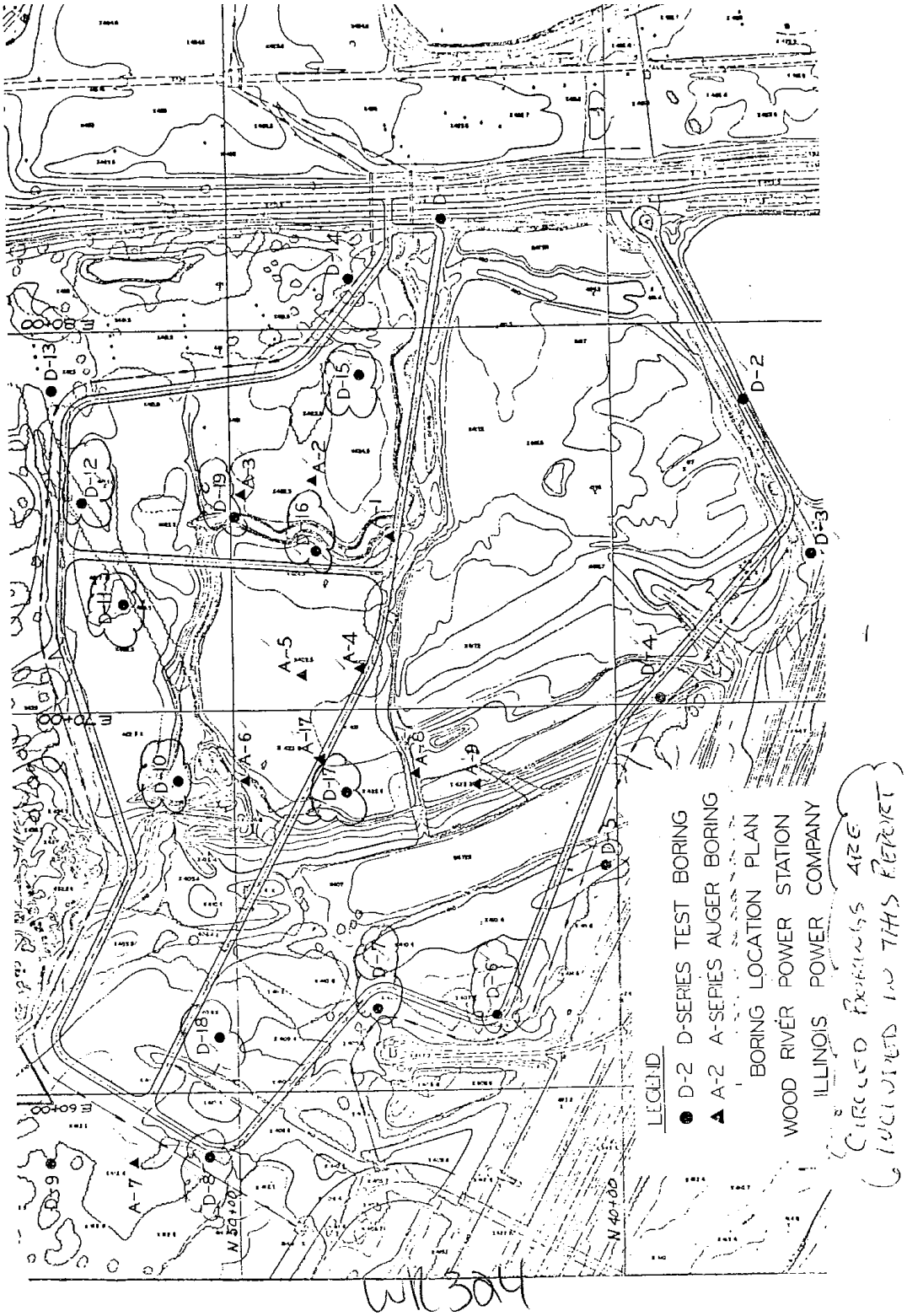
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Soil Reports

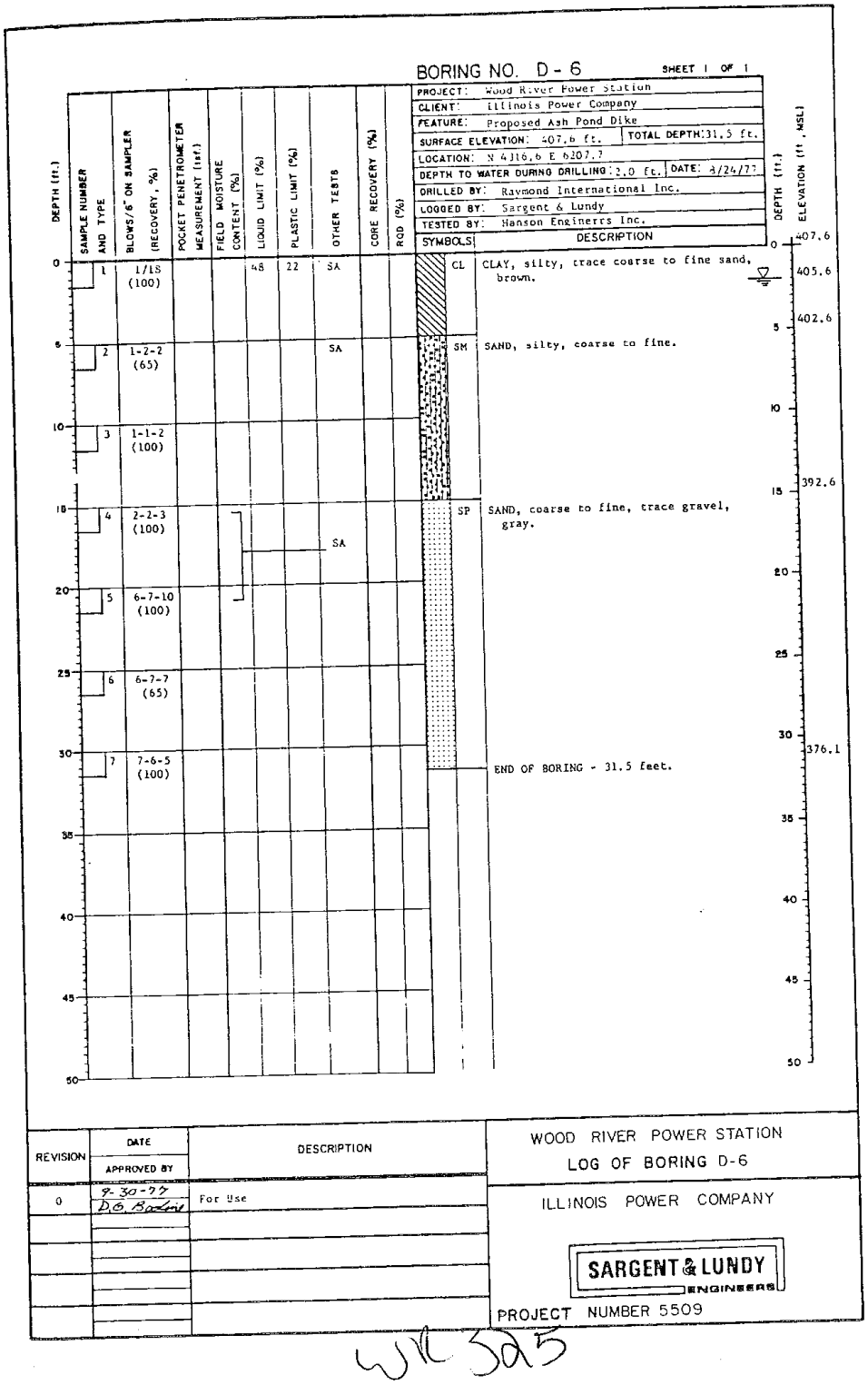


WR 323

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LEGEND
D-2 D-SERIES TEST BORING
A-2 A-SERIES AUGER BORING
BORING LOCATION PLAN
WOOD RIVER POWER STATION
ILLINOIS POWER COMPANY
E 80+00
E 70+00
E 60+00
N 50+00
N 40+00
D-1
D-2
D-3
D-4
D-5
D-6
D-7
D-8
D-9
D-10
D-11
D-12
D-13
D-14
D-15
D-16
D-17
D-18
D-19
A-1
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9

DRAFT



BORING NO. D - 6 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	407.6 ft.
TOTAL DEPTH:	31.5 ft.
LOCATION:	N 4316.6 E 6207.7
DEPTH TO WATER DURING DRILLING:	2.0 ft.
DATE:	8/24/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	SYMBOLS	DESCRIPTION
1	1/1S (100)	CL	CLAY, silty, trace coarse to fine sand, brown.
2	1-2-2 (65)	SM	SAND, silty, coarse to fine.
3	1-1-2 (100)		
4	2-2-3 (100)	SP	SAND, coarse to fine, trace gravel, gray.
5	6-7-10 (100)		
6	6-7-7 (65)		
7	7-6-5 (100)		END OF BORING - 31.5 feet.

POCKET PENETROMETER MEASUREMENT (tsf.) | FIELD MOISTURE CONTENT (%) | LIQUID LIMIT (%): 48 | PLASTIC LIMIT (%): 22 | OTHER TESTS: SA | CORE RECOVERY (%) | RQD (%)

DEPTH (ft.): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

DEPTH (ft.) / ELEVATION (ft., MSL): 0 / 407.6; 5 / 402.6; 10; 15 / 392.6; 20; 25; 30 / 376.1; 35; 40; 45; 50

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 D.O. Bakini	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-6

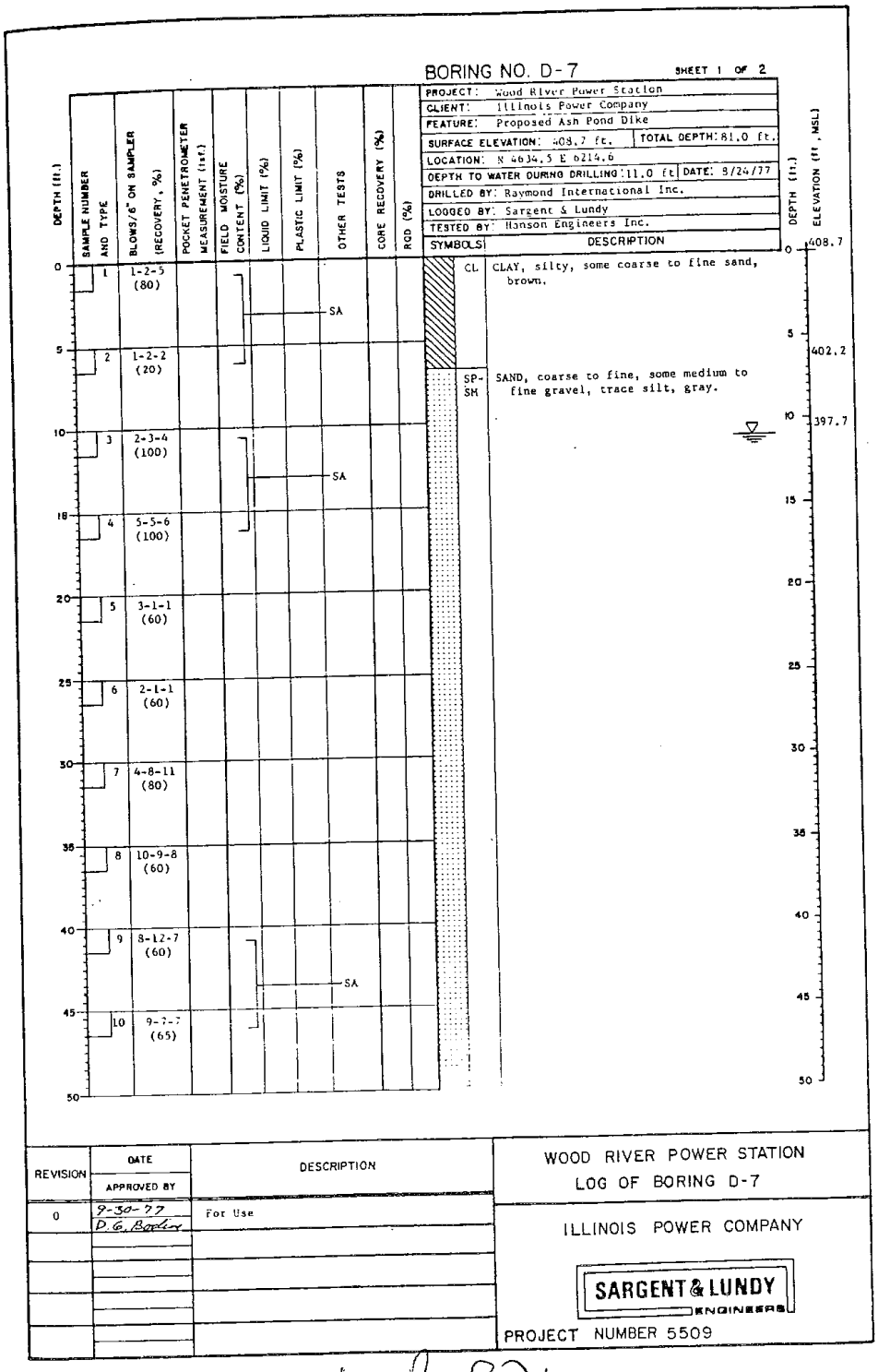
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 325

DRAFT



BORING NO. D-7 SHEET 1 OF 2

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 408.7 ft. TOTAL DEPTH: 81.0 ft.
LOCATION: N 4634.5 E 6214.6
DEPTH TO WATER DURING DRILLING: 11.0 ft DATE: 8/24/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION
0	1	1-2-5 (80)					SA			CL	CLAY, silty, some coarse to fine sand, brown.
5	2	1-2-2 (20)								SP-SM	SAND, coarse to fine, some medium to fine gravel, trace silt, gray.
10	3	2-3-4 (100)					SA				
15	4	5-5-6 (100)									
20	5	3-1-1 (60)									
25	6	2-1-1 (60)									
30	7	4-8-11 (80)									
35	8	10-9-8 (60)									
40	9	8-12-7 (60)					SA				
45	10	9-7-7 (65)									
50											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	408.7
5	402.2
10	397.7
15	
20	
25	
30	
35	
40	
45	
50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 / D.G. Bailey	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

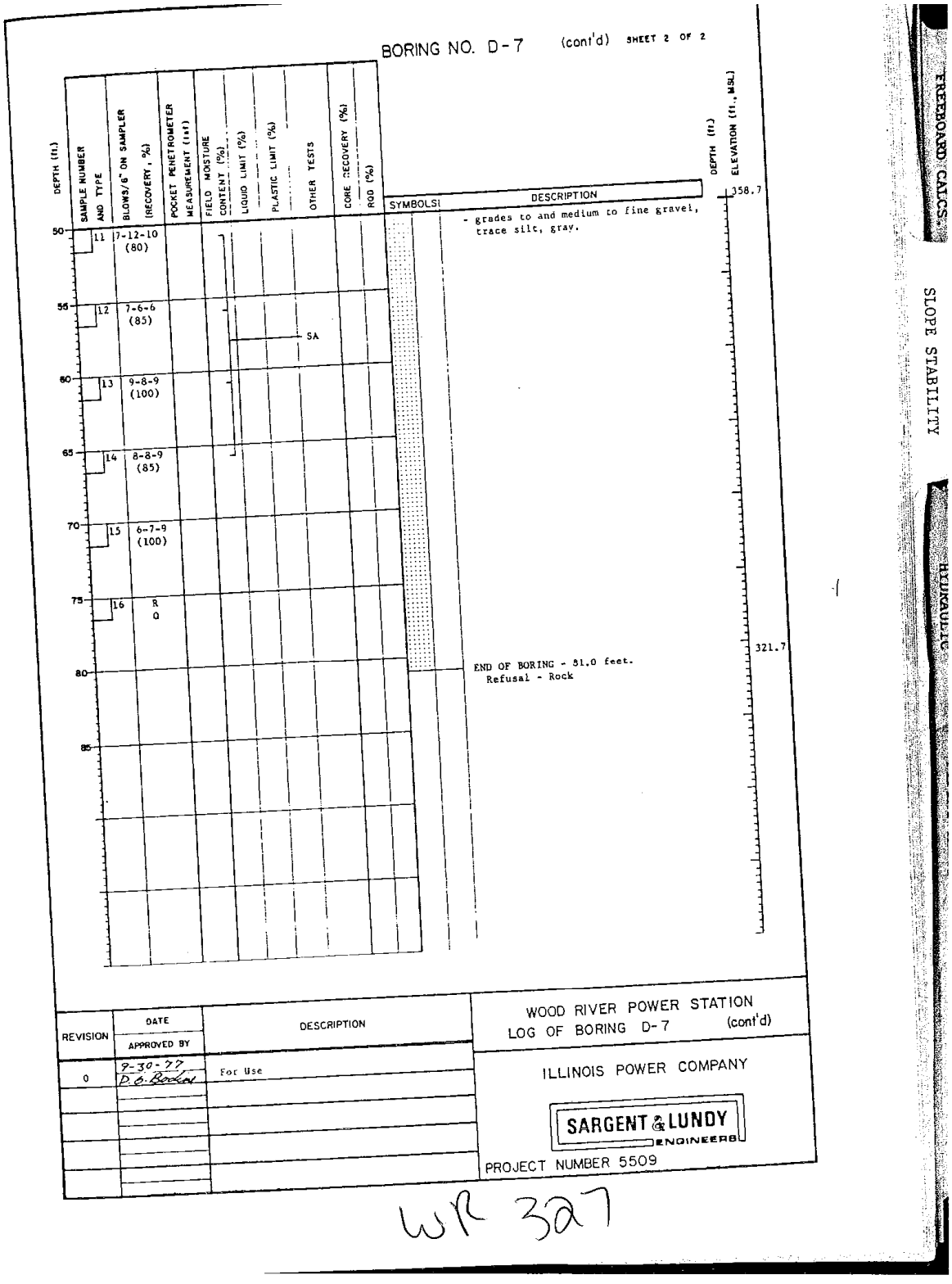
PROJECT NUMBER 5509

WR 326

SLOPE STABILITY

DEWATERING CALCS.

DRAFT



BORING NO. D-7 (cont'd) SHEET 2 OF 2

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
50	11	7-12-10 (80)									- grades to and medium to fine gravel, trace silt, gray.		358.7
55	12	7-6-6 (85)					SA						
60	13	9-8-9 (100)											
65	14	8-8-9 (85)											
70	15	6-7-9 (100)											
75	16	R 0											
80											END OF BORING - 81.0 feet. Refusal - Rock		321.7
85													

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 / D.S. Rockel	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-7 (cont'd)

ILLINOIS POWER COMPANY

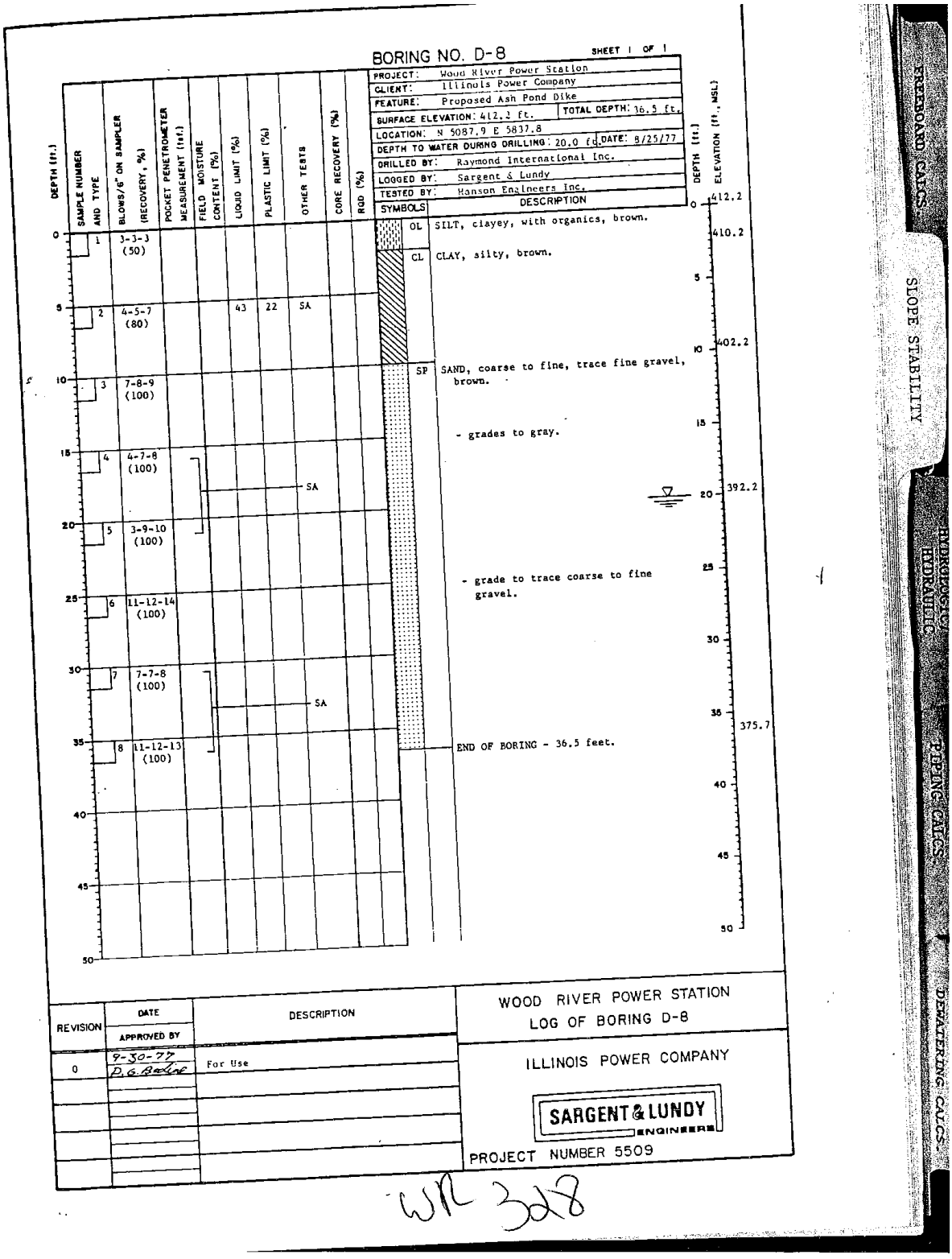
SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 327

FREEBOARD CALCS.
SLOPE STABILITY
HYDRAULIC

DRAFT



BORING NO. D-8 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 412.2 ft. TOTAL DEPTH: 36.5 ft.
LOCATION: N 5087.9 E 5837.8 DATE: 8/25/77
DEPTH TO WATER DURING DRILLING: 20.0 ft.
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-3-3 (50)								OL	SILT, clayey, with organics, brown.	0	412.2
5	2	4-5-7 (80)			43	22	SA			CL	CLAY, silty, brown.	5	410.2
10	3	7-8-9 (100)								SP	SAND, coarse to fine, trace fine gravel, brown.	10	402.2
15	4	4-7-8 (100)					SA				- grades to gray.	15	
20	5	3-9-10 (100)										20	392.2
25	6	11-12-14 (100)									- grade to trace coarse to fine gravel.	25	
30	7	7-7-8 (100)					SA					30	
35	8	11-12-13 (100)									END OF BORING - 36.5 feet.	35	375.7
40												40	
45												45	
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	9-30-77 P.G.Bedi	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-8

ILLINOIS POWER COMPANY

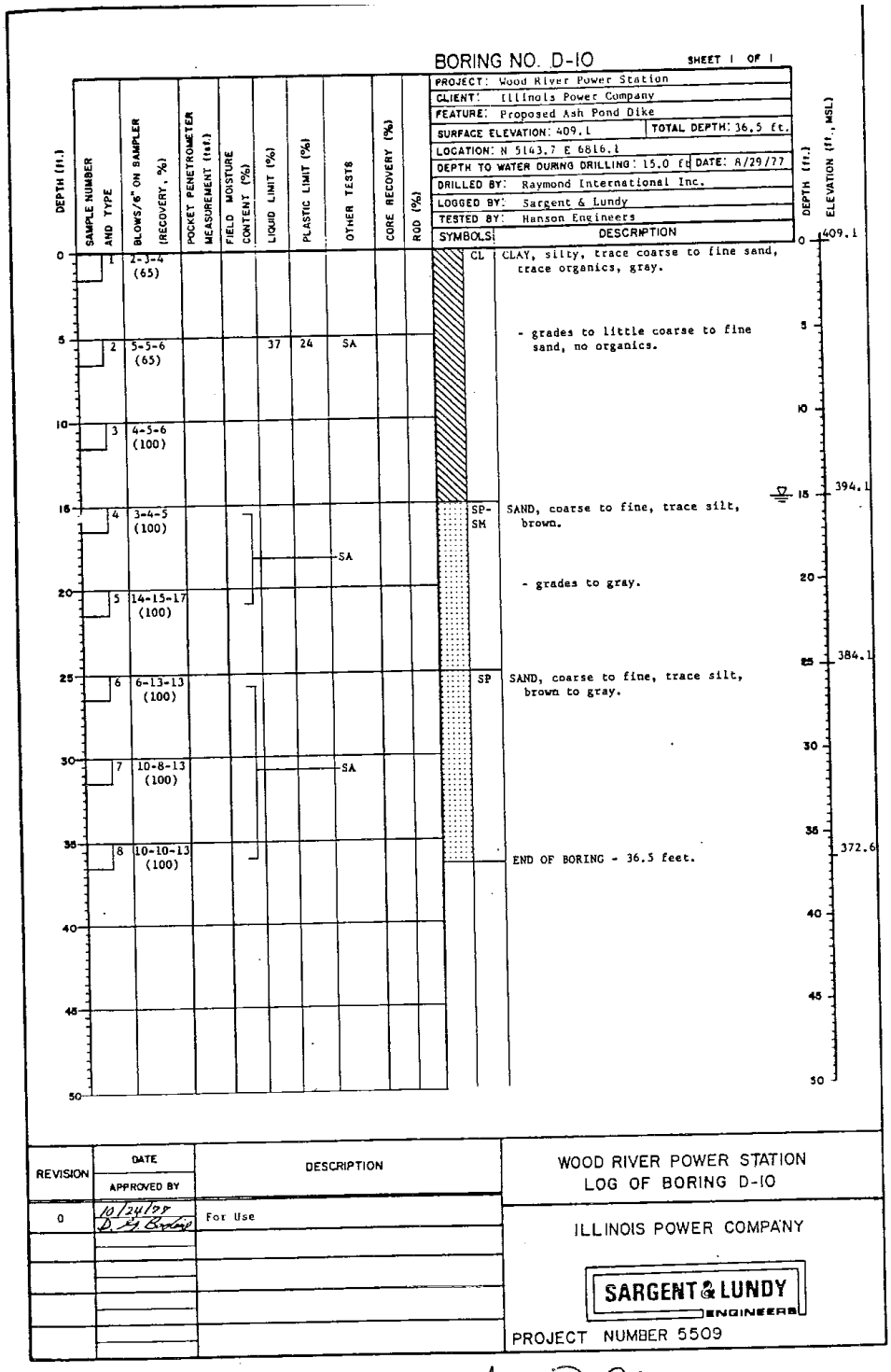
SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 328

FREEBOARD CALCS.
SLOPE STABILITY
HYDROLOGY/HYDRAULICS
PIPING CALCS.
DEWATERING CALCS.

DRAFT



BORING NO. D-10 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 409.1 TOTAL DEPTH: 36.5 ft.
LOCATION: N 5143.7 E 6816.1
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 8/29/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	2-3-4 (65)								CL	CLAY, silty, trace coarse to fine sand, trace organics, gray.	0	409.1
5	2	5-5-6 (65)			37	24	SA				- grades to little coarse to fine sand, no organics.	5	
10	3	4-5-6 (100)										10	
15	4	3-4-5 (100)					SA			SP-SM	SAND, coarse to fine, trace silt, brown.	15	394.1
20	5	14-15-17 (100)									- grades to gray.	20	
25	6	6-13-13 (100)								SP	SAND, coarse to fine, trace silt, brown to gray.	25	384.1
30	7	10-8-13 (100)					SA					30	
35	8	10-10-13 (100)									END OF BORING - 36.5 feet.	35	372.6
40												40	
45												45	
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D. H. Gordon	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-10

ILLINOIS POWER COMPANY

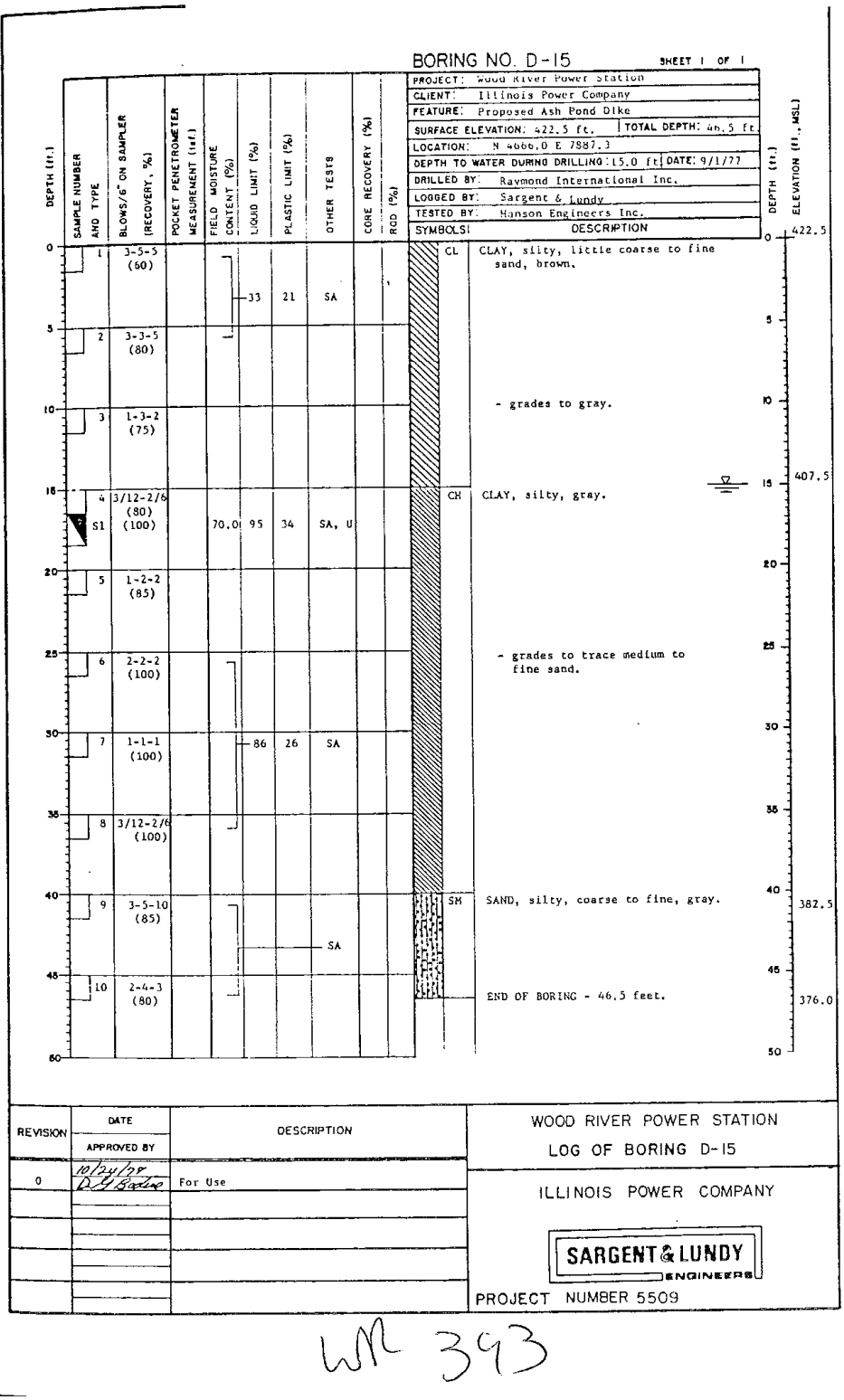
SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WL 392

FREEBOARD CALCS.
SLOPE STABILITY
HYDROLOGIC/ HYDRAULIC
PIPING CALCS.
DEWATERING CALCS.

DRAFT



BORING NO. D-15 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 422.5 ft. TOTAL DEPTH: 46.5 ft
LOCATION: N 4666.0 E 7887.3
DEPTH TO WATER DURING DRILLING: 15.0 ft DATE: 9/1/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.
SYMBOLS: DESCRIPTION

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)		DESCRIPTION	DEPTH (ft.)	ELEVATION (ft., MSL)
0	1	3-5-5 (60)			33	21	SA			CL	CLAY, silty, little coarse to fine sand, brown.	0	422.5
5	2	3-3-5 (80)										5	
10	3	1-3-2 (75)									- grades to gray.	10	
15	4 S1	3/12-2/6 (80) (100)		70.0	95	34	SA, U			CH	CLAY, silty, gray.	15	407.5
20	5	1-2-2 (85)										20	
25	6	2-2-2 (100)									- grades to trace medium to fine sand.	25	
30	7	1-1-1 (100)			86	26	SA					30	
35	8	3/12-2/6 (100)										35	
40	9	3-5-10 (85)					SA			SM	SAND, silty, coarse to fine, gray.	40	382.5
45	10	2-4-3 (80)									END OF BORING - 46.5 feet.	45	376.0
50												50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/78 D.E. Barker	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-15

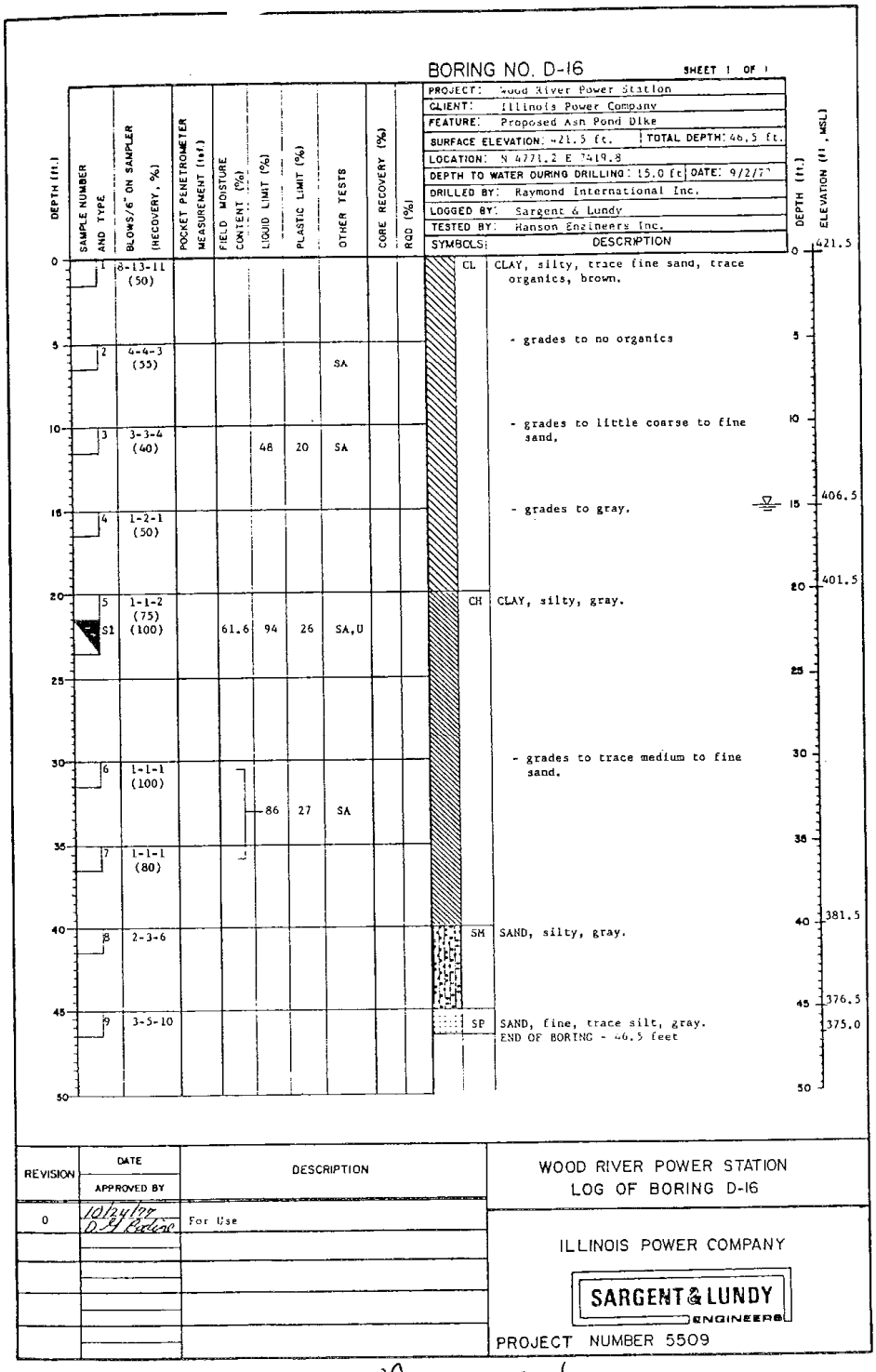
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 393

DRAFT



BORING NO. D-16 SHEET 1 OF 1

PROJECT:	Wood River Power Station
CLIENT:	Illinois Power Company
FEATURE:	Proposed Ash Pond Dike
SURFACE ELEVATION:	421.5 ft. TOTAL DEPTH: 46.5 ft.
LOCATION:	N 4771.2 E 7419.8
DEPTH TO WATER DURING DRILLING:	15.0 ft DATE: 9/2/77
DRILLED BY:	Raymond International Inc.
LOGGED BY:	Sargent & Lundy
TESTED BY:	Hanson Engineers Inc.

SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	DEPTH (ft.)	DESCRIPTION	ELEVATION (ft., MSL)
1	8-13-11 (50)								0	CL CLAY, silty, trace fine sand, trace organics, brown.	421.5
2	4-4-3 (33)					SA			5	- grades to no organics	
3	3-3-4 (40)			48	20	SA			10	- grades to little coarse to fine sand.	
4	1-2-1 (50)								15	- grades to gray. ▽	406.5
5 S1	1-1-2 (75) (100)		61.6	94	26	SA,U			20	CH CLAY, silty, gray.	401.5
6	1-1-1 (100)			86	27	SA			30	- grades to trace medium to fine sand.	
7	1-1-1 (80)								35		
8	2-3-6								40	SM SAND, silty, gray.	381.5
9	3-5-10								45	SP SAND, fine, trace silt, gray. END OF BORING - 46.5 feet	376.5 375.0
									50		

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.J. Ketzner	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-16

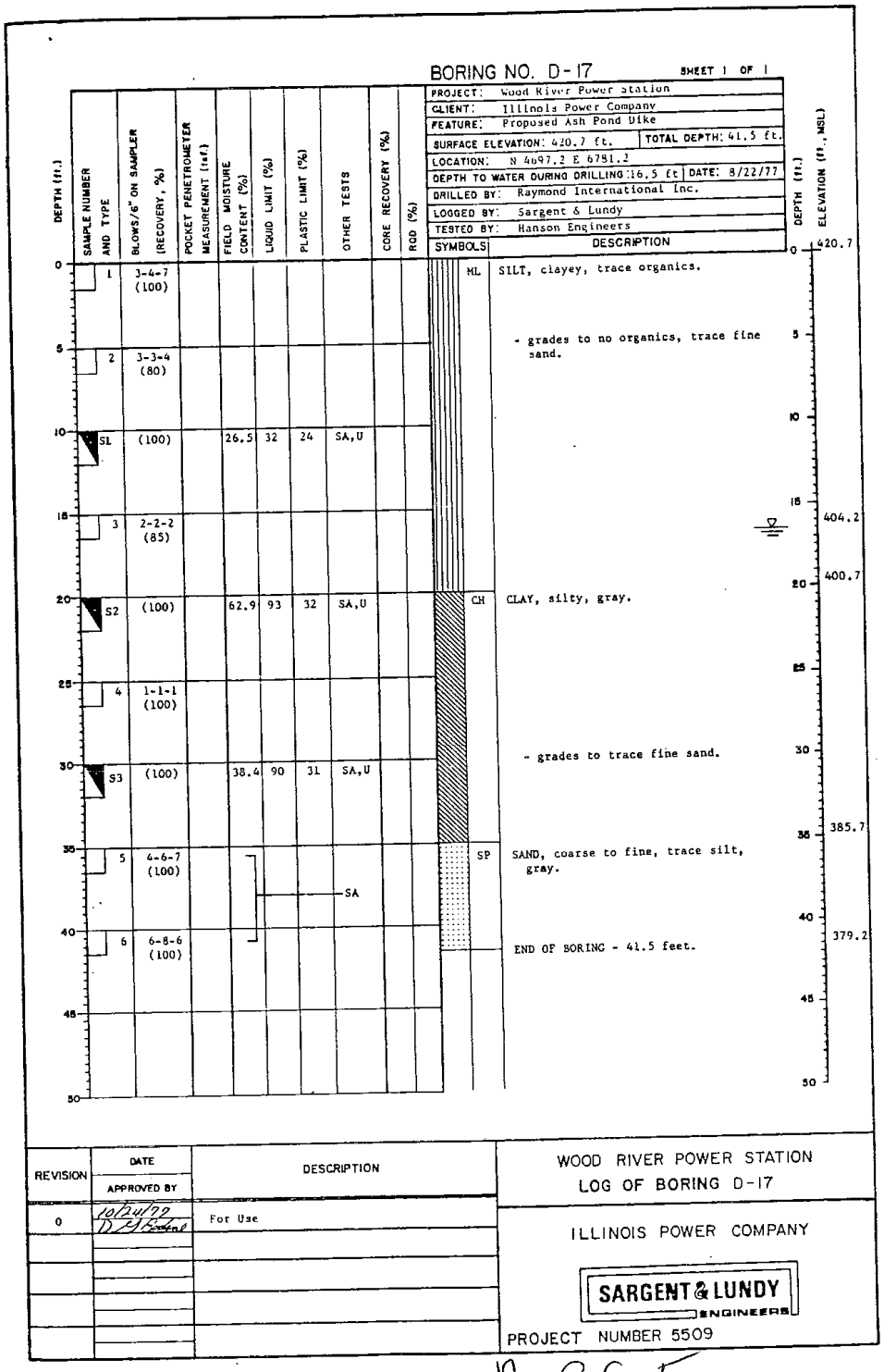
ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 394

DRAFT



BORING NO. D-17 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 420.7 ft. TOTAL DEPTH: 41.5 ft.
LOCATION: N 4697.2 E 6781.2
DEPTH TO WATER DURING DRILLING: 16.5 ft DATE: 8/22/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	RQD (%)	SYMBOLS	DESCRIPTION
0	1	3-4-7 (100)								ML	SILT, clayey, trace organics.
5	2	3-3-4 (80)									- grades to no organics, trace fine sand.
10	SL	(100)		26.5	32	24	SA,U				
15	3	2-2-2 (85)									
20	S2	(100)		62.9	93	32	SA,U			CH	CLAY, silty, gray.
25	4	1-1-1 (100)									
30	S3	(100)		38.4	90	31	SA,U				- grades to trace fine sand.
35	5	4-6-7 (100)					SA			SP	SAND, coarse to fine, trace silt, gray.
40	6	6-8-6 (100)									END OF BORING - 41.5 feet.
45											
50											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	420.7
5	
10	
15	404.2
20	400.7
25	
30	
35	385.7
40	379.2
45	
50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/79 D.A. Bodnal	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-17

ILLINOIS POWER COMPANY

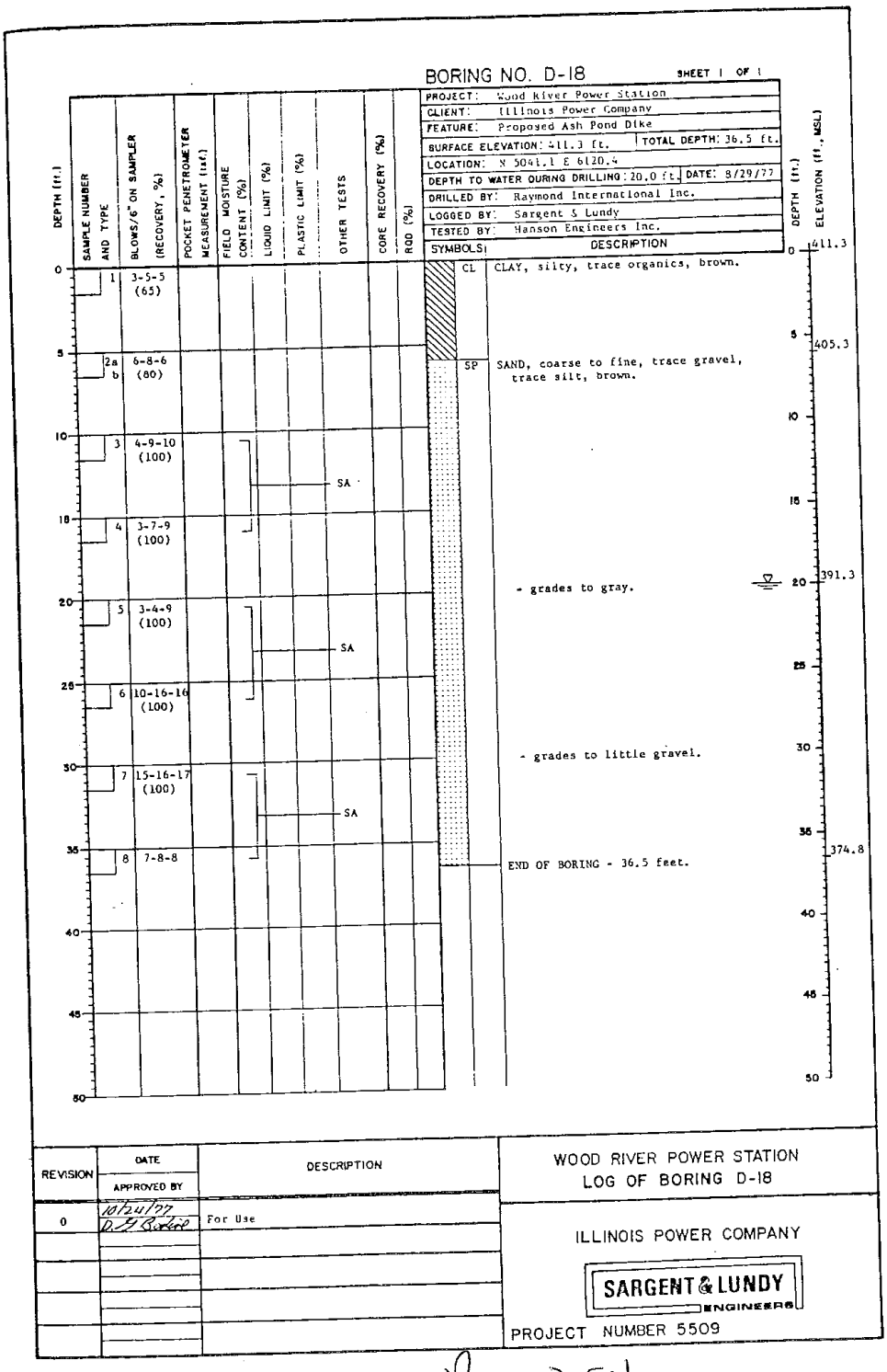
SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 395

FREEBOARD CALCS.
SLOPE STABILITY
HYDROLOGIC/HYDRAULIC
PIPING CALCS.
DEWATERING CALCS.

DRAFT



REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/24/77 D.F. Barker	For Use

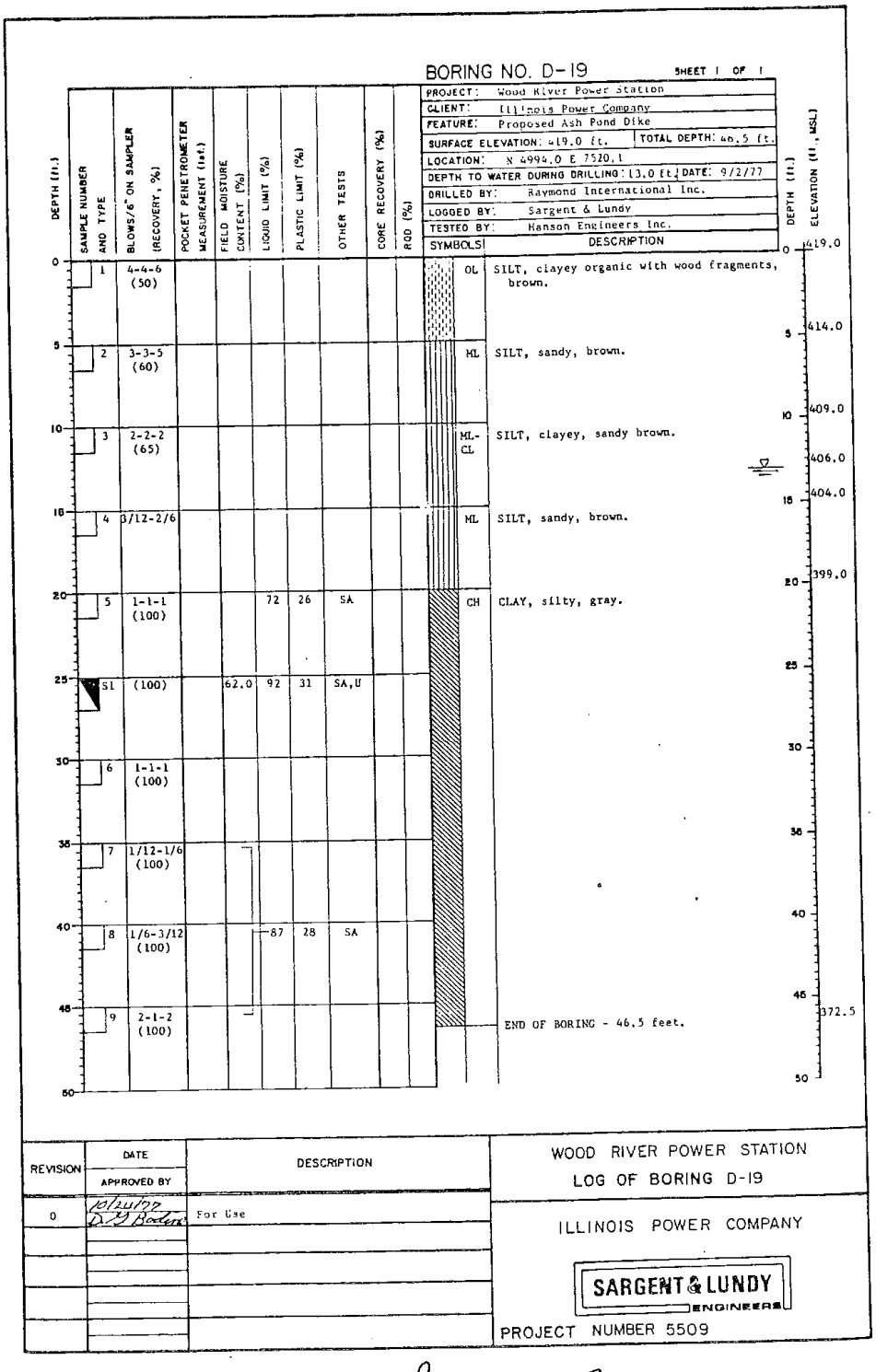
WOOD RIVER POWER STATION
LOG OF BORING D-18

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 396



BORING NO. D-19 SHEET 1 OF 1

PROJECT: Wood River Power Station
CLIENT: Illinois Power Company
FEATURE: Proposed Ash Pond Dike
SURFACE ELEVATION: 419.0 ft. TOTAL DEPTH: 46.5 ft.
LOCATION: N 4994.0 E 7520.1
DEPTH TO WATER DURING DRILLING: 13.0 ft. DATE: 9/2/77
DRILLED BY: Raymond International Inc.
LOGGED BY: Sargent & Lundy
TESTED BY: Hanson Engineers Inc.

DEPTH (ft.)	SAMPLE NUMBER AND TYPE	BLOWS/6" ON SAMPLER (RECOVERY, %)	POCKET PENETROMETER MEASUREMENT (tsf.)	FIELD MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	OTHER TESTS	CORE RECOVERY (%)	ROD (%)	SYMBOLS	DESCRIPTION
0	1	4-4-6 (50)								OL	SILT, clayey organic with wood fragments, brown.
5	2	3-3-5 (60)								ML	SILT, sandy, brown.
10	3	2-2-2 (65)								ML-CL	SILT, clayey, sandy brown.
15	4	3/12-2/6								ML	SILT, sandy, brown.
20	5	1-1-1 (100)			72	26	SA			CH	CLAY, silty, gray.
25	S1	(100)		62.0	92	31	SA,U				
30	6	1-1-1 (100)									
35	7	1/12-1/6 (100)									
40	8	1/6-3/12 (100)			87	28	SA				
45	9	2-1-2 (100)									END OF BORING - 46.5 feet.
50											

DEPTH (ft.)	ELEVATION (ft., MSL)
0	419.0
5	414.0
10	409.0
15	404.0
20	399.0
25	
30	
35	
40	
45	372.5
50	

REVISION	DATE / APPROVED BY	DESCRIPTION
0	10/14/77 D.J. Boden	For Use

WOOD RIVER POWER STATION
LOG OF BORING D-19

ILLINOIS POWER COMPANY

SARGENT & LUNDY ENGINEERS

PROJECT NUMBER 5509

WR 397

WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 B-SERIES BORINGS

Boring No. / Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
D-15, ST-1	16.5-18.5	100	100	100	100	95.0	34.0	61.0	CH	70.0	56.9	620
Combined D-15, SS-1 SS-2	0-1.5 5-6.5	100	100	98	85	33.0	20.8	12.2	CL	-	-	-
Combined D-15, SS-6 SS-7 SS-8	25-26.5 30-31.5 35-36.5	100	100	99	96	85.0	26.0	59.0	CH	-	-	-
Combined D-15, SS-9 SS-10	40-41.5 45-46.5	100	100	99	35	-	-	-	SM	-	-	-
D-16, SS-2	5-6.5	100	100	100	92	-	-	-	CL	-	-	-
D-16, SS-3	10-11.5	100	100	97	86	48.0	20.2	27.8	CL	-	-	-
D-16, ST-1	21.5-23.5	100	100	100	100	94.0	26.3	67.7	CH	61.6	61.8	780
Combined D-16, SS-6 SS-7	30-31.5 35-36.5	100	100	99	98	86.2	27.3	58.9	CH	-	-	-
D-17, ST-1	10-12	100	100	100	98	31.7	23.8	7.9	ML	26.5	92.7	1010
D-17, ST-2	20-12	100	100	100	100	93.0	32.0	61.0	CH	62.9	58.7	1500
D-17, ST-3	30-32	100	100	100	98	90.0	30.7	59.3	CH	38.4	72.9	1500
Combined D-17, SS-5 SS-6	35-36.5 40-41.5	100	100	92	4	-	-	-	SP	-	-	-

See Page 8 of 8 for Notes

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WOOD RIVER POWER STATION

ILLINOIS POWER COMPANY

LABORATORY TEST RESULTS

TABLE 1 D-SERIES BORINGS

Boring No. / Sample No.	Sample Depth	Particle Size Analysis (1) (% Passing)				Atterberg Limits (2)			Unified Soil Classification	Field (3) Water Content	Dry (4) Density (pcf)	Unconfined (5) Compressive Strength (psf)
		No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index				
Combined D-18, SS-3 SS-4	10-11.5 15-16.5	100	97	87	4	-	-	-	SP	-	-	-
Combined D-18, SS-5 SS-6	20-21.5 25-26.5	100	98	50	3	-	-	-	SP	-	-	-
Combined D-18, SS-7 SS-8	30-31.5 35-36.5	100	87	40	4	-	-	-	SP	-	-	-
D-19, SS-5	20-21.5	100	100	100	100	72.2	26.0	46.2	CH	-	-	-
Combined D-19, SS-7 SS-8 SS-9	35-36.5 40-41.5 45-46.5	100	100	100	100	86.8	28.2	58.6	CH	-	-	-
D-19, ST-1	25-27	100	100	100	100	92.0	31.4	60.6	CH	62.0	59.7	840

WK 399

NOTES:

(1) Particle-Size Analysis of Soils, ASTM Test Designation D422. Only Selected Particles Sizes Reported.

(2) Atterberg Limit Tests, ASTM Test Designations D423 and D424.

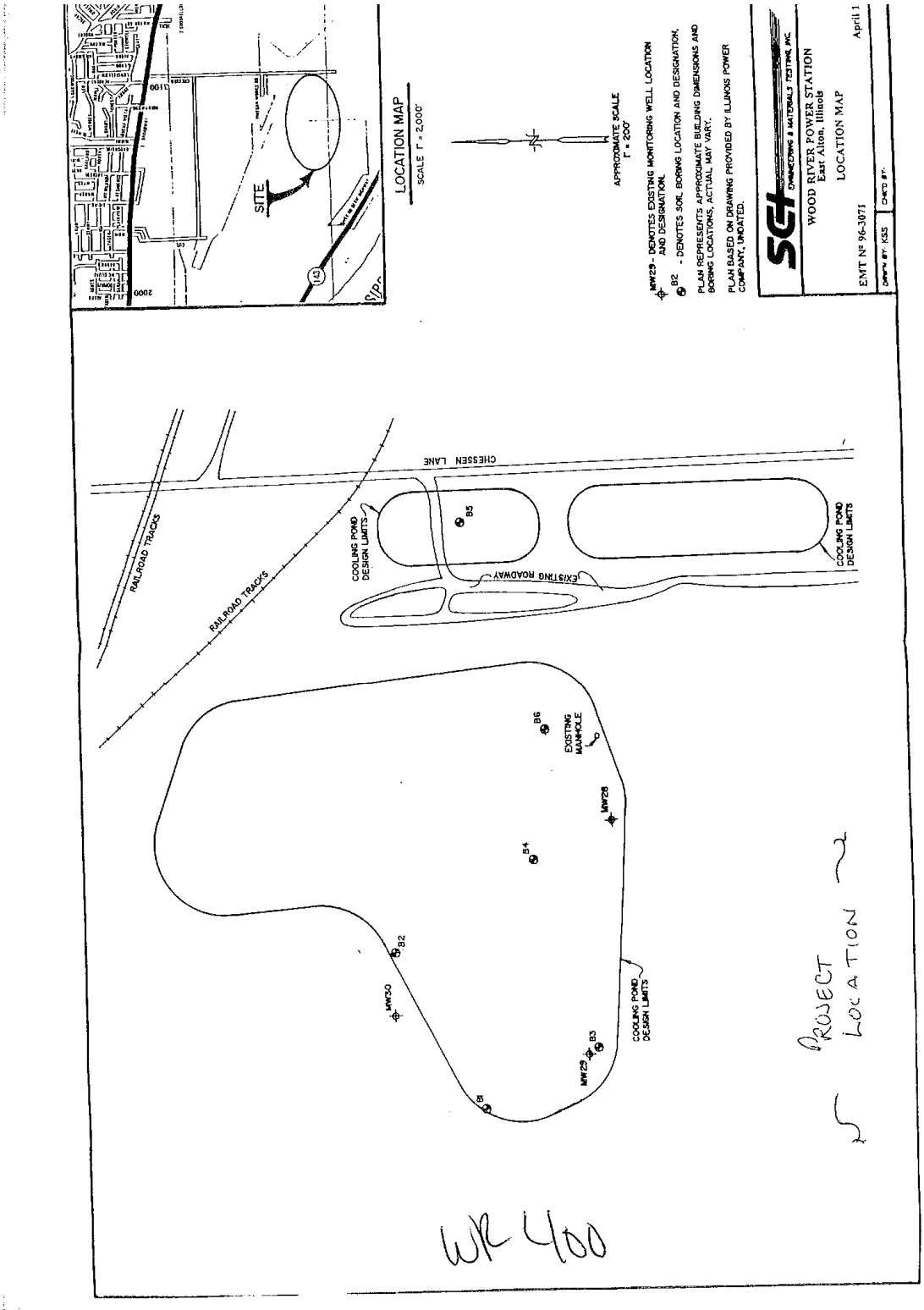
(3) Field Water Content, ASTM Test Designation D2216.

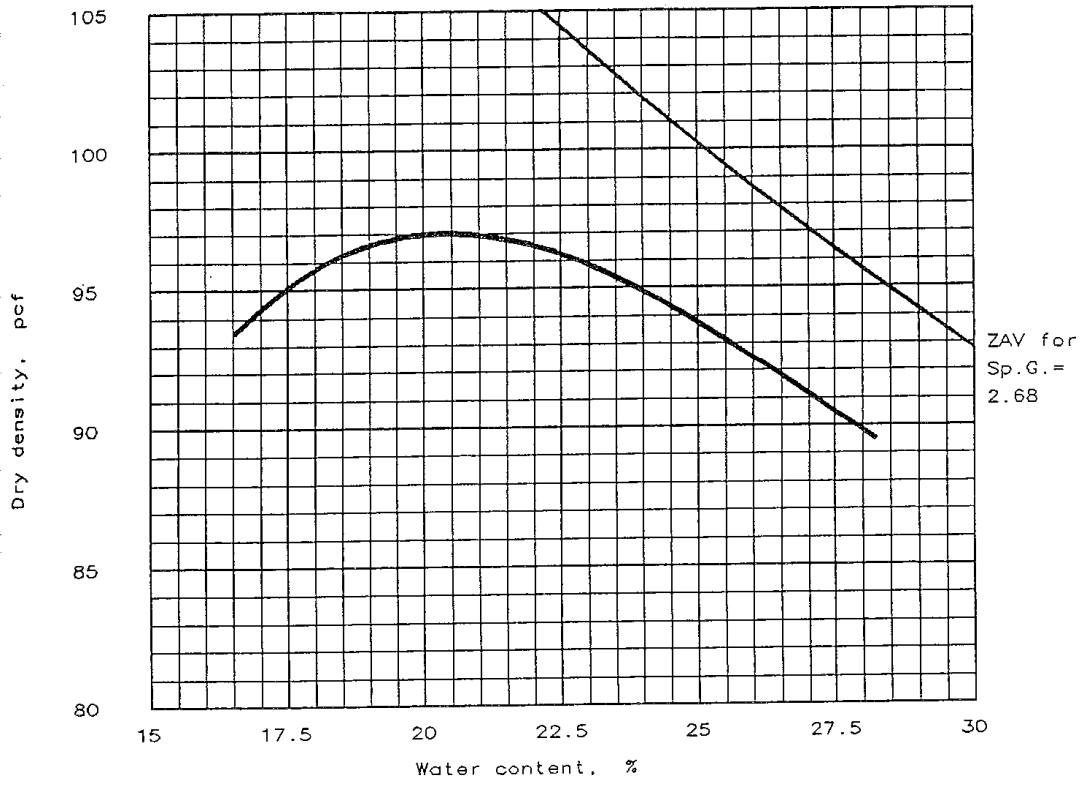
(4) Dry Density Calculated From Shelby Tube Sample.

(5) Unconfined Compressive Strength of Cohesive Soils, ASTM Test Designation D2166.

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LOCATION MAP
SCALE 1" = 2,000'
SITE
APPROXIMATE SCALE
1" = 200'
MW29 - DENOTES EXISTING MONITORING WELL LOCATION AND DESIGNATION.
B2 - DENOTES SOIL BORING LOCATION AND DESIGNATION.
PLAN REPRESENTS APPROXIMATE BUILDING DIMENSIONS AND BORING LOCATIONS, ACTUAL MAY VARY.
PLAN BASED ON DRAWING PROVIDED BY ILLINOIS POWER COMPANY, UNDATED.
SGI
WOOD RIVER POWER STATION
East Alton, Illinois
LOCATION MAP
EMT Nº 96-3071
April 1
CHESSEN LANE
RAILROAD TRACKS
RAILROAD TRACKS
COOLING POND DESIGN LIMITS
B5
EXISTING ROADWAY
COOLING POND DESIGN LIMITS
B6
EXISTING MANHOLE
MW28
B4
B2
MW30
COOLING POND DESIGN LIMITS
MW29
B3
B1
PROJECT LOCATION
WR 400

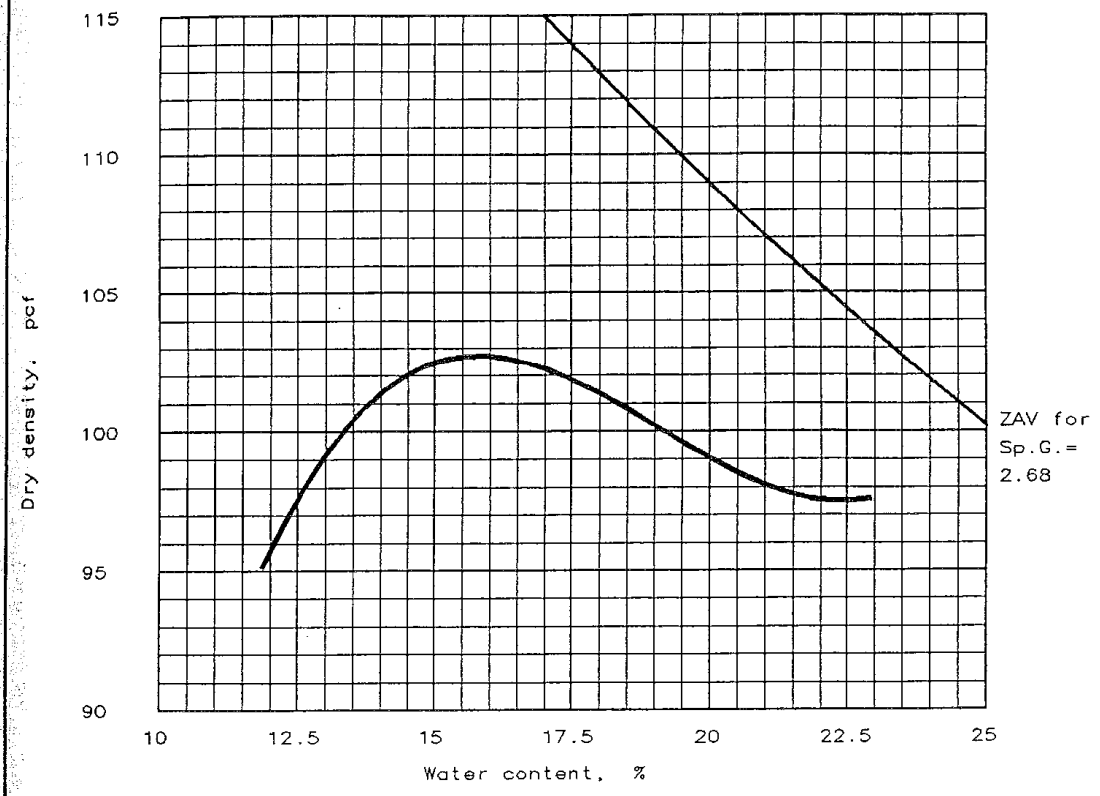


"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
1	CL-CH		26 %	2.68	46	27		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 20.4 % Maximum dry density = 97.0 pcf	Gray medium plastic SILTY CLAY
Project No.: 96-3071 Project: Illinois Power-Wood River Power Station Location: B-2 East Alton, Illinois Date: 4-16-1996	Remarks: Rammer - Manual Preparation - Moist Lab# 807
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 1

WR 401



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
4	CL		23 %	2.68				

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 15.8 % Maximum dry density = 102.7 pcf	Brown low plastic SILTY CLAY
Project No.: 96-3071 Project: Illinois Power-Wood River Power Station Location: B-1 East Alton, Illinois Date: 4-17-1996	Remarks: Rammer - Manual Preparation - Moist Lab# 807
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 2

WR 1/02

DRAFT

PROJECT Illinois Power–Wood River Po\ ...
LOCATION East Alton, Illinois
DRILLER Midwest Drilling Inc.
SURFACE ELEVATION _____ DRILLING METHOD 4" O.D. CFA

BORING NO. B-1
SHEET 1 OF 1
PROJECT NO. 96-3071
DATE DRILLED 4/2/96

DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN.)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)	LIQUID LIMIT	PLASTIC LIMIT
0					TOPSOIL 5"							
					Brown medium plastic SILTY CLAY, trace sand	CL/CH	1					
2	1	ST	22/24					27	93	1.9		
					Brown low plastic SILTY CLAY, trace sand	CL		28	95			
4	2	SS		3 5 6			2	23				
6	3	ST	24/24					30	86	1.3		
					Brown low plastic SANDY CLAY	CL		29	88			
8					Brown low plastic SILTY CLAY, trace sand	CL						
	4	SS		1 2 2				37				
10					Brown fine SAND, little clay	SP						
12	5	ST	20/24		Brown fine SAND	SP		17 7				
14	6	SS		6 8 10				2				
16												
18	7	SS		3 4 8				4				
20					Boring Terminated at 20 feet							

WATER LEVEL:
- X NO GROUND WATER NOTED AT TIME OF DRILLING
- ____ FT WHILE DRILLING
- ____ FT ____ HRS AFTER DRILLING
- ____ FT ____ HRS AFTER DRILLING

REMARKS:
1) Unconsolidated–Undrained triaxial test performed; principal stress difference reported.
2) Bulk sample also collected.

WR 403

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PROJECT Illinois Power–Wood River Power Station
LOCATION East Alton, Illinois
DRILLER Midwest Drilling Inc.
SURFACE ELEVATION _____ DRILLING METHOD 4" O.D. CFA

BORING NO. B-3
SHEET 1 OF 1
PROJECT NO. 96-3071
DATE DRILLED 4/2/96

DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN.)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT
0					TOPSOIL 6"							
					Brown low plastic SILTY CLAY, trace sand	CL						
2	1	SS		3 3 4				21				
					Brown low plastic CLAYEY SILT, little sand	ML	1					
4	2	ST	19/24				2	27	94	1.7	31	5
6	3	SS		2 2 3				31				
8	4	ST	18/24		Brown low plastic SILTY CLAY, trace sand	CL		32	81	1.2		
10					Brown high plastic SILTY CLAY, trace sand	CH		39				
12					Brown fine SAND	SP						
14	5	SS		5 6 10				4				
16												
18	6	SS		4 7 11				6				
20					Boring Terminated at 20 feet							

WATER LEVEL:
- X NO GROUND WATER NOTED AT TIME OF DRILLING
- _____ FT WHILE DRILLING
- _____ FT ____ HRS AFTER DRILLING
- _____ FT ____ HRS AFTER DRILLING

REMARKS:
1) Bulk sample also collected.
2) Unconsolidated–Undrained triaxial test performed; maximum principal stress reported.

WR 4/04

DRAFT

PROJECT Illinois Power–Wood River Power Station
LOCATION East Alton, Illinois
DRILLER Midwest Drilling Inc.
SURFACE ELEVATION _____ DRILLING METHOD 4" O.D. CFA

BORING NO. B-4
SHEET 1 OF 1
PROJECT NO. 96-3071
DATE DRILLED 4/2/96

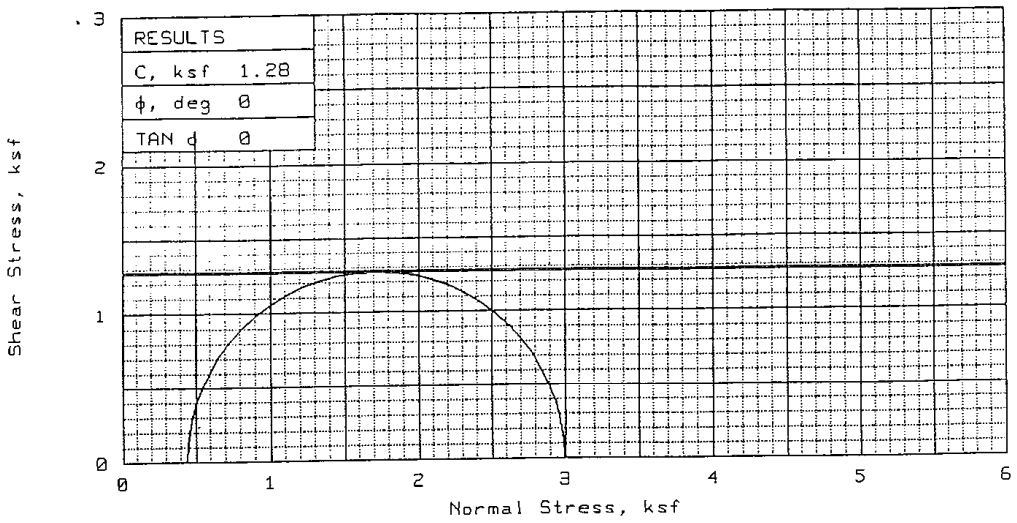
DEPTH (FT.)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (IN/IN)	SAMPLE BLOWS (PER 6 IN.)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (PCF)	LAB: UNCONFINED COMPRESSIVE STRENGTH (KSF)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT
0					TOPSOIL 14"		1					
2	1	ST	18/24		Brown medium plastic SILTY CLAY, trace sand	CL/CH		28	98	2.5		
4	2	SS		2 4 5	Brown low plastic SILTY CLAY, trace sand	CL		25				
6	3	ST	22/24		Brown fine SAND, trace clay	SP		14	82			
8					Brown low plastic SANDY SILT	ML		10	89			
10	4	SS		3 4 5				9				
12					Brown fine SAND	SP	2					
14	5	SS		11 17 18				4				
16												
18	6	SS		9 14 12				4				
20					Boring Terminated at 20 feet							

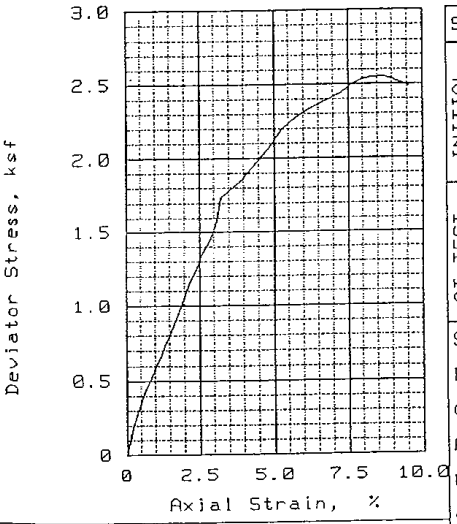
WATER LEVEL:
- X NO GROUND WATER NOTED AT TIME OF DRILLING
- _____ FT WHILE DRILLING
- _____ FT ____ HRS AFTER DRILLING
- _____ FT ____ HRS AFTER DRILLING

REMARKS:
1) Unconsolidated–Undrained triaxial test performed; maximum principal stress reported.
2) Bulk sample also collected.

WR 4/05

DRAFT





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	20.6
	DRY DENSITY, pcf	99.2
	SATURATION, %	80.4
	VOID RATIO	0.687
	DIAMETER, in	2.84
	HEIGHT, in	5.92
AT TEST	WATER CONTENT, %	25.6
	DRY DENSITY, pcf	99.2
	SATURATION, %	100.0
	VOID RATIO	0.687
	DIAMETER, in	2.84
	HEIGHT, in	5.92
Strain rate, %/min		1.00
BACK PRESSURE, ksf		0.00
CELL PRESSURE, ksf		0.43
FAILURE STRESS, ksf		2.55
ULTIMATE STRESS, ksf		
σ_1 FAILURE, ksf		2.98
σ_3 FAILURE, ksf		0.43

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: undisturbed
DESCRIPTION: Brown low plastic SANDY CLAY

SPECIFIC GRAVITY= 2.68
REMARKS:

Fig. No.: 1

CLIENT: Illinois Power

PROJECT: Illinois Power Wood River

SAMPLE LOCATION: B-2 ST-1

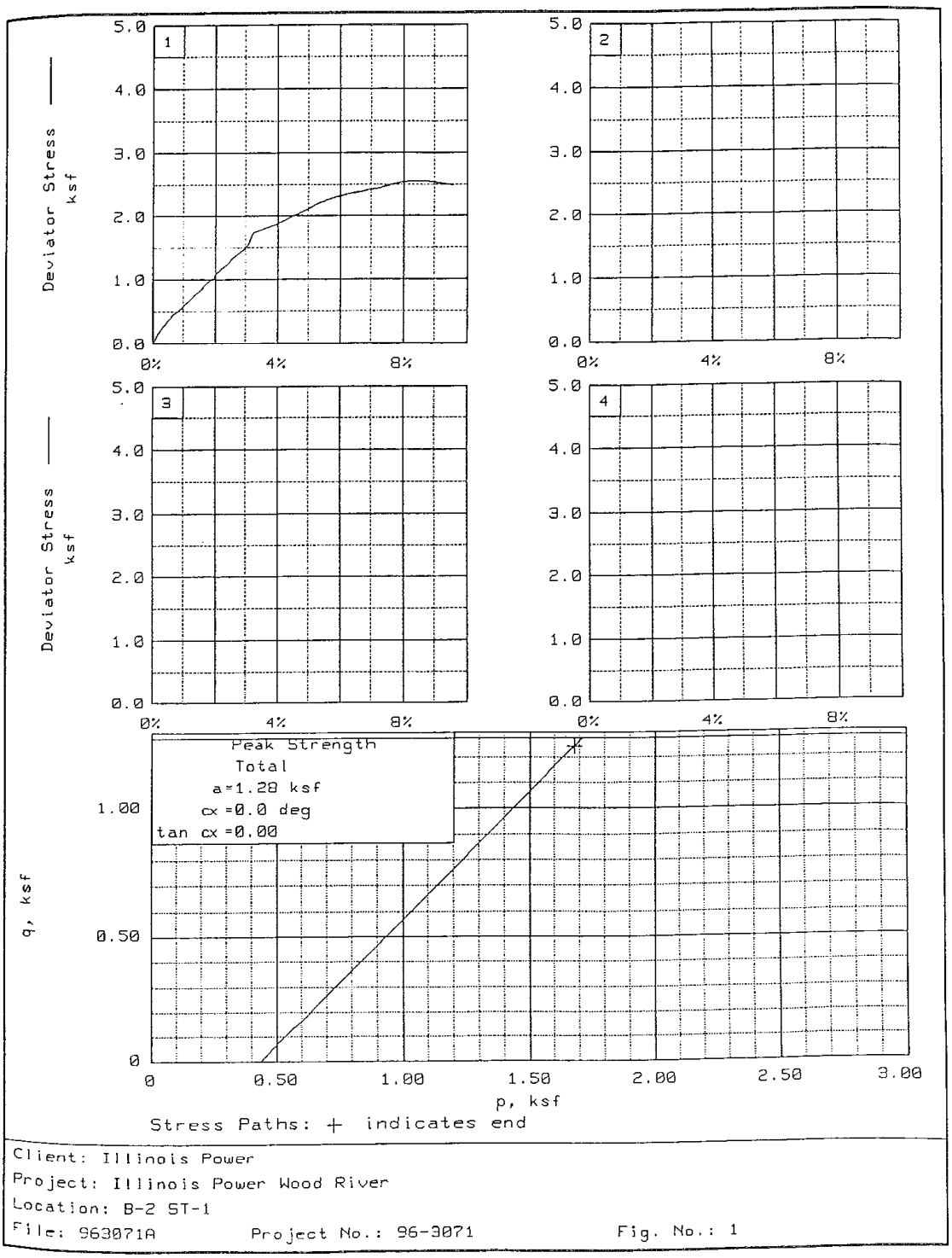
PROJ. NO.: 96-3071 DATE: 4/9/96

TRIAXIAL SHEAR TEST REPORT

SCI ENGINEERING

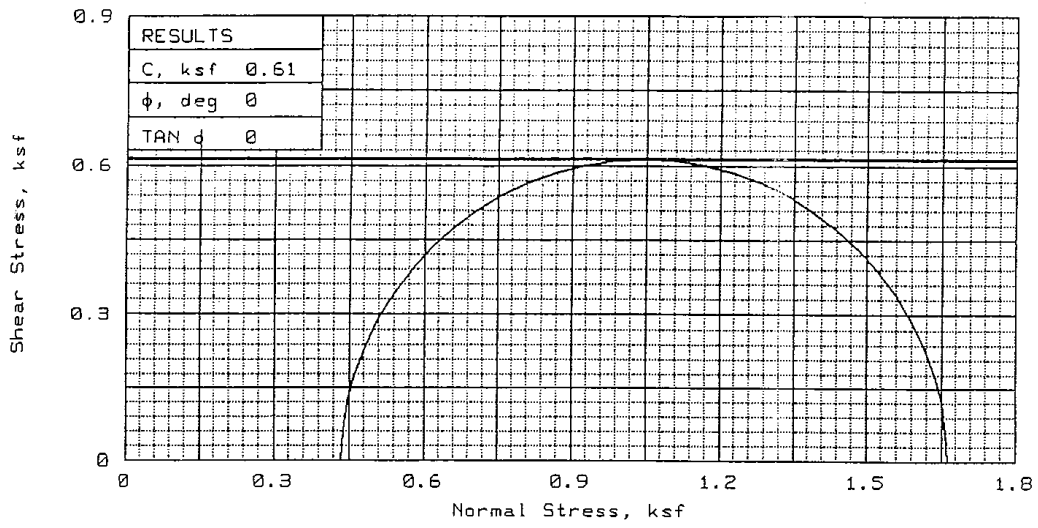
WR 406

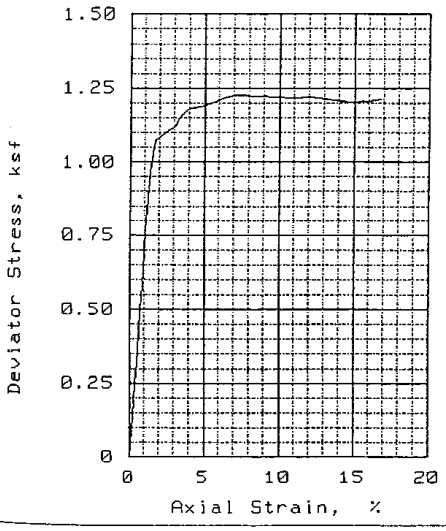
DRAFT


Deviator Stress
ksf
1
2
3
4
5.0
4.0
3.0
2.0
1.0
0.0
0%
4%
8%
Peak Strength
Total
a=1.28 ksf
cx =0.0 deg
tan cx =0.00
q, ksf
1.00
0.50
0
0.50
1.00
1.50
2.00
2.50
3.00
p, ksf
Stress Paths: + indicates end
Client: Illinois Power
Project: Illinois Power Wood River
Location: B-2 ST-1
File: 963071A
Project No.: 96-3071
Fig. No.: 1

WR 407

DRAFT





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	31.8
	DRY DENSITY, pcf	85.4
	SATURATION, %	89.0
	VOID RATIO	0.959
	DIAMETER, in	2.84
	HEIGHT, in	5.92
AT TEST	WATER CONTENT, %	35.8
	DRY DENSITY, pcf	85.4
	SATURATION, %	100.0
	VOID RATIO	0.959
	DIAMETER, in	2.84
	HEIGHT, in	5.92
Strain rate, %/min		1.00
BACK PRESSURE, ksf		0.00
CELL PRESSURE, ksf		0.43
FAILURE STRESS, ksf		1.23
ULTIMATE STRESS, ksf		
σ_1 FAILURE, ksf		1.66
σ_3 FAILURE, ksf		0.43

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: undisturbed
DESCRIPTION: Brown low plastic SILTY CLAY

SPECIFIC GRAVITY= 2.68
REMARKS:

CLIENT: Illinois Power

PROJECT: Illinois Power Wood River

SAMPLE LOCATION: B-3 ST-2

PROJ. NO.: 96-3071 DATE: 4/9/96

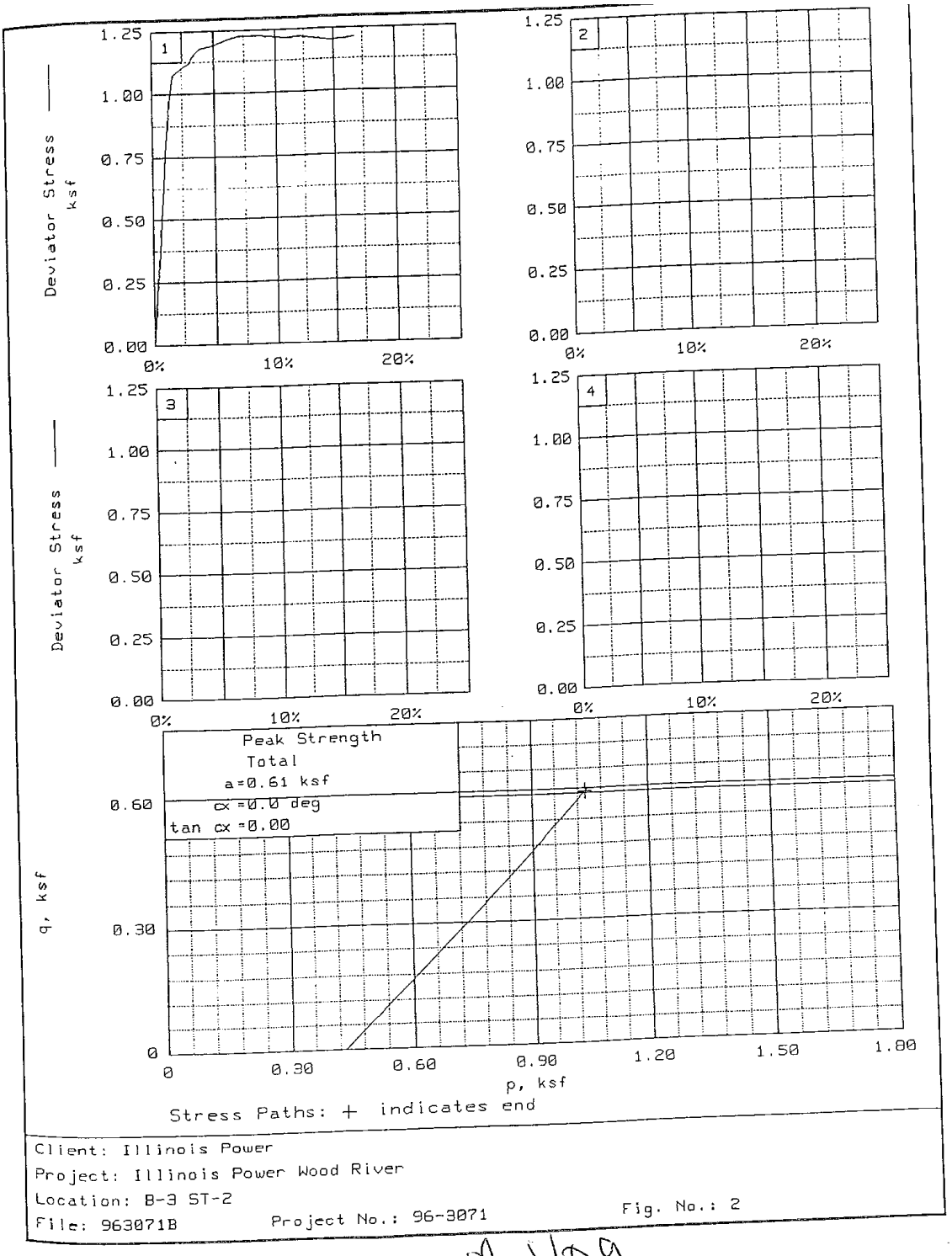
TRIAXIAL SHEAR TEST REPORT

SCI ENGINEERING

Fig. No.: 2

WR 408

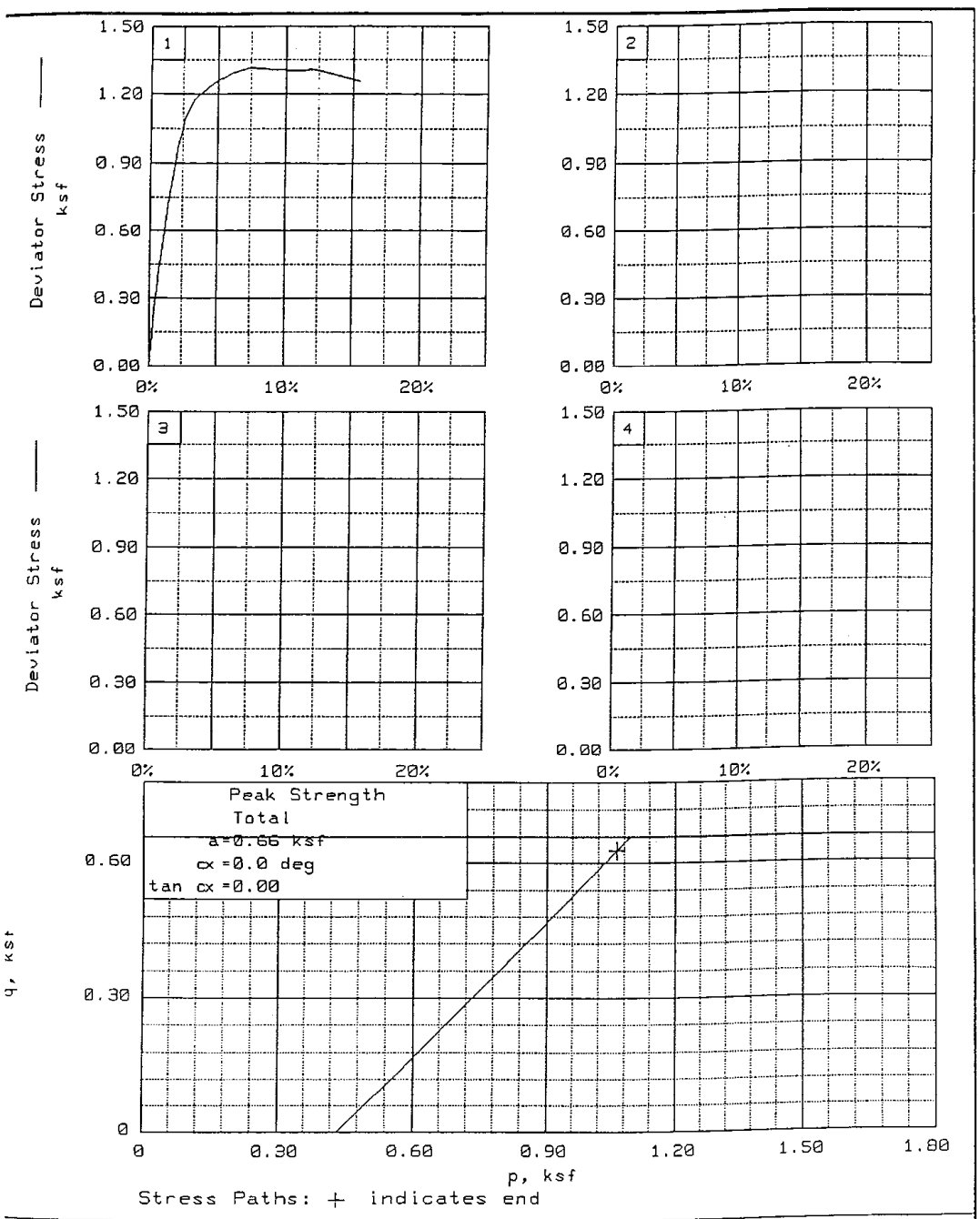
DRAFT



Client: Illinois Power
Project: Illinois Power Wood River
Location: B-3 ST-2
File: 963071B Project No.: 96-3071 Fig. No.: 2

WR 4/09

DRAFT

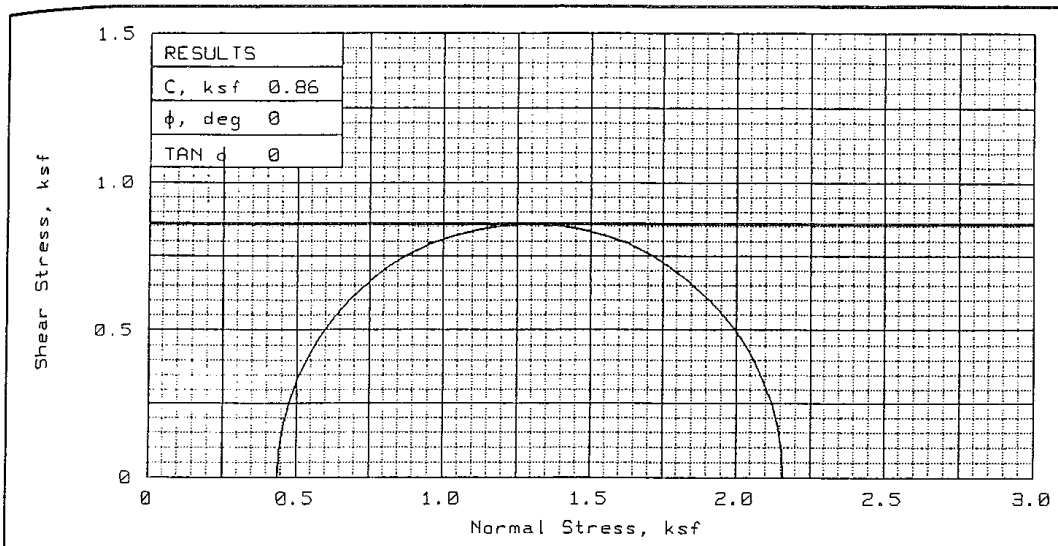


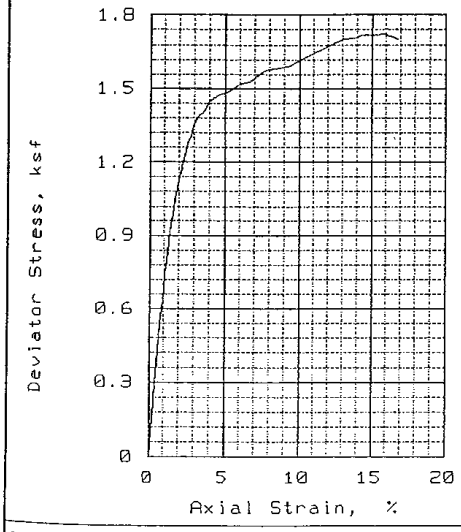
lient: Illinois Power
roject: Illinois Power Wood River
ocation: B-1 ST-2
ile: 963071C Project No.: 96-3071 Fig. No.: 3

WR 410

FREEBOARD CALCS.
SLOPE STABILITY
HYDROLOGIC/ HYDRAULIC
PIPING CALCS.
DEWATERING CALCS.

DRAFT





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	30.6
	DRY DENSITY, pcf	90.9
	SATURATION, %	97.6
	VOID RATIO	0.841
	DIAMETER, in	2.84
	HEIGHT, in	5.92
AT TEST	WATER CONTENT, %	31.4
	DRY DENSITY, pcf	90.9
	SATURATION, %	100.0
	VOID RATIO	0.841
	DIAMETER, in	2.84
	HEIGHT, in	5.92
Strain rate, %/min		1.00
BACK PRESSURE, ksf		0.00
CELL PRESSURE, ksf		0.43
FAILURE STRESS, ksf		1.72
ULTIMATE STRESS, ksf		
σ_1 FAILURE, ksf		2.15
σ_3 FAILURE, ksf		0.43

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: undisturbed
DESCRIPTION: Brown low plastic
SANDY SILT

SPECIFIC GRAVITY= 2.68
REMARKS:

Fig. No.: 4

CLIENT: Illinois Power

PROJECT: Illinois Power Wood River

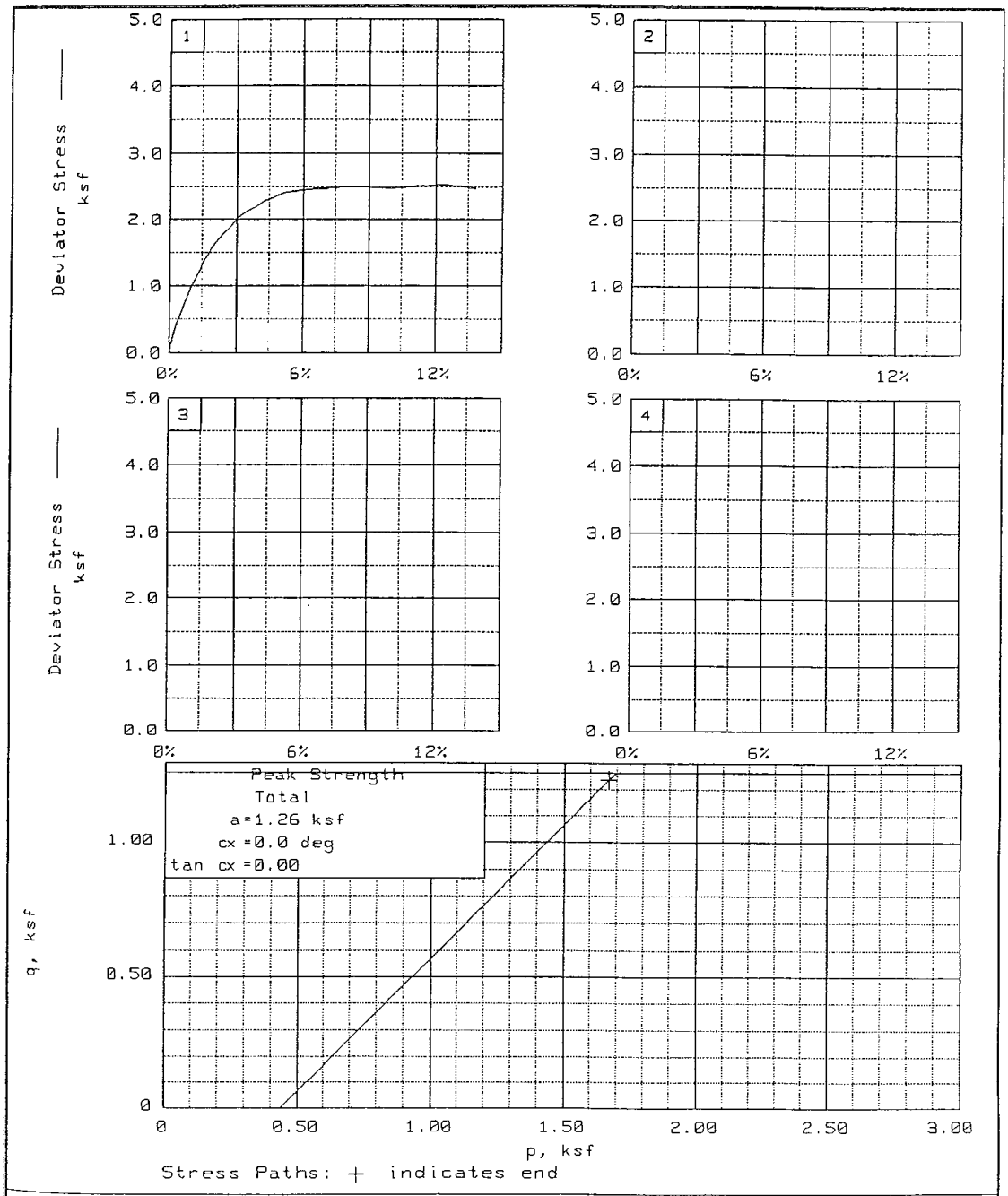
SAMPLE LOCATION: B-3 ST-1

PROJ. NO.: 96-3071 DATE: 4/9/96

TRIAXIAL SHEAR TEST REPORT

SCI ENGINEERING

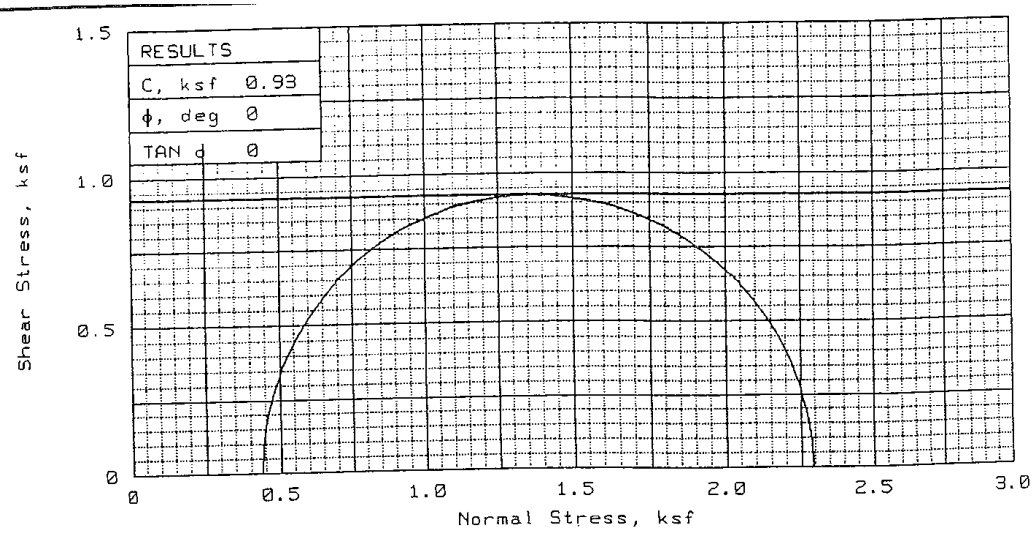
WR 4/11

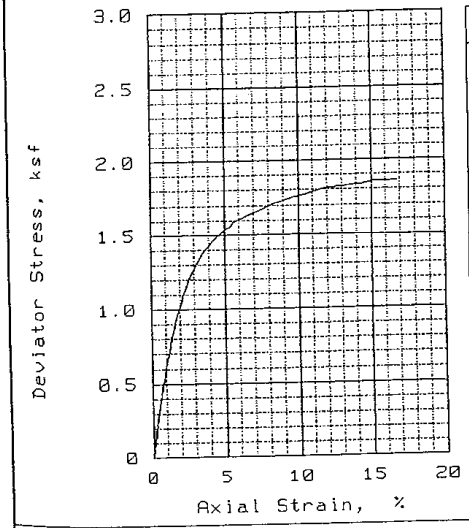


Client: Illinois Power
Project: Illinois Power Wood River
Location: B-4 ST-1
File: 963071E Project No.: 96-3071 Fig. No.: 5

WR 412

DRAFT





SAMPLE NO.:		1
INITIAL	WATER CONTENT, %	28.8
	DRY DENSITY, pcf	94.4
	SATURATION, %	100.0
	VOID RATIO	0.772
	DIAMETER, in	2.84
	HEIGHT, in	5.92
AT TEST	WATER CONTENT, %	28.8
	DRY DENSITY, pcf	94.4
	SATURATION, %	100.0
	VOID RATIO	0.772
	DIAMETER, in	2.84
	HEIGHT, in	5.92
Strain rate, %/min		1.00
BACK PRESSURE, ksf		0.00
CELL PRESSURE, ksf		0.43
FAILURE STRESS, ksf		1.86
ULTIMATE STRESS, ksf		
σ_1 FAILURE, ksf		2.29
σ_3 FAILURE, ksf		0.43

TYPE OF TEST:
Unconsolidated Undrained
SAMPLE TYPE: undisturbed
DESCRIPTION: Brown medium plastic SILTY CLAY

SPECIFIC GRAVITY= 2.68
REMARKS:

Fig. No.: 6

CLIENT: Illinois Power

PROJECT: Illinois Power Wood River

SAMPLE LOCATION: B-1 ST-1

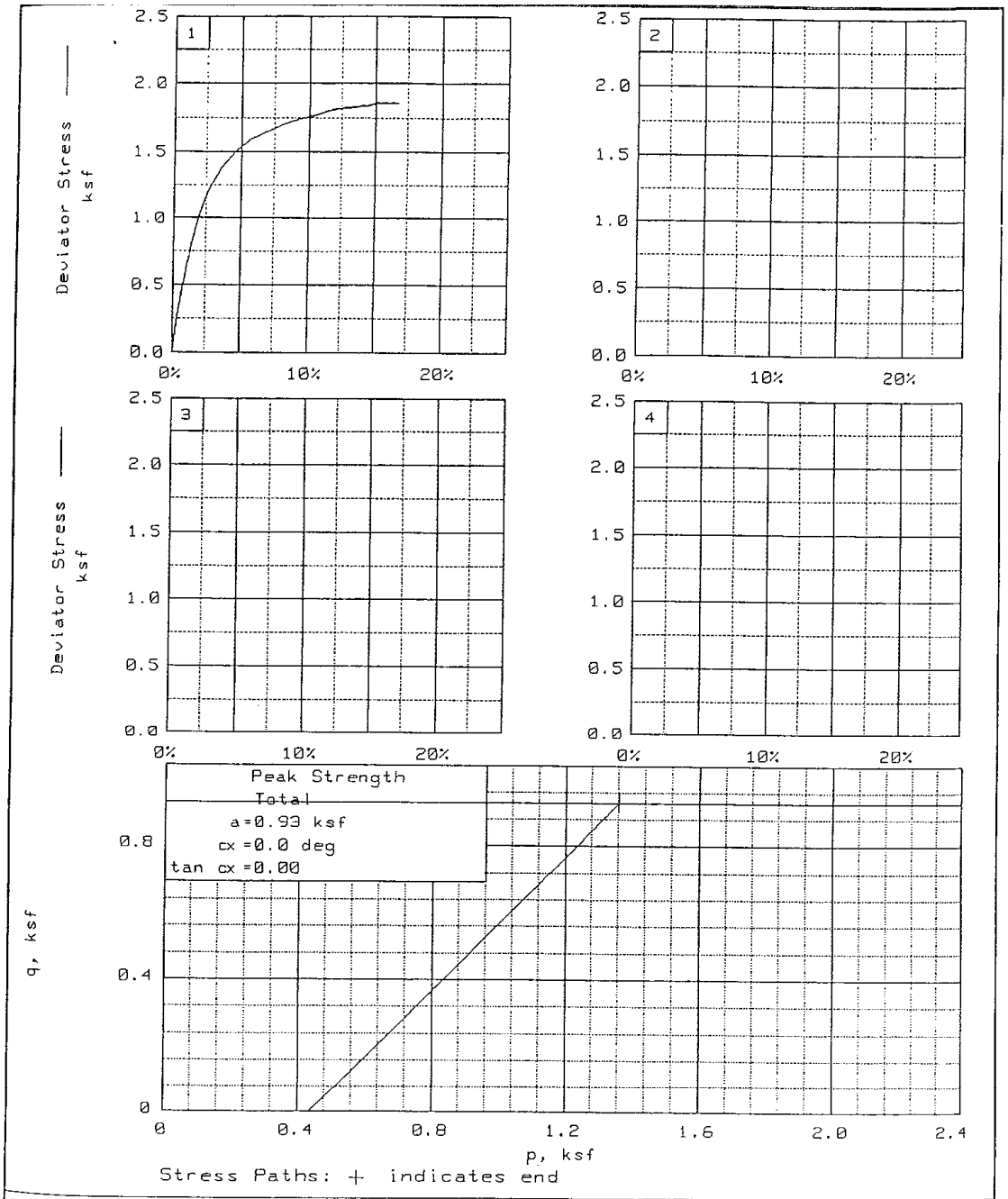
PROJ. NO.: 96-3071 DATE: 4/9/96

TRIAXIAL SHEAR TEST REPORT

SCI ENGINEERING

WR 413

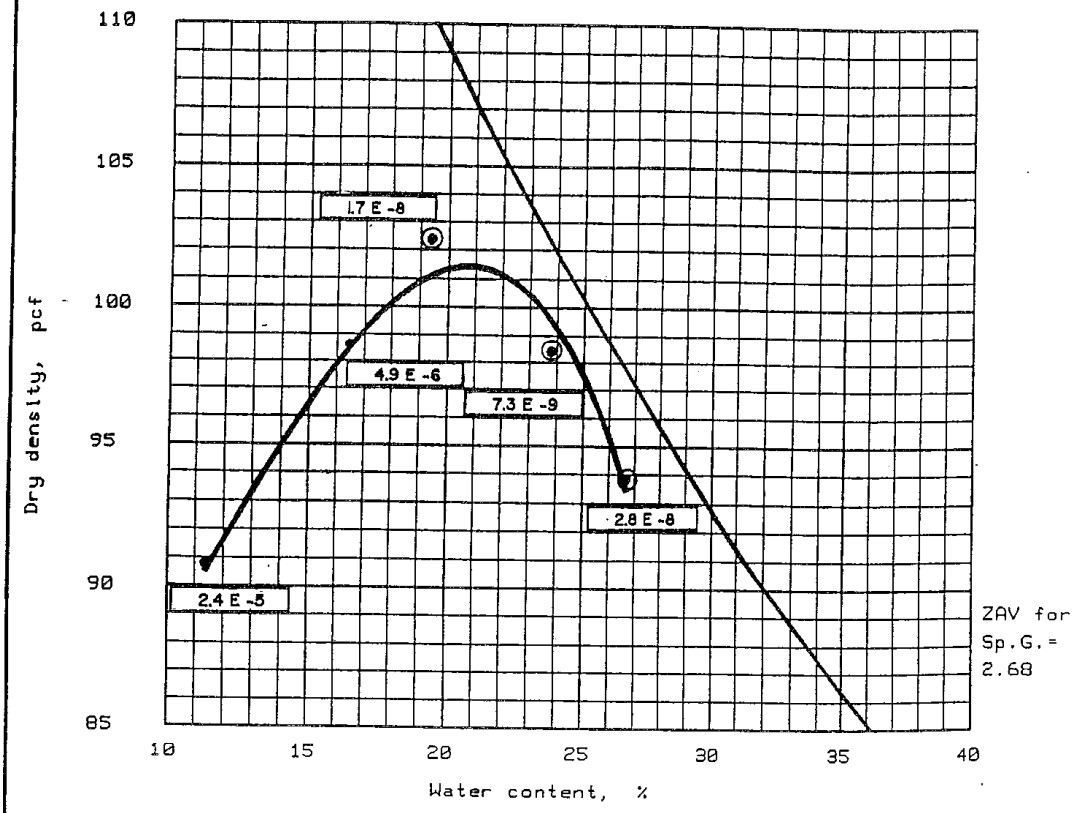
DRAFT



Client: Illinois Power
Project: Illinois Power Wood River
Location: B-1 ST-1
File: 963071F Project No.: 96-3071 Fig. No.: 6

WR 414

COMPACTION CONTROL CURVE



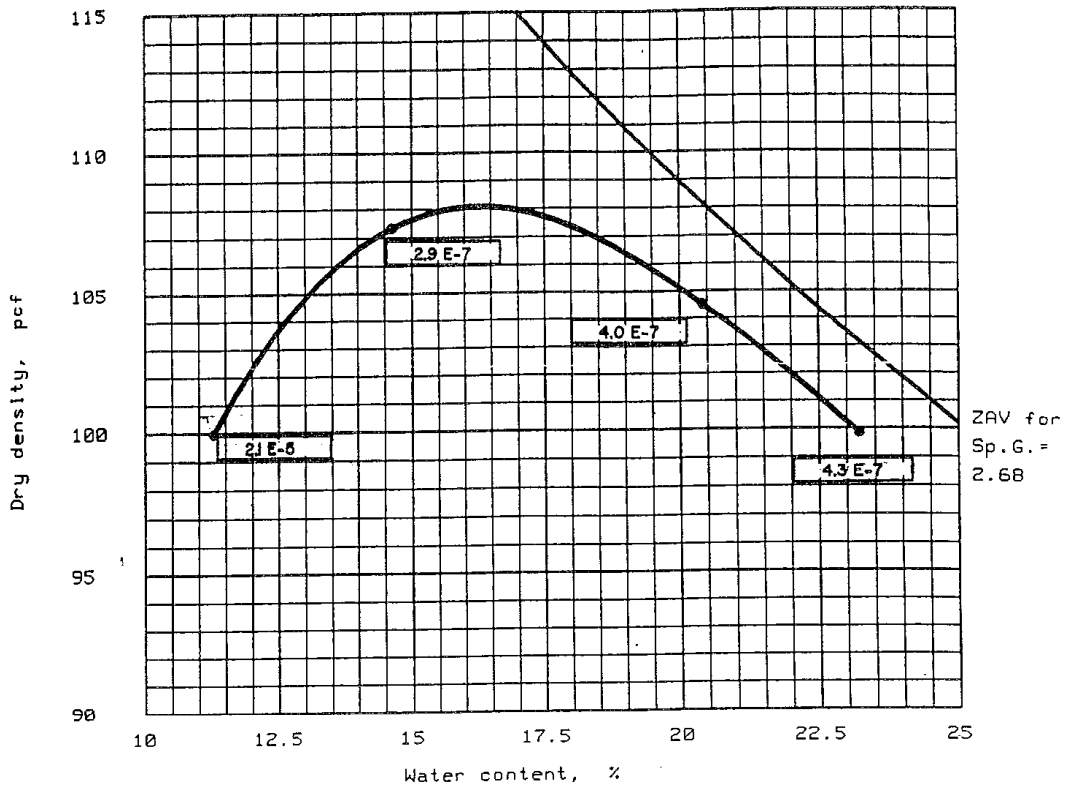
"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
5	CL		22 %	2.68	38	18		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 20.7 % Maximum dry density = 101.5 pcf	Brown Low Plastic SILTY CLAY
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Keller Pit #1-Sample 1 Date: 3-14-95	Remarks: Rammer-Manual Perparation-Moist Lab#576
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 1

WR 415

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

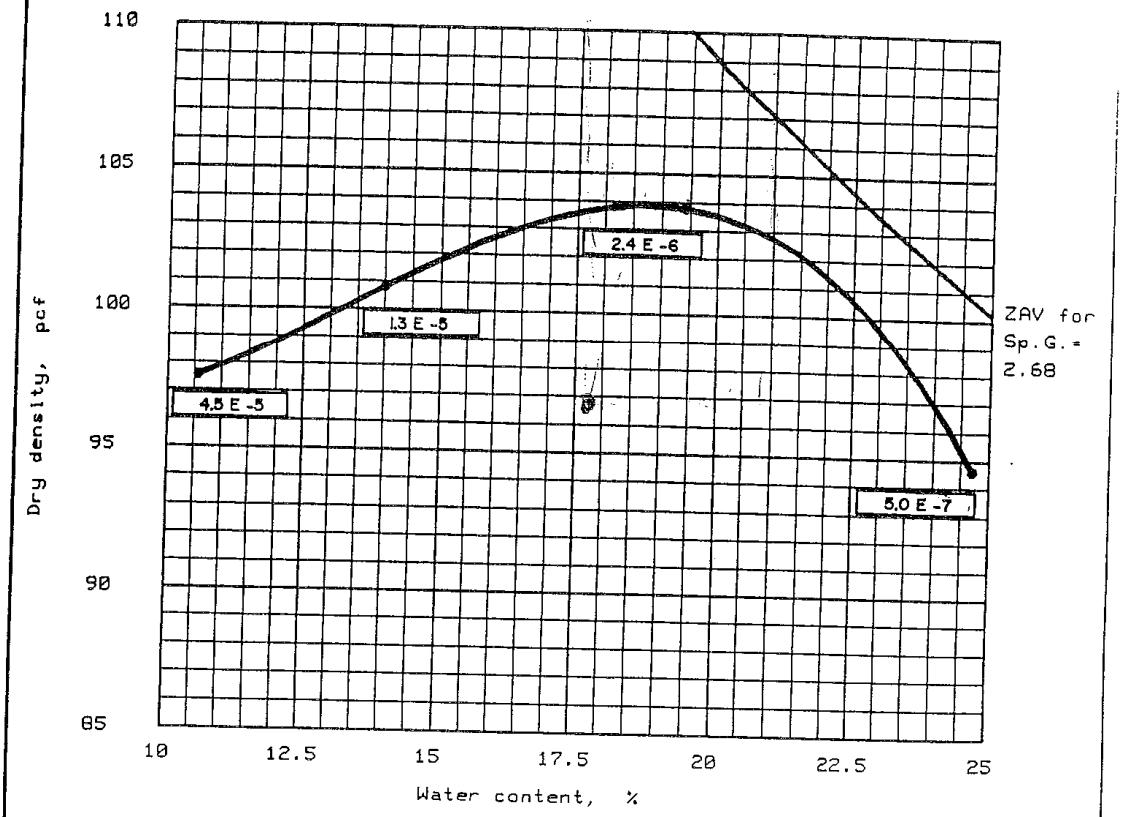
Elev/ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
7	CL		21 %	2.68	30	9		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 16.3 % Maximum dry density = 108.1 pcf	Brown Low Plastic SILTY CLAY
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Keller Pit # 1-Sample 2 Revised 9/18/95 Date: 3-14-95	Remarks: Rammer-Manual Perparation-Moist Lab#577
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 2

WR-116

DRAFT

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
7	ML		18 %	2.68	30	6		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 18.8 % Maximum dry density = 103.9 pcf	Brown Low Plastic CLAYEY SILT
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Keller Pit #1-Sample 3 Date: 3-14-95	Remarks: Rammer-Manual Preparation-Moist Lab#578
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 3

WR 417

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

BORING LOG

DRAFT

PROJECT Illinois Power - Keller Pit #3
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B1
SHEET 1 OF 1
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
0					Brown and gray, high plastic SILTY CLAY, trace sand & gravel	CH							0
5	1	SS		3 4 5				19	--	--	--	--	5
10					Auger refusal on limestone at 8 feet								10
15													15
20													20

WATER LEVEL.
XX
—— NO GROUND WATER NOTED AT TIME OF DRILLING
—— FT. WHILE DRILLING
—— FT. —— HRS. AFTER DRILLING
—— FT. —— HRS. AFTER DRILLING

REMARKS:

WP 4/8

SLOPE STABILITY

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

DRAFT

PROJECT Illinois Power - Keller Pit #3
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B2
SHEET 1 OF 1
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

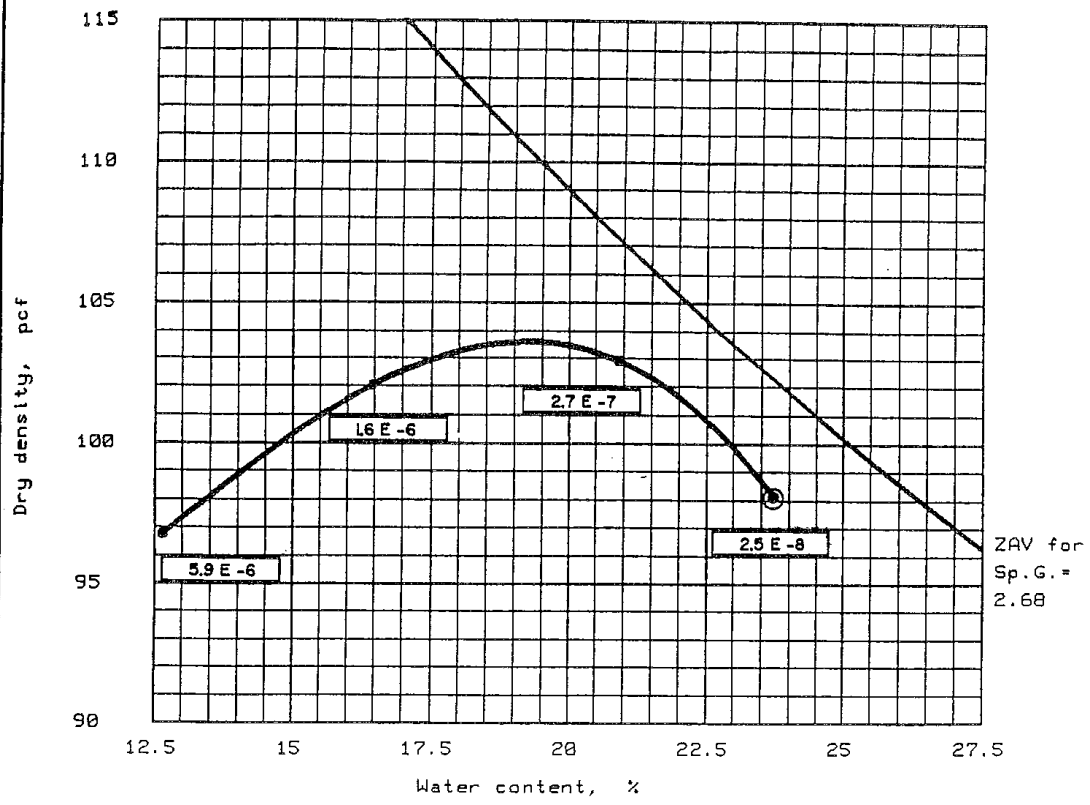
DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (pcf)	LAB: UNCONFINED COMPRESSIVE STRENGTH (ksf)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (ft)
0					Brown, high plastic SILTY CLAY trace gravel	CH							0
5	1	SS		3 5 5				21	--	--	--	--	5
					Auger refusal on limestone at 7½ feet								
10													10
15													15
20													20

WATER LEVEL.
XX NO GROUND WATER NOTED AT TIME OF DRILLING
___ FT. WHILE DRILLING
___ FT. ___ HRS. AFTER DRILLING
___ FT. ___ HRS. AFTER DRILLING

REMARKS

WR 419

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

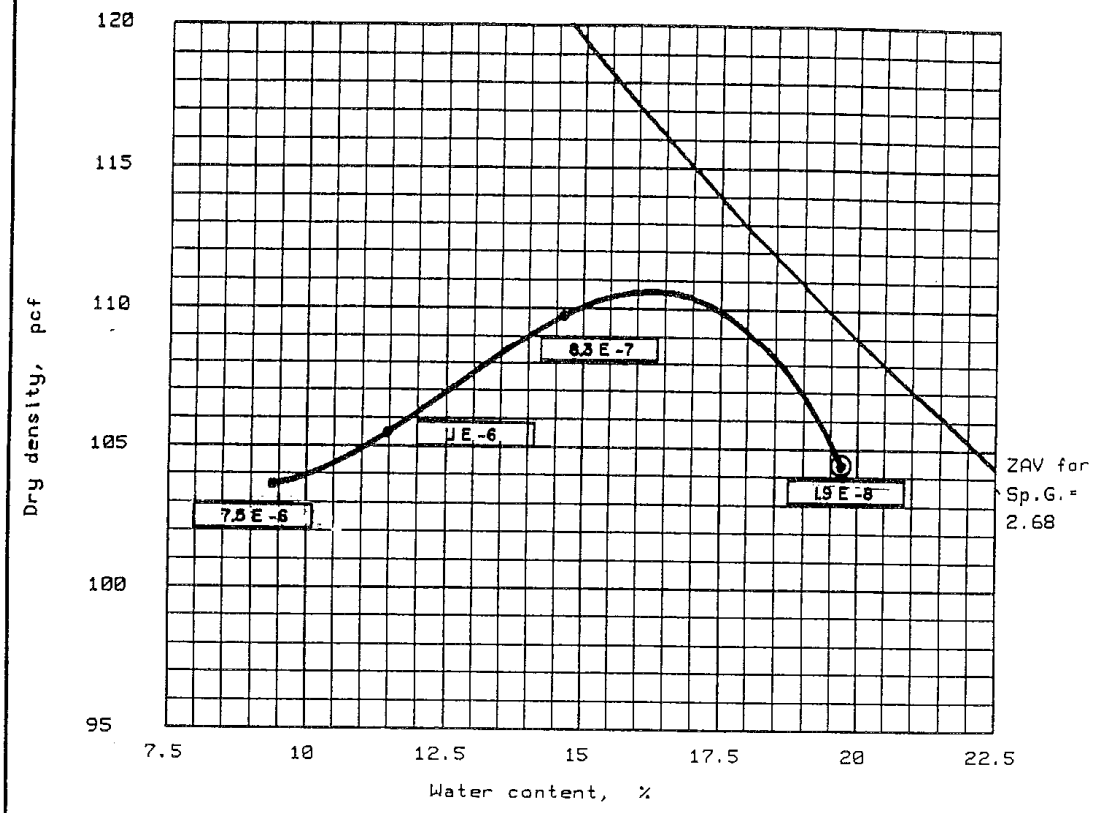
Elev/ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
10	CL		29 %	2.68	30	19		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 19.3 % Maximum dry density = 103.6 pcf	Brown Low Plastic SILTY CLAY
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Widman Pit #1-Sample 1 Date: 3-14-95	Remarks: Rammer-Manual Perparation-Moist Lab#574
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 6

WR 4/20

DRAFT

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification USCS	Classification AASHTO	Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
10	CL			2.68	30	13		

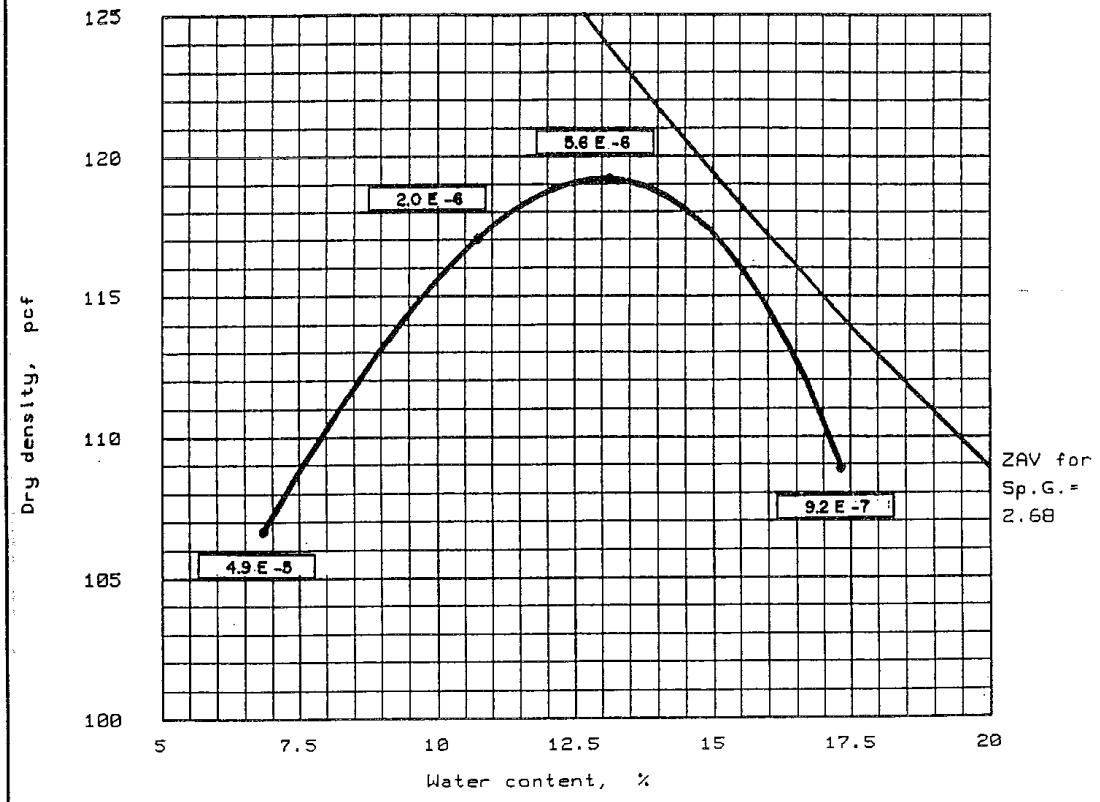
TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 16.2 % Maximum dry density = 110.6 pcf	Brown Low Plastic SILTY CLAY
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Georgewitz Pit B1 5-10' Date: 4-5-95	Remarks: Rammer - Manual Preparation - Moist Lab#597
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 8

WR 421

SLOPE STABILITY

DRAFT

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
20	CL			2.68	25	12		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 13.0 % Maximum dry density = 119.2 pcf	Brown Low Plastic SILTY CLAY little sand
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Georgewitz Pit B1 13-20' Date: 4-18-95	Remarks: Rammer - Manual Preparation - Moist Lab#597
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 9

WR 422

DRAFT

ENGINEERING & MATERIALS TESTING

PROJECT Illinois Power - Georgewitz Pit #1
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B1
SHEET 1 OF 2
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	SAMPLE BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
0					Brown, low plastic SILTY CLAY	CL							0
	1	SS		3 5 5				21	--	--	--	--	
5													5
					Brown, low plastic SILTY CLAY trace sand	CL							
	2	SS		3 4 5				19	--	--	--	--	
10													10
					Brown and gray, low plastic SILTY CLAY, trace sand & gravel	CL							
	3	SS		3 4 5				18	--	--	--	--	
15													15
					Gray and brown, high plastic SILTY CLAY, little sand, trace gravel	CH							
	4	SS		9 10 14				12	--	--	--	--	
20					Continued on sheet 2 of 2								20

WATER LEVEL.
XX NO GROUND WATER NOTED AT TIME OF DRILLING
____ FT. WHILE DRILLING
____ FT. ____ HRS. AFTER DRILLING
____ FT. ____ HRS. AFTER DRILLING

REMARKS:
WR 423

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

JECT Illinois Power - Georgewitz Pit #1
ATION Alton, Illinois
LLER Midwest Drilling, Inc.
FACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. DRAFT B-1
SHEET 1 OF 1
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
				Gray and brown, high plastic SILTY CLAY, little sand, trace gravel	CH							
5	SS		11 17 18				13	--	--	--	--	25
6	SS		6 9 10				15	--	--	--	--	10
				Drilling terminated at 30 feet								
												35
												40

WATER LEVEL:
XX NO GROUND WATER NOTED AT TIME OF DRILLING
___ FT. WHILE DRILLING
___ FT. ___ HRS. AFTER DRILLING
___ FT. ___ HRS. AFTER DRILLING

REMARKS:
WL 4/24

SLOPE STABILITY

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

DRAFT

PROJECT Illinois Power - Georgewitz Pit #1
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B2
SHEET 1 OF 2
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
					Reddish-brown, low plastic SILTY CLAY	CL							
5	1	SS		3 4 4				21	--	--	--	--	5
					Brown, low plastic SILTY CLAY trace sand	CL							
10	2	SS		3 4 5				17	--	--	--	--	10
					Brown and gray, medium plastic SILTY CLAY, trace sand & gravel	CL/CH							
15	3	SS		3 4 4				18	--	--	--	--	15
					Brown and gray, high plastic SILTY CLAY, little sand & gravel	CH							
20	4	SS		9 13 13				19	--	--	--	--	20
					Continued on sheet 2 of 2								

WATER LEVEL.
XX NO GROUND WATER NOTED AT TIME OF DRILLING
____ FT. WHILE DRILLING
____ FT. ____ HRS. AFTER DRILLING
____ FT. ____ HRS. AFTER DRILLING

REMARKS

WR 4/95

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

PROJECT Illinois Power - Georgewitz Pit #1
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B2 (DRAFT)
SHEET 2 OF 2
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	SAMPLE BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
					Brown and gray, high plastic SILTY CLAY, little sand & gravel	CH							
25	5	SS		13 17 19				12	--	--	--	--	25
					Gray, high plastic SILTY CLAY little sand, trace gravel	CH							
30	6	SS		10 13 16				10	--	--	--	--	10
					Drilling terminated at 30 feet								
35													35
40													40

WATER LEVEL:
XX NO GROUND WATER NOTED AT TIME OF DRILLING
____ FT. WHILE DRILLING
____ FT. ____ HRS. AFTER DRILLING
____ FT. ____ HRS. AFTER DRILLING

REMARKS:
WR 4/26

ENGINEERING & MATERIALS TESTING, INC.

DRAFT

OJECT Illinois Power - Georgewitz Pit #1
CATION Alton, Illinois
ILLER Midwest Drilling, Inc.
RFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B3
SHEET 1 OF 2
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LAB: MOISTURE CONTENT (%)	LAB: DRY DENSITY (pcf)	LAB: UNCONFINED COMPRESSIVE STRENGTH (ksf)	LAB: LIQUID LIMIT	LAB: PLASTIC LIMIT	DEPTH (ft)
					Reddish-brown, low plastic CLAYEY SILT	ML							
	1	SS		3 4 5				21	--	--	--	--	5
					Brown, low plastic SILTY CLAY trace sand	CL							
	2	SS		3 3 3				19	--	--	--	--	10
					Brown, medium plastic SILTY CLAY, trace sand & gravel	CL/CH							
	3	SS		3 5 6				16	--	--	--	--	15
					Brown and gray, high plastic SILTY CLAY, little sand & gravel	CH							
	4	SS		10 13 15				15	--	--	--	--	20
					Continued on sheet 2 of 2								

WATER LEVEL:
XX NO GROUND WATER NOTED AT TIME OF DRILLING
____ FT. WHILE DRILLING
____ FT. ____ HRS. AFTER DRILLING
____ FT. ____ HRS. AFTER DRILLING

REMARKS:
WL 427

SLOPE STABILITY

DRAFT

ENGINEERING & MATERIALS TESTING, INC.

PROJECT Illinois Power - Georgewitz Pit #1
LOCATION Alton, Illinois
DRILLER Midwest Drilling, Inc.
SURFACE ELEVATION X DRILLING METHOD 4" O.D. CFA

BORING NO. B2
SHEET 2 OF 2
PROJECT NO. 95-3036
DATE DRILLED 3/31/95

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in/in)	SAMPLE BLOWS (per 6 in)	DESCRIPTION	UNIFIED SOIL CLASSIFICATION	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTIC LIMIT	DEPTH (ft)
					Brown and gray, high plastic SILTY CLAY, little sand & gravel	CH							
25	5	SS		12 14 16				12	--	--	--	--	25
					Gray, high plastic SILTY CLAY trace sand & gravel	CH							
	6	SS		9 10 9				16	--	--	--	--	10
30					Drilling terminated at 30 feet								
35													35
40													40

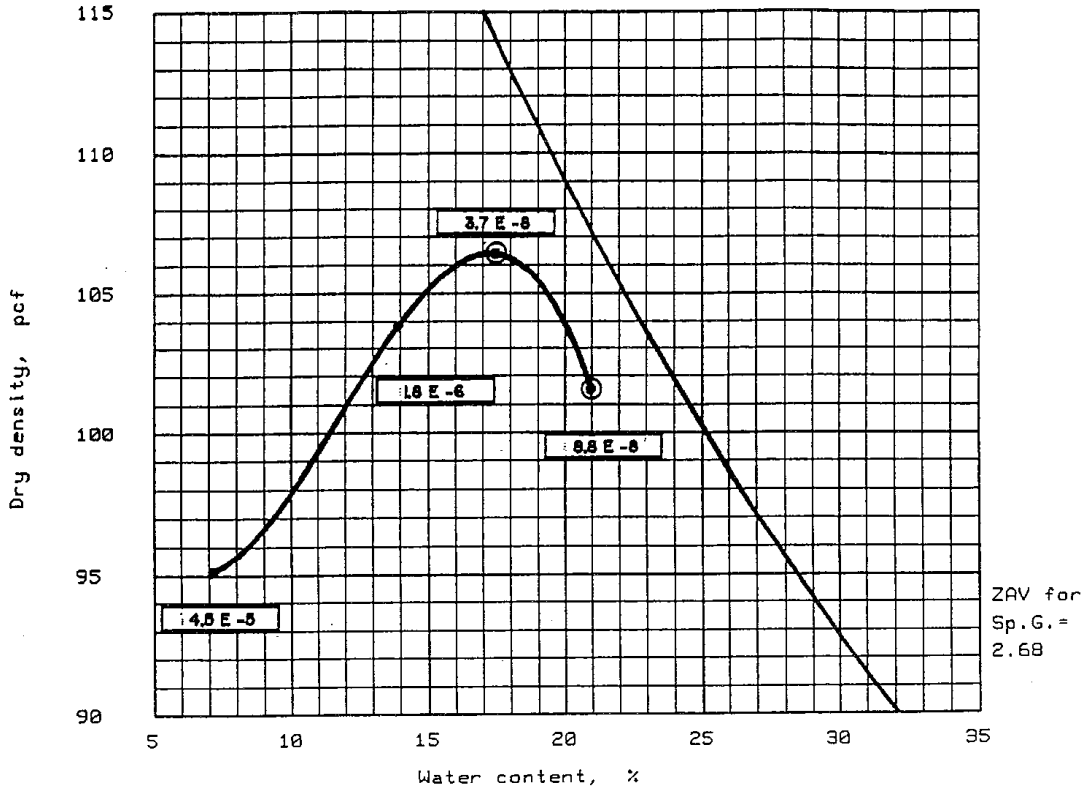
WATER LEVEL:
XX
____ NO GROUND WATER NOTED AT TIME OF DRILLING
____ FT. WHILE DRILLING
____ FT. ____ HRS. AFTER DRILLING
____ FT. ____ HRS. AFTER DRILLING

REMARKS:
WR 428

SLOPE STABILITY

DRAFT

COMPACTION CONTROL CURVE



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
5	CL			2.68	35	17		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 17.2 % Maximum dry density = 106.4 pcf	Brown Low Plastic SILTY CLAY
Project No.: 95-3036 Project: ILL POWER ALTON COOLING POND Location: Helmkamp B2 5' Date: 4-5-95	Remarks: Rammer - Manual Preparation - Moist Lab#598
COMPACTION CONTROL CURVE SCI ENGINEERING	Figure No. 13

WR 429

DRAFT

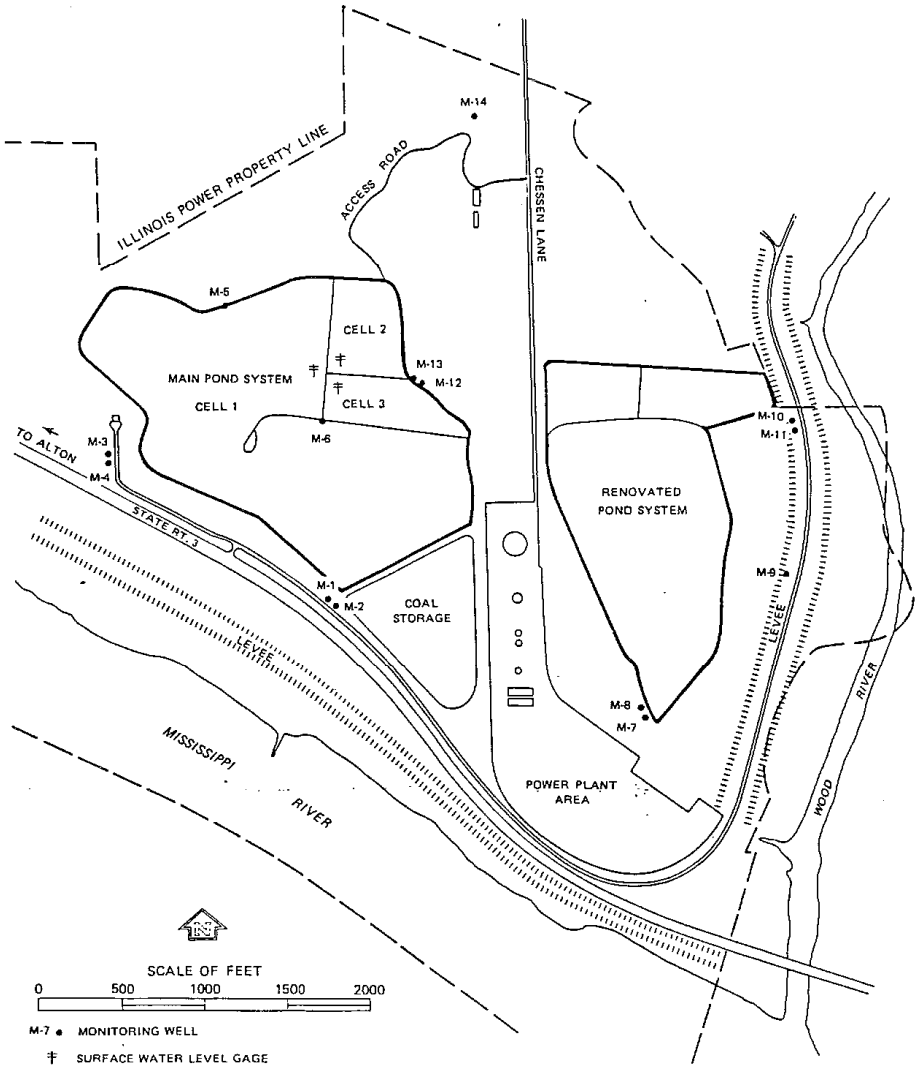


Figure 1. Locations of the monitoring wells and staff gages at the Wood River Power Station

WL 4130

DRAFT

RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 83-1344
BORING M-5
SHEET 1 OF 1

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System: Unified. Surface Elevation: –	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf (SV△ QP/2□ QU/2○ 0 ½ 1 1½ 2 2½; PL NMC LL; 0 50 100; Rock Quality Designation 0 50 100)
					Dark Gray CLAY, with Silt			
5	1	SS	18/16			5-7-10		
					Brown Silty CLAY, Trace Fine Sand	4-5-6		
10	2	SS	18/14					
					Brown Fine SAND, Dry			
15	3	SS	18/10			5-6-6		
					Brown Fine Silty SAND			
20	4	SS	18/12			2-3-8		
					Brown Fine to Medium SAND	6-8-11		
25	5	SS	18/10					
30	6	SS	18/12			6-8-11		
35	7	SS	30/20		36' TOB	6-11-12		

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at 19.0 Feet
___ Hours after completion ___ Feet
___ after completion ___ Feet
___ after completion ___ Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

John Mathes & Associates, Inc.

VOR431

DRAFT

RECORD OF [illegible]

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344

BORING M-6
SHEET 1 OF 2

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System Unified. Surface Elevation —	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf: SV△ QP/₂□ QU/₂○ (0, ½, 1, 1½, 2, 2½); PL NMC LL; Rock Quality Designation (0, 50, 100)
5	1	SS	18/16		Brown Silty CLAY	4-5-6		
10	2	SS	18/18		Gray Silty CLAY	3-5-9		
15	3	SS	18/14		Gray Silty CLAY, Trace Silt, Organics, Fine Sand	3-4-6		
20	4	SS	18/14			1-1-1		
25	5	SS	18/18		Gray CLAY	WH-WH-1		
30	6	SS	18/18			WH-1-1		
35	7	SS	18/10		Gray Fine SAND, Trace Silt	3-9-15		

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at — Feet
— Hours after completion — Feet
— after completion — Feet
— after completion — Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

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WR432

DRAFT

RECORD OF SUBSURFACE EXPLORATION

PROJECT Illinois Power - Wood River Power Plant Monitoring Wells
JOB NO. 82-1344

BORING M-6
SHEET 2 OF 2

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL AND TYPE	SAMPLE ADVANCED / RECOVERED (in)	SEE REMARK #	DESCRIPTION OF MATERIALS (Color Modifier MATERIAL. Classification) Soil Classification System: Unified. Surface Elevation: -	BLOWS (per 6 in)	DRY UNIT WEIGHT (pcf)	Shear Strength, tsf: SV△ QP/2□ QU/2○ (0, ½, 1, 1½, 2, 2½); PL + NMC • LL x (0, 50, 100); Rock Quality Designation (0, 50, 100)
					Gray Fine SAND, Trace Silt			
40	8	SS	18/18		Gray Fine to Medium SAND			
					TOB			
45								
50								
55								
60								
65								
70								

DRILLING METHOD Hollow Augers
DATE DRILLED 12-17-82
DRILLED BY Bignall
LOGGED BY Hileman
PIEZOMETER See Sketch

GROUNDWATER LEVELS
Encountered at ____ Feet
___ Hours after completion ___ Feet
___ after completion ___ Feet
___ after completion ___ Feet

NOTE: Refer to the attached GENERAL NOTES and NOTATION USED ON RECORDS OF SUBSURFACE EXPLORATION for abbreviations, explanations, and qualifications relative to this log.

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WR4/33

DRAFT

Slope Stability Analysis

WR 434

DRAFT

SLOPE STABILITY ANALYSIS/DESIGN

For the slope stability analysis, several load cases were reviewed using the SLOPE/W computer program (Ver. 3.03) from Geo-Slope International. The factor of safety values were calculated using Spencer's method of slices. Both static and seismic conditions were investigated. This project is located in a seismic zone 2, and a pseudo-static horizontal force coefficient of 0.10 was used in the analysis. The following load cases were analyzed:

Use of total stresses
Case I End of Construction
Case II Rapid Drawdown
Use of effective stresses
Case III Steady Seepage (No Ash accumulation)
Case IV Steady Seepage (Ash/Water up to elevation 427.0)
Case V Fully Submerged up to 430.0 with water (conservative)

The following table outlines the soil properties used for the slope stability analysis: (summaries of the specific values used in each case are given in the results of this section).

Soil type	Undrained Case (total stresses)				Drained Case (effective stresses)			
	total wt., γ (pcf.)	ϕ (deg.)	cohesion C (psf.)	total wt., γ_{sat} (pcf.)	total wt., γ (pcf.)	ϕ' (deg.)	cohesion C' (psf.)	total wt., γ_{sat} (pcf.)
clay liner	120	0	2000	131	120	25	0	131
drainage rock	125	37	0	140	125	37	0	140
embankment	115	0	1200	125	115	30	0	125
old dikes	117	0	1200	125	117	25	230	125
subgrade, clay	119	0	500	122	119	23.2	5	122
subgrade, sand	125	30	0	130	125	30	0	130
ash	85	20	0	90	85	30	0	90

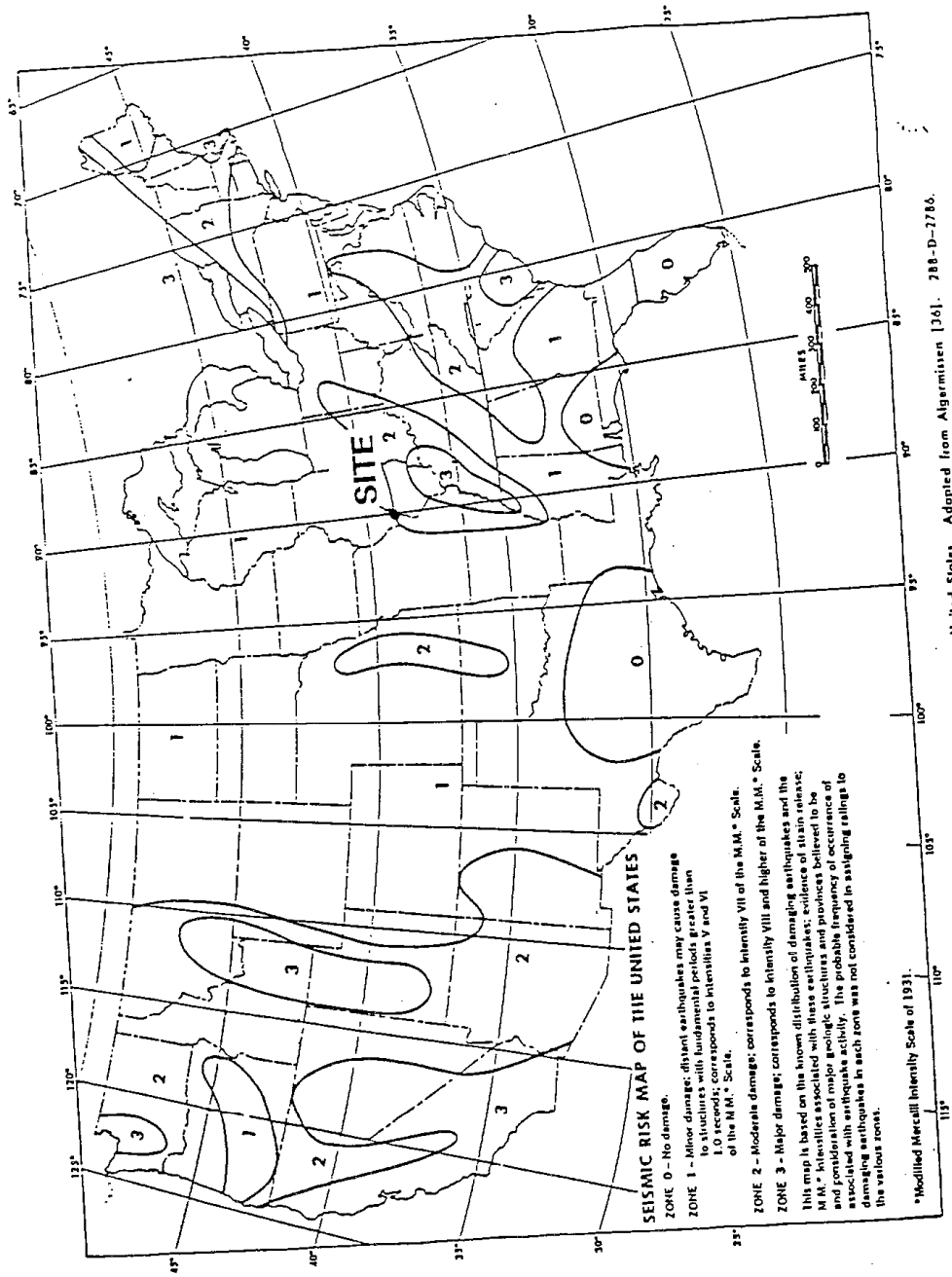
The seismic factor was determined using the "Procedural Guidelines for Preparation of Technical Data to be Included in Applications for Permits for Construction and Maintenance of Dams", IDOT, Printed January, 1990. This facility is in a seismic zone 2 (see attached seismic risk map from Algermissen), and the seismic coefficient used was 0.10.

SOILS

The total strength properties for the soils were determined by a geotechnical consulting firm, and were used in the modeling of Load Case I and II. The effective strength properties were based on previous testing, conservatively estimated based on the total strength properties, and they were used to model Load Cases III, IV and V. The properties of sedimented ash were estimated from similar facilities owned by Illinois Power Company. In addition, the bedrock is very deep (approximately 80 to 100 feet) and does not enter into any of the failure surfaces. The backup calculations for soil properties are included in this section.

WR 4135

DRAFT


SITE
SEISMIC RISK MAP OF THE UNITED STATES
ZONE 0 – No damage.
ZONE 1 – Minor damage; distant earthquakes may cause damage to structures with fundamental periods greater than 1.0 seconds; corresponds to intensities V and VI of the M.M.* Scale.
ZONE 2 – Moderate damage; corresponds to intensity VII of the M.M.* Scale.
ZONE 3 – Major damage; corresponds to intensity VIII and higher of the M.M.* Scale.
This map is based on the known distribution of damaging earthquakes and the M.M.* intensities associated with these earthquakes; evidence of strain release; and consideration of major geologic structures and provinces believed to be associated with earthquake activity. The probable frequency of occurrence of damaging earthquakes in each zone was not considered in assigning ratings to the various zones.
*Modified Mercalli Intensity Scale of 1931.
MILES
Seismic risk map of the conterminous United States. Adopted from Algermissen [36]. 288-D-2786.

WR 436

DRAFT

MODELING

The location and geometry of the worst-case section is shown on the following two pages. Primarily, the section consists of an existing dike with both faces at 2.5H:1V. The dike was placed on a 10 ft. layer of clay. Below that is 70 to 80 feet of sand. In addition to the existing dike, we are placing embankment on the upstream face to attain a grade of 4H:1V. The upstream face and bottom is then lined with the leachate collection system (LCS). The LCS consists of one foot of clay above 8 inches of drainage rock, above two feet of clay. On the sides, the section is modified so that the 8 inches of rock is replaced by a geocomposite drain. The veneer stability calculations, of the liner layers, are included in the leachate collection system section of this report.

The models for all load cases are similar, except for:

- the addition of seismic loadings
- the fluctuation of ash and water levels inside the facility
- drained versus undrained soil properties
- the phreatic surface

The phreatic surface was estimated conservatively, for load cases II through V. Since there is a leachate collection system that will be returning most of the seepage back into the ponds, there will not be a significant phreatic surface caused by the pond. However, for conservatism, the phreatic surface was as if it was at the groundwater level (404.0 msl) outside the facility, underneath the facility, it rises towards the rock drainage layer, and continues in that layer under the bottom of the pond. Again we feel this is a conservative surface, and would conservatively model the system even if the pumps were to fail for a short time.

A sketch of the cross section is shown before the analysis runs, that shows the primary points that were used for the models. For analysis, Spencer's method of slices was used. This method was chosen because it solves for both force and moment equilibrium. The assumption this method makes is that the inclination of side forces is the same for every slice. The program then guesses at a value of that inclination. As a point of reference, a few runs were also done using Morgenstern and Price's method of slices, and the results were similar to using Spencer's.

WR 437

DRAFT

N100-203 (1-81)

CALCULATION SHEET

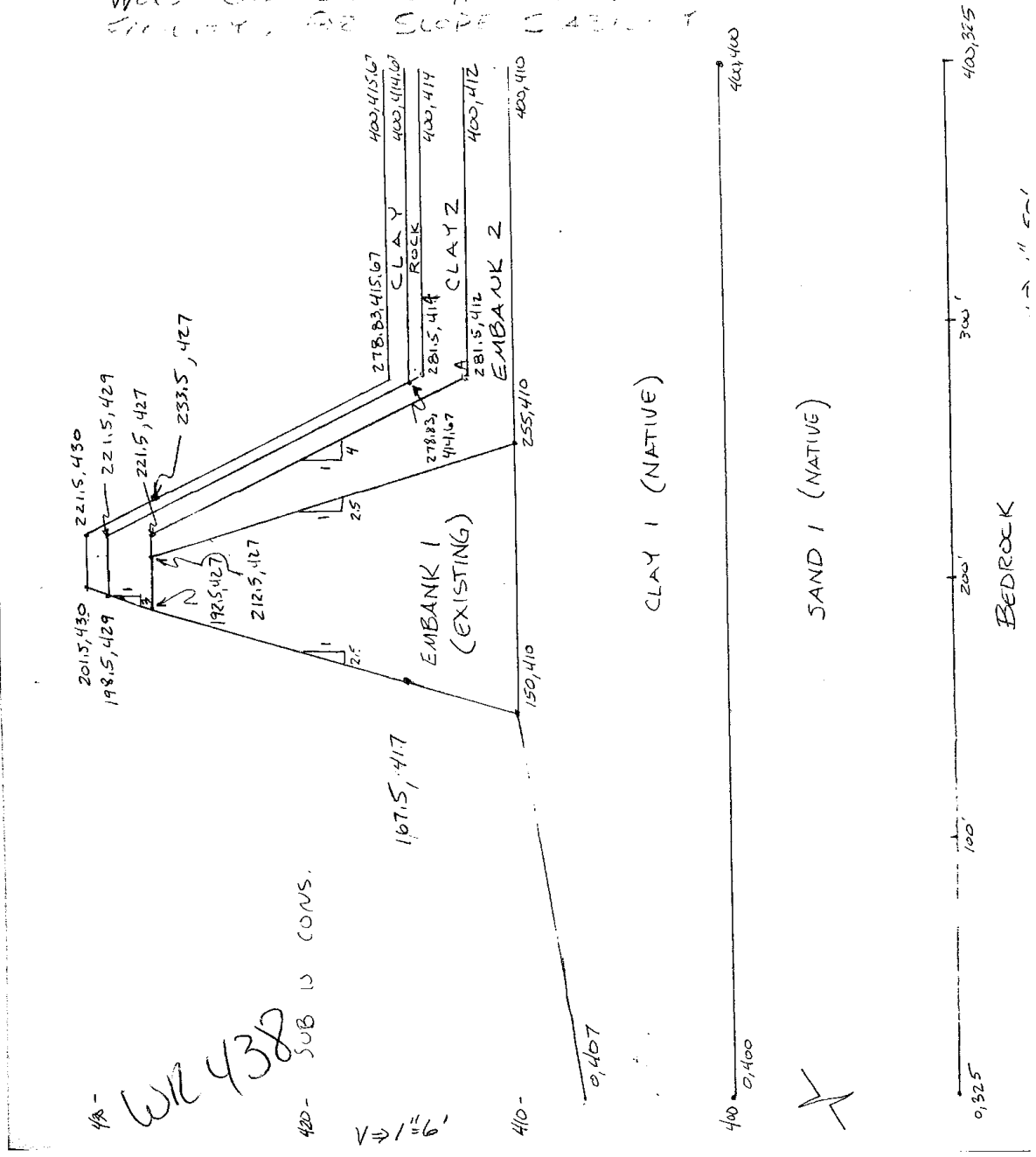
Date _____

Design by JPK Date 2/28/97 Checked by _____ Sheet No. _____

Project WR ASH IMPOUNDMENT

Subject BERM SOIL LAYOUT File No. _____

WORST CASE OCCURS IN THE NW CORNER OF THE [illegible], AS SLOPE IS [illegible]



WR-WL 438

SUB IS CONS.

DRAFT

RESULTS

The following are the minimum safety factors, after running all load cases, for each face of the embankment.

Loading Condition	Location	static	F.S. w/seismic
End of construction	upstream	3.27	N/A
Case I	downstream	2.18	N/A
Rapid drawdown	upstream	3.31	N/A
Case II	downstream	2.13	N/A
Steady seepage, no ash	upstream	2.97	2.01
Case III	downstream	1.79	1.36
Steady seepage, with ash/water	upstream	3.08	2.07
Case IV	downstream	1.79	1.36
Fully Submerged	upstream	6.98	3.50
Case V	downstream	1.79	1.36

The Illinois Department of Natural Resources, Division of Water Resources requirements for minimum safety factors are:

Loading Condition	static	F.S. w/seismic
End of construction	1.3	N/A
Rapid drawdown	1.2	N/A
Steady seepage	1.5	1.0

The most critical factor of safety for all analyses is steady seepage, no ash. For this case, the closest factor of safety to the required minimum is the downstream seismic. I will include the full analysis for this case in this report, for review purposes. Due to the size of these files, I will not submit any others. They will be made available, if required. This output information is included in the results of all failure conditions.

Summary

The results show that the facility can safely be constructed to an elevation of 430.0 msl.

As stated, the veneer stability calculations between material layers are included in this report, in the leachate collection system section.

The last analysis performed was for shallow sloughing failures (file CIII_ISH). This was found not to be a problem. The factor of safety was around 2.0. The above tabular results reflect deep failures.

WL 439

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by JPK Date 8/2/96 Checked by Sheet No. 1 of

Project WOOD RIVER ASH POND

Subject SOIL PROPERTIES File No.

INFORMATION BASED ON SOIL REPORTS ENCLOSED

CLAY LINER

BASED ON INFO FROM SCI AT 95% STD PROCTOR

$\gamma = \frac{\gamma_d(100+w)}{100} \Rightarrow$ $116.4 < \gamma < 128.0$

$w = 20\%$ $= 13\%$

USE $\gamma = 120$ pcf @ 17% $\gamma_d = 110$ pcf

FOR UNIT SAMPLE

$\gamma_{SUB} \Rightarrow V_s = \frac{110\#}{167.2 \text{ pcf}} = .658 \text{ ft}^3$ $\gamma_s = 62.4(2.68) = 167.2$ pcf

$M_w = 110(.17) = 17\#$

$V_w = \frac{17\#}{62.4 \text{ pcf}} = .272 \text{ ft}^3$

$V_a = V_T - V_s - V_w = 1 - .658 - .272 = .070$

$\eta = \frac{V_V}{V_T} = \frac{.272 + .070}{1} = .342$ 34.2% porosity

$S = \frac{V_w}{V_V} = \frac{.272}{.342} = 80\%$ D.O.S.

If $S = 100\%$ $M_w = .342(62.4 \#/\text{ft}^3) = 21.3\#$

$\gamma_{SUB} = \frac{110\# + 21.3\#}{1 \text{ ft}^3} = 131.3$ pcf USE 131.6

FOR UNDRAINED CASE

$C = 2000$ psf BASED ON BLOW COUNTS

$\phi = 0$

FOR DRAINED CASE

$C = 0$ psf

$\phi = 25$ CONSERVATIVE

WL440

N100-203 (1-81) CALCULATION SHEET Date

Design by JPK Date Checked by Sheet No. 2 of 5

Project

Subject File No.

DRAINAGE ROCK

ASSUMPTIONS WERE MADE BASED ON A CLEAN UNIFORM DRAINAGE ROCK

$\gamma = 125$ pcf

$\gamma_{SAT} = 140$ pcf

FOR UNDRAINED CASE & DRAINED CASE

$\Phi = 37°$

$C = 0.0$

EMBANKMENT & SUBGRADE-CLAY

WE WILL USE THE SILTY CLAY LAYER OF SITE MATERIAL FOR EMBANKMENT, REMOLDED, THE FIRST SUBGRADE LAYER IS ALSO CALCULATED HERE

SUBGRADE CLAY → $\gamma_d = 95$ pcf $w = 27\%$

$\gamma = 119$ pcf

FOR γ_{SUB} ⇒ $V_S = 95\#/167.12\ \#/ft^3 = .568\ ft^3$

$M_W = 95(.27) = 25.65\#$

$V_W = 25.65/62.4 = .411\ ft^3$

$V_a = V_T - V_S - V_W = .021$

$\eta = V_V/V_T = .021 + .411/1 = .432$

$S = V_W/V_V = .411/.411 + .021 = 95\%$

$S_{100\%} \Rightarrow M_W = .432(62.4) = 27.0\#$

$\gamma_{SUB} = \frac{27 + 95}{1} = 122$ pcf

WR 411

DRAFT

N100-203 (1-81) CALCULATION SHEET Date _____

Design by _____ Date _____ Checked by _____ Sheet No. 30f

Project _____

Subject _____ File No. _____

SUBGRADE cont

UNDRAINED CASE
$\phi = 0°$
$C = 500$ psf BASED ON NAVFAC DESIGN MANUAL 7 TABLE 1 pg 7.2-34

DRAINED CASE
$C = 5$ psf : BASED ON PREVIOUS TESTING
$\phi = 23.2$: BY BOWSER MORNER

FOR EMBANKMENT, REMOLDED (NEW), USING 95% STD PROCTOR

$\gamma_d = 100$ pcf $w = 15\%$

$\gamma = 100(1.11) = 115$ pcf

$V_s = 100/167.2 = .600$ ft³

$M_w = 100(.15) = 15.0$ #

$V_w = 15\#/62.4 = .240$ ft³

$V_a = 1 - .600 - .240 = .160$

$n = V_v/V_T = \frac{.240 + .160}{1} = .400$

$S = V_w/V_v = \frac{.240}{.400} = 60\%$

If $S = 100\%$ $V_w = .400$ ft³
$M_w = .400(62.4 \text{ pcf}) = 25.0$ #

$\gamma_{sub} = \frac{100 + 25.0}{1 \text{ ft}^3} = 125.0$ pcf

WRL 442

FROM NAVFAC $\phi = 0$ $C = 1200$ psf ϕ', C' ESTIMATED

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by Date Checked by Sheet No. 4 of 5

Project File No.

Subject

FOR THE SAND SUBGRADE
C & C' = 0
$\phi = 27.2 + .29N$ FOR UNDRAINED
$N \times 10 \Rightarrow 30.1 = \phi$ USE 30°

DUE TO THE FACT THAT IT IS NOT A DENSE SAND, (LOW N VALUES) THE EFFECTIVE STRESS ϕ, ϕ', WILL BE SLIGHTLY HIGHER, USE $\phi' = 30°$ ANYWAY

γ & γ_{sat} WERE ASSUMED.

ASH — ASH VALUES WERE USED FROM DATA AT OTHER ILLINOIS POWER SITES.

BEDROCK IS BELOW THE POTENTIAL FAILURE AREAS, AND IS NOT SHOWN
BEDROCK ELEVATION IS APPROX. 325 M.S.L.

EXISTING EMBANKMENTS

CLAYEY SILT / SILTY CLAY

BASED ON BOWLES / MORNER ANALYSES
$\gamma = 117$ pcf $\gamma_{sub} = 125$ pcf

FROM NAVFAC $\phi = 0$ $C = 1200$ psf
ϕ' & C' WERE ESTIMATED

WR 443

DRAFT

9.3 STRENGTH PARAMETERS USED IN STABILITY ANALYSIS

A summary of the strength parameters used for the design of the embankment is as follows (actual test results are shown in Appendix A1).

TABLE 9-2

Material	Wet Unit Weight (pcf)	Saturated Unit Weight (pcf)	Effective Stress Parameters φ(°)	Effective Stress Parameters C'(psi)	Total Stress Parameters φu(°)	Total Stress Parameters Cu(psi)
~~Original soil~~ SUBGRADE CLAY	125	130	23.2	0	12.3	1.26
Existing Embankment CLAY DIKE	117	125	27.2	0	23.8	2.0
New embankment	115	120	~~32.5~~	0	0	13.5*
Ash	90	90	31.9	2.5	0	2.5*

*Conservatively, for total stress parameter only half of the cohesion was considered.

9.4 LOCATION OF PHREATIC SURFACE

The phreatic surface was determined for steady state conditions with the water in the reservoir at normal pool, as shown in Chapter 8 and in Appendix D "Seepage Analysis".

9.5 RESULTS OF STATIC AND PSEUDO-STATIC ANALYSIS

The static and pseudo-static analyses were performed for the highest and most critical stage of the construction utilizing the program GEOSLOPE, the strength parameters as shown in Table 9-2 and the phreatic surface developed as discussed in Chapter 8. A seismic coefficient of 0.10 was used in the pseudo-static analysis. The results of these analyses are as follows:

TABLE 9-3

Cross Section	Hypothesis	Location and Type of Sliding Surface	Factor of Safety Static	Factor of Safety Earthquake
1-1	End of Construction	Upstream Slope	1.9	N/A
		Downstream Slope	1.5	N/A
	Long Term, Steady Seepage	Downstream Slope	2.2	1.2
		Upstream Slope	1.5	1 0
	Sudden Drawdown	Upstream Slope	1.9	N/A

BOWSER MORNER

WR 444

DRAFT

CALCULATION SHEET

Date _____

N100-203 (1-81)

Design by JPK Date 8/7/96 Checked by _____ Sheet No. 1 of 3

Project WR ASH POND

Subject SLOPE STABILITY RUN NOTES File No. _____

REQUIREMENTS FOR SLOPE STABILITY

CASE I	END of CONSTRUCTION INSIDE & OUTSIDE	UNDRAINED
CASE II	RAPID DRAWDOWN INSIDE & OUTSIDE	UNDRAINED
CASE III	STEADY SEEPAGE - NO ASH INSIDE & OUTSIDE	DRAINED SOILS
CASE IV	STEADY SEEPAGE - ASH TO 438.0 INSIDE & OUTSIDE	DRAINED
CASE V	FULLY SUBMERGED (CONSERVATIVE) INSIDE & OUTSIDE	DRAINED

THE EMBANKMENT THAT IS MOST CRITICAL IS ON THE NW SIDE OF POND TWO.

THE LINER SYSTEM WILL BE 1' of CLAY ON 8" of POORLY GRADED ROCK ON TOP of 2' of CLAY.

WOODWARD - CLYDE CONSULTANTS ARE DESIGNING THE LINER, AND WILL BE ANALYZING THE SLIP FACTORS of SAFETY BETWEEN LINER MATERIALS (VENEER FAILURES).

SINCE THE FACILITY IS IN A SIESMIC ZONE 2, A SEISMIC COEFFICIENT of 0.10 WILL BE USED, SEE ATTACHED MAP

WR 445

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by Date Checked by Sheet No. 2 of 3

Project

Subject File No.

THE FAILURE LOCATION IS DESIGNED AT THE NORTH WEST LEG OF THE SYSTEM, WHERE IT RUNS ALONG NATIVE GROUND 20' BELOW THE DIKE, THIS IS THE WORST CASE, OUTSIDE AND INSIDE.

FILES WILL BE NAMED AS FOLLOWS

EXAMPLE

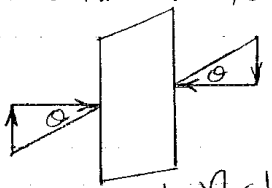
C I I (S)

- → S SEISMIC (ONLY CASES I and II)
- → I or O [I]NSIDE POND FAILURE, [O]UTSIDE FAILURE
- → I, II, III, IV, V LOAD CASES

THE GROUNDWATER IS TAKEN TO BE AT EL. 404.0 BASED ON GROUNDWATER STUDIES DONE BY ILLINOIS POWER, ENVIRONMENTAL RESOURCES DEPT.

BASED ON SOIL BORINGS, BEDROCK IS ABOUT 80' BELOW GRADE OF 410.0, IT DOES NOT COME INTO PLAY ON ANY MINIMUM FAILURE SURFACES

ANALYSIS WILL BE DONE USING SPENCER'S METHOD OF SLICES. THIS METHOD SOLVES FOR BOTH FORCE AND MOMENT EQUILIBRIUM. THE ASSUMPTION IN THIS METHOD IS THAT THE INCLINATION OF SIDE FORCES IS THE SAME FOR EVERY SLICE. THE PROGRAM GUESSES THE VALUE θ.



TYPICAL SECTION
θ's ARE EQUAL

WR 4/4/96

DRAFT

N100-203 (1-81)

CALCULATION SHEET

Date

Design by _____ Date _____ Checked by _____ Sheet No. 3 of 3

Project

Subject

File No.

CASES	FACTOR of SAFETY STATIC	SEISMIC
CI_I	3.27	—
CI_O	2.18	—
CII_I	3.31	—
CII_O	2.13	—
CIII_I	2.97	2.01
CIII_O	1.79	1.36
CIV_I	3.08	2.07
CIV_O	1.79	1.36
CV_I	6.98	3.50
CV_O	BY INSPECTION, OUTSIDE F.S.'s WILL BE SAME AS CIII_O & CIV_O	
	1.79	1.36

SHALLOW SLOUGHING WAS INVESTIGATED (CIII_ISH) AND FOUND TO NOT BE A PROBLEM, THE SAFETY FACTOR WAS AROUND 2.0. THE ABOVE VALUES REFLECT DEEP FAILURES.

WR 4147

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Undrained Soil Properties (Case I, End of Construction)

Soil 1
Water
Soil Model No Strength
Unit Weight 62.4
Piezometric Line # 1
Pore-Air Pressure 0

Soil 2
ash
Soil Model Mohr-Coulomb
Unit Weight 85
Cohesion 0
Phi 20
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 3
upper clay
Soil Model Mohr-Coulomb
Unit Weight 120
Cohesion 2000
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 4
drainage rock
Soil Model Mohr-Coulomb
Unit Weight 125
Cohesion 0
Phi 37
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 5
lower clay
Soil Model Mohr-Coulomb
Unit Weight 120
Cohesion 2000
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 6
embankment
Soil Model Mohr-Coulomb
Unit Weight 115
Cohesion 1200
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 7
old dikes
Soil Model Mohr-Coulomb
Unit Weight 117
Cohesion 1200
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

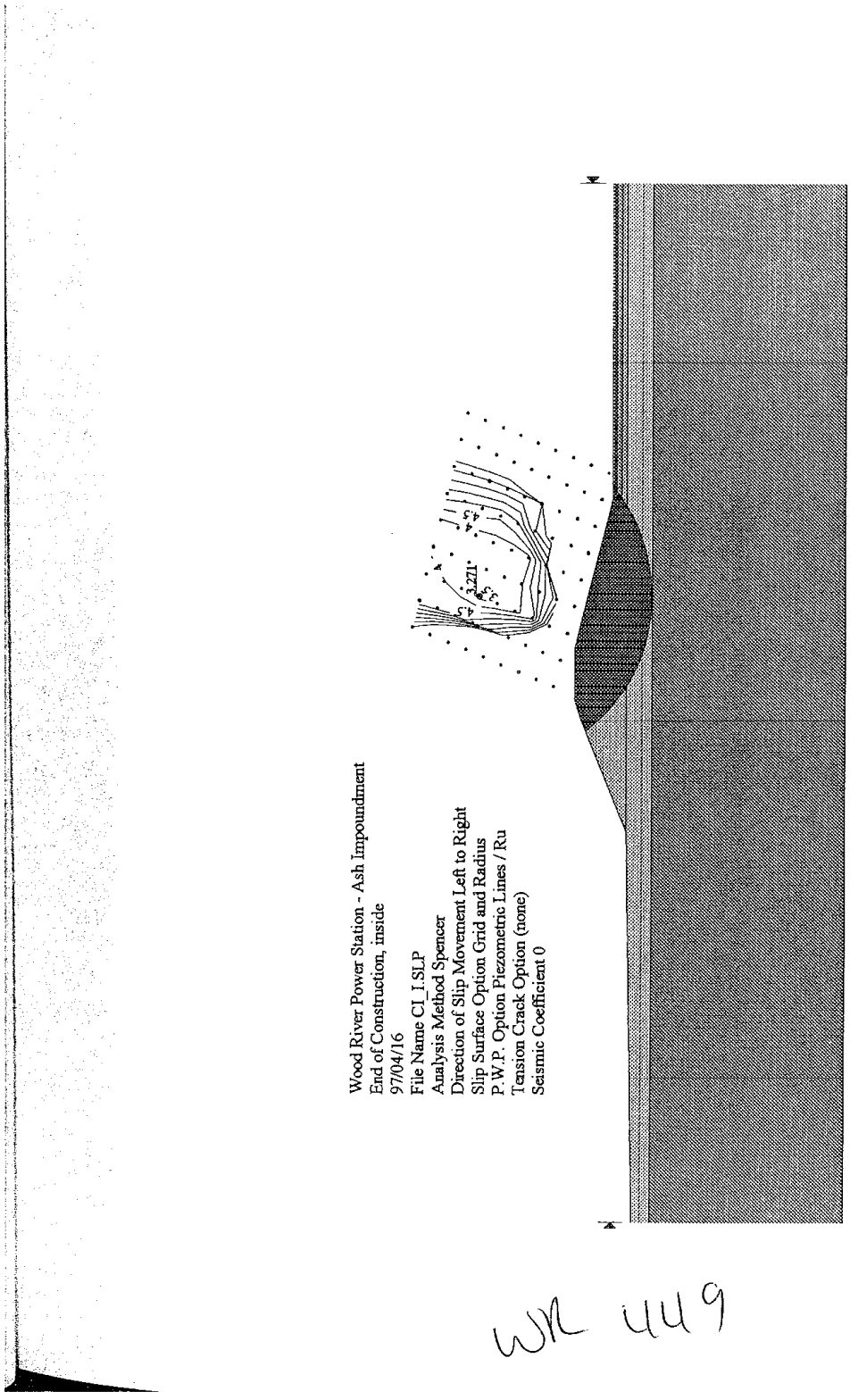
Soil 8
subgrade clay
Soil Model Mohr-Coulomb
Unit Weight 122
Cohesion 500
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 9
subgrade sand
Soil Model Mohr-Coulomb
Unit Weight 130
Cohesion 0
Phi 30
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 10
Bedrock
Soil Model Bedrock
Unit Weight -1
Piezometric Line # 1
Pore-Air Pressure 0

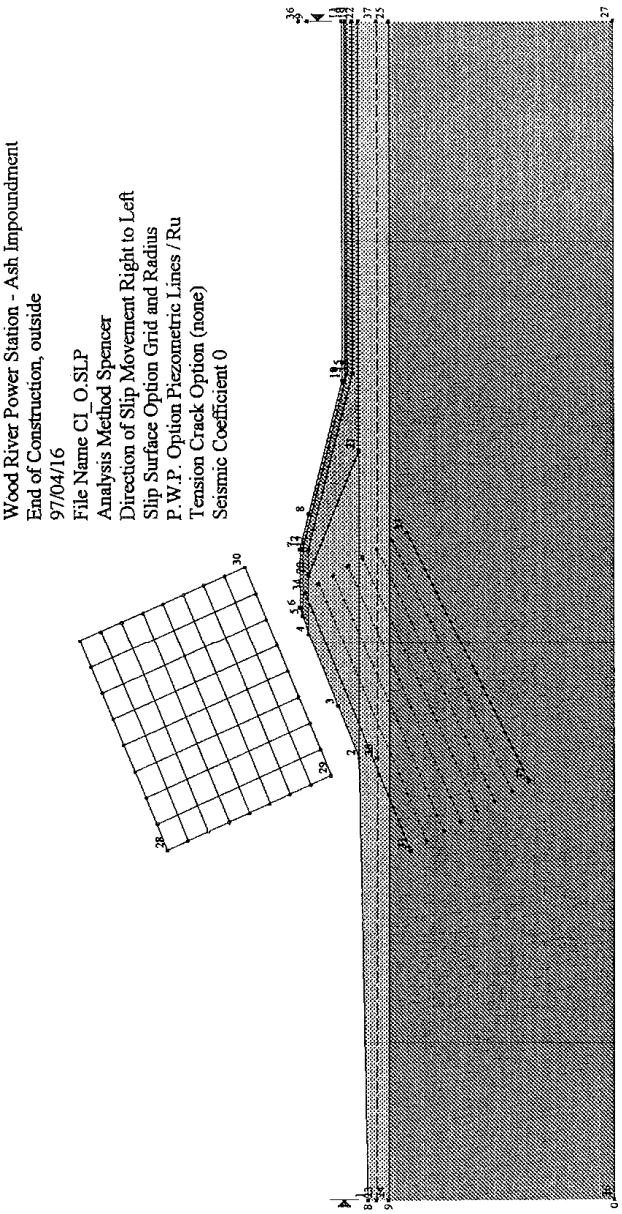
WR 1148

DRAFT


Wood River Power Station - Ash Impoundment
End of Construction, inside
97/04/16
File Name CI_I.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0
1271

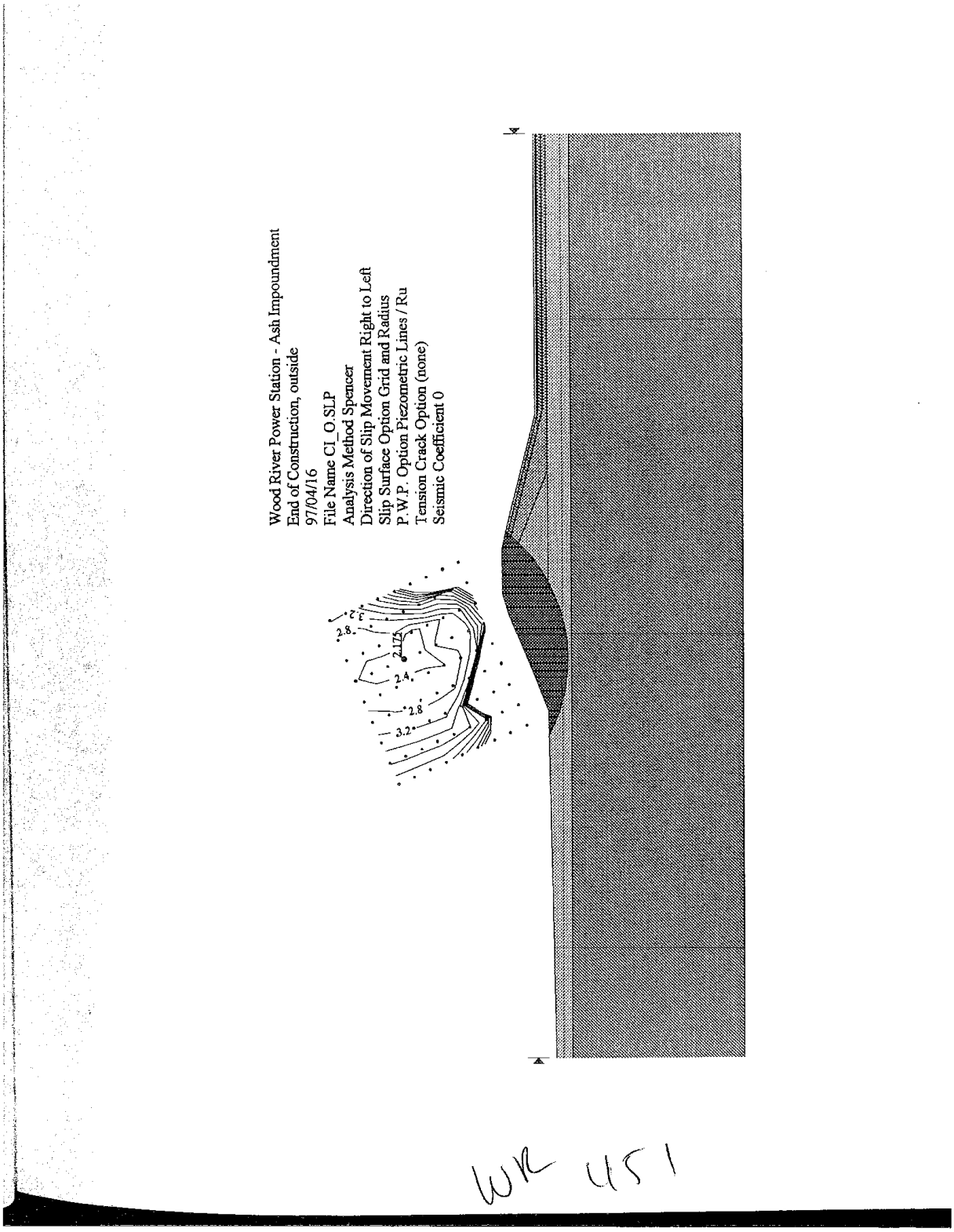
WR 449

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WR 4150

DRAFT


Wood River Power Station - Ash Impoundment
End of Construction, outside
97/04/16
File Name CI_O.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0
3.2
2.8
2.173
2.4
2.8
3.2

WR 451

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Undrained Soil Properties (Case II, Rapid Drawdown)

Soil 1
Water
Soil Model No Strength
Unit Weight 62.4
Piezometric Line # 1
Pore-Air Pressure 0

Soil 2
ash
Soil Model Mohr-Coulomb
Unit Weight 90
Cohesion 0
Phi 20
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 3
upper clay
Soil Model Mohr-Coulomb
Unit Weight 131
Cohesion 2000
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 4
drainage rock
Soil Model Mohr-Coulomb
Unit Weight 140
Cohesion 0
Phi 37
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 5
lower clay
Soil Model Mohr-Coulomb
Unit Weight 131
Cohesion 2000
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 6
embankment
Soil Model Mohr-Coulomb
Unit Weight 125
Cohesion 1200
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 7
old dikes
Soil Model Mohr-Coulomb
Unit Weight 117
Cohesion 1200
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

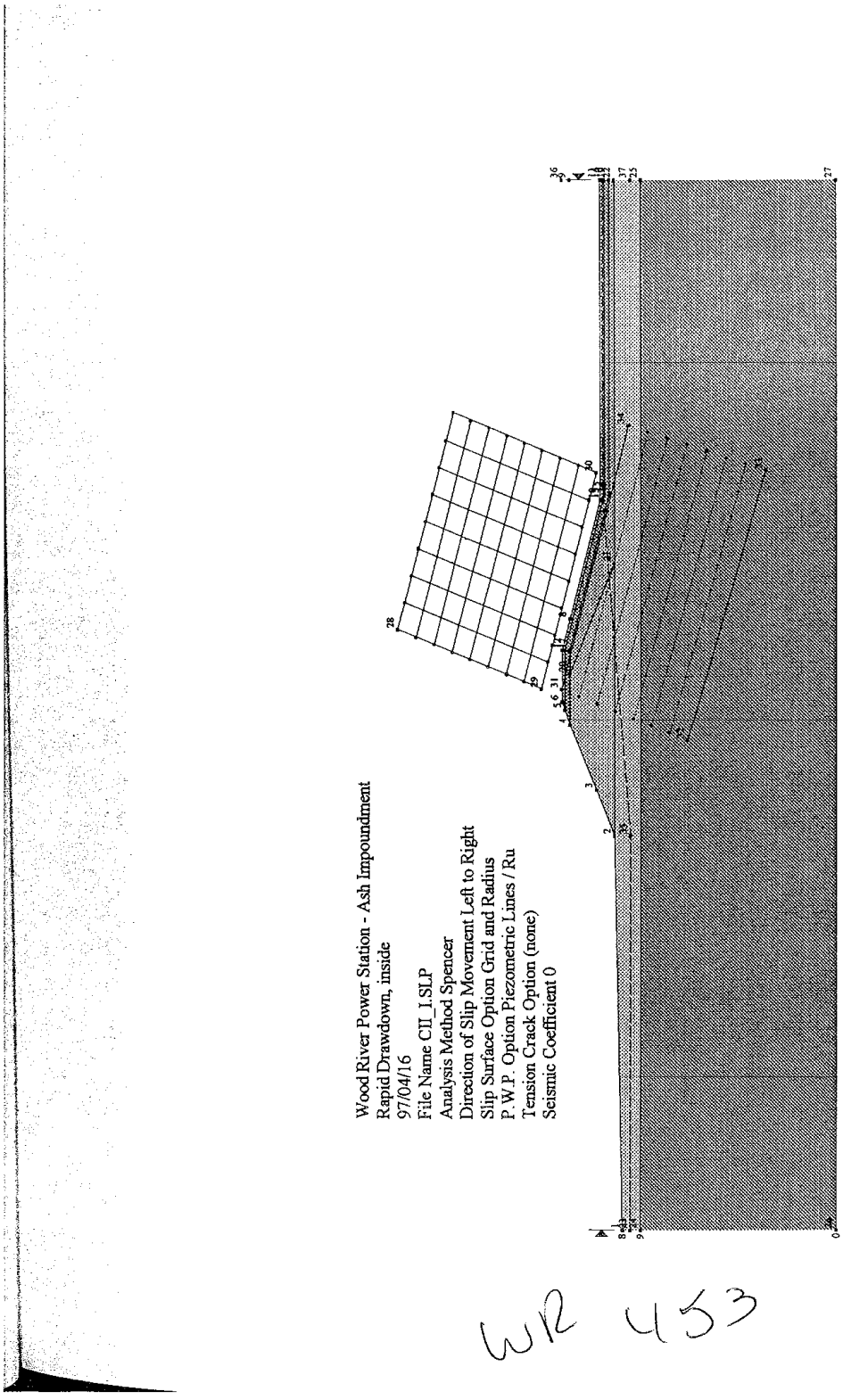
Soil 8
subgrade clay
Soil Model Mohr-Coulomb
Unit Weight 122
Cohesion 500
Phi 0
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 9
subgrade sand
Soil Model Mohr-Coulomb
Unit Weight 130
Cohesion 0
Phi 30
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 10
Bedrock
Soil Model Bedrock
Unit Weight -1
Piezometric Line # 1
Pore-Air Pressure 0

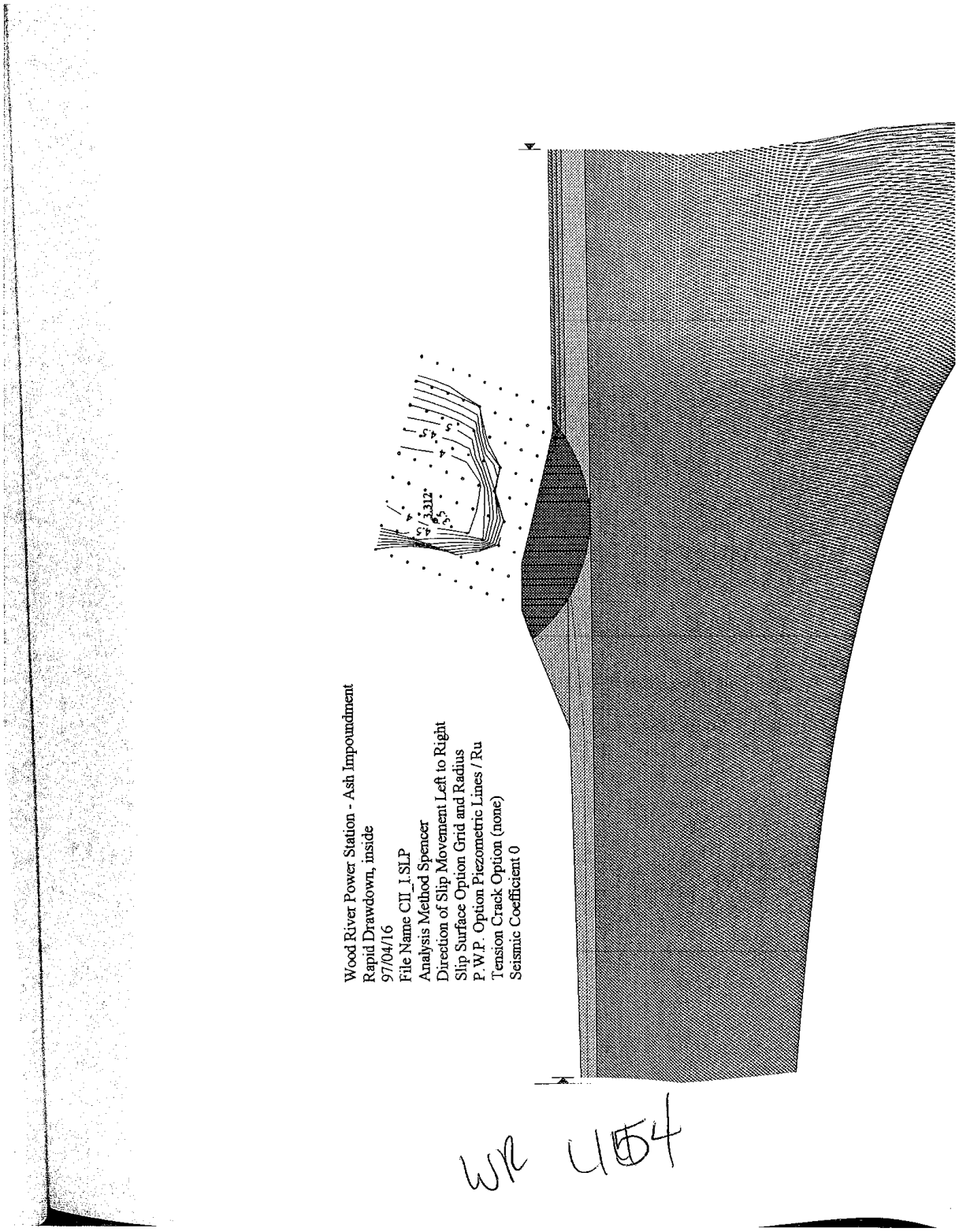
WR 452

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Wood River Power Station - Ash Impoundment
Rapid Drawdown, inside
97/04/16
File Name CII_1.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0

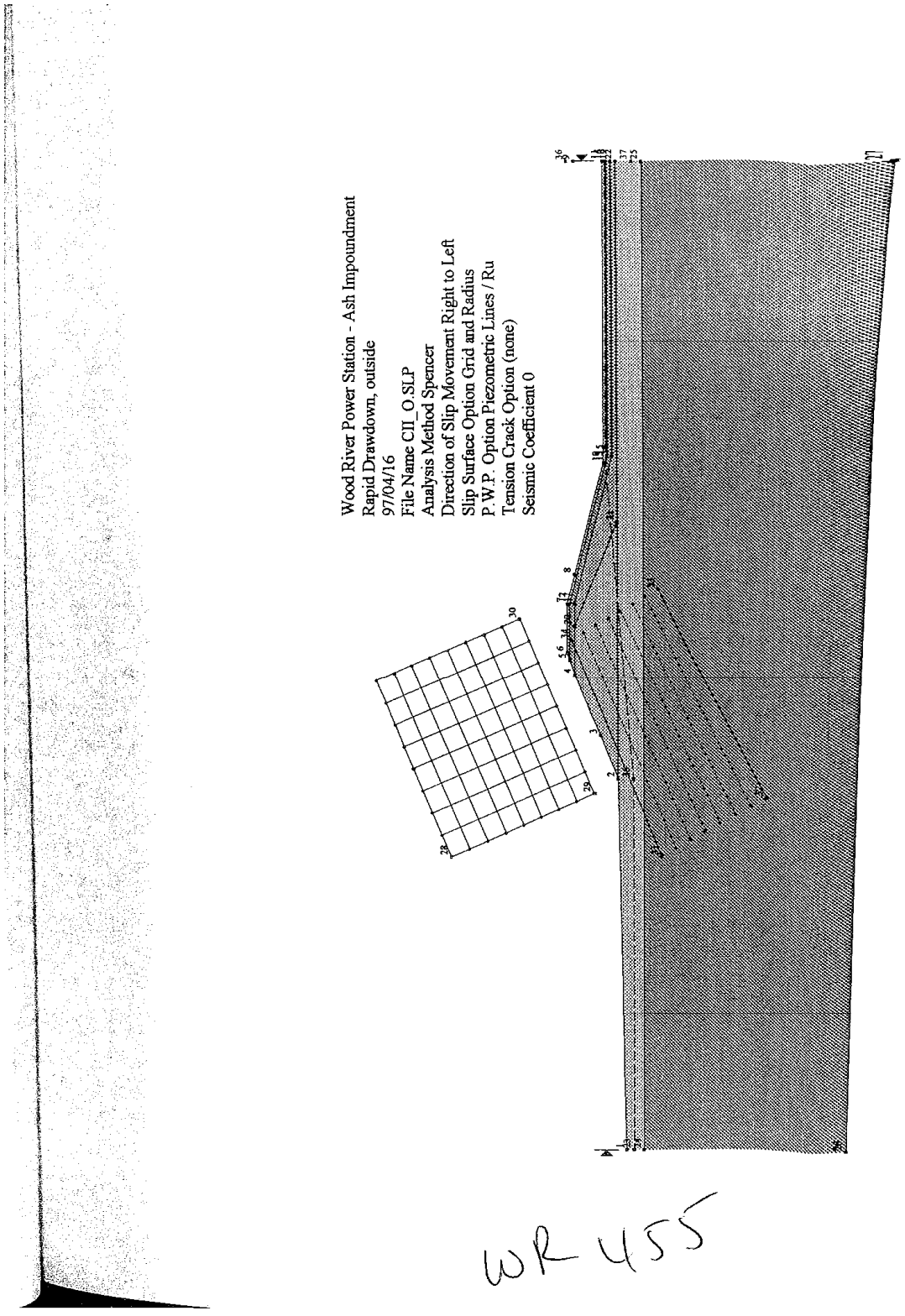
WR 453

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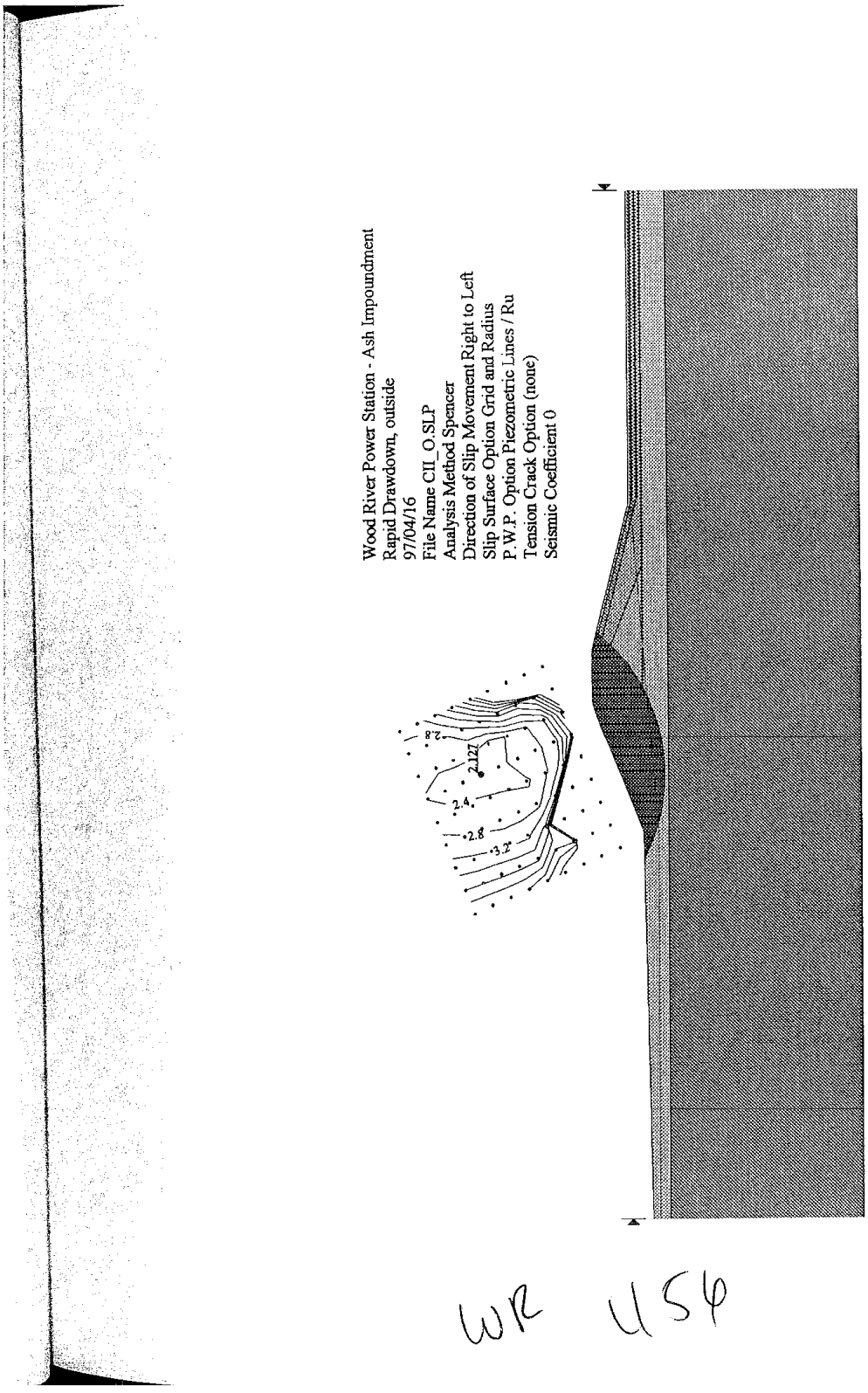
WR 4154

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Wood River Power Station - Ash Impoundment
Rapid Drawdown, outside
97/04/16
File Name CII_O.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0

WR 455

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Wood River Power Station - Ash Impoundment
Rapid Drawdown, outside
97/04/16
File Name CII_O.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0
2.8
2.127
2.4
2.8
3.2

WR 456

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Drained Soil Properties (Cases III, IV and V)

Soil 1
Water
Soil Model No Strength
Unit Weight 62.4
Piezometric Line # 1
Pore-Air Pressure 0

Soil 2
ash
Soil Model Mohr-Coulomb
Unit Weight 90
Cohesion 0
Phi 30
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 3
upper clay
Soil Model Mohr-Coulomb
Unit Weight 131
Cohesion 0
Phi 25
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 4
drainage rock
Soil Model Mohr-Coulomb
Unit Weight 140
Cohesion 0
Phi 37
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 5
lower clay
Soil Model Mohr-Coulomb
Unit Weight 131
Cohesion 0
Phi 25
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 6
embankment
Soil Model Mohr-Coulomb
Unit Weight 125
Cohesion 0
Phi 30
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 7
old dikes
Soil Model Mohr-Coulomb
Unit Weight 117
Cohesion 230
Phi 25
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 8
subgrade clay
Soil Model Mohr-Coulomb
Unit Weight 122
Cohesion 5
Phi 23.2
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 9
subgrade sand
Soil Model Mohr-Coulomb
Unit Weight 130
Cohesion 0
Phi 30
Unsaturated Phi B 0
Piezometric Line # 1
Pore-Air Pressure 0

Soil 10
Bedrock
Soil Model Bedrock
Unit Weight -1
Piezometric Line # 1
Pore-Air Pressure 0

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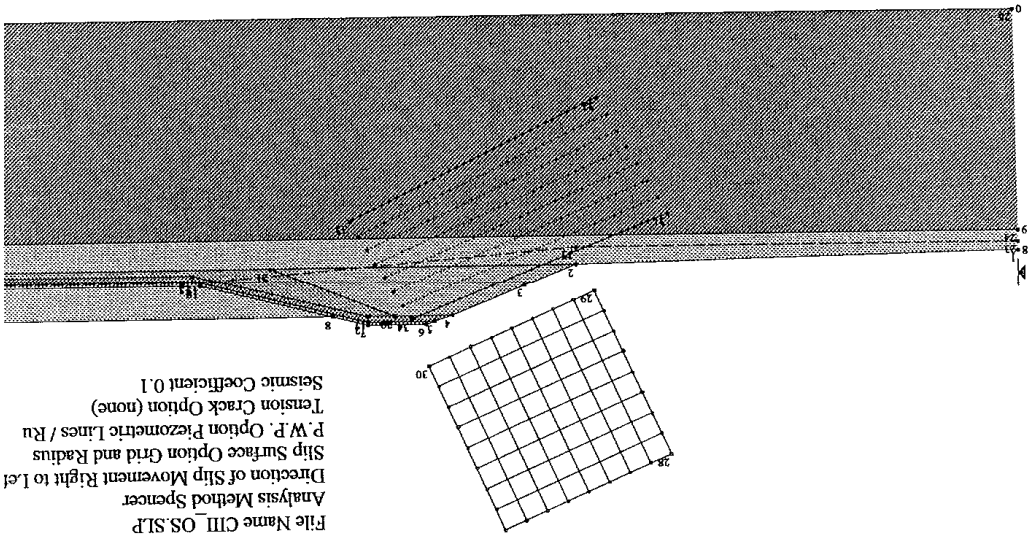
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ENERGY DISSIPATION CALCS.

HYDROLOGIC/ HYDRAULIC

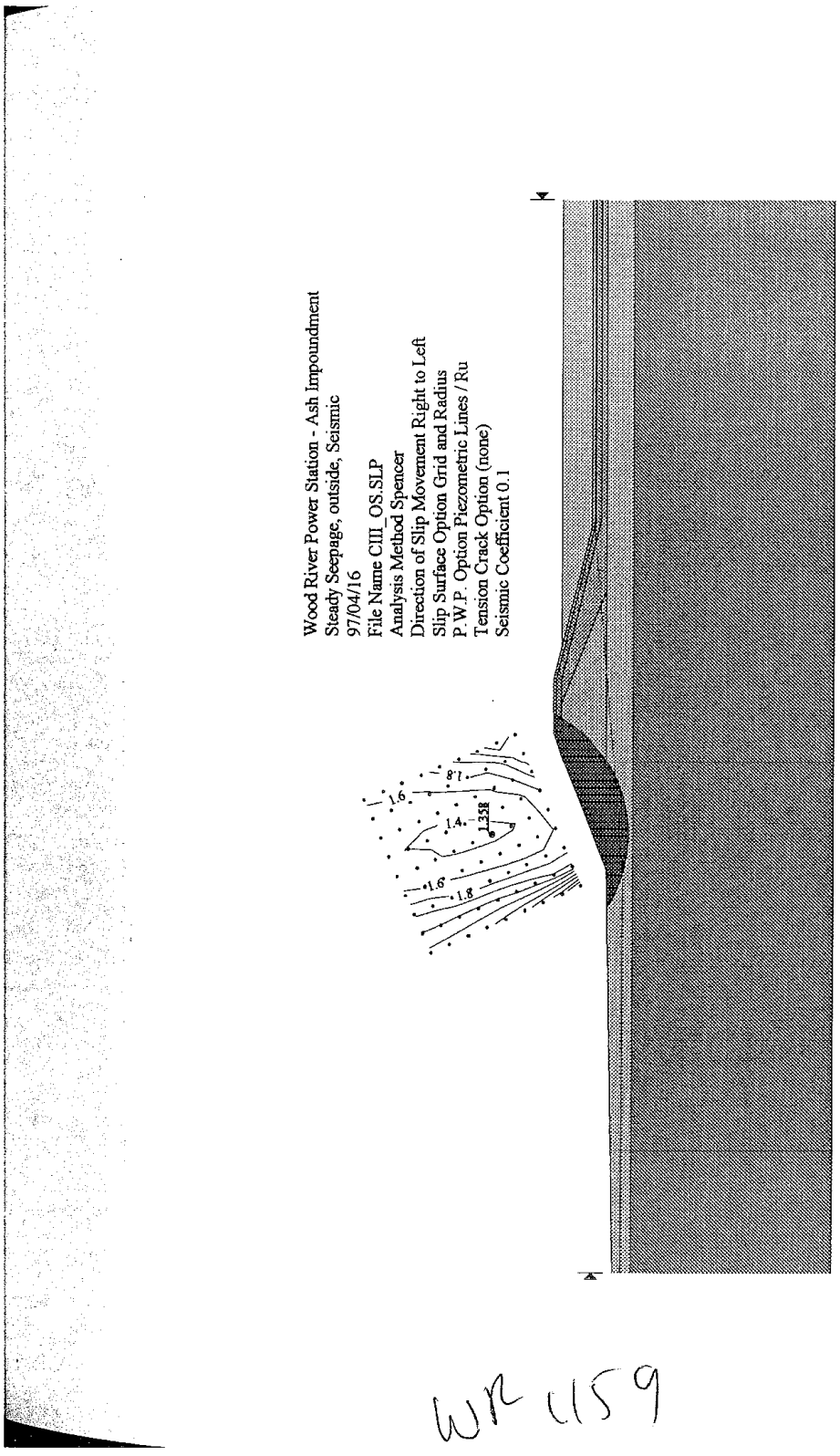
PIPING CALCS.

DEWATERING CALCS.



Wood River Power Station - Ash Impou
Steady Seepage, outside, Seismic
97/04/16
File Name CIII_OS.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Le
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1

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Wood River Power Station - Ash Impoundment
Steady Seepage, outside, Seismic
97/04/16
File Name CIII_OS.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1
1.6
1.4
1.358
1.6
1.8

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Wood River Power Station - Ash Impoundment
Steady Seepage, Outside, Seismic
97/04/16

Z=METHOD SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY MOMENT	FORCE
1	143.800	419.400	15.225	1	0.0000	3.137	2.995
1	143.800	419.400	15.225	6	0.0000	3.643	3.152
1	143.800	419.400	15.225	14	-0.1232	3.652	3.645
2	143.800	419.400	21.427	1	0.0000	2.571	2.518
2	143.800	419.400	21.427	8	0.0000	3.419	2.626
2	143.800	419.400	21.427	32	-0.1362	3.439	3.439
3	143.800	419.400	27.644	1	0.0000	2.330	2.251
3	143.800	419.400	27.644	4	0.0000	3.508	2.574
3	143.800	419.400	27.644	50	-0.1294	999.000	999.000
4	143.800	419.400	33.874	0	0.0000	997.000	997.000
4	143.800	419.400	33.874	0	0.0000	997.000	997.000
4	143.800	419.400	33.874	0	0.0000	997.000	997.000
5	143.800	419.400	40.116	0	0.0000	997.000	997.000
5	143.800	419.400	40.116	0	0.0000	997.000	997.000
5	143.800	419.400	40.116	0	0.0000	997.000	997.000
6	143.800	419.400	46.369	0	0.0000	997.000	997.000
6	143.800	419.400	46.369	0	0.0000	997.000	997.000
6	143.800	419.400	46.369	0	0.0000	997.000	997.000
7	143.800	419.400	52.630	0	0.0000	997.000	997.000
7	143.800	419.400	52.630	0	0.0000	997.000	997.000
7	143.800	419.400	52.630	0	0.0000	997.000	997.000
8	143.800	419.400	58.899	0	0.0000	997.000	997.000
8	143.800	419.400	58.899	0	0.0000	997.000	997.000
8	143.800	419.400	58.899	0	0.0000	997.000	997.000
9	150.925	422.525	15.471	1	0.0000	1.943	1.863
9	150.925	422.525	15.471	5	0.0000	2.039	1.985
9	150.925	422.525	15.471	6	-0.1290	2.044	2.037
10	150.925	422.525	21.603	1	0.0000	1.681	1.670
10	150.925	422.525	21.603	7	0.0000	2.088	1.785
10	150.925	422.525	21.603	12	-0.1667	2.104	2.109
11	150.925	422.525	27.750	1	0.0000	1.861	1.887
11	150.925	422.525	27.750	8	0.0000	2.567	1.997
11	150.925	422.525	27.750	39	-0.1617	2.599	2.600
12	150.925	422.525	33.910	0	0.0000	997.000	997.000
12	150.925	422.525	33.910	0	0.0000	997.000	997.000
12	150.925	422.525	33.910	0	0.0000	997.000	997.000
13	150.925	422.525	40.082	0	0.0000	997.000	997.000
13	150.925	422.525	40.082	0	0.0000	997.000	997.000
13	150.925	422.525	40.082	0	0.0000	997.000	997.000
14	150.925	422.525	46.265	0	0.0000	997.000	997.000
14	150.925	422.525	46.265	0	0.0000	997.000	997.000
14	150.925	422.525	46.265	0	0.0000	997.000	997.000
15	150.925	422.525	52.456	0	0.0000	997.000	997.000
15	150.925	422.525	52.456	0	0.0000	997.000	997.000
15	150.925	422.525	52.456	0	0.0000	997.000	997.000
16	150.925	422.525	58.654	0	0.0000	997.000	997.000
16	150.925	422.525	58.654	0	0.0000	997.000	997.000
16	150.925	422.525	58.654	0	0.0000	997.000	997.000
17	158.050	425.650	15.717	1	0.0000	2.710	2.729
17	158.050	425.650	15.717	6	0.0000	2.807	2.639
17	158.050	425.650	15.717	10	-0.3267	2.807	2.805
18	158.050	425.650	21.780	1	0.0000	1.483	1.483
18	158.050	425.650	21.780	6	0.0000	1.697	1.496
18	158.050	425.650	21.780	14	-0.2566	1.708	1.703
19	158.050	425.650	27.857	1	0.0000	1.570	1.621
19	158.050	425.650	27.857	7	0.0000	2.005	1.619
19	158.050	425.650	27.857	29	-0.2142	2.032	2.033
20	158.050	425.650	33.947	0	0.0000	997.000	997.000
20	158.050	425.650	33.947	0	0.0000	997.000	997.000
20	158.050	425.650	33.947	0	0.0000	997.000	997.000
21	158.050	425.650	40.048	0	0.0000	997.000	997.000
21	158.050	425.650	40.048	0	0.0000	997.000	997.000
21	158.050	425.650	40.048	0	0.0000	997.000	997.000
22	158.050	425.650	46.160	0	0.0000	997.000	997.000
22	158.050	425.650	46.160	0	0.0000	997.000	997.000
22	158.050	425.650	46.160	0	0.0000	997.000	997.000
23	158.050	425.650	52.281	0	0.0000	997.000	997.000
23	158.050	425.650	52.281	0	0.0000	997.000	997.000

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23	158.050	425.650	52.281	0	0.0000	997.000	997.000
24	158.050	425.650	58.409	0	0.0000	997.000	997.000
24	158.050	425.650	58.409	0	0.0000	997.000	997.000
24	158.050	425.650	58.409	0	0.0000	997.000	997.000
25	165.175	428.775	15.964	1	0.0000	2.951	3.012
25	165.175	428.775	15.964	6	0.0000	3.063	2.836
25	165.175	428.775	15.964	11	-0.3458	3.061	3.062
26	165.175	428.775	21.956	1	0.0000	1.559	1.559
26	165.175	428.775	21.956	6	0.0000	1.740	1.545
26	165.175	428.775	21.956	11	-0.2992	1.746	1.741
27	165.175	428.775	27.963	1	0.0000	1.323	1.342
27	165.175	428.775	27.963	6	0.0000	1.636	1.346
27	165.175	428.775	27.963	15	-0.2663	1.622	1.615
28	165.175	428.775	33.983	0	0.0000	997.000	997.000
28	165.175	428.775	33.983	0	0.0000	997.000	997.000
28	165.175	428.775	33.983	0	0.0000	997.000	997.000
29	165.175	428.775	40.014	0	0.0000	997.000	997.000
29	165.175	428.775	40.014	0	0.0000	997.000	997.000
29	165.175	428.775	40.014	0	0.0000	997.000	997.000
30	165.175	428.775	46.056	0	0.0000	997.000	997.000
30	165.175	428.775	46.056	0	0.0000	997.000	997.000
30	165.175	428.775	46.056	0	0.0000	997.000	997.000
31	165.175	428.775	52.107	0	0.0000	997.000	997.000
31	165.175	428.775	52.107	0	0.0000	997.000	997.000
31	165.175	428.775	52.107	0	0.0000	997.000	997.000
32	165.175	428.775	58.165	0	0.0000	997.000	997.000
32	165.175	428.775	58.165	0	0.0000	997.000	997.000
32	165.175	428.775	58.165	0	0.0000	997.000	997.000
33	172.300	431.900	16.210	1	0.0000	2.945	3.005
33	172.300	431.900	16.210	6	0.0000	3.054	2.841
33	172.300	431.900	16.210	10	-0.3413	3.052	3.049
34	172.300	431.900	22.132	1	0.0000	1.959	2.033
34	172.300	431.900	22.132	6	0.0000	2.192	1.876
34	172.300	431.900	22.132	16	-0.3231	2.192	2.194
35	172.300	431.900	28.069	1	0.0000	1.414	1.468
35	172.300	431.900	28.069	6	0.0000	1.706	1.389
35	172.300	431.900	28.069	16	-0.3078	1.713	1.714
36	172.300	431.900	34.019	1	0.0000	1.441	1.530
36	172.300	431.900	34.019	6	0.0000	1.825	1.405
36	172.300	431.900	34.019	24	-0.2979	1.847	1.840
37	172.300	431.900	39.980	1	0.0000	1.516	1.584
37	172.300	431.900	39.980	6	0.0000	2.033	1.541
37	172.300	431.900	39.980	26	-0.2413	2.071	2.068
38	172.300	431.900	45.952	1	0.0000	1.550	1.594
38	172.300	431.900	45.952	7	0.0000	2.215	1.665
38	172.300	431.900	45.952	25	-0.1993	2.262	2.258
39	172.300	431.900	51.932	1	0.0000	1.583	1.602
39	172.300	431.900	51.932	6	0.0000	2.388	1.783
39	172.300	431.900	51.932	25	-0.1705	2.443	2.439
40	172.300	431.900	57.920	1	0.0000	1.630	1.617
40	172.300	431.900	57.920	7	0.0000	2.579	1.930
40	172.300	431.900	57.920	30	-0.1461	2.642	2.647
41	179.425	435.025	16.456	1	0.0000	2.884	2.968
41	179.425	435.025	16.456	5	0.0000	3.001	2.763
41	179.425	435.025	16.456	11	-0.3662	2.997	2.998
42	179.425	435.025	22.308	1	0.0000	2.072	2.212
42	179.425	435.025	22.308	6	0.0000	2.330	1.933
42	179.425	435.025	22.308	17	-0.3451	2.325	2.323
43	179.425	435.025	28.175	1	0.0000	1.605	1.664
43	179.425	435.025	28.175	6	0.0000	1.914	1.561
43	179.425	435.025	28.175	15	-0.2935	1.921	1.919
44	179.425	435.025	34.055	1	0.0000	1.428	1.458
44	179.425	435.025	34.055	6	0.0000	1.779	1.421
44	179.425	435.025	34.055	17	-0.2680	1.792	1.790
45	179.425	435.025	39.946	1	0.0000	1.609	1.673
45	179.425	435.025	39.946	6	0.0000	2.061	1.567
45	179.425	435.025	39.946	23	-0.2789	2.089	2.093
46	179.425	435.025	45.848	1	0.0000	1.638	1.681
46	179.425	435.025	45.848	6	0.0000	2.209	1.659
46	179.425	435.025	45.848	24	-0.2359	2.247	2.245
47	179.425	435.025	51.758	1	0.0000	1.672	1.684
47	179.425	435.025	51.758	6	0.0000	2.369	1.772
47	179.425	435.025	51.758	23	-0.1985	2.416	2.414
48	179.425	435.025	57.675	1	0.0000	1.724	1.694
48	179.425	435.025	57.675	4	0.0000	2.550	1.912
48	179.425	435.025	57.675	24	-0.1685	2.602	2.601

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48	186.550	438.150	16.702	1	0.0000	2.693	2.849
49	186.550	438.150	16.702	5	0.0000	2.840	2.831
49	186.550	438.150	16.702	8	-0.4006	2.831	2.837
50	186.550	438.150	22.485	1	0.0000	2.192	2.301
50	186.550	438.150	22.485	6	0.0000	2.439	2.056
50	186.550	438.150	22.485	12	-0.3248	2.437	2.430
51	186.550	438.150	28.281	1	0.0000	2.098	2.158
51	186.550	438.150	28.281	6	0.0000	2.428	1.884
51	186.550	438.150	28.281	14	-0.2842	2.427	2.421
52	186.550	438.150	34.091	1	0.0000	1.709	1.722
52	186.550	438.150	34.091	6	0.0000	2.082	1.676
52	186.550	438.150	34.091	14	-0.2527	2.093	2.086
53	186.550	438.150	39.912	1	0.0000	1.780	1.808
53	186.550	438.150	39.912	6	0.0000	2.218	1.719
53	186.550	438.150	39.912	15	-0.2523	2.237	2.229
54	186.550	438.150	45.744	1	0.0000	1.848	1.861
54	186.550	438.150	45.744	5	0.0000	2.379	1.806
54	186.550	438.150	45.744	20	-0.2485	2.408	2.409
55	186.550	438.150	51.583	1	0.0000	1.866	1.845
55	186.550	438.150	51.583	5	0.0000	2.500	1.884
55	186.550	438.150	51.583	20	-0.2201	2.538	2.538
56	186.550	438.150	57.431	1	0.0000	1.885	1.830
56	186.550	438.150	57.431	5	0.0000	2.637	1.977
56	186.550	438.150	57.431	20	-0.1908	2.681	2.681
57	193.675	441.275	16.948	1	0.0000	3.043	3.151
57	193.675	441.275	16.948	4	0.0000	3.182	2.897
57	193.675	441.275	16.948	6	-0.3329	3.178	3.186
58	193.675	441.275	22.661	1	0.0000	2.672	2.717
58	193.675	441.275	22.661	5	0.0000	2.910	2.516
58	193.675	441.275	22.661	11	-0.2887	2.910	2.908
59	193.675	441.275	28.388	1	0.0000	2.564	2.596
59	193.675	441.275	28.388	5	0.0000	2.905	2.397
59	193.675	441.275	28.388	12	-0.2638	2.906	2.896
60	193.675	441.275	34.127	1	0.0000	2.163	2.139
60	193.675	441.275	34.127	5	0.0000	2.568	2.088
60	193.675	441.275	34.127	13	-0.2313	2.575	2.566
61	193.675	441.275	39.878	1	0.0000	1.939	1.879
61	193.675	441.275	39.878	5	0.0000	2.388	1.914
61	193.675	441.275	39.878	17	-0.2168	2.401	2.399
62	193.675	441.275	45.639	1	0.0000	2.204	2.141
62	193.675	441.275	45.639	5	0.0000	2.738	2.114
62	193.675	441.275	45.639	17	-0.2231	2.759	2.756
63	193.675	441.275	51.409	1	0.0000	2.198	2.113
63	193.675	441.275	51.409	5	0.0000	2.831	2.141
63	193.675	441.275	51.409	19	-0.2181	2.860	2.859
64	193.675	441.275	57.186	1	0.0000	2.151	2.045
64	193.675	441.275	57.186	5	0.0000	2.877	2.149
64	193.675	441.275	57.186	20	-0.2049	2.914	2.911
65	200.800	444.400	17.195	1	0.0000	2.174	2.159
65	200.800	444.400	17.195	3	0.0000	2.260	2.146
65	200.800	444.400	17.195	6	-0.2967	2.263	2.269
66	200.800	444.400	22.837	1	0.0000	3.731	3.699
66	200.800	444.400	22.837	5	0.0000	3.995	3.510
66	200.800	444.400	22.837	10	-0.2350	3.993	3.990
67	200.800	444.400	28.494	1	0.0000	3.297	3.239
67	200.800	444.400	28.494	5	0.0000	3.672	3.078
67	200.800	444.400	28.494	11	-0.2253	3.672	3.663
68	200.800	444.400	34.163	1	0.0000	3.272	3.144
68	200.800	444.400	34.163	5	0.0000	3.729	3.041
68	200.800	444.400	34.163	16	-0.2134	3.732	3.731
69	200.800	444.400	39.844	1	0.0000	2.619	2.433
69	200.800	444.400	39.844	5	0.0000	3.125	2.531
69	200.800	444.400	39.844	16	-0.1902	3.135	3.134
70	200.800	444.400	45.535	1	0.0000	2.635	2.445
70	200.800	444.400	45.535	5	0.0000	3.199	2.506
70	200.800	444.400	45.535	17	-0.1944	3.214	3.211
71	200.800	444.400	51.235	1	0.0000	2.698	2.489
71	200.800	444.400	51.235	5	0.0000	3.363	2.562
71	200.800	444.400	51.235	17	-0.1970	3.384	3.379
72	200.800	444.400	56.941	1	0.0000	2.596	2.377
72	200.800	444.400	56.941	5	0.0000	3.354	2.510
72	200.800	444.400	56.941	18	-0.1951	3.383	3.379
73	140.650	426.425	22.918	1	0.0000	3.055	2.965
73	140.650	426.425	22.918	5	0.0000	3.418	3.069
73	140.650	426.425	22.918	11	-0.1284	3.423	3.422
74	140.650	426.425	29.122	1	0.0000	2.457	2.449

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74	140.650	426.425	29.122	6	0.0000	3.079	2.519
74	140.650	426.425	29.122	16	-0.1450	3.096	3.096
75	140.650	426.425	35.341	1	0.0000	2.198	2.189
75	140.650	426.425	35.341	7	0.0000	3.079	2.393
75	140.650	426.425	35.341	24	-0.1391	3.109	3.104
76	140.650	426.425	41.573	1	0.0000	2.018	2.018
76	140.650	426.425	41.573	5	0.0000	3.110	2.306
76	140.650	426.425	41.573	38	-0.1374	3.152	3.145
77	140.650	426.425	47.815	1	0.0000	1.902	1.903
77	140.650	426.425	47.815	11	0.0000	3.164	2.295
77	140.650	426.425	47.815	51	-0.1291	999.000	999.000
78	140.650	426.425	54.068	0	0.0000	997.000	997.000
78	140.650	426.425	54.068	0	0.0000	997.000	997.000
78	140.650	426.425	54.068	0	0.0000	997.000	997.000
79	140.650	426.425	60.328	0	0.0000	997.000	997.000
79	140.650	426.425	60.328	0	0.0000	997.000	997.000
79	140.650	426.425	60.328	0	0.0000	997.000	997.000
80	140.650	426.425	66.595	0	0.0000	997.000	997.000
80	140.650	426.425	66.595	0	0.0000	997.000	997.000
80	140.650	426.425	66.595	0	0.0000	997.000	997.000
81	147.775	429.550	23.164	1	0.0000	2.075	2.037
81	147.775	429.550	23.164	5	0.0000	2.179	2.105
81	147.775	429.550	23.164	3	-0.1494	2.182	2.181
82	147.775	429.550	29.299	1	0.0000	1.666	1.678
82	147.775	429.550	29.299	6	0.0000	1.997	1.746
82	147.775	429.550	29.299	9	-0.1762	2.008	2.014
83	147.775	429.550	35.447	1	0.0000	1.798	1.861
83	147.775	429.550	35.447	7	0.0000	2.373	1.907
83	147.775	429.550	35.447	20	-0.1759	2.399	2.392
84	147.775	429.550	41.609	1	0.0000	1.747	1.796
84	147.775	429.550	41.609	7	0.0000	2.522	1.953
84	147.775	429.550	41.609	28	-0.1618	2.560	2.564
85	147.775	429.550	47.781	1	0.0000	1.693	1.739
85	147.775	429.550	47.781	5	0.0000	2.643	1.981
85	147.775	429.550	47.781	35	-0.1513	2.692	2.696
86	147.775	429.550	53.963	0	0.0000	997.000	997.000
86	147.775	429.550	53.963	0	0.0000	997.000	997.000
86	147.775	429.550	53.963	0	0.0000	997.000	997.000
87	147.775	429.550	60.154	0	0.0000	997.000	997.000
87	147.775	429.550	60.154	0	0.0000	997.000	997.000
87	147.775	429.550	60.154	0	0.0000	997.000	997.000
88	147.775	429.550	66.351	0	0.0000	997.000	997.000
88	147.775	429.550	66.351	0	0.0000	997.000	997.000
88	147.775	429.550	66.351	0	0.0000	997.000	997.000
89	154.900	432.675	23.410	1	0.0000	2.044	1.996
89	154.900	432.675	23.410	5	0.0000	2.055	2.030
89	154.900	432.675	23.410	21	-1.4224	999.000	999.000
90	154.900	432.675	29.475	1	0.0000	1.459	1.472
90	154.900	432.675	29.475	5	0.0000	1.640	1.482
90	154.900	432.675	29.475	10	-0.2414	1.648	1.644
91	154.900	432.675	35.554	1	0.0000	1.533	1.597
91	154.900	432.675	35.554	6	0.0000	1.899	1.581
91	154.900	432.675	35.554	15	-0.2196	1.922	1.921
92	154.900	432.675	41.645	1	0.0000	1.542	1.627
92	154.900	432.675	41.645	7	0.0000	2.106	1.652
92	154.900	432.675	41.645	21	-0.2007	2.140	2.143
93	154.900	432.675	47.747	1	0.0000	1.535	1.606
93	154.900	432.675	47.747	7	0.0000	2.258	1.737
93	154.900	432.675	47.747	23	-0.1754	2.303	2.308
94	154.900	432.675	53.859	1	0.0000	1.538	1.601
94	154.900	432.675	53.859	6	0.0000	2.412	1.802
94	154.900	432.675	53.859	32	-0.1614	2.466	2.460
95	154.900	432.675	59.979	1	0.0000	1.567	1.600
95	154.900	432.675	59.979	9	0.0000	2.576	1.929
95	154.900	432.675	59.979	34	-0.1400	2.637	2.640
96	154.900	432.675	66.106	1	0.0000	1.595	1.602
96	154.900	432.675	66.106	12	0.0000	2.726	2.046
96	154.900	432.675	66.106	34	-0.1253	2.792	2.789
97	162.025	435.800	23.656	1	0.0000	2.756	2.802
97	162.025	435.800	23.656	5	0.0000	2.828	2.688
97	162.025	435.800	23.656	6	-0.3748	2.827	2.830
98	162.025	435.800	29.651	1	0.0000	1.400	1.406
98	162.025	435.800	29.651	5	0.0000	1.510	1.384
98	162.025	435.800	29.651	9	-0.3619	1.512	1.510
99	162.025	435.800	35.660	1	0.0000	1.238	1.276
99	162.025	435.800	35.660	5	0.0000	1.477	1.263

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99	162.025	435.800	35.660	12	-0.2754	1.488	1.486
100	162.025	435.800	41.681	1	0.0000	1.416	1.506
100	162.025	435.800	41.681	6	0.0000	1.824	1.457
100	162.025	435.800	41.681	17	-0.2424	1.854	1.852
101	162.025	435.800	47.713	1	0.0000	1.457	1.534
101	162.025	435.800	47.713	6	0.0000	2.014	1.569
101	162.025	435.800	47.713	20	-0.2264	2.055	2.048
102	162.025	435.800	53.755	1	0.0000	1.500	1.551
102	162.025	435.800	53.755	6	0.0000	2.137	1.695
102	162.025	435.800	53.755	21	-0.1766	2.245	2.239
103	162.025	435.800	59.805	1	0.0000	1.538	1.570
103	162.025	435.800	59.805	4	0.0000	2.379	1.822
103	162.025	435.800	59.805	23	-0.1540	2.432	2.431
104	162.025	435.800	65.861	1	0.0000	1.583	1.586
104	162.025	435.800	65.861	8	0.0000	2.547	1.947
104	162.025	435.800	65.861	24	-0.1357	2.605	2.597
105	169.150	438.925	23.903	1	0.0000	2.756	2.801
105	169.150	438.925	23.903	5	0.0000	2.827	2.688
105	169.150	438.925	23.903	6	-0.3752	2.825	2.829
106	169.150	438.925	29.827	1	0.0000	1.625	1.676
106	169.150	438.925	29.827	5	0.0000	1.773	1.583
106	169.150	438.925	29.827	11	-0.3615	1.773	1.774
107	169.150	438.925	35.766	1	0.0000	1.259	1.312
107	169.150	438.925	35.766	5	0.0000	1.459	1.239
107	169.150	438.925	35.766	12	-0.3532	1.462	1.456
108	169.150	438.925	41.717	1	0.0000	1.375	1.454
108	169.150	438.925	41.717	5	0.0000	1.684	1.369
108	169.150	438.925	41.717	14	-0.2930	1.709	1.701
109	169.150	438.925	47.679	1	0.0000	1.455	1.522
109	169.150	438.925	47.679	5	0.0000	1.890	1.503
109	169.150	438.925	47.679	15	-0.2394	1.925	1.921
110	169.150	438.925	53.651	1	0.0000	1.504	1.553
110	169.150	438.925	53.651	6	0.0000	2.074	1.620
110	169.150	438.925	53.651	21	-0.2039	2.116	2.118
111	169.150	438.925	59.630	1	0.0000	1.551	1.578
111	169.150	438.925	59.630	5	0.0000	2.251	1.744
111	169.150	438.925	59.630	21	-0.1773	2.299	2.302
112	169.150	438.925	65.617	1	0.0000	1.613	1.606
112	169.150	438.925	65.617	5	0.0000	2.444	1.889
112	169.150	438.925	65.617	22	-0.1512	2.497	2.500
113	176.275	442.050	24.149	1	0.0000	2.655	2.733
113	176.275	442.050	24.149	5	0.0000	2.739	2.565
113	176.275	442.050	24.149	6	-0.3993	2.735	2.737
114	176.275	442.050	30.004	1	0.0000	1.891	2.003
114	176.275	442.050	30.004	5	0.0000	2.071	1.800
114	176.275	442.050	30.004	11	-0.3783	2.067	2.068
115	176.275	442.050	35.872	1	0.0000	1.453	1.501
115	176.275	442.050	35.872	5	0.0000	1.661	1.424
115	176.275	442.050	35.872	11	-0.3290	1.665	1.664
116	176.275	442.050	41.753	1	0.0000	1.292	1.327
116	176.275	442.050	41.753	5	0.0000	1.540	1.284
116	176.275	442.050	41.753	11	-0.3129	1.549	1.546
117	176.275	442.050	47.645	1	0.0000	1.511	1.574
117	176.275	442.050	47.645	5	0.0000	1.874	1.500
117	176.275	442.050	47.645	14	-0.2761	1.902	1.895
118	176.275	442.050	53.547	1	0.0000	1.570	1.611
118	176.275	442.050	53.547	5	0.0000	2.047	1.616
118	176.275	442.050	53.547	18	-0.2336	2.082	2.080
119	176.275	442.050	59.456	1	0.0000	1.627	1.639
119	176.275	442.050	59.456	5	0.0000	2.225	1.744
119	176.275	442.050	59.456	18	-0.1966	2.266	2.263
120	176.275	442.050	65.372	1	0.0000	1.687	1.664
120	176.275	442.050	65.372	4	0.0000	2.407	1.874
120	176.275	442.050	65.372	19	-0.1707	2.453	2.455
121	183.400	445.175	24.395	1	0.0000	2.522	2.635
121	183.400	445.175	24.395	4	0.0000	2.623	2.416
121	183.400	445.175	24.395	6	-0.4042	2.617	2.618
122	183.400	445.175	30.180	1	0.0000	2.047	2.128
122	183.400	445.175	30.180	5	0.0000	2.216	1.959
122	183.400	445.175	30.180	10	-0.3503	2.214	2.214
123	183.400	445.175	35.979	1	0.0000	1.805	1.848
123	183.400	445.175	35.979	5	0.0000	2.028	1.749
123	183.400	445.175	35.979	11	-0.3062	2.031	2.030
124	183.400	445.175	41.789	1	0.0000	1.534	1.559
124	183.400	445.175	41.789	5	0.0000	1.799	1.513
124	183.400	445.175	41.789	11	-0.2859	1.805	1.802

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125	183.400	445.175	47.611	1	0.0000	1.642	1.681
125	183.400	445.175	47.611	5	0.0000	1.969	1.897
125	183.400	445.175	47.611	15	-0.2908	1.989	1.991
126	183.400	445.175	53.442	1	0.0000	1.724	1.743
126	183.400	445.175	53.442	5	0.0000	2.118	2.079
126	183.400	445.175	53.442	16	-0.2870	2.139	2.171
127	183.400	445.175	59.282	1	0.0000	1.771	1.760
127	183.400	445.175	59.282	5	0.0000	2.227	2.213
127	183.400	445.175	59.282	17	-0.2195	2.332	2.329
128	183.400	445.175	65.127	1	0.0000	1.809	1.767
128	183.400	445.175	65.127	5	0.0000	2.452	2.317
128	183.400	445.175	65.127	17	-0.1696	2.491	2.489
129	190.525	448.300	24.641	1	0.0000	1.873	1.952
129	190.525	448.300	24.641	4	0.0000	2.966	2.778
129	190.525	448.300	24.641	6	-0.3488	2.964	2.966
130	190.525	448.300	30.356	1	0.0000	2.433	2.475
130	190.525	448.300	30.356	4	0.0000	2.592	2.332
130	190.525	448.300	30.356	9	-0.3145	2.592	2.589
131	190.525	448.300	36.085	1	0.0000	2.308	2.356
131	190.525	448.300	36.085	5	0.0000	2.546	2.199
131	190.525	448.300	36.085	10	-0.2937	2.547	2.544
132	190.525	448.300	41.826	1	0.0000	1.919	1.914
132	190.525	448.300	41.826	5	0.0000	2.202	1.872
132	190.525	448.300	41.826	10	-0.2596	2.206	2.202
133	190.525	448.300	47.577	1	0.0000	1.734	1.706
133	190.525	448.300	47.577	5	0.0000	2.056	1.716
133	190.525	448.300	47.577	10	-0.2424	2.065	2.059
134	190.525	448.300	53.338	1	0.0000	1.995	1.971
134	190.525	448.300	53.338	5	0.0000	2.398	1.931
134	190.525	448.300	53.338	15	-0.2526	2.420	2.421
135	190.525	448.300	59.107	1	0.0000	2.002	1.957
135	190.525	448.300	59.107	5	0.0000	2.495	1.974
135	190.525	448.300	59.107	16	-0.2351	2.524	2.522
136	190.525	448.300	64.883	1	0.0000	2.002	1.929
136	190.525	448.300	64.883	5	0.0000	2.596	2.030
136	190.525	448.300	64.883	17	-0.2089	2.630	2.627
137	197.650	451.425	24.887	1	0.0000	3.834	3.864
137	197.650	451.425	24.887	4	0.0000	3.922	3.751
137	197.650	451.425	24.887	6	-0.2441	3.922	3.924
138	197.650	451.425	30.532	1	0.0000	3.161	3.164
138	197.650	451.425	30.532	4	0.0000	3.326	3.030
138	197.650	451.425	30.532	9	-0.2715	3.325	3.323
139	197.650	451.425	36.191	1	0.0000	2.865	2.851
139	197.650	451.425	36.191	4	0.0000	3.113	2.727
139	197.650	451.425	36.191	10	-0.2572	3.112	3.109
140	197.650	451.425	41.862	1	0.0000	2.670	2.604
140	197.650	451.425	41.862	5	0.0000	2.981	2.555
140	197.650	451.425	41.862	10	-0.2334	2.984	2.978
141	197.650	451.425	47.543	1	0.0000	2.257	2.157
141	197.650	451.425	47.543	5	0.0000	2.610	2.202
141	197.650	451.425	47.543	10	-0.2149	2.617	2.609
142	197.650	451.425	53.234	1	0.0000	2.352	2.249
142	197.650	451.425	53.234	5	0.0000	2.763	2.253
142	197.650	451.425	53.234	13	-0.2254	2.778	2.779
143	197.650	451.425	58.933	1	0.0000	2.385	2.266
143	197.650	451.425	58.933	5	0.0000	2.885	2.294
143	197.650	451.425	58.933	15	-0.2239	2.907	2.905
144	197.650	451.425	64.638	1	0.0000	2.312	2.180
144	197.650	451.425	64.638	5	0.0000	2.897	2.263
144	197.650	451.425	64.638	16	-0.2165	2.926	2.922
145	137.500	433.450	30.611	1	0.0000	3.013	2.936
145	137.500	433.450	30.611	5	0.0000	3.310	3.030
145	137.500	433.450	30.611	9	-0.1271	3.314	3.312
146	137.500	433.450	36.818	1	0.0000	2.417	2.427
146	137.500	433.450	36.818	5	0.0000	2.932	2.475
146	137.500	433.450	36.818	13	-0.1501	2.947	2.941
147	137.500	433.450	43.038	1	0.0000	2.135	2.156
147	137.500	433.450	43.038	6	0.0000	2.861	2.292
147	137.500	433.450	43.038	16	-0.1495	2.987	2.988
148	137.500	433.450	49.271	1	0.0000	1.970	1.989
148	137.500	433.450	49.271	5	0.0000	2.867	2.227
148	137.500	433.450	49.271	22	-0.1431	2.903	2.897
149	137.500	433.450	55.514	1	0.0000	1.855	1.884
149	137.500	433.450	55.514	4	0.0000	2.901	2.173
149	137.500	433.450	55.514	31	-0.1411	2.946	2.941
150	137.500	433.450	61.766	1	0.0000	1.788	1.806

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150	137.500	433.450	61.766	9	0.0000	2.958	2.197
150	137.500	433.450	61.766	33	-0.1289	3.012	3.002
151	137.500	433.450	68.026	1	0.0000	1.735	1.753
151	137.500	433.450	68.026	12	0.0000	3.016	2.213
151	137.500	433.450	68.026	43	-0.1239	3.077	3.075
152	137.500	433.450	74.292	1	0.0000	1.705	1.718
152	137.500	433.450	74.292	16	0.0000	3.097	2.272
152	137.500	433.450	74.292	45	-0.1156	3.165	3.167
153	144.625	436.575	30.857	1	0.0000	2.219	2.200
153	144.625	436.575	30.857	5	0.0000	2.329	2.241
153	144.625	436.575	30.857	6	-0.1560	2.331	2.332
154	144.625	436.575	36.994	1	0.0000	1.796	1.834
154	144.625	436.575	36.994	5	0.0000	2.093	1.848
154	144.625	436.575	36.994	11	-0.1821	2.104	2.104
155	144.625	436.575	43.144	1	0.0000	1.790	1.855
155	144.625	436.575	43.144	6	0.0000	2.283	1.889
155	144.625	436.575	43.144	14	-0.1783	2.307	2.299
156	144.625	436.575	49.307	1	0.0000	1.719	1.782
156	144.625	436.575	49.307	6	0.0000	2.381	1.895
156	144.625	436.575	49.307	18	-0.1676	2.415	2.413
157	144.625	436.575	55.480	1	0.0000	1.661	1.721
157	144.625	436.575	55.480	6	0.0000	2.471	1.912
157	144.625	436.575	55.480	22	-0.1576	2.514	2.510
158	144.625	436.575	61.662	1	0.0000	1.632	1.685
158	144.625	436.575	61.662	5	0.0000	2.579	1.955
158	144.625	436.575	61.662	26	-0.1448	2.629	2.626
159	144.625	436.575	67.852	1	0.0000	1.627	1.664
159	144.625	436.575	67.852	9	0.0000	2.692	2.019
159	144.625	436.575	67.852	31	-0.1349	2.749	2.744
160	144.625	436.575	74.048	1	0.0000	1.642	1.653
160	144.625	436.575	74.048	11	0.0000	2.815	2.109
160	144.625	436.575	74.048	31	-0.1234	2.877	2.872
161	151.750	439.700	31.103	1	0.0000	1.986	1.945
161	151.750	439.700	31.103	4	0.0000	1.995	1.981
161	151.750	439.700	31.103	3	-0.2063	1.996	1.988
162	151.750	439.700	37.170	1	0.0000	1.480	1.499
162	151.750	439.700	37.170	5	0.0000	1.647	1.506
162	151.750	439.700	37.170	6	-0.2372	1.653	1.659
163	151.750	439.700	43.251	1	0.0000	1.535	1.603
163	151.750	439.700	43.251	5	0.0000	1.863	1.588
163	151.750	439.700	43.251	12	-0.2193	1.884	1.884
164	151.750	439.700	49.343	1	0.0000	1.526	1.610
164	151.750	439.700	49.343	6	0.0000	2.017	1.634
164	151.750	439.700	49.343	15	-0.2005	2.049	2.045
165	151.750	439.700	55.446	1	0.0000	1.519	1.599
165	151.750	439.700	55.446	6	0.0000	2.153	1.692
165	151.750	439.700	55.446	19	-0.1808	2.193	2.184
166	151.750	439.700	61.558	1	0.0000	1.541	1.596
166	151.750	439.700	61.558	5	0.0000	2.301	1.795
166	151.750	439.700	61.558	21	-0.1617	2.348	2.341
167	151.750	439.700	67.677	1	0.0000	1.563	1.601
167	151.750	439.700	67.677	6	0.0000	2.453	1.890
167	151.750	439.700	67.677	23	-0.1459	2.506	2.503
168	151.750	439.700	73.803	1	0.0000	1.598	1.609
168	151.750	439.700	73.803	8	0.0000	2.601	2.001
168	151.750	439.700	73.803	24	-0.1307	2.657	2.650
169	158.875	442.825	31.349	1	0.0000	2.666	2.702
169	158.875	442.825	31.349	5	0.0000	2.719	2.615
169	158.875	442.825	31.349	6	-0.3866	2.718	2.720
170	158.875	442.825	37.346	1	0.0000	1.376	1.384
170	158.875	442.825	37.346	4	0.0000	1.469	1.366
170	158.875	442.825	37.346	6	-0.3668	1.471	1.480
171	158.875	442.825	43.357	1	0.0000	1.303	1.362
171	158.875	442.825	43.357	5	0.0000	1.526	1.320
171	158.875	442.825	43.357	11	-0.2763	1.541	1.540
172	158.875	442.825	49.379	1	0.0000	1.402	1.488
172	158.875	442.825	49.379	5	0.0000	1.766	1.453
172	158.875	442.825	49.379	13	-0.2383	1.794	1.785
173	158.875	442.825	55.412	1	0.0000	1.456	1.524
173	158.875	442.825	55.412	5	0.0000	1.947	1.575
173	158.875	442.825	55.412	15	-0.2029	1.983	1.981
174	158.875	442.825	61.454	1	0.0000	1.497	1.549
174	158.875	442.825	61.454	5	0.0000	2.117	1.684
174	158.875	442.825	61.454	16	-0.1784	2.159	2.157
175	158.875	442.825	67.503	1	0.0000	1.538	1.568
175	158.875	442.825	67.503	4	0.0000	2.279	1.791

WR466

DRAFT

ENERGY DISSIPATION CALCS.

HYDROLOGIC/ HYDRAULIC

PIPING CALCS.

DEWATERING CALCS.

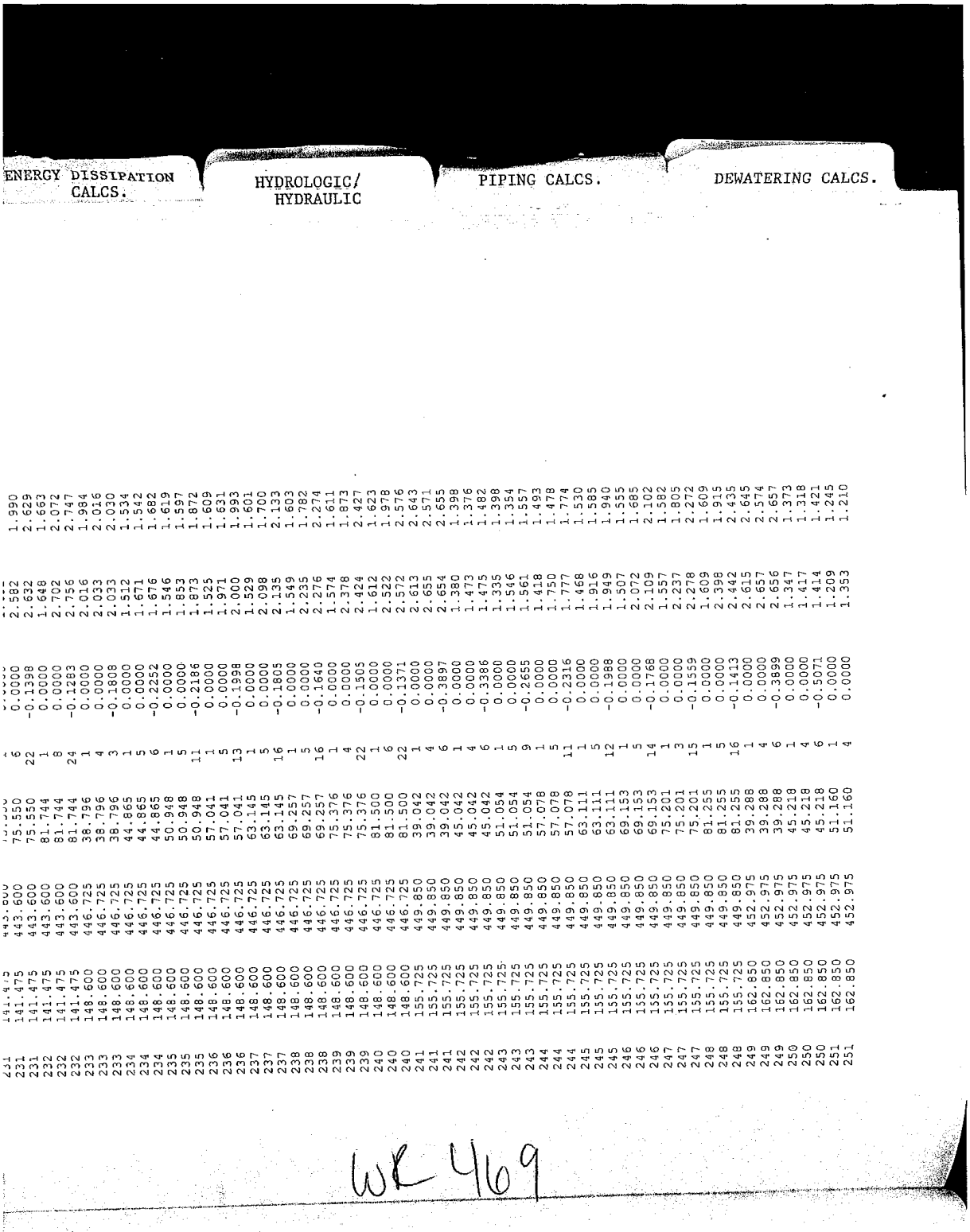
| | | |

DRAFT

201	187.375	455.325	32.334	1	0.0000	2.781	2.843
201	187.375	455.325	32.334	4	0.0000	2.851	2.709
201	187.375	455.325	32.334	6	-0.3588	2.649	2.849
202	187.375	455.325	38.051	1	0.0000	2.295	2.331
202	187.375	455.325	38.051	4	0.0000	2.413	2.221
202	187.375	455.325	38.051	6	-0.3493	2.413	2.422
203	187.375	455.325	43.782	1	0.0000	2.161	2.199
203	187.375	455.325	43.782	4	0.0000	2.342	2.081
203	187.375	455.325	43.782	9	-0.3115	2.342	2.339
204	187.375	455.325	49.524	1	0.0000	1.760	1.760
204	187.375	455.325	49.524	4	0.0000	1.970	1.725
204	187.375	455.325	49.524	9	-0.2808	1.974	1.969
205	187.375	455.325	55.276	1	0.0000	1.594	1.579
205	187.375	455.325	55.276	4	0.0000	1.838	1.676
205	187.375	455.325	55.276	10	-0.2677	1.845	1.841
206	187.375	455.325	61.037	1	0.0000	1.860	1.850
206	187.375	455.325	61.037	4	0.0000	2.184	1.815
206	187.375	455.325	61.037	10	-0.2646	2.207	2.197
207	187.375	455.325	66.805	1	0.0000	1.895	1.863
207	187.375	455.325	66.805	4	0.0000	2.311	1.890
207	187.375	455.325	66.805	13	-0.2381	2.338	2.339
208	187.375	455.325	72.580	1	0.0000	1.920	1.860
208	187.375	455.325	72.580	4	0.0000	2.435	1.967
208	187.375	455.325	72.580	14	-0.2077	2.466	2.467
209	194.500	458.450	32.580	1	0.0000	3.618	3.653
209	194.500	458.450	32.580	4	0.0000	3.683	3.550
209	194.500	458.450	32.580	6	-0.2735	3.682	3.683
210	194.500	458.450	38.228	1	0.0000	2.851	2.863
210	194.500	458.450	38.228	4	0.0000	2.970	2.761
210	194.500	458.450	38.228	6	-0.3101	2.969	2.978
211	194.500	458.450	43.888	1	0.0000	2.612	2.612
211	194.500	458.450	43.888	4	0.0000	2.794	2.515
211	194.500	458.450	43.888	9	-0.2798	2.794	2.792
212	194.500	458.450	49.560	1	0.0000	2.334	2.294
212	194.500	458.450	49.560	4	0.0000	2.562	2.263
212	194.500	458.450	49.560	9	-0.2530	2.564	2.560
213	194.500	458.450	55.242	1	0.0000	2.019	1.958
213	194.500	458.450	55.242	4	0.0000	2.283	1.979
213	194.500	458.450	55.242	9	-0.2380	2.289	2.282
214	194.500	458.450	60.933	1	0.0000	2.156	2.096
214	194.500	458.450	60.933	4	0.0000	2.477	2.078
214	194.500	458.450	60.933	13	-0.2505	2.493	2.493
215	194.500	458.450	66.631	1	0.0000	2.172	2.098
215	194.500	458.450	66.631	4	0.0000	2.570	2.108
215	194.500	458.450	66.631	13	-0.2457	2.593	2.594
216	194.500	458.450	72.335	1	0.0000	2.149	2.053
216	194.500	458.450	72.335	4	0.0000	2.633	2.129
216	194.500	458.450	72.335	13	-0.2238	2.662	2.662
217	134.350	440.475	38.303	1	0.0000	2.979	2.907
217	134.350	440.475	38.303	4	0.0000	3.239	3.000
217	134.350	440.475	38.303	6	-0.1298	3.243	3.252
218	134.350	440.475	44.513	1	0.0000	2.410	2.423
218	134.350	440.475	44.513	5	0.0000	2.859	2.466
218	134.350	440.475	44.513	11	-0.1529	2.874	2.872
219	134.350	440.475	50.735	1	0.0000	2.109	2.140
219	134.350	440.475	50.735	5	0.0000	2.737	2.252
219	134.350	440.475	50.735	14	-0.1528	2.761	2.756
220	134.350	440.475	56.969	1	0.0000	1.940	1.974
220	134.350	440.475	56.969	5	0.0000	2.716	2.162
220	134.350	440.475	56.969	17	-0.1498	2.749	2.748
221	134.350	440.475	63.213	1	0.0000	1.830	1.868
221	134.350	440.475	63.213	5	0.0000	2.735	2.117
221	134.350	440.475	63.213	21	-0.1456	2.775	2.768
222	134.350	440.475	69.465	1	0.0000	1.761	1.795
222	134.350	440.475	69.465	6	0.0000	2.781	2.123
222	134.350	440.475	69.465	22	-0.1367	2.829	2.822
223	134.350	440.475	75.724	1	0.0000	1.722	1.750
223	134.350	440.475	75.724	8	0.0000	2.848	2.140
223	134.350	440.475	75.724	27	-0.1312	2.901	2.892
224	134.350	440.475	81.989	1	0.0000	1.716	1.724
224	134.350	440.475	81.989	10	0.0000	2.938	2.202
224	134.350	440.475	81.989	33	-0.1225	2.997	2.996
225	141.475	443.600	38.550	1	0.0000	2.357	2.346
225	141.475	443.600	38.550	4	0.0000	2.471	2.373
225	141.475	443.600	38.550	6	-0.1548	2.473	2.474
226	141.475	443.600	44.689	1	0.0000	1.886	1.932

WR 4/08

DRAFT

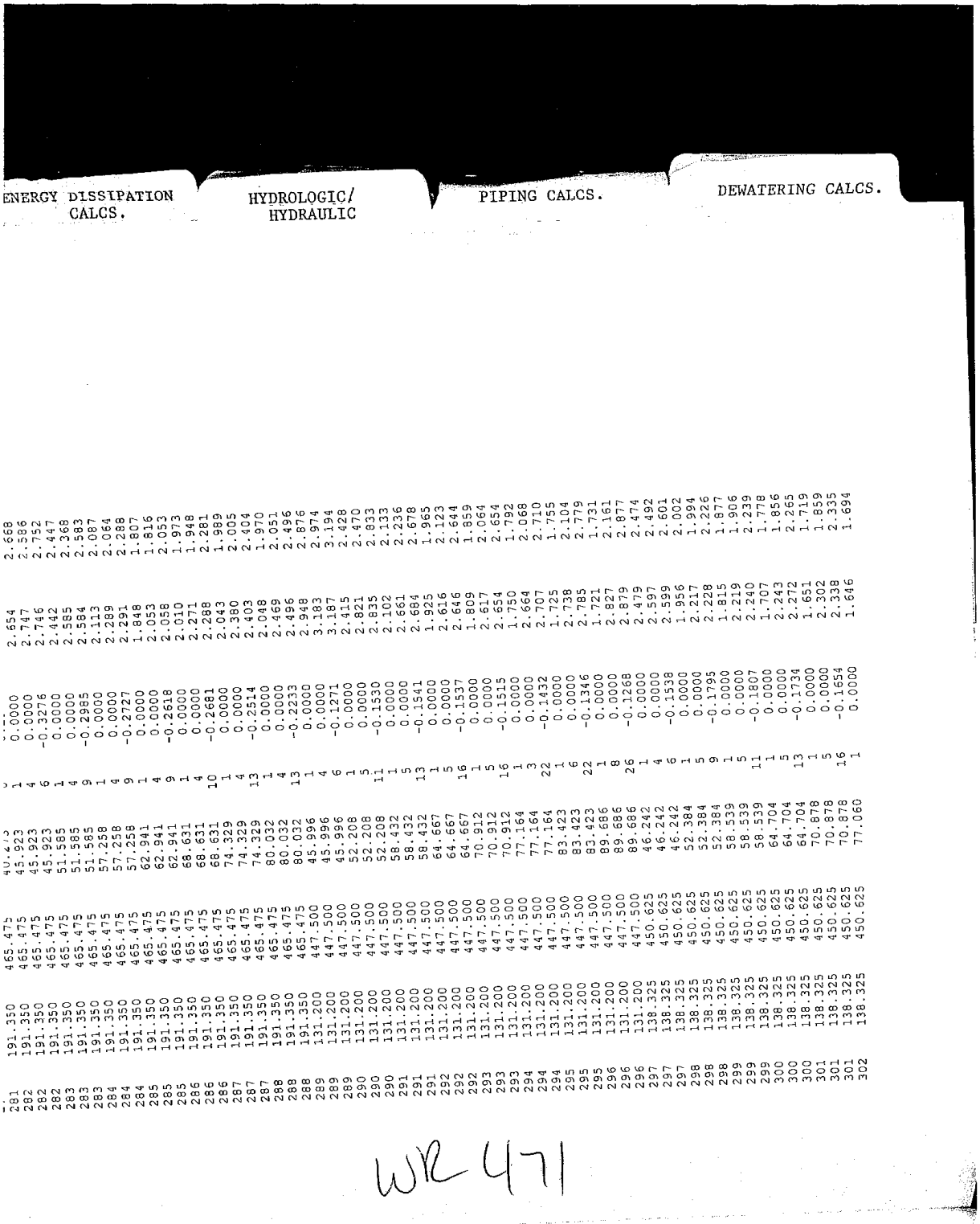

ENERGY DISSIPATION CALCS.
HYDROLOGIC/ HYDRAULIC
PIPING CALCS.
DEWATERING CALCS.
WR 469

DRAFT

251	162.850	452.975	51.160	9	-0.3225	1.359	1.359
252	162.850	452.975	57.114	1	0.0000	1.371	1.430
252	162.850	452.975	57.114	5	0.0000	1.618	1.392
252	162.850	452.975	57.114	10	-0.2667	1.640	1.638
253	162.850	452.975	63.077	1	0.0000	1.444	1.488
253	162.850	452.975	63.077	5	0.0000	1.799	1.511
253	162.850	452.975	63.077	11	-0.2257	1.828	1.823
254	162.850	452.975	69.048	1	0.0000	1.503	1.542
254	162.850	452.975	69.048	5	0.0000	1.968	1.627
254	162.850	452.975	69.048	15	-0.1977	2.002	2.004
255	162.850	452.975	75.027	1	0.0000	1.565	1.581
255	162.850	452.975	75.027	4	0.0000	2.139	1.745
255	162.850	452.975	75.027	16	-0.1734	2.176	2.175
256	162.850	452.975	81.010	1	0.0000	1.633	1.619
256	162.850	452.975	81.010	4	0.0000	2.319	1.885
256	162.850	452.975	81.010	17	-0.1514	2.359	2.357
257	169.975	456.100	39.534	1	0.0000	2.472	2.535
257	169.975	456.100	39.534	4	0.0000	2.529	2.413
257	169.975	456.100	39.534	6	-0.4167	2.526	2.525
258	169.975	456.100	45.394	1	0.0000	1.772	1.843
258	169.975	456.100	45.394	4	0.0000	1.882	1.719
258	169.975	456.100	45.394	6	-0.4077	1.881	1.887
259	169.975	456.100	51.266	1	0.0000	1.304	1.331
259	169.975	456.100	51.266	4	0.0000	1.419	1.282
259	169.975	456.100	51.266	9	-0.3881	1.420	1.418
260	169.975	456.100	57.150	1	0.0000	1.339	1.380
260	169.975	456.100	57.150	4	0.0000	1.527	1.333
260	169.975	456.100	57.150	9	-0.3082	1.544	1.540
261	169.975	456.100	63.043	1	0.0000	1.467	1.511
261	169.975	456.100	63.043	4	0.0000	1.750	1.487
261	169.975	456.100	63.043	10	-0.2568	1.775	1.770
262	169.975	456.100	68.944	1	0.0000	1.546	1.572
262	169.975	456.100	68.944	4	0.0000	1.929	1.615
262	169.975	456.100	68.944	10	-0.2156	1.958	1.952
263	169.975	456.100	74.852	1	0.0000	1.615	1.617
263	169.975	456.100	74.852	4	0.0000	2.103	1.741
263	169.975	456.100	74.852	11	-0.1854	2.135	2.126
264	169.975	456.100	80.766	1	0.0000	1.675	1.651
264	169.975	456.100	80.766	4	0.0000	2.270	1.858
264	169.975	456.100	80.766	16	-0.1675	2.306	2.305
265	177.100	459.225	39.781	1	0.0000	2.427	2.499
265	177.100	459.225	39.781	4	0.0000	2.490	2.365
265	177.100	459.225	39.781	6	-0.4068	2.487	2.486
266	177.100	459.225	45.570	1	0.0000	1.924	1.976
266	177.100	459.225	45.570	4	0.0000	2.026	1.872
266	177.100	459.225	45.570	6	-0.3869	2.025	2.031
267	177.100	459.225	51.373	1	0.0000	1.539	1.563
267	177.100	459.225	51.373	4	0.0000	1.665	1.511
267	177.100	459.225	51.373	9	-0.3495	1.665	1.663
268	177.100	459.225	57.186	1	0.0000	1.351	1.368
268	177.100	459.225	57.186	4	0.0000	1.506	1.335
268	177.100	459.225	57.186	9	-0.3363	1.509	1.506
269	177.100	459.225	63.009	1	0.0000	1.544	1.572
269	177.100	459.225	63.009	4	0.0000	1.776	1.529
269	177.100	459.225	63.009	10	-0.2882	1.798	1.793
270	177.100	459.225	68.840	1	0.0000	1.636	1.648
270	177.100	459.225	68.840	4	0.0000	1.956	1.655
270	177.100	459.225	68.840	10	-0.2406	1.982	1.974
271	177.100	459.225	74.678	1	0.0000	1.699	1.688
271	177.100	459.225	74.678	4	0.0000	2.118	1.768
271	177.100	459.225	74.678	13	-0.2105	2.147	2.148
272	177.100	459.225	80.521	1	0.0000	1.753	1.715
272	177.100	459.225	80.521	4	0.0000	2.274	1.876
272	177.100	459.225	80.521	13	-0.1844	2.307	2.308
273	184.225	462.350	40.027	1	0.0000	2.719	2.772
273	184.225	462.350	40.027	4	0.0000	2.776	2.662
273	184.225	462.350	40.027	6	-0.3650	2.774	2.774
274	184.225	462.350	45.747	1	0.0000	2.202	2.233
274	184.225	462.350	45.747	4	0.0000	2.296	2.144
274	184.225	462.350	45.747	6	-0.3612	2.296	2.302
275	184.225	462.350	51.479	1	0.0000	2.064	2.098
275	184.225	462.350	51.479	4	0.0000	2.209	2.002
275	184.225	462.350	51.479	9	-0.3265	2.209	2.208
276	184.225	462.350	57.222	1	0.0000	1.642	1.644
276	184.225	462.350	57.222	4	0.0000	1.806	1.615
276	184.225	462.350	57.222	9	-0.3046	1.807	1.805

WR 470

DRAFT


ENERGY DISSIPATION CALCS.
HYDROLOGIC/ HYDRAULIC
PIPING CALCS.
DEWATERING CALCS.

WR 471

DRAFT

302	138.325	450.625	[illegible]	4	0.0000	2.406	1.817
302	138.325	450.625	[illegible]	16	-0.1507	2.446	2.445
303	138.325	450.625	83.248	1	0.0000	1.645	1.661
303	138.325	450.625	83.248	5	0.0000	2.510	1.970
303	138.325	450.625	83.248	21	-0.1439	2.555	2.538
304	138.325	450.625	89.441	1	0.0000	1.665	1.676
304	138.325	450.625	89.441	6	0.0000	2.627	2.058
304	138.325	450.625	89.441	22	-0.1327	2.675	2.679
305	145.450	453.750	46.489	1	0.0000	2.081	2.059
305	145.450	453.750	46.489	4	0.0000	2.106	2.084
305	145.450	453.750	46.489	3	-0.1627	2.109	2.106
306	145.450	453.750	52.561	1	0.0000	1.548	1.571
306	145.450	453.750	52.561	4	0.0000	1.702	1.578
306	145.450	453.750	52.561	6	-0.2138	1.706	1.711
307	145.450	453.750	58.645	1	0.0000	1.569	1.642
307	145.450	453.750	58.645	5	0.0000	1.859	1.622
307	145.450	453.750	58.645	11	-0.2146	1.879	1.878
308	145.450	453.750	64.740	1	0.0000	1.541	1.620
308	145.450	453.750	64.740	5	0.0000	1.953	1.644
308	145.450	453.750	64.740	11	-0.1995	1.980	1.978
309	145.450	453.750	70.844	1	0.0000	1.547	1.613
309	145.450	453.750	70.844	5	0.0000	2.070	1.707
309	145.450	453.750	70.844	13	-0.1790	2.103	2.094
310	145.450	453.750	76.956	1	0.0000	1.568	1.618
310	145.450	453.750	76.956	5	0.0000	2.198	1.788
310	145.450	453.750	76.956	14	-0.1627	2.236	2.229
311	145.450	453.750	83.074	1	0.0000	1.594	1.625
311	145.450	453.750	83.074	3	0.0000	2.332	1.873
311	145.450	453.750	83.074	15	-0.1489	2.373	2.368
312	145.450	453.750	89.196	1	0.0000	1.636	1.642
312	145.450	453.750	89.196	5	0.0000	2.474	1.972
312	145.450	453.750	89.196	16	-0.1361	2.517	2.511
313	152.575	456.875	46.735	1	0.0000	2.579	2.604
313	152.575	456.875	46.735	4	0.0000	2.614	2.545
313	152.575	456.875	46.735	6	-0.3942	2.613	2.614
314	152.575	456.875	52.737	1	0.0000	1.405	1.428
314	152.575	456.875	52.737	4	0.0000	1.500	1.405
314	152.575	456.875	52.737	6	-0.3115	1.501	1.507
315	152.575	456.875	58.751	1	0.0000	1.374	1.436
315	152.575	456.875	58.751	4	0.0000	1.577	1.396
315	152.575	456.875	58.751	9	-0.2546	1.592	1.589
316	152.575	456.875	64.776	1	0.0000	1.443	1.511
316	152.575	456.875	64.776	5	0.0000	1.754	1.507
316	152.575	456.875	64.776	11	-0.2238	1.779	1.776
317	152.575	456.875	70.810	1	0.0000	1.487	1.544
317	152.575	456.875	70.810	5	0.0000	1.905	1.603
317	152.575	456.875	70.810	11	-0.1967	1.935	1.931
318	152.575	456.875	76.851	1	0.0000	1.527	1.570
318	152.575	456.875	76.851	5	0.0000	2.050	1.698
318	152.575	456.875	76.851	12	-0.1750	2.084	2.074
319	152.575	456.875	82.899	1	0.0000	1.578	1.599
319	152.575	456.875	82.899	4	0.0000	2.208	1.809
319	152.575	456.875	82.899	14	-0.1553	2.244	2.236
320	152.575	456.875	88.952	1	0.0000	1.632	1.628
320	152.575	456.875	88.952	4	0.0000	2.363	1.924
320	152.575	456.875	88.952	17	-0.1437	2.403	2.401
321	159.700	460.000	46.981	1	0.0000	2.558	2.588
321	159.700	460.000	46.981	4	0.0000	2.595	2.521
321	159.700	460.000	46.981	6	-0.4010	2.594	2.594
322	159.700	460.000	52.913	1	0.0000	1.325	1.348
322	159.700	460.000	52.913	4	0.0000	1.388	1.304
322	159.700	460.000	52.913	6	-0.4879	1.385	1.391
323	159.700	460.000	58.857	1	0.0000	1.221	1.251
323	159.700	460.000	58.857	4	0.0000	1.355	1.230
323	159.700	460.000	58.857	9	-0.2993	1.359	1.358
324	159.700	460.000	64.812	1	0.0000	1.391	1.443
324	159.700	460.000	64.812	4	0.0000	1.623	1.418
324	159.700	460.000	64.812	9	-0.2523	1.644	1.640
325	159.700	460.000	70.776	1	0.0000	1.460	1.508
325	159.700	460.000	70.776	4	0.0000	1.792	1.530
325	159.700	460.000	70.776	10	-0.2182	1.819	1.816
326	159.700	460.000	76.747	1	0.0000	1.522	1.554
326	159.700	460.000	76.747	4	0.0000	1.955	1.644
326	159.700	460.000	76.747	11	-0.1902	1.985	1.980
327	159.700	460.000	82.725	1	0.0000	1.585	1.596
327	159.700	460.000	82.725	4	0.0000	2.119	1.762

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327	159.700	460.000	82.705	16	-0.1716	2.153	2.154
328	159.700	460.000	88.707	1	0.0000	1.659	1.634
328	159.700	460.000	88.707	3	0.0000	2.288	1.899
328	159.700	460.000	88.707	16	-0.1516	2.324	2.323
329	166.825	463.125	47.227	1	0.0000	2.425	2.481
329	166.825	463.125	47.227	4	0.0000	2.474	2.373
329	166.825	463.125	47.227	6	-0.4201	2.471	2.471
330	166.825	463.125	53.089	1	0.0000	1.746	1.805
330	166.825	463.125	53.089	4	0.0000	1.838	1.703
330	166.825	463.125	53.089	6	-0.4128	1.837	1.841
331	166.825	463.125	58.963	1	0.0000	1.286	1.309
331	166.825	463.125	58.963	4	0.0000	1.386	1.272
331	166.825	463.125	58.963	9	-0.3769	1.397	1.386
332	166.825	463.125	64.848	1	0.0000	1.360	1.398
332	166.825	463.125	64.848	4	0.0000	1.535	1.361
332	166.825	463.125	64.848	9	-0.2934	1.552	1.549
333	166.825	463.125	70.742	1	0.0000	1.474	1.511
333	166.825	463.125	70.742	4	0.0000	1.737	1.505
333	166.825	463.125	70.742	10	-0.2452	1.761	1.757
334	166.825	463.125	76.643	1	0.0000	1.556	1.576
334	166.825	463.125	76.643	4	0.0000	1.912	1.632
334	166.825	463.125	76.643	10	-0.2081	1.939	1.934
335	166.825	463.125	82.550	1	0.0000	1.624	1.622
335	166.825	463.125	82.550	4	0.0000	2.079	1.753
335	166.825	463.125	82.550	10	-0.1814	2.109	2.101
336	166.825	463.125	88.463	1	0.0000	1.683	1.658
336	166.825	463.125	88.463	4	0.0000	2.237	1.864
336	166.825	463.125	88.463	14	-0.1662	2.271	2.272
337	173.950	466.250	47.473	1	0.0000	2.409	2.470
337	173.950	466.250	47.473	4	0.0000	2.462	2.358
337	173.950	466.250	47.473	6	-0.4065	2.460	2.459
338	173.950	466.250	53.266	1	0.0000	1.890	1.934
338	173.950	466.250	53.266	4	0.0000	1.975	1.847
338	173.950	466.250	53.266	6	-0.3934	1.974	1.979
339	173.950	466.250	59.070	1	0.0000	1.459	1.477
339	173.950	466.250	59.070	4	0.0000	1.557	1.435
339	173.950	466.250	59.070	9	-0.3801	1.556	1.555
340	173.950	466.250	64.884	1	0.0000	1.317	1.331
340	173.950	466.250	64.884	4	0.0000	1.451	1.309
340	173.950	466.250	64.884	9	-0.3326	1.454	1.452
341	173.950	466.250	70.708	1	0.0000	1.534	1.557
341	173.950	466.250	70.708	4	0.0000	1.745	1.531
341	173.950	466.250	70.708	9	-0.2751	1.766	1.761
342	173.950	466.250	76.539	1	0.0000	1.626	1.633
342	173.950	466.250	76.539	4	0.0000	1.922	1.658
342	173.950	466.250	76.539	10	-0.2311	1.945	1.939
343	173.950	466.250	82.376	1	0.0000	1.691	1.678
343	173.950	466.250	82.376	4	0.0000	2.080	1.769
343	173.950	466.250	82.376	10	-0.1991	2.106	2.098
344	173.950	466.250	88.218	1	0.0000	1.747	1.709
344	173.950	466.250	88.218	4	0.0000	2.231	1.875
344	173.950	466.250	88.218	13	-0.1805	2.261	2.262
345	181.075	469.375	47.720	1	0.0000	2.675	2.722
345	181.075	469.375	47.720	4	0.0000	2.723	2.627
345	181.075	469.375	47.720	6	-0.3700	2.722	2.721
346	181.075	469.375	53.442	1	0.0000	2.134	2.162
346	181.075	469.375	53.442	4	0.0000	2.212	2.087
346	181.075	469.375	53.442	6	-0.3706	2.212	2.216
347	181.075	469.375	59.176	1	0.0000	1.994	2.024
347	181.075	469.375	59.176	4	0.0000	2.114	1.943
347	181.075	469.375	59.176	9	-0.3383	2.114	2.113
348	181.075	469.375	64.920	1	0.0000	1.549	1.551
348	181.075	469.375	64.920	4	0.0000	1.679	1.525
348	181.075	469.375	64.920	9	-0.3380	1.680	1.678
349	181.075	469.375	70.674	1	0.0000	1.608	1.612
349	181.075	469.375	70.674	4	0.0000	1.784	1.582
349	181.075	469.375	70.674	9	-0.3020	1.799	1.795
350	181.075	469.375	76.434	1	0.0000	1.741	1.735
350	181.075	469.375	76.434	4	0.0000	1.992	1.731
350	181.075	469.375	76.434	9	-0.2575	2.014	2.006
351	181.075	469.375	82.201	1	0.0000	1.799	1.772
351	181.075	469.375	82.201	4	0.0000	2.134	1.826
351	181.075	469.375	82.201	10	-0.2214	2.157	2.148
352	181.075	469.375	87.973	1	0.0000	1.842	1.791
352	181.075	469.375	87.973	4	0.0000	2.267	1.915
352	181.075	469.375	87.973	13	-0.1985	2.295	2.295

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DRAFT

353	188.200	472.500	47.966	1	0.0000	3.267	3.300
353	188.200	472.500	47.966	4	0.0000	3.311	3.229
353	188.200	472.500	47.966	6	-0.3122	3.310	3.310
354	188.200	472.500	53.618	1	0.0000	2.516	2.539
354	188.200	472.500	53.618	4	0.0000	2.592	2.462
354	188.200	472.500	53.618	6	-0.3412	2.590	2.594
355	188.200	472.500	59.282	1	0.0000	2.319	2.327
355	188.200	472.500	59.282	4	0.0000	2.436	2.260
355	188.200	472.500	59.282	9	-0.3137	2.436	2.435
356	188.200	472.500	64.956	1	0.0000	1.953	1.934
356	188.200	472.500	64.956	4	0.0000	2.093	1.914
356	188.200	472.500	64.956	9	-0.2830	2.093	2.091
357	188.200	472.500	70.640	1	0.0000	1.716	1.687
357	188.200	472.500	70.640	4	0.0000	1.881	1.689
357	188.200	472.500	70.640	9	-0.2852	1.884	1.881
358	188.200	472.500	76.330	1	0.0000	1.914	1.887
358	188.200	472.500	76.330	4	0.0000	2.137	1.867
358	188.200	472.500	76.330	9	-0.2774	2.156	2.149
359	188.200	472.500	82.027	1	0.0000	1.963	1.918
359	188.200	472.500	82.027	4	0.0000	2.260	1.943
359	188.200	472.500	82.027	10	-0.2437	2.283	2.273
360	188.200	472.500	87.729	1	0.0000	1.983	1.915
360	188.200	472.500	87.729	4	0.0000	2.363	2.003
360	188.200	472.500	87.729	13	-0.2191	2.388	2.388
361	128.050	454.525	53.689	1	0.0000	2.915	2.843
361	128.050	454.525	53.689	4	0.0000	3.133	2.945
361	128.050	454.525	53.689	6	-0.1245	3.136	3.143
362	128.050	454.525	59.903	1	0.0000	2.422	2.433
362	128.050	454.525	59.903	5	0.0000	2.797	2.478
362	128.050	454.525	59.903	9	-0.1517	2.811	2.807
363	128.050	454.525	66.129	1	0.0000	2.099	2.130
363	128.050	454.525	66.129	5	0.0000	2.609	2.224
363	128.050	454.525	66.129	11	-0.1561	2.630	2.628
364	128.050	454.525	72.366	1	0.0000	1.918	1.960
364	128.050	454.525	72.366	5	0.0000	2.546	2.104
364	128.050	454.525	72.366	13	-0.1543	2.574	2.566
365	128.050	454.525	78.611	1	0.0000	1.804	1.855
365	128.050	454.525	78.611	5	0.0000	2.538	2.041
365	128.050	454.525	78.611	16	-0.1528	2.572	2.569
366	128.050	454.525	84.863	1	0.0000	1.752	1.796
366	128.050	454.525	84.863	4	0.0000	2.586	2.043
366	128.050	454.525	84.863	16	-0.1450	2.625	2.622
367	128.050	454.525	91.121	1	0.0000	1.734	1.762
367	128.050	454.525	91.121	5	0.0000	2.660	2.080
367	128.050	454.525	91.121	21	-0.1386	2.704	2.707
368	128.050	454.525	97.383	1	0.0000	1.732	1.741
368	128.050	454.525	97.383	6	0.0000	2.747	2.140
368	128.050	454.525	97.383	22	-0.1303	2.795	2.798
369	135.175	457.650	53.935	1	0.0000	2.582	2.577
369	135.175	457.650	53.935	4	0.0000	2.702	2.593
369	135.175	457.650	53.935	6	-0.1505	2.704	2.706
370	135.175	457.650	60.080	1	0.0000	2.016	2.060
370	135.175	457.650	60.080	5	0.0000	2.266	2.052
370	135.175	457.650	60.080	9	-0.1771	2.277	2.275
371	135.175	457.650	66.236	1	0.0000	1.829	1.891
371	135.175	457.650	66.236	5	0.0000	2.207	1.915
371	135.175	457.650	66.236	11	-0.1803	2.228	2.226
372	135.175	457.650	72.402	1	0.0000	1.711	1.782
372	135.175	457.650	72.402	5	0.0000	2.207	1.850
372	135.175	457.650	72.402	11	-0.1765	2.234	2.232
373	135.175	457.650	78.577	1	0.0000	1.664	1.729
373	135.175	457.650	78.577	5	0.0000	2.264	1.857
373	135.175	457.650	78.577	13	-0.1654	2.297	2.287
374	135.175	457.650	84.759	1	0.0000	1.662	1.707
374	135.175	457.650	84.759	4	0.0000	2.363	1.915
374	135.175	457.650	84.759	14	-0.1506	2.399	2.392
375	135.175	457.650	90.946	1	0.0000	1.662	1.694
375	135.175	457.650	90.946	4	0.0000	2.460	1.968
375	135.175	457.650	90.946	16	-0.1432	2.500	2.495
376	135.175	457.650	97.138	1	0.0000	1.684	1.692
376	135.175	457.650	97.138	6	0.0000	2.574	2.048
376	135.175	457.650	97.138	20	-0.1346	2.618	2.620
377	142.300	460.775	54.181	1	0.0000	2.162	2.148
377	142.300	460.775	54.181	4	0.0000	2.200	2.167
377	142.300	460.775	54.181	3	-0.1490	2.200	2.196
378	142.300	460.775	60.256	1	0.0000	1.582	1.605

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DRAFT

ENERGY DISSIPATION CALCS.

HYDROLOGIC/ HYDRAULIC

PIPING CALCS.

DEWATERING CALCS.

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DRAFT

403	163.675	470.150	66.661	9	-0.3539	1.379	1.378
404	163.675	470.150	72.546	1	0.0000	1.383	1.417
404	163.675	470.150	72.546	4	0.0000	1.550	1.391
404	163.675	470.150	72.546	9	-0.2782	1.567	1.564
405	163.675	470.150	78.441	1	0.0000	1.490	1.521
405	163.675	470.150	78.441	4	0.0000	1.740	1.529
405	163.675	470.150	78.441	9	-0.2332	1.762	1.757
406	163.675	470.150	84.342	1	0.0000	1.572	1.587
406	163.675	470.150	84.342	4	0.0000	1.909	1.653
406	163.675	470.150	84.342	10	-0.2011	1.934	1.929
407	163.675	470.150	90.248	1	0.0000	1.638	1.633
407	163.675	470.150	90.248	4	0.0000	2.067	1.768
407	163.675	470.150	90.248	10	-0.1775	2.095	2.088
408	163.675	470.150	96.159	1	0.0000	1.697	1.670
408	163.675	470.150	96.159	4	0.0000	2.219	1.876
408	163.675	470.150	96.159	10	-0.1603	2.249	2.240
409	170.800	473.275	55.166	1	0.0000	2.397	2.450
409	170.800	473.275	55.166	4	0.0000	2.443	2.352
409	170.800	473.275	55.166	6	-0.4064	2.441	2.440
410	170.800	473.275	60.961	1	0.0000	1.865	1.902
410	170.800	473.275	60.961	4	0.0000	1.937	1.828
410	170.800	473.275	60.961	6	-0.3983	1.937	1.940
411	170.800	473.275	66.767	1	0.0000	1.397	1.411
411	170.800	473.275	66.767	4	0.0000	1.475	1.374
411	170.800	473.275	66.767	6	-0.4532	1.473	1.481
412	170.800	473.275	72.582	1	0.0000	1.303	1.313
412	170.800	473.275	72.582	4	0.0000	1.424	1.301
412	170.800	473.275	72.582	9	-0.3184	1.427	1.426
413	170.800	473.275	78.407	1	0.0000	1.535	1.554
413	170.800	473.275	78.407	4	0.0000	1.733	1.541
413	170.800	473.275	78.407	9	-0.2631	1.752	1.749
414	170.800	473.275	84.238	1	0.0000	1.626	1.631
414	170.800	473.275	84.238	4	0.0000	1.905	1.667
414	170.800	473.275	84.238	9	-0.2216	1.927	1.921
415	170.800	473.275	90.074	1	0.0000	1.692	1.677
415	170.800	473.275	90.074	4	0.0000	2.058	1.776
415	170.800	473.275	90.074	10	-0.1936	2.083	2.076
416	170.800	473.275	95.915	1	0.0000	1.748	1.711
416	170.800	473.275	95.915	4	0.0000	2.204	1.879
416	170.800	473.275	95.915	10	-0.1727	2.231	2.222
417	177.925	476.400	55.412	1	0.0000	2.641	2.682
417	177.925	476.400	55.412	4	0.0000	2.683	2.599
417	177.925	476.400	55.412	6	-0.3739	2.681	2.681
418	177.925	476.400	61.137	1	0.0000	2.082	2.107
418	177.925	476.400	61.137	4	0.0000	2.149	2.042
418	177.925	476.400	61.137	6	-0.3782	2.148	2.152
419	177.925	476.400	66.873	1	0.0000	1.776	1.791
419	177.925	476.400	66.873	4	0.0000	1.869	1.744
419	177.925	476.400	66.873	6	-0.3760	1.868	1.877
420	177.925	476.400	72.619	1	0.0000	1.478	1.478
420	177.925	476.400	72.619	4	0.0000	1.584	1.456
420	177.925	476.400	72.619	9	-0.3538	1.584	1.583
421	177.925	476.400	78.372	1	0.0000	1.601	1.605
421	177.925	476.400	78.372	4	0.0000	1.761	1.582
421	177.925	476.400	78.372	9	-0.2953	1.778	1.775
422	177.925	476.400	84.133	1	0.0000	1.717	1.710
422	177.925	476.400	84.133	4	0.0000	1.949	1.719
422	177.925	476.400	84.133	9	-0.2495	1.970	1.964
423	177.925	476.400	89.900	1	0.0000	1.779	1.753
423	177.925	476.400	89.900	4	0.0000	2.092	1.818
423	177.925	476.400	89.900	9	-0.2140	2.114	2.106
424	177.925	476.400	95.670	1	0.0000	1.825	1.777
424	177.925	476.400	95.670	4	0.0000	2.224	1.907
424	177.925	476.400	95.670	13	-0.1934	2.249	2.249
425	185.050	479.525	55.659	1	0.0000	3.157	3.188
425	185.050	479.525	55.659	4	0.0000	3.194	3.116
425	185.050	479.525	55.659	6	-0.3242	3.194	3.193
426	185.050	479.525	61.313	1	0.0000	2.412	2.427
426	185.050	479.525	61.313	4	0.0000	2.477	2.368
426	185.050	479.525	61.313	6	-0.3523	2.476	2.479
427	185.050	479.525	66.979	1	0.0000	2.225	2.234
427	185.050	479.525	66.979	4	0.0000	2.324	2.175
427	185.050	479.525	66.979	6	-0.3432	2.323	2.331
428	185.050	479.525	72.655	1	0.0000	1.827	1.813
428	185.050	479.525	72.655	4	0.0000	1.941	1.795
428	185.050	479.525	72.655	9	-0.3149	1.941	1.939

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429	185.050	479.525	78.338	1	0.0000	1.612	1.590
429	185.050	479.525	78.338	4	0.0000	1.747	1.988
429	185.050	479.525	78.338	9	-0.3080	1.780	1.748
430	185.050	479.525	84.029	1	0.0000	1.856	1.834
430	185.050	479.525	84.029	4	0.0000	2.056	1.824
430	185.050	479.525	84.029	9	-0.2755	2.075	2.070
431	185.050	479.525	89.725	1	0.0000	1.910	1.870
431	185.050	479.525	89.725	4	0.0000	2.191	1.905
431	185.050	479.525	89.725	9	-0.2382	2.202	2.194
432	185.050	479.525	95.420	1	0.0000	1.942	1.879
432	185.050	479.525	95.420	4	0.0000	2.292	1.975
432	185.050	479.525	95.420	13	-0.2136	2.316	2.316
433	124.900	461.550	61.382	1	0.0000	2.882	2.809
433	124.900	461.550	61.382	4	0.0000	3.087	2.916
433	124.900	461.550	61.382	6	-0.1218	3.096	3.096
434	124.900	461.550	67.599	1	0.0000	2.435	2.443
434	124.900	461.550	67.599	4	0.0000	2.787	2.491
434	124.900	461.550	67.599	9	-0.1505	2.800	2.797
435	124.900	461.550	73.826	1	0.0000	2.102	2.131
435	124.900	461.550	73.826	5	0.0000	2.574	2.221
435	124.900	461.550	73.826	11	-0.1564	2.594	2.592
436	124.900	461.550	80.064	1	0.0000	1.912	1.958
436	124.900	461.550	80.064	5	0.0000	2.492	2.083
436	124.900	461.550	80.064	12	-0.1572	2.519	2.513
437	124.900	461.550	86.310	1	0.0000	1.812	1.858
437	124.900	461.550	86.310	5	0.0000	2.491	2.039
437	124.900	461.550	86.310	13	-0.1506	2.522	2.513
438	124.900	461.550	92.562	1	0.0000	1.769	1.804
438	124.900	461.550	92.562	4	0.0000	2.536	2.045
438	124.900	461.550	92.562	14	-0.1434	2.572	2.564
439	124.900	461.550	98.819	1	0.0000	1.747	1.771
439	124.900	461.550	98.819	4	0.0000	2.604	2.075
439	124.900	461.550	98.819	16	-0.1377	2.644	2.637
440	124.900	461.550	105.079	1	0.0000	1.749	1.753
440	124.900	461.550	105.079	6	0.0000	2.691	2.130
440	124.900	461.550	105.079	20	-0.1315	2.734	2.736
441	132.025	464.675	61.628	1	0.0000	2.639	2.630
441	132.025	464.675	61.628	4	0.0000	2.760	2.651
441	132.025	464.675	61.628	6	-0.1458	2.761	2.764
442	132.025	464.675	67.775	1	0.0000	2.066	2.108
442	132.025	464.675	67.775	4	0.0000	2.308	2.101
442	132.025	464.675	67.775	9	-0.1748	2.319	2.318
443	132.025	464.675	73.933	1	0.0000	1.848	1.908
443	132.025	464.675	73.933	5	0.0000	2.207	1.932
443	132.025	464.675	73.933	11	-0.1786	2.226	2.225
444	132.025	464.675	80.100	1	0.0000	1.726	1.793
444	132.025	464.675	80.100	5	0.0000	2.190	1.860
444	132.025	464.675	80.100	11	-0.1750	2.216	2.213
445	132.025	464.675	86.276	1	0.0000	1.685	1.741
445	132.025	464.675	86.276	5	0.0000	2.244	1.870
445	132.025	464.675	86.276	12	-0.1637	2.274	2.266
446	132.025	464.675	92.457	1	0.0000	1.681	1.720
446	132.025	464.675	92.457	4	0.0000	2.334	1.919
446	132.025	464.675	92.457	13	-0.1512	2.367	2.358
447	132.025	464.675	98.644	1	0.0000	1.683	1.709
447	132.025	464.675	98.644	3	0.0000	2.427	1.970
447	132.025	464.675	98.644	14	-0.1427	2.463	2.454
448	132.025	464.675	104.835	1	0.0000	1.707	1.710
448	132.025	464.675	104.835	5	0.0000	2.538	2.046
448	132.025	464.675	104.835	15	-0.1332	2.578	2.569
449	139.150	467.800	61.874	1	0.0000	2.250	2.243
449	139.150	467.800	61.874	4	0.0000	2.298	2.257
449	139.150	467.800	61.874	3	-0.1382	2.298	2.291
450	139.150	467.800	67.951	1	0.0000	1.663	1.695
450	139.150	467.800	67.951	4	0.0000	1.816	1.691
450	139.150	467.800	67.951	6	-0.2059	1.821	1.926
451	139.150	467.800	74.039	1	0.0000	1.625	1.694
451	139.150	467.800	74.039	4	0.0000	1.893	1.677
451	139.150	467.800	74.039	9	-0.2052	1.911	1.909
452	139.150	467.800	80.136	1	0.0000	1.595	1.661
452	139.150	467.800	80.136	5	0.0000	1.961	1.696
452	139.150	467.800	80.136	11	-0.1308	1.985	1.983
453	139.150	467.800	86.241	1	0.0000	1.596	1.651
453	139.150	467.800	86.241	5	0.0000	2.056	1.746
453	139.150	467.800	86.241	11	-0.1759	2.085	2.081
454	139.150	467.800	92.353	1	0.0000	1.614	1.653

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454	139.150	467.800	92.353	4	0.0000	2.166	1.811
454	139.150	467.800	92.353	11	-0.1625	2.197	2.193
455	139.150	467.800	98.470	1	0.0000	1.646	1.665
455	139.150	467.800	98.470	3	0.0000	2.230	1.899
455	139.150	467.800	98.470	13	-0.1472	2.324	2.315
456	139.150	467.800	104.590	1	0.0000	1.687	1.683
456	139.150	467.800	104.590	4	0.0000	2.421	1.992
456	139.150	467.800	104.590	16	-0.1385	2.457	2.456
457	146.275	470.925	62.120	1	0.0000	2.194	2.181
457	146.275	470.925	62.120	4	0.0000	2.262	2.185
457	146.275	470.925	62.120	6	-0.5233	2.232	2.204
458	146.275	470.925	68.127	1	0.0000	1.461	1.491
458	146.275	470.925	68.127	4	0.0000	1.561	1.470
458	146.275	470.925	68.127	6	-0.2705	1.563	1.568
459	146.275	470.925	74.145	1	0.0000	1.462	1.515
459	146.275	470.925	74.145	4	0.0000	1.655	1.492
459	146.275	470.925	74.145	9	-0.2343	1.679	1.668
460	146.275	470.925	80.172	1	0.0000	1.508	1.563
460	146.275	470.925	80.172	4	0.0000	1.791	1.576
460	146.275	470.925	80.172	9	-0.2070	1.813	1.810
461	146.275	470.925	86.207	1	0.0000	1.538	1.585
461	146.275	470.925	86.207	4	0.0000	1.913	1.651
461	146.275	470.925	86.207	10	-0.1881	1.939	1.937
462	146.275	470.925	92.249	1	0.0000	1.579	1.611
462	146.275	470.925	92.249	4	0.0000	2.044	1.739
462	146.275	470.925	92.249	11	-0.1710	2.073	2.068
463	146.275	470.925	98.295	1	0.0000	1.630	1.641
463	146.275	470.925	98.295	4	0.0000	2.188	1.843
463	146.275	470.925	98.295	11	-0.1540	2.219	2.212
464	146.275	470.925	104.345	1	0.0000	1.680	1.668
464	146.275	470.925	104.345	3	0.0000	2.326	1.940
464	146.275	470.925	104.345	15	-0.1445	2.360	2.361
465	153.400	474.050	62.367	1	0.0000	2.476	2.506
465	153.400	474.050	62.367	4	0.0000	2.507	2.444
465	153.400	474.050	62.367	6	-0.4143	2.505	2.505
466	153.400	474.050	68.304	1	0.0000	1.356	1.377
466	153.400	474.050	68.304	4	0.0000	1.416	1.346
466	153.400	474.050	68.304	6	-0.3939	1.416	1.420
467	153.400	474.050	74.251	1	0.0000	1.305	1.335
467	153.400	474.050	74.251	4	0.0000	1.434	1.322
467	153.400	474.050	74.251	6	-0.2868	1.442	1.452
468	153.400	474.050	80.208	1	0.0000	1.445	1.490
468	153.400	474.050	80.208	4	0.0000	1.662	1.485
468	153.400	474.050	80.208	9	-0.2315	1.681	1.679
469	153.400	474.050	86.173	1	0.0000	1.509	1.547
469	153.400	474.050	86.173	4	0.0000	1.811	1.587
469	153.400	474.050	86.173	9	-0.2030	1.834	1.830
470	153.400	474.050	92.145	1	0.0000	1.570	1.592
470	153.400	474.050	92.145	4	0.0000	1.960	1.693
470	153.400	474.050	92.145	10	-0.1816	1.986	1.982
471	153.400	474.050	98.121	1	0.0000	1.631	1.634
471	153.400	474.050	98.121	4	0.0000	2.109	1.802
471	153.400	474.050	98.121	10	-0.1636	2.137	2.132
472	153.400	474.050	104.101	1	0.0000	1.690	1.669
472	153.400	474.050	104.101	3	0.0000	2.258	1.912
472	153.400	474.050	104.101	11	-0.1476	2.288	2.279
473	160.525	477.175	62.613	1	0.0000	2.364	2.412
473	160.525	477.175	62.613	4	0.0000	2.404	2.324
473	160.525	477.175	62.613	6	-0.4226	2.402	2.401
474	160.525	477.175	68.480	1	0.0000	1.428	1.444
474	160.525	477.175	68.480	4	0.0000	1.470	1.405
474	160.525	477.175	68.480	6	-0.5467	1.467	1.469
475	160.525	477.175	74.358	1	0.0000	1.293	1.310
475	160.525	477.175	74.358	4	0.0000	1.382	1.291
475	160.525	477.175	74.358	6	-0.3585	1.384	1.393
476	160.525	477.175	80.245	1	0.0000	1.409	1.441
476	160.525	477.175	80.245	4	0.0000	1.571	1.424
476	160.525	477.175	80.245	9	-0.2640	1.588	1.586
477	160.525	477.175	86.139	1	0.0000	1.511	1.538
477	160.525	477.175	86.139	4	0.0000	1.751	1.556
477	160.525	477.175	86.139	9	-0.2239	1.772	1.768
478	160.525	477.175	92.041	1	0.0000	1.590	1.601
478	160.525	477.175	92.041	4	0.0000	1.913	1.676
478	160.525	477.175	92.041	9	-0.1942	1.936	1.931
479	160.525	477.175	97.947	1	0.0000	1.655	1.647
479	160.525	477.175	97.947	4	0.0000	2.064	1.785

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479	160.525	477.175	97.947	10	-0.1740	2.089	2.084
480	160.525	477.175	103.856	1	0.0000	1.712	1.693
480	160.525	477.175	103.856	4	0.0000	2.208	1.888
480	160.525	477.175	103.856	10	-0.1552	2.236	2.228
481	167.650	480.300	62.855	1	0.0000	2.388	2.435
481	167.650	480.300	62.855	4	0.0000	2.429	2.346
481	167.650	480.300	62.855	6	-0.4064	2.427	2.426
482	167.650	480.300	68.656	1	0.0000	1.844	1.877
482	167.650	480.300	68.656	4	0.0000	1.908	1.812
482	167.650	480.300	68.656	6	-0.4025	1.907	1.910
483	167.650	480.300	74.464	1	0.0000	1.378	1.390
483	167.650	480.300	74.464	4	0.0000	1.447	1.360
483	167.650	480.300	74.464	6	-0.4488	1.446	1.453
484	167.650	480.300	80.281	1	0.0000	1.300	1.308
484	167.650	480.300	80.281	4	0.0000	1.414	1.304
484	167.650	480.300	80.281	9	-0.3006	1.417	1.416
485	167.650	480.300	86.105	1	0.0000	1.544	1.560
485	167.650	480.300	86.105	4	0.0000	1.733	1.558
485	167.650	480.300	86.105	9	-0.2511	1.752	1.749
486	167.650	480.300	91.936	1	0.0000	1.633	1.635
486	167.650	480.300	91.936	4	0.0000	1.899	1.681
486	167.650	480.300	91.936	9	-0.2139	1.920	1.915
487	167.650	480.300	97.772	1	0.0000	1.699	1.682
487	167.650	480.300	97.772	4	0.0000	2.047	1.788
487	167.650	480.300	97.772	9	-0.1877	2.070	2.063
488	167.650	480.300	103.611	1	0.0000	1.754	1.716
488	167.650	480.300	103.611	4	0.0000	2.187	1.886
488	167.650	480.300	103.611	10	-0.1695	2.213	2.205
489	174.775	483.425	63.105	1	0.0000	2.613	2.651
489	174.775	483.425	63.105	4	0.0000	2.650	2.576
489	174.775	483.425	63.105	6	-0.3770	2.649	2.649
490	174.775	483.425	68.832	1	0.0000	2.039	2.063
490	174.775	483.425	68.832	4	0.0000	2.098	2.005
490	174.775	483.425	68.832	6	-0.3845	2.098	2.100
491	174.775	483.425	74.570	1	0.0000	1.649	1.658
491	174.775	483.425	74.570	4	0.0000	1.723	1.624
491	174.775	483.425	74.570	6	-0.4046	1.722	1.728
492	174.775	483.425	80.317	1	0.0000	1.440	1.440
492	174.775	483.425	80.317	4	0.0000	1.533	1.424
492	174.775	483.425	80.317	9	-0.3524	1.534	1.533
493	174.775	483.425	86.071	1	0.0000	1.598	1.602
493	174.775	483.425	86.071	4	0.0000	1.749	1.587
493	174.775	483.425	86.071	9	-0.2842	1.766	1.764
494	174.775	483.425	91.832	1	0.0000	1.706	1.698
494	174.775	483.425	91.832	4	0.0000	1.925	1.717
494	174.775	483.425	91.832	9	-0.2404	1.944	1.940
495	174.775	483.425	97.598	1	0.0000	1.770	1.743
495	174.775	483.425	97.598	4	0.0000	2.066	1.817
495	174.775	483.425	97.598	9	-0.2077	2.087	2.080
496	174.775	483.425	103.367	1	0.0000	1.819	1.772
496	174.775	483.425	103.367	4	0.0000	2.196	1.907
496	174.775	483.425	103.367	9	-0.1834	2.220	2.210
497	181.900	486.550	63.351	1	0.0000	3.071	3.100
497	181.900	486.550	63.351	4	0.0000	3.104	3.034
497	181.900	486.550	63.351	6	-0.3335	3.103	3.103
498	181.900	486.550	69.009	1	0.0000	2.332	2.346
498	181.900	486.550	69.009	4	0.0000	2.388	2.294
498	181.900	486.550	69.009	6	-0.3613	2.387	2.389
499	181.900	486.550	74.676	1	0.0000	2.150	2.159
499	181.900	486.550	74.676	4	0.0000	2.235	2.108
499	181.900	486.550	74.676	6	-0.3534	2.234	2.241
500	181.900	486.550	80.353	1	0.0000	1.723	1.711
500	181.900	486.550	80.353	4	0.0000	1.816	1.695
500	181.900	486.550	80.353	9	-0.3395	1.815	1.814
501	181.900	486.550	86.037	1	0.0000	1.549	1.530
501	181.900	486.550	86.037	4	0.0000	1.667	1.532
501	181.900	486.550	86.037	9	-0.3118	1.670	1.668
502	181.900	486.550	91.728	1	0.0000	1.818	1.798
502	181.900	486.550	91.728	4	0.0000	2.002	1.797
502	181.900	486.550	91.728	9	-0.2694	2.021	2.017
503	181.900	486.550	97.423	1	0.0000	1.877	1.840
503	181.900	486.550	97.423	4	0.0000	2.131	1.884
503	181.900	486.550	97.423	9	-0.2310	2.150	2.144
504	181.900	486.550	103.122	1	0.0000	1.915	1.856
504	181.900	486.550	103.122	4	0.0000	2.244	1.959
504	181.900	486.550	103.122	9	-0.2015	2.266	2.257

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505	121.750	468.575	69.074	1	0.0000	3.096	3.031
505	121.750	468.575	69.074	4	0.0000	3.296	3.111
505	121.750	468.575	69.074	6	-0.1284	3.321	3.308
506	121.750	468.575	75.294	1	0.0000	2.449	2.453
506	121.750	468.575	75.294	4	0.0000	2.782	2.507
506	121.750	468.575	75.294	9	-0.1490	2.795	2.793
507	121.750	468.575	81.524	1	0.0000	2.108	2.135
507	121.750	468.575	81.524	5	0.0000	2.550	2.222
507	121.750	468.575	81.524	11	-0.1562	2.569	2.567
508	121.750	468.575	87.762	1	0.0000	1.914	1.959
508	121.750	468.575	87.762	5	0.0000	2.456	2.075
508	121.750	468.575	87.762	11	-0.1566	2.481	2.478
509	121.750	468.575	94.008	1	0.0000	1.822	1.864
509	121.750	468.575	94.008	5	0.0000	2.454	2.036
509	121.750	468.575	94.008	12	-0.1511	2.465	2.475
510	121.750	468.575	100.260	1	0.0000	1.782	1.813
510	121.750	468.575	100.260	4	0.0000	2.498	2.044
510	121.750	468.575	100.260	14	-0.1440	2.532	2.524
511	121.750	468.575	106.517	1	0.0000	1.763	1.783
511	121.750	468.575	106.517	3	0.0000	2.564	2.068
511	121.750	468.575	106.517	14	-0.1378	2.600	2.590
512	121.750	468.575	112.776	1	0.0000	1.767	1.767
512	121.750	468.575	112.776	5	0.0000	2.649	2.124
512	121.750	468.575	112.776	15	-0.1300	2.688	2.678
513	128.875	471.700	69.321	1	0.0000	2.671	2.658
513	128.875	471.700	69.321	4	0.0000	2.792	2.685
513	128.875	471.700	69.321	6	-0.1412	2.794	2.796
514	128.875	471.700	75.470	1	0.0000	2.112	2.151
514	128.875	471.700	75.470	4	0.0000	2.348	2.148
514	128.875	471.700	75.470	6	-0.1795	2.359	2.369
515	128.875	471.700	81.630	1	0.0000	1.865	1.923
515	128.875	471.700	81.630	5	0.0000	2.208	1.947
515	128.875	471.700	81.630	9	-0.1765	2.226	2.223
516	128.875	471.700	87.798	1	0.0000	1.746	1.807
516	128.875	471.700	87.798	5	0.0000	2.184	1.875
516	128.875	471.700	87.798	11	-0.1730	2.208	2.206
517	128.875	471.700	93.974	1	0.0000	1.707	1.757
517	128.875	471.700	93.974	5	0.0000	2.233	1.884
517	128.875	471.700	93.974	11	-0.1634	2.261	2.257
518	128.875	471.700	100.156	1	0.0000	1.700	1.736
518	128.875	471.700	100.156	4	0.0000	2.315	1.927
518	128.875	471.700	100.156	12	-0.1512	2.346	2.338
519	128.875	471.700	106.343	1	0.0000	1.707	1.727
519	128.875	471.700	106.343	3	0.0000	2.407	1.983
519	128.875	471.700	106.343	13	-0.1420	2.441	2.432
520	128.875	471.700	112.532	1	0.0000	1.732	1.729
520	128.875	471.700	112.532	5	0.0000	2.515	2.055
520	128.875	471.700	112.532	17	-0.1351	2.551	2.550
521	136.000	474.825	69.567	1	0.0000	2.340	2.338
521	136.000	474.825	69.567	4	0.0000	2.396	2.347
521	136.000	474.825	69.567	6	-0.1643	2.397	2.397
522	136.000	474.825	75.646	1	0.0000	1.759	1.799
522	136.000	474.825	75.646	4	0.0000	1.916	1.783
522	136.000	474.825	75.646	6	-0.2073	1.924	1.930
523	136.000	474.825	81.736	1	0.0000	1.657	1.723
523	136.000	474.825	81.736	4	0.0000	1.918	1.712
523	136.000	474.825	81.736	9	-0.2006	1.935	1.933
524	136.000	474.825	87.835	1	0.0000	1.625	1.685
524	136.000	474.825	87.835	4	0.0000	1.974	1.723
524	136.000	474.825	87.835	9	-0.1857	1.997	1.993
525	136.000	474.825	93.940	1	0.0000	1.624	1.673
525	136.000	474.825	93.940	4	0.0000	2.061	1.767
525	136.000	474.825	93.940	11	-0.1734	2.088	2.085
526	136.000	474.825	100.052	1	0.0000	1.640	1.674
526	136.000	474.825	100.052	4	0.0000	2.163	1.830
526	136.000	474.825	100.052	11	-0.1607	2.193	2.188
527	136.000	474.825	106.168	1	0.0000	1.672	1.687
527	136.000	474.825	106.168	3	0.0000	2.282	1.915
527	136.000	474.825	106.168	15	-0.1498	2.314	2.316
528	136.000	474.825	112.287	1	0.0000	1.713	1.704
528	136.000	474.825	112.287	4	0.0000	2.407	2.003
528	136.000	474.825	112.287	16	-0.1386	2.441	2.440
529	143.125	477.950	69.813	1	0.0000	2.191	2.179
529	143.125	477.950	69.813	4	0.0000	2.202	2.186
529	143.125	477.950	69.813	3	-0.1747	2.202	2.195
530	143.125	477.950	75.823	1	0.0000	1.489	1.520

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530	143.125	477.950	75.823	4	0.0000	1.592	1.591
530	143.125	477.950	75.823	6	-0.2581	1.593	1.593
531	143.125	477.950	81.842	1	0.0000	1.606	1.662
531	143.125	477.950	81.842	4	0.0000	1.698	1.642
531	143.125	477.950	81.842	9	-0.2242	1.713	1.712
532	143.125	477.950	87.871	1	0.0000	1.640	1.591
532	143.125	477.950	87.871	4	0.0000	1.814	1.610
532	143.125	477.950	87.871	9	-0.2014	1.835	1.833
533	143.125	477.950	93.906	1	0.0000	1.587	1.609
533	143.125	477.950	93.906	4	0.0000	1.926	1.679
533	143.125	477.950	93.906	9	-0.1825	1.951	1.946
534	143.125	477.950	99.946	1	0.0000	1.608	1.635
534	143.125	477.950	99.946	4	0.0000	2.052	1.765
534	143.125	477.950	99.946	10	-0.1681	2.079	2.075
535	143.125	477.950	105.994	1	0.0000	1.658	1.664
535	143.125	477.950	105.994	4	0.0000	2.188	1.864
535	143.125	477.950	105.994	11	-0.1524	2.217	2.211
536	143.125	477.950	112.042	1	0.0000	1.705	1.689
536	143.125	477.950	112.042	3	0.0000	2.319	1.956
536	143.125	477.950	112.042	11	-0.1414	2.350	2.342
537	150.250	481.075	70.059	1	0.0000	2.448	2.478
537	150.250	481.075	70.059	4	0.0000	2.477	2.418
537	150.250	481.075	70.059	6	-0.4175	2.475	2.475
538	150.250	481.075	75.999	1	0.0000	1.390	1.412
538	150.250	481.075	75.999	4	0.0000	1.454	1.386
538	150.250	481.075	75.999	6	-0.3517	1.453	1.458
539	150.250	481.075	81.948	1	0.0000	1.377	1.409
539	150.250	481.075	81.948	4	0.0000	1.507	1.394
539	150.250	481.075	81.948	6	-0.2728	1.518	1.528
540	150.250	481.075	87.907	1	0.0000	1.476	1.518
540	150.250	481.075	87.907	4	0.0000	1.688	1.520
540	150.250	481.075	87.907	9	-0.2228	1.707	1.705
541	150.250	481.075	93.872	1	0.0000	1.537	1.571
541	150.250	481.075	93.872	4	0.0000	1.829	1.619
541	150.250	481.075	93.872	9	-0.1970	1.851	1.848
542	150.250	481.075	99.844	1	0.0000	1.599	1.616
542	150.250	481.075	99.844	4	0.0000	1.972	1.722
542	150.250	481.075	99.844	9	-0.1759	1.997	1.991
543	150.250	481.075	105.819	1	0.0000	1.656	1.655
543	150.250	481.075	105.819	4	0.0000	2.113	1.823
543	150.250	481.075	105.819	10	-0.1611	2.139	2.134
544	150.250	481.075	111.798	1	0.0000	1.712	1.688
544	150.250	481.075	111.798	3	0.0000	2.254	1.928
544	150.250	481.075	111.798	10	-0.1467	2.282	2.274
545	157.375	484.200	70.306	1	0.0000	2.346	2.390
545	157.375	484.200	70.306	4	0.0000	2.382	2.310
545	157.375	484.200	70.306	6	-0.4225	2.380	2.379
546	157.375	484.200	76.175	1	0.0000	1.413	1.425
546	157.375	484.200	76.175	4	0.0000	1.451	1.395
546	157.375	484.200	76.175	6	-0.5246	1.448	1.451
547	157.375	484.200	82.055	1	0.0000	1.307	1.323
547	157.375	484.200	82.055	4	0.0000	1.395	1.310
547	157.375	484.200	82.055	6	-0.3303	1.397	1.405
548	157.375	484.200	87.943	1	0.0000	1.439	1.469
548	157.375	484.200	87.943	4	0.0000	1.598	1.459
548	157.375	484.200	87.943	9	-0.2505	1.615	1.613
549	157.375	484.200	93.838	1	0.0000	1.535	1.559
549	157.375	484.200	93.838	4	0.0000	1.769	1.586
549	157.375	484.200	93.838	9	-0.2146	1.789	1.786
550	157.375	484.200	99.739	1	0.0000	1.611	1.620
550	157.375	484.200	99.739	4	0.0000	1.923	1.701
550	157.375	484.200	99.739	9	-0.1884	1.945	1.940
551	157.375	484.200	105.645	1	0.0000	1.673	1.664
551	157.375	484.200	105.645	4	0.0000	2.066	1.804
551	157.375	484.200	105.645	9	-0.1698	2.089	2.083
552	157.375	484.200	111.553	1	0.0000	1.728	1.698
552	157.375	484.200	111.553	4	0.0000	2.203	1.901
552	157.375	484.200	111.553	10	-0.1562	2.229	2.222
553	164.500	487.325	70.552	1	0.0000	2.381	2.424
553	164.500	487.325	70.552	4	0.0000	2.418	2.346
553	164.500	487.325	70.552	6	-0.4063	2.416	2.415
554	164.500	487.325	76.351	1	0.0000	1.827	1.857
554	164.500	487.325	76.351	4	0.0000	1.883	1.798
554	164.500	487.325	76.351	6	-0.4061	1.883	1.885
555	164.500	487.325	82.161	1	0.0000	1.374	1.384
555	164.500	487.325	82.161	4	0.0000	1.439	1.360

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555	164.500	487.325	82.161	6	-0.4265	1.457	1.444
556	164.500	487.325	87.973	1	0.0000	1.397	1.411
556	164.500	487.325	87.973	4	0.0000	1.513	1.400
556	164.500	487.325	87.973	9	-0.2869	1.524	1.523
557	164.500	487.325	93.804	1	0.0000	1.558	1.571
557	164.500	487.325	93.804	4	0.0000	1.741	1.579
557	164.500	487.325	93.804	9	-0.2387	1.759	1.757
558	164.500	487.325	99.635	1	0.0000	1.644	1.644
558	164.500	487.325	99.635	4	0.0000	1.900	1.697
558	164.500	487.325	99.635	9	-0.2069	1.920	1.916
559	164.500	487.325	105.470	1	0.0000	1.709	1.691
559	164.500	487.325	105.470	4	0.0000	2.044	1.802
559	164.500	487.325	105.470	9	-0.1831	2.066	2.060
560	164.500	487.325	111.308	1	0.0000	1.763	1.725
560	164.500	487.325	111.308	4	0.0000	2.178	1.897
560	164.500	487.325	111.308	9	-0.1658	2.202	2.193
561	171.625	490.450	70.798	1	0.0000	2.590	2.625
561	171.625	490.450	70.798	4	0.0000	2.624	2.556
561	171.625	490.450	70.798	6	-0.3796	2.622	2.622
562	171.625	490.450	76.528	1	0.0000	2.005	2.026
562	171.625	490.450	76.528	4	0.0000	2.057	1.975
562	171.625	490.450	76.528	6	-0.3897	2.057	2.059
563	171.625	490.450	82.267	1	0.0000	1.558	1.563
563	171.625	490.450	82.267	4	0.0000	1.617	1.535
563	171.625	490.450	82.267	6	-0.4472	1.614	1.620
564	171.625	490.450	88.015	1	0.0000	1.417	1.417
564	171.625	490.450	88.015	4	0.0000	1.504	1.407
564	171.625	490.450	88.015	9	-0.3403	1.505	1.504
565	171.625	490.450	93.770	1	0.0000	1.600	1.603
565	171.625	490.450	93.770	4	0.0000	1.744	1.596
565	171.625	490.450	93.770	9	-0.2723	1.760	1.758
566	171.625	490.450	99.531	1	0.0000	1.702	1.694
566	171.625	490.450	99.531	4	0.0000	1.912	1.722
566	171.625	490.450	99.531	9	-0.2314	1.931	1.927
567	171.625	490.450	105.296	1	0.0000	1.767	1.741
567	171.625	490.450	105.296	4	0.0000	2.051	1.822
567	171.625	490.450	105.296	9	-0.2015	2.071	2.066
568	171.625	490.450	111.064	1	0.0000	1.818	1.771
568	171.625	490.450	111.064	4	0.0000	2.178	1.911
568	171.625	490.450	111.064	9	-0.1794	2.200	2.193
569	178.750	493.575	71.044	1	0.0000	3.002	3.030
569	178.750	493.575	71.044	4	0.0000	3.032	2.969
569	178.750	493.575	71.044	6	-0.3409	3.031	3.031
570	178.750	493.575	76.704	1	0.0000	2.267	2.281
570	178.750	493.575	76.704	4	0.0000	2.317	2.234
570	178.750	493.575	76.704	6	-0.3689	2.316	2.317
571	178.750	493.575	82.373	1	0.0000	2.088	2.098
571	178.750	493.575	82.373	4	0.0000	2.163	2.052
571	178.750	493.575	82.373	6	-0.3619	2.163	2.168
572	178.750	493.575	88.051	1	0.0000	1.634	1.624
572	178.750	493.575	88.051	4	0.0000	1.711	1.608
572	178.750	493.575	88.051	6	-0.4027	1.709	1.719
573	178.750	493.575	93.736	1	0.0000	1.573	1.559
573	178.750	493.575	93.736	4	0.0000	1.685	1.557
573	178.750	493.575	93.736	9	-0.3075	1.692	1.691
574	178.750	493.575	99.427	1	0.0000	1.793	1.775
574	178.750	493.575	99.427	4	0.0000	1.967	1.782
574	178.750	493.575	99.427	9	-0.2608	1.984	1.981
575	178.750	493.575	105.121	1	0.0000	1.855	1.819
575	178.750	493.575	105.121	4	0.0000	2.096	1.872
575	178.750	493.575	105.121	9	-0.2240	2.115	2.110
576	178.750	493.575	110.819	1	0.0000	1.898	1.843
576	178.750	493.575	110.819	4	0.0000	2.212	1.951
576	178.750	493.575	110.819	9	-0.1964	2.233	2.225
577	118.600	475.600	76.767	1	0.0000	3.177	3.112
577	118.600	475.600	76.767	4	0.0000	3.374	3.190
577	118.600	475.600	76.767	6	-0.1289	3.378	3.385
578	118.600	475.600	82.989	1	0.0000	2.461	2.462
578	118.600	475.600	82.989	4	0.0000	2.779	2.521
578	118.600	475.600	82.989	9	-0.1478	2.791	2.790
579	118.600	475.600	89.221	1	0.0000	2.114	2.140
579	118.600	475.600	89.221	4	0.0000	2.533	2.224
579	118.600	475.600	89.221	9	-0.1542	2.551	2.548
580	118.600	475.600	95.461	1	0.0000	1.920	1.962
580	118.600	475.600	95.461	5	0.0000	2.429	2.075
580	118.600	475.600	95.461	11	-0.1582	2.453	2.450

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581	118.600	475.600	101.707	1	0.0000	1.634	1.675
581	118.600	475.600	101.707	5	0.0000	2.429	2.038
581	118.600	475.600	101.707	11	-0.1521	2.457	2.452
582	118.600	475.600	107.959	1	0.0000	1.799	1.825
582	118.600	475.600	107.959	4	0.0000	2.473	2.047
582	118.600	475.600	107.959	10	-0.1441	2.503	2.494
583	118.600	475.600	114.215	1	0.0000	1.781	1.796
583	118.600	475.600	114.215	3	0.0000	2.438	2.073
583	118.600	475.600	114.215	14	-0.1380	2.568	2.559
584	118.600	475.600	120.473	1	0.0000	1.790	1.785
584	118.600	475.600	120.473	5	0.0000	2.621	2.130
584	118.600	475.600	120.473	11	-0.1319	2.658	2.656
585	125.725	478.725	77.013	1	0.0000	2.686	2.663
585	125.725	478.725	77.013	4	0.0000	2.807	2.703
585	125.725	478.725	77.013	6	-0.1369	2.808	2.811
586	125.725	478.725	83.165	1	0.0000	2.153	2.198
586	125.725	478.725	83.165	4	0.0000	2.393	2.190
586	125.725	478.725	83.165	6	-0.1766	2.394	2.403
587	125.725	478.725	89.327	1	0.0000	1.881	1.937
587	125.725	478.725	89.327	4	0.0000	2.211	1.960
587	125.725	478.725	89.327	9	-0.1758	2.229	2.227
588	125.725	478.725	95.497	1	0.0000	1.768	1.824
588	125.725	478.725	95.497	5	0.0000	2.185	1.894
588	125.725	478.725	95.497	11	-0.1710	2.208	2.206
589	125.725	478.725	101.673	1	0.0000	1.730	1.775
589	125.725	478.725	101.673	4	0.0000	2.229	1.898
589	125.725	478.725	101.673	11	-0.1620	2.256	2.252
590	125.725	478.725	107.855	1	0.0000	1.722	1.752
590	125.725	478.725	107.855	4	0.0000	2.304	1.939
590	125.725	478.725	107.855	11	-0.1516	2.334	2.329
591	125.725	478.725	114.041	1	0.0000	1.731	1.745
591	125.725	478.725	114.041	3	0.0000	2.394	1.996
591	125.725	478.725	114.041	15	-0.1445	2.426	2.428
592	125.725	478.725	120.228	1	0.0000	1.757	1.749
592	125.725	478.725	120.228	4	0.0000	2.499	2.068
592	125.725	478.725	120.228	16	-0.1350	2.533	2.532
593	132.850	481.850	77.260	1	0.0000	2.428	2.429
593	132.850	481.850	77.260	4	0.0000	2.492	2.435
593	132.850	481.850	77.260	6	-0.1608	2.492	2.493
594	132.850	481.850	83.342	1	0.0000	1.826	1.870
594	132.850	481.850	83.342	4	0.0000	1.986	1.848
594	132.850	481.850	83.342	6	-0.2046	1.994	2.001
595	132.850	481.850	89.433	1	0.0000	1.692	1.753
595	132.850	481.850	89.433	4	0.0000	1.945	1.747
595	132.850	481.850	89.433	9	-0.1962	1.962	1.960
596	132.850	481.850	95.533	1	0.0000	1.656	1.711
596	132.850	481.850	95.533	4	0.0000	1.992	1.754
596	132.850	481.850	95.533	9	-0.1823	2.014	2.011
597	132.850	481.850	101.639	1	0.0000	1.651	1.695
597	132.850	481.850	101.639	4	0.0000	2.070	1.791
597	132.850	481.850	101.639	10	-0.1710	2.094	2.092
598	132.850	481.850	107.751	1	0.0000	1.669	1.698
598	132.850	481.850	107.751	4	0.0000	2.170	1.856
598	132.850	481.850	107.751	11	-0.1575	2.198	2.193
599	132.850	481.850	113.866	1	0.0000	1.698	1.709
599	132.850	481.850	113.866	4	0.0000	2.280	1.930
599	132.850	481.850	113.866	11	-0.1467	2.309	2.303
600	132.850	481.850	119.984	1	0.0000	1.737	1.725
600	132.850	481.850	119.984	4	0.0000	2.399	2.015
600	132.850	481.850	119.984	11	-0.1364	2.430	2.420
601	139.975	484.975	77.506	1	0.0000	2.218	2.210
601	139.975	484.975	77.506	4	0.0000	2.235	2.216
601	139.975	484.975	77.506	3	-0.1611	2.235	2.229
602	139.975	484.975	83.518	1	0.0000	1.518	1.550
602	139.975	484.975	83.518	4	0.0000	1.623	1.534
602	139.975	484.975	83.518	6	-0.2416	1.625	1.629
603	139.975	484.975	89.539	1	0.0000	1.552	1.603
603	139.975	484.975	89.539	4	0.0000	1.740	1.588
603	139.975	484.975	89.539	9	-0.2163	1.755	1.754
604	139.975	484.975	95.569	1	0.0000	1.572	1.620
604	139.975	484.975	95.569	4	0.0000	1.840	1.644
604	139.975	484.975	95.569	9	-0.1962	1.860	1.857
605	139.975	484.975	101.605	1	0.0000	1.595	1.634
605	139.975	484.975	101.605	4	0.0000	1.942	1.707
605	139.975	484.975	101.605	9	-0.1798	1.965	1.961
606	139.975	484.975	107.647	1	0.0000	1.636	1.659

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606	139.975	484.			[illegible]	2.063	1.790
606	139.975	484.	[illegible]	10	-0.1654	2.088	2.084
607	139.975	484.975	113.692	1	0.0000	1.685	1.687
607	139.975	484.975	113.692	4	0.0000	2.192	1.985
607	139.975	484.975	113.692	10	-0.1510	2.219	2.214
608	139.975	484.975	119.739	1	0.0000	1.728	1.710
608	139.975	484.975	119.739	3	0.0000	2.316	1.971
608	139.975	484.975	119.739	10	-0.1410	2.345	2.336
609	147.100	488.100	77.752	1	0.0000	2.424	2.454
609	147.100	488.100	77.752	4	0.0000	2.452	2.396
609	147.100	488.100	77.752	6	-0.4200	2.450	2.450
610	147.100	488.100	83.694	1	0.0000	1.432	1.456
610	147.100	488.100	83.694	4	0.0000	1.499	1.421
610	147.100	488.100	83.694	6	-0.3180	1.499	1.503
611	147.100	488.100	89.646	1	0.0000	1.432	1.466
611	147.100	488.100	89.646	4	0.0000	1.564	1.452
611	147.100	488.100	89.646	6	-0.2596	1.576	1.585
612	147.100	488.100	95.605	1	0.0000	1.509	1.548
612	147.100	488.100	95.605	4	0.0000	1.717	1.556
612	147.100	488.100	95.605	9	-0.2149	1.735	1.733
613	147.100	488.100	101.571	1	0.0000	1.567	1.596
613	147.100	488.100	101.571	4	0.0000	1.850	1.650
613	147.100	488.100	101.571	9	-0.1915	1.871	1.868
614	147.100	488.100	107.542	1	0.0000	1.625	1.640
614	147.100	488.100	107.542	4	0.0000	1.986	1.749
614	147.100	488.100	107.542	9	-0.1725	2.009	2.004
615	147.100	488.100	113.517	1	0.0000	1.680	1.676
615	147.100	488.100	113.517	4	0.0000	2.119	1.844
615	147.100	488.100	113.517	10	-0.1589	2.144	2.139
616	147.100	488.100	119.494	1	0.0000	1.734	1.708
616	147.100	488.100	119.494	3	0.0000	2.254	1.944
616	147.100	488.100	119.494	10	-0.1455	2.280	2.273
617	154.225	491.225	77.998	1	0.0000	2.333	2.374
617	154.225	491.225	77.998	4	0.0000	2.366	2.300
617	154.225	491.225	77.998	6	-0.4221	2.364	2.364
618	154.225	491.225	83.870	1	0.0000	1.417	1.428
618	154.225	491.225	83.870	4	0.0000	1.453	1.402
618	154.225	491.225	83.870	6	-0.4767	1.452	1.454
619	154.225	491.225	89.752	1	0.0000	1.323	1.338
619	154.225	491.225	89.752	4	0.0000	1.411	1.331
619	154.225	491.225	89.752	6	-0.3058	1.413	1.420
620	154.225	491.225	95.641	1	0.0000	1.470	1.498
620	154.225	491.225	95.641	4	0.0000	1.628	1.494
620	154.225	491.225	95.641	9	-0.2390	1.643	1.642
621	154.225	491.225	101.537	1	0.0000	1.560	1.581
621	154.225	491.225	101.537	4	0.0000	1.788	1.615
621	154.225	491.225	101.537	9	-0.2073	1.807	1.805
622	154.225	491.225	107.438	1	0.0000	1.633	1.639
622	154.225	491.225	107.438	4	0.0000	1.935	1.725
622	154.225	491.225	107.438	9	-0.1837	1.956	1.952
623	154.225	491.225	113.343	1	0.0000	1.693	1.681
623	154.225	491.225	113.343	4	0.0000	2.072	1.823
623	154.225	491.225	113.343	9	-0.1669	2.094	2.088
624	154.225	491.225	119.250	1	0.0000	1.749	1.717
624	154.225	491.225	119.250	4	0.0000	2.207	1.922
624	154.225	491.225	119.250	10	-0.1526	2.231	2.225
625	161.350	494.350	78.245	1	0.0000	2.375	2.415
625	161.350	494.350	78.245	4	0.0000	2.409	2.343
625	161.350	494.350	78.245	6	-0.4062	2.407	2.406
626	161.350	494.350	84.047	1	0.0000	1.812	1.839
626	161.350	494.350	84.047	4	0.0000	1.863	1.786
626	161.350	494.350	84.047	6	-0.4090	1.863	1.865
627	161.350	494.350	89.858	1	0.0000	1.377	1.386
627	161.350	494.350	89.858	4	0.0000	1.440	1.368
627	161.350	494.350	89.858	6	-0.3966	1.439	1.445
628	161.350	494.350	95.677	1	0.0000	1.436	1.450
628	161.350	494.350	95.677	4	0.0000	1.551	1.442
628	161.350	494.350	95.677	9	-0.2720	1.563	1.562
629	161.350	494.350	101.503	1	0.0000	1.575	1.587
629	161.350	494.350	101.503	4	0.0000	1.755	1.602
629	161.350	494.350	101.503	9	-0.2295	1.772	1.770
630	161.350	494.350	107.334	1	0.0000	1.658	1.656
630	161.350	494.350	107.334	4	0.0000	1.908	1.717
630	161.350	494.350	107.334	9	-0.2003	1.927	1.923
631	161.350	494.350	113.168	1	0.0000	1.723	1.703
631	161.350	494.350	113.168	4	0.0000	2.046	1.818

WL 4784

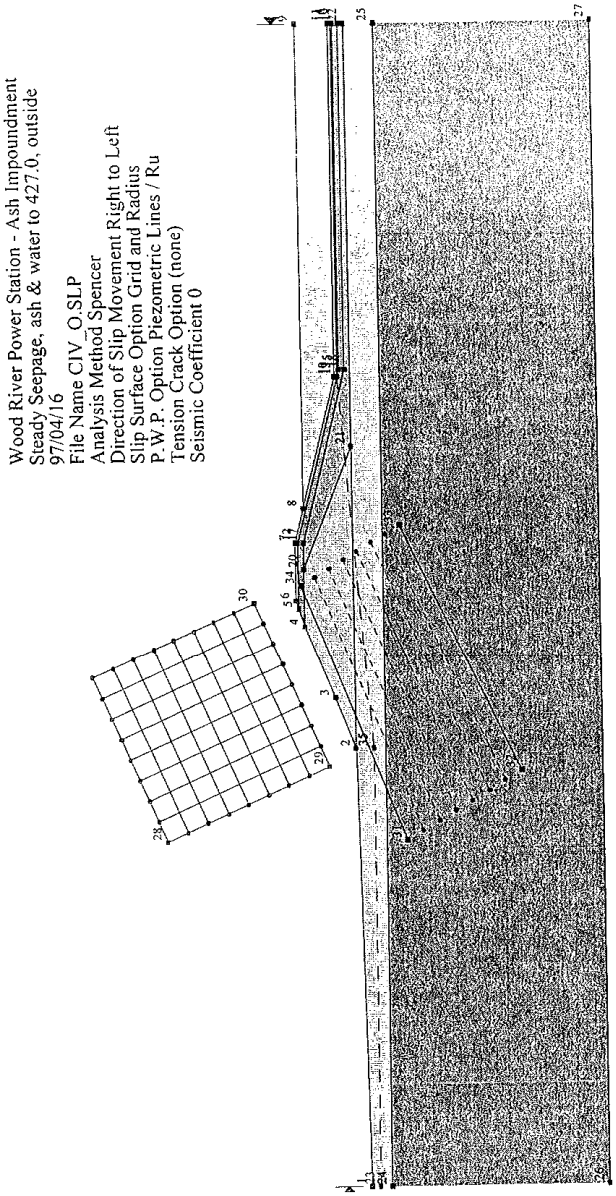
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631	161.350	494.350	113.168	9	-0.1789	2.067	2.062
632	161.350	494.350	119.005	1	0.0000	1.775	1.736
632	161.350	494.350	119.005	4	0.0000	2.174	1.909
632	161.350	494.350	119.005	9	-0.1681	2.198	2.189
633	168.475	497.475	78.491	1	0.0000	2.671	2.604
633	168.475	497.475	78.491	4	0.0000	2.602	2.540
633	168.475	497.475	78.491	6	-0.3818	2.600	2.600
634	168.475	497.475	84.223	1	0.0000	1.976	1.996
634	168.475	497.475	84.223	4	0.0000	2.023	1.949
634	168.475	497.475	84.223	6	-0.3942	2.023	2.024
635	168.475	497.475	89.964	1	0.0000	1.498	1.501
635	168.475	497.475	89.964	4	0.0000	1.547	1.477
635	168.475	497.475	89.964	6	-0.4660	1.548	1.548
636	168.475	497.475	95.713	1	0.0000	1.407	1.406
636	168.475	497.475	95.713	3	0.0000	1.489	1.401
636	168.475	497.475	95.713	6	-0.3556	1.490	1.500
637	168.475	497.475	101.469	1	0.0000	1.807	1.610
637	168.475	497.475	101.469	4	0.0000	1.748	1.610
637	168.475	497.475	101.469	9	-0.2598	1.763	1.762
638	168.475	497.475	107.230	1	0.0000	1.706	1.697
638	168.475	497.475	107.230	4	0.0000	1.910	1.733
638	168.475	497.475	107.230	9	-0.2221	1.928	1.925
639	168.475	497.475	112.994	1	0.0000	1.770	1.744
639	168.475	497.475	112.994	4	0.0000	2.044	1.830
639	168.475	497.475	112.994	9	-0.1957	2.063	2.059
640	168.475	497.475	118.760	1	0.0000	1.821	1.775
640	168.475	497.475	118.760	4	0.0000	2.168	1.917
640	168.475	497.475	118.760	9	-0.1757	2.189	2.182
641	175.600	500.600	78.737	1	0.0000	2.945	2.971
641	175.600	500.600	78.737	4	0.0000	2.973	2.915
641	175.600	500.600	78.737	6	-0.3471	2.972	2.971
642	175.600	500.600	84.399	1	0.0000	2.213	2.226
642	175.600	500.600	84.399	4	0.0000	2.258	2.184
642	175.600	500.600	84.399	6	-0.3754	2.257	2.258
643	175.600	500.600	90.070	1	0.0000	2.037	2.047
643	175.600	500.600	90.070	4	0.0000	2.104	2.005
643	175.600	500.600	90.070	6	-0.3697	2.103	2.108
644	175.600	500.600	95.750	1	0.0000	1.579	1.570
644	175.600	500.600	95.750	3	0.0000	1.647	1.557
644	175.600	500.600	95.750	6	-0.4107	1.645	1.653
645	175.600	500.600	101.435	1	0.0000	1.620	1.610
645	175.600	500.600	101.435	4	0.0000	1.729	1.606
645	175.600	500.600	101.435	9	-0.2971	1.741	1.740
646	175.600	500.600	107.125	1	0.0000	1.778	1.761
646	175.600	500.600	107.125	4	0.0000	1.945	1.776
646	175.600	500.600	107.125	9	-0.2511	1.962	1.959
647	175.600	500.600	112.820	1	0.0000	1.843	1.809
647	175.600	500.600	112.820	4	0.0000	2.074	1.868
647	175.600	500.600	112.820	9	-0.2168	2.092	2.088
648	175.600	500.600	118.516	1	0.0000	1.889	1.835
648	175.600	500.600	118.516	4	0.0000	2.190	1.948
648	175.600	500.600	118.516	9	-0.1915	2.209	2.203

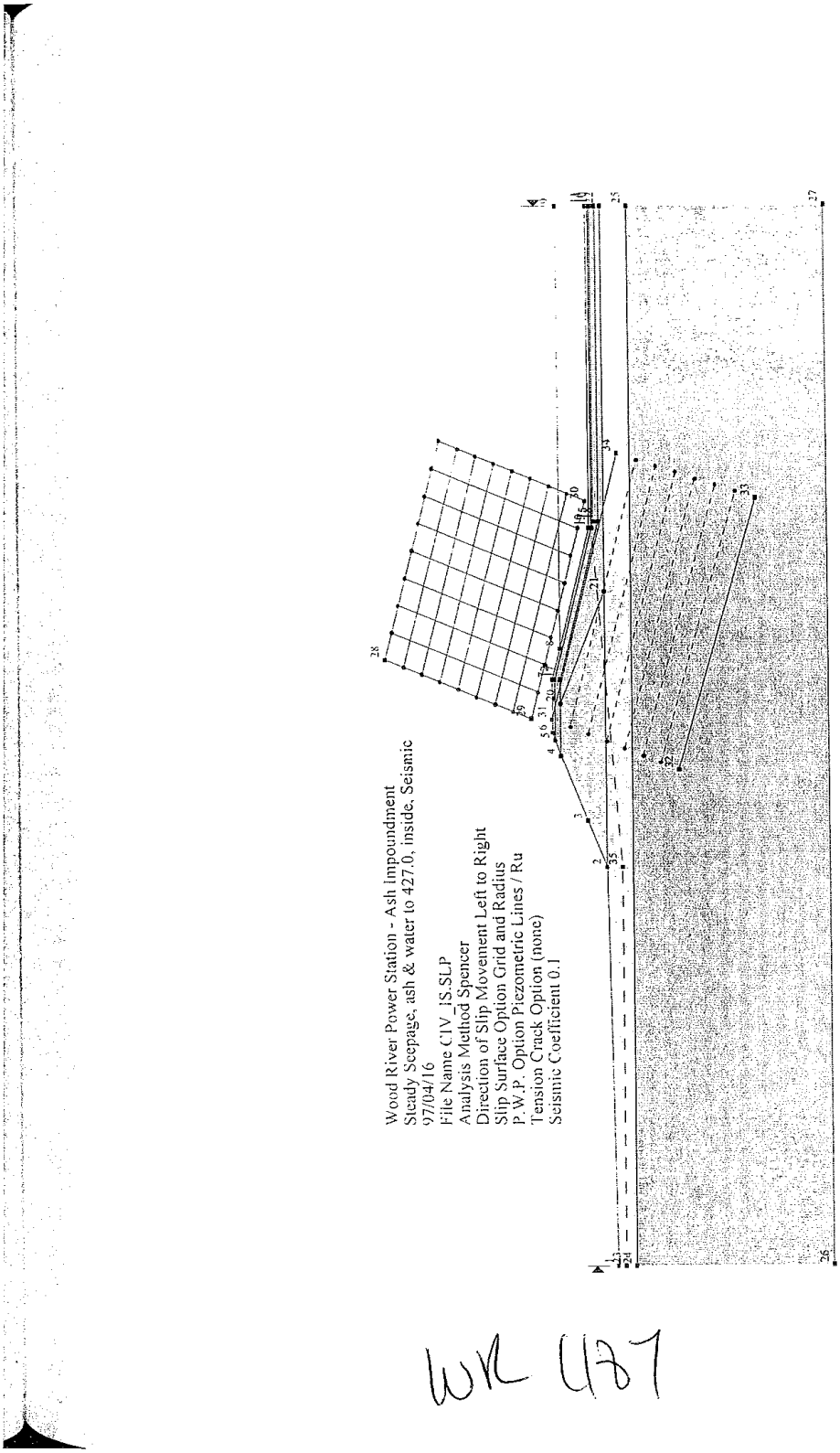
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----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    162.8500=X-COOR.     452.9750=Y-COOR.      51.1602=RADIUS       1.209=F.S.    251=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    162.8500=X-COOR.     452.9750=Y-COOR.      51.1602=RADIUS       1.353=F.S.    251=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    166.0000=X-COOR.     445.9500=Y-COOR.      43.4631=RADIUS       1.205=F.S.    179=SLIP#
MOMENT AND FORCE EQUILIBRIUM: SPENCER METHOD
    162.8500=X-COOR.     452.9750=Y-COOR.      51.1602=RADIUS       1.358=F.S.    251=SLIP#

NORMAL TERMINATION OF SLOPE
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WR 485

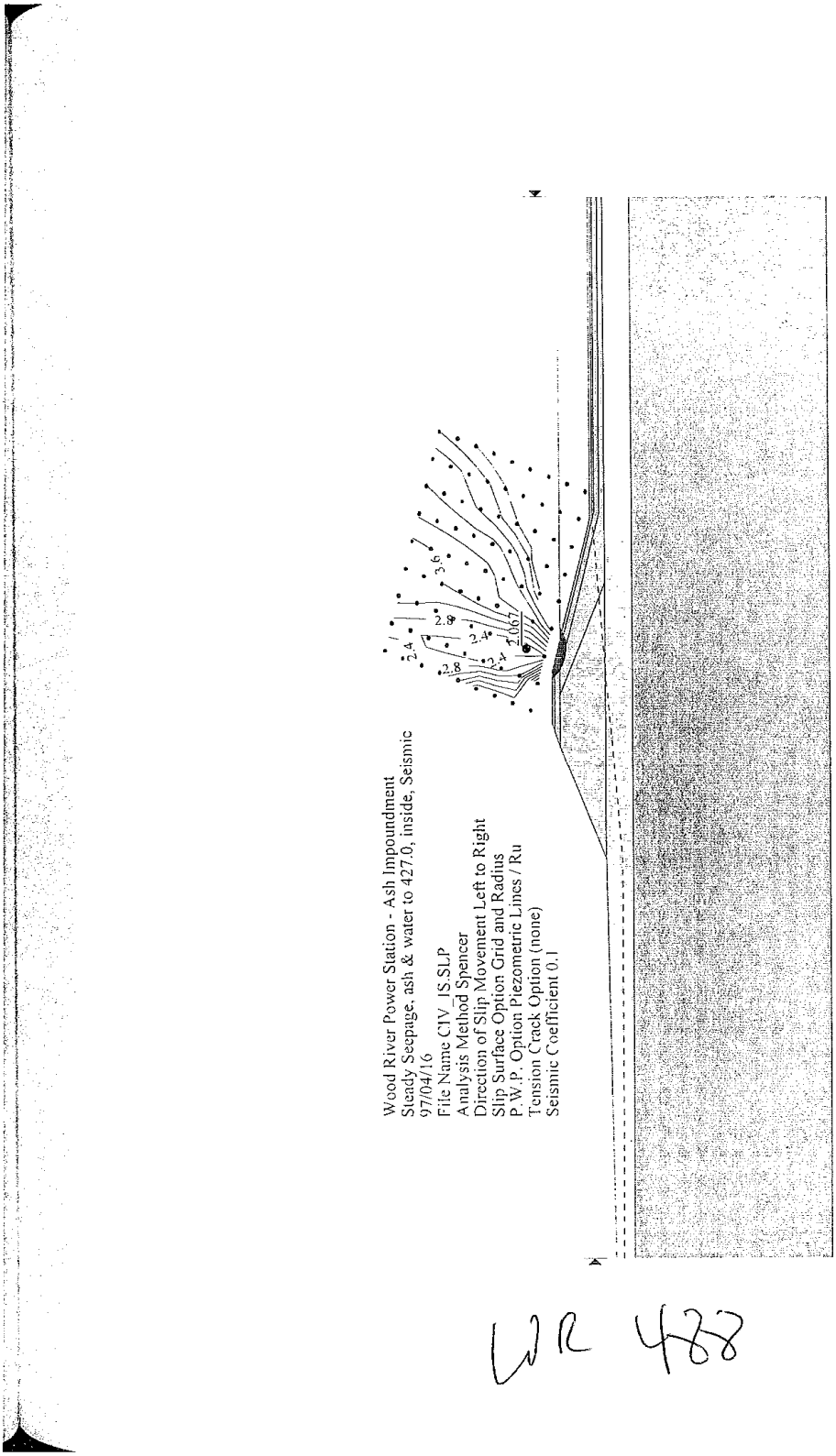

Wood River Power Station - Ash Impoundment
Steady Seepage, ash & water to 427.0, outside
97/04/16
File Name CIV_O.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0

WR 1176


Wood River Power Station - Ash Impoundment
Steady Seepage, ash & water to 427.0, inside, Seismic
97/04/16
File Name CIV_IS.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1

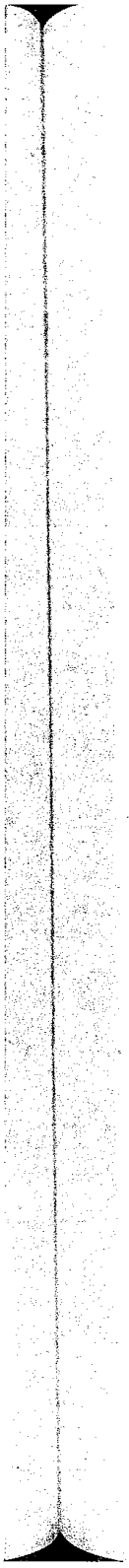
WL 427

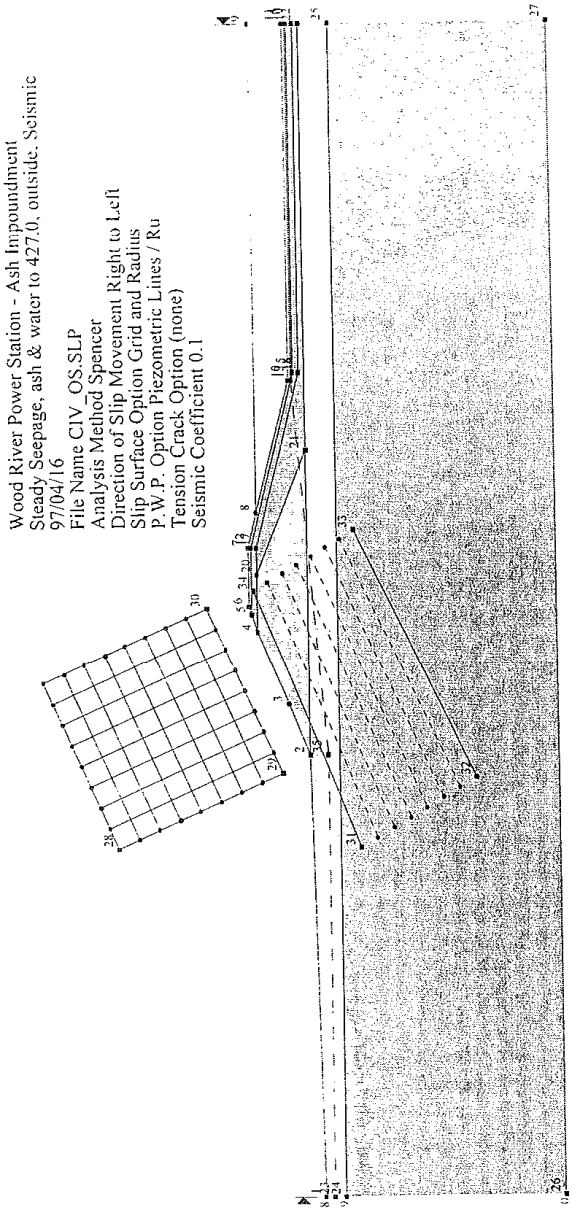
DRAFT


Wood River Power Station - Ash Impoundment
Steady Seepage, ash & water to 427.0, inside, Seismic
97/04/16
File Name CIV_IS.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1
2.4
2.8
3.2
3.6
2.067

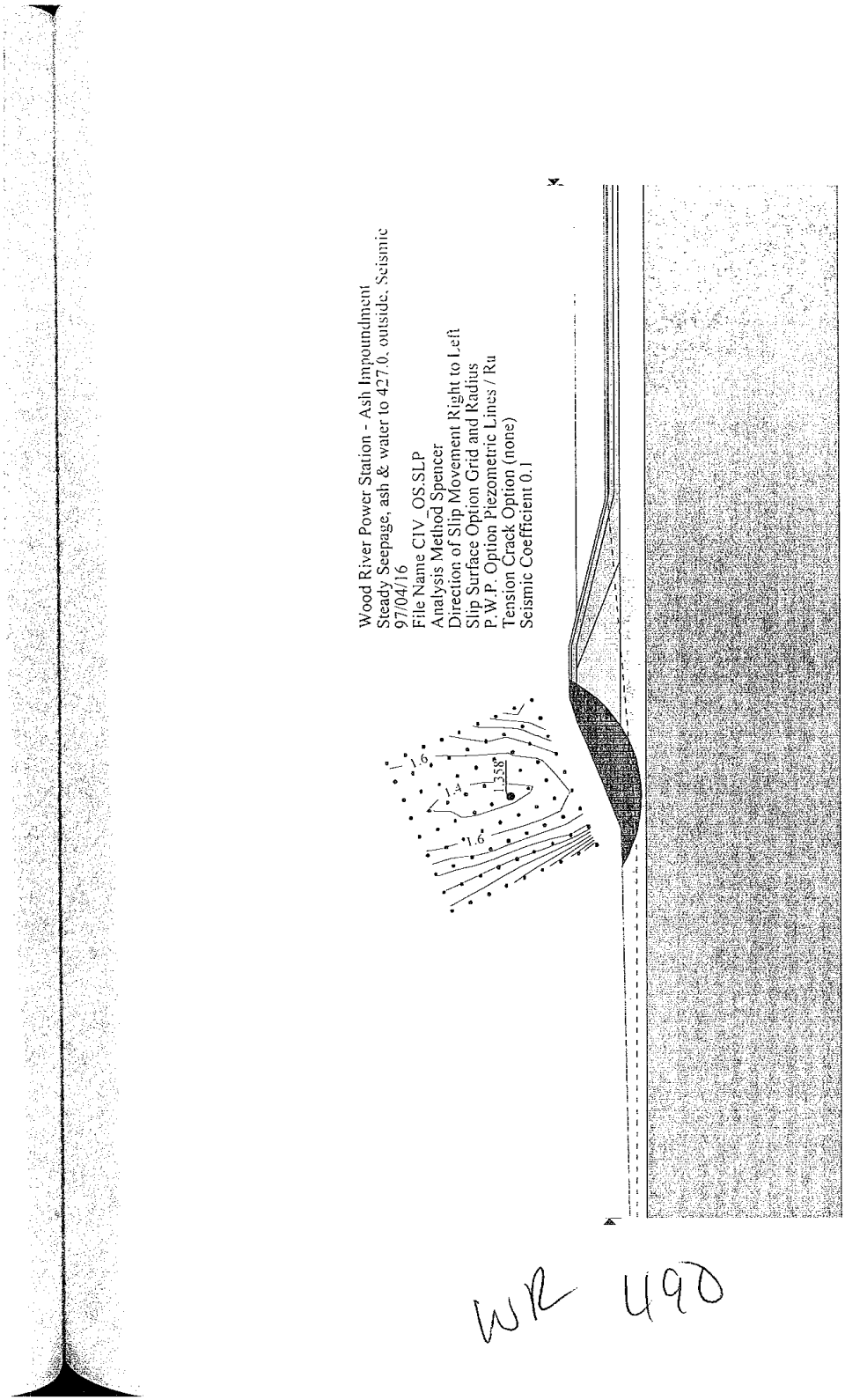
WR 488

DRAFT



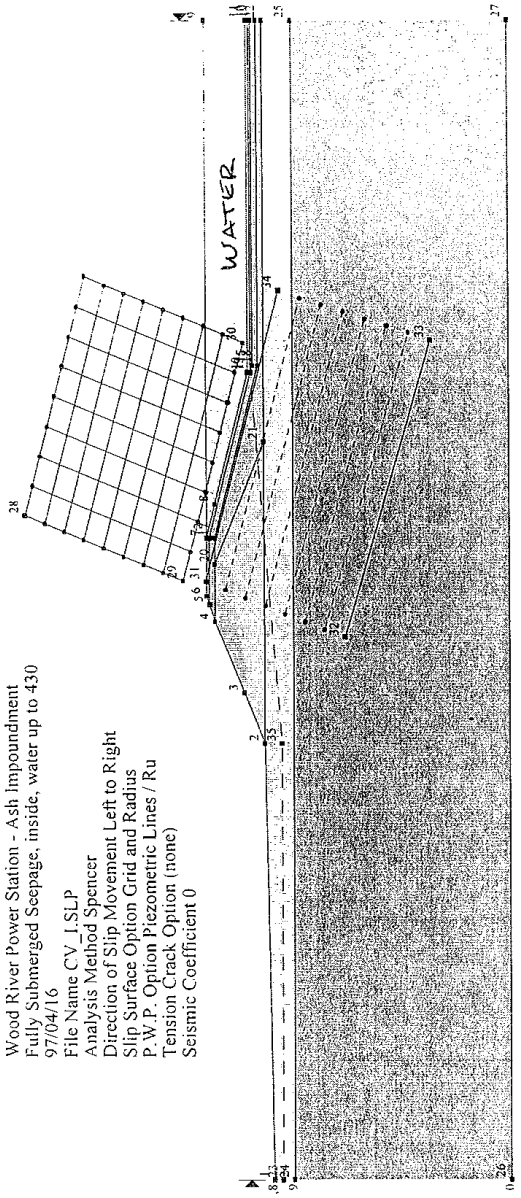

Wood River Power Station - Ash Impoundment
Steady Seepage, ash & water to 427.0, outside. Seismic
97/04/16
File Name CIV_OS.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1

WR 489


Wood River Power Station - Ash Impoundment
Steady Seepage, ash & water to 427.0, outside, Seismic
97/04/16
File Name CIV_OS.SLP
Analysis Method Spencer
Direction of Slip Movement Right to Left
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1
1.6
1.4
1.358
1.6

WR 490

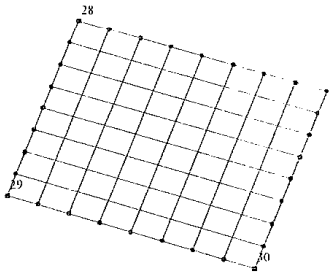


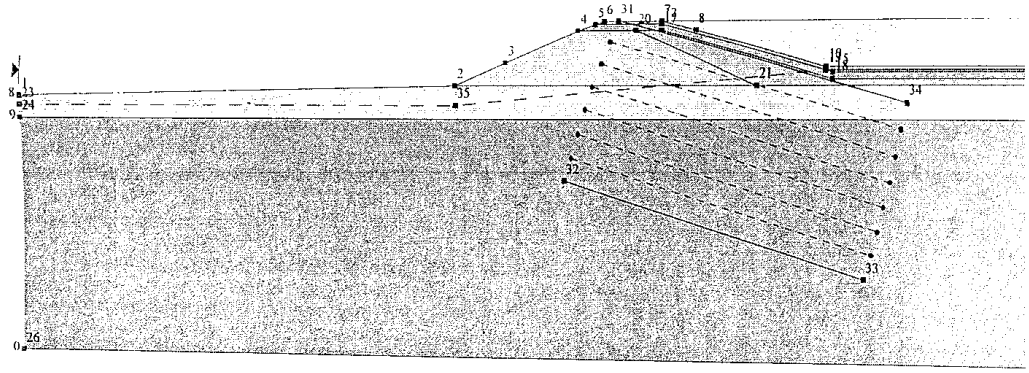

WATER
Wood River Power Station - Ash Impoundment
Fully Submerged Seepage, inside, water up to 430
97/04/16
File Name CV_1.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0

WR 491

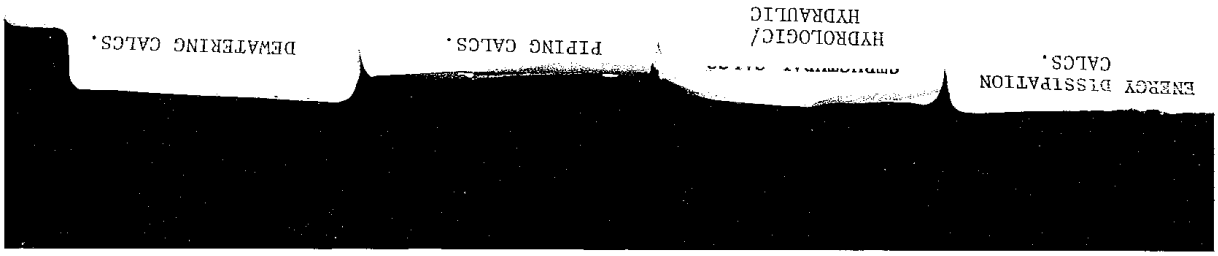
DRAFT

Wood River Power Station - Ash Impoundment
Fully Submerged Seepage, inside, water up to 430, Seismic
97/04/16
File Name CV_IS.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1

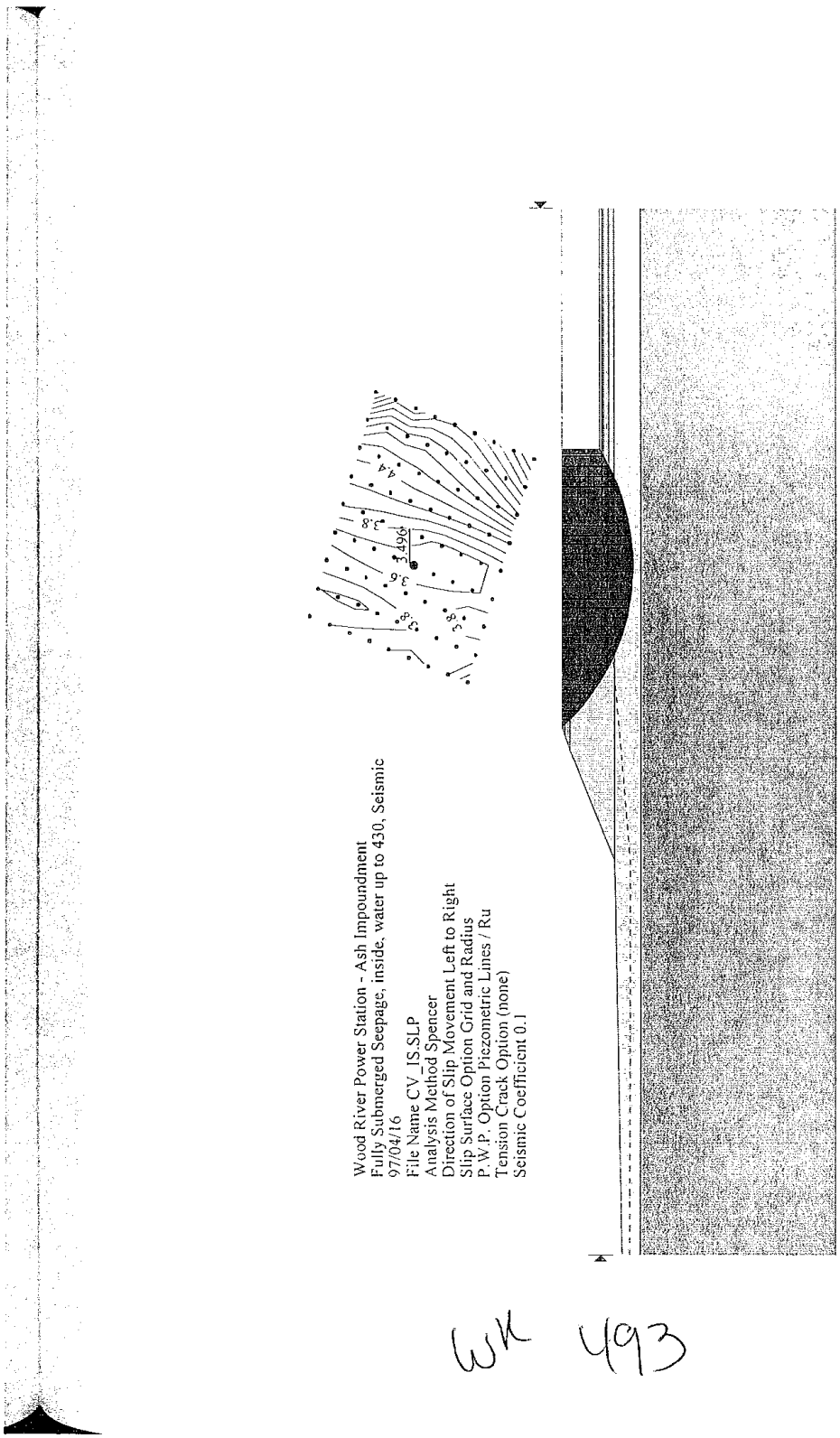




WR492

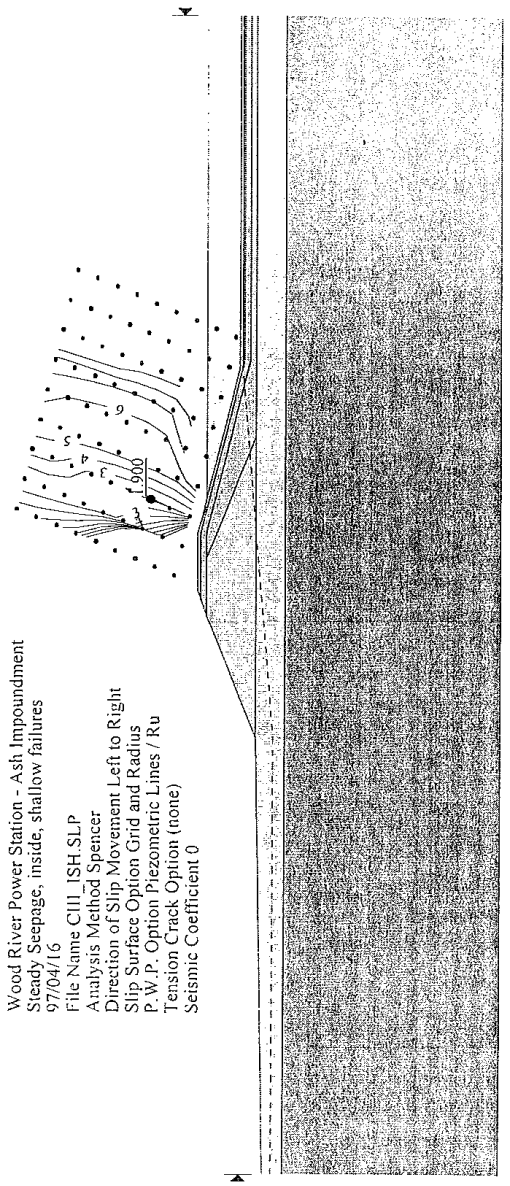


DRAFT


Wood River Power Station - Ash Impoundment
Fully Submerged Seepage, inside, water up to 430, Seismic
97/04/16
File Name CV_IS.SLP
Analysis Method Spencer
Direction of Slip Movement Left to Right
Slip Surface Option Grid and Radius
P.W.P. Option Piezometric Lines / Ru
Tension Crack Option (none)
Seismic Coefficient 0.1
3.496

WK 493

DRAFT



WR 494

HYDRAULIC

DRAFT

Hydrologic/Hydraulic Design Information

WR 495

DRAFT

H HYDRAULIC DESIGN INFORMATION

Since this is considered to be a Class III facility, we shall use the 100 yr., 24 hr. duration storm, in the Southwest Region of Illinois, to design the hydraulics of the system. That storm value is 8.21" (or 0.684'), as given from "Frequency Distributions of Heavy Rainstorms in Illinois," Circular 172, State of Illinois Department of Energy and Natural Resources, Illinois State Water Survey, 1989.

Rainfall runoff, or watershed, consists only of the immediate pond and dike areas, there is no runoff into this system from other land.

The 100 yr., 24 hr. storm has been added to the maximum plant outflows to obtain a maximum steady state outflow. The maximum plant flow (including waste streams and ancillary systems) is 4.0 mgd, as calculated from the most recent NPDES permit #IL0000701. The value of 10.0 cfs. is the total flow through the final pond outfall, and has been used for pipe flows, and dissipation calculations, as required.. The storm value has also been used to determine the freeboard required, which allowed the normal pool elevation to be 427.0 msl, in pond #2. The elevation of the V-notch weir is computed in the piping section.

Due to the classification of this system, no dam breach wave analysis was done. However, upstream and downstream information is provided in the final section of this report.

WR 496

DRAFT

N100-203 (1-81) CALCULATION SHEET Date 3/27/97

Design by JPK Date ____ Checked by ____ Sheet No. 1 of 1

Project WR ASH PONDS

Subject MAX PLANT FLOWS File No. ____

BASED ON NPDES PERMIT IL0000701

FLOWS TO OUTLET 002 (ASH POND DISCHARGE) ~~XRE~~.

FLY/BOTTOM ASH	= 1.37 MGD
ASH HOPPER OVERFLOW	1.08
BOILER BLOWDOWN	.11
DEMINERALIZER	.05
WATER TRSATMENT FILTER BACKWASH	.07
TURBINE ROOM & BOILER DRAINS	.02
	2.7 MGD

PLUS INTERMITTENT ACTIVITIES

WATER TREATMENT CLARIFIER (3X/DAY)	.2	MGD
NON CHEM. CLEANING	.25	
CHEM. METAL CLEANING	.2	
	.65	MGD

TOTAL MAXIMUM PLANT FLOWS

2.7 + .7 = 3.4 MGD

USE 4.0 MGD * $\frac{1 \text{ DAY}}{86,400 \text{ s}}$ * $\frac{1.337 \text{ cuft}}{1 \text{ GAL}}$ $\frac{1 \times 10^6}{1 \text{ MIL}}$

= 6.2 cfs

WR 1197

DRAFT

N100-203 (1-81) CALCULATION SHEET Date 4/23/97

Design by SPK Date ____ Checked by ____ Sheet No. 1 of 1

Project WR ASH PONDS

Subject OUTFALL PIPE FLOW - STORM & PLANT File No. ____

- FIND MAX OUTFALL FLOW WITH STORM AND PLANT FLOW.
- SINCE CLASS III USE, 100 yr. 24 hr. STORM. FOR THIS LOCATION = .68"

IN A 90° V-NOTCH $Q = 2.49H^{2.48}$ * 4 SIDED
FLOW FOR THE STORM (EQUIVALENT)

$Q = [2.49(.68)^{2.48}] * 4 = .96$ cfs * 4 = 3.83 cfs

ADD WITH PLANT FLOW of 6.2 cfs

TOTAL FLOW = 10.03 cfs OR 6.5 MGD

THE HEAD ON THE WEIR (TOTAL)

$H = \left(\frac{Q/4}{2.49}\right)^{1/2.48} = .1003' = 12.03''$ ✓ OK

THE EXISTING WEIR V-NOTCH IS 14" DEEP
∴ USE SAME WEIR

WR 498

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Piping Calculations

WR 499

DRAFT

N100-203 (1-81) CALCULATION SHEET Date 4/21/97

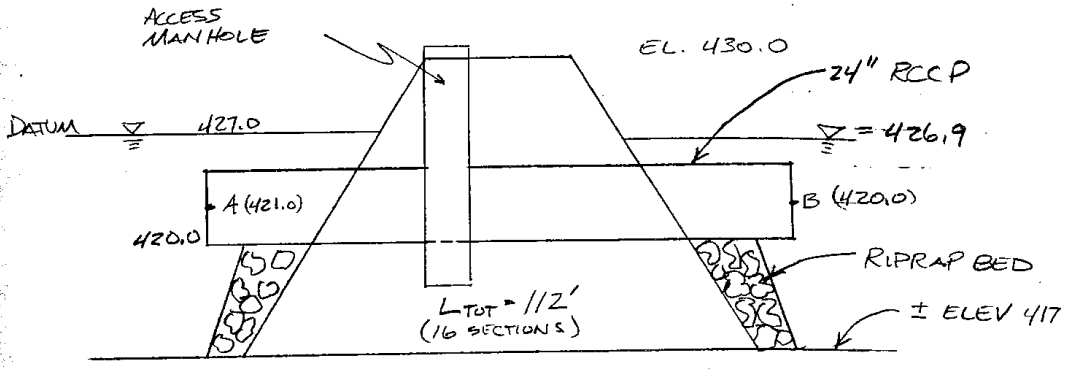
Design by JPK Date _____ Checked by _____ Sheet No. 1 of 1

Project WR

Subject FLOW THRU DIKE File No. _____

TO SET MAX STAGE AT 427.0, CALCULATE HEAD THRU DIKE CULVERT & USE MAX OPERATION HEAD ON V-NOTCH.

PIPE THRU DIKE



STEADY STATE NORMAL FLOW 4 MGD OR 6.2 CFS

FROM BERNOULLI

$$Z_A + \frac{P_A}{w} + \frac{V_A^2}{2g} = Z_B + \frac{P_B}{w} + \frac{V_B^2}{2g} + hf \qquad V_A = V_B$$

$$-6 + 6 = -7 + \frac{P_B}{w} + hf$$

$$h_f = \frac{4.727}{D^{4.87}} L \left(\frac{Q}{C_1}\right)^{1.85} \qquad \text{HAZEN-WILLIAMS}$$

$D = 2$ ft
$L = 112$ ft
$Q = 6.2$ ft^3/s
$C_1 =$

$$h_f = \frac{4.727}{2^{4.87}} (112) \left(\frac{6.2}{120}\right)^{1.85} = .075$$

WR 500

DRAFT

N100-203 (1-81) CALCULATION SHEET Date _____

Design by JPK Date _____ Checked by _____ Sheet No. 2 of 2

Project WR2

Subject _____ File No. _____

$\frac{P_s}{w}$ = 0 + 7 − hf
= 7 − .075 = 6.925

∴ WATER IN POND #3&#4 IS 426.925'

SAY 426.9

SET V of V-NOTCH WEIR (90°, 4 SIDED)

- ELEV. IN POND #3&#4 IS 426.9
- FROM THE FOLLOWING SHEET, THE HEAD FOR PLANT FLOW OVER WEIR = 0.9'

THEREFORE, SET V OF V-NOTCH AT

426.0

WR 501

DRAFT

N100-203 (1-81) CALCULATION SHEET Date 3/27/97

Design by JPK Date ____ Checked by ____ Sheet No. 1 of 1

Project WR ASH PONDS

Subject V-NOTCH HEAD - MAX PLANT FLOW File No. ____

DETERMINE THE HEAD ON THE V-NOTCH TO MAINTAIN STEADY STATE MAX PLANT FLOW.

THE MAX PLANT FLOW = 4.0 MGD OR 6.2 cfs

FOR A 90° V NOTCH $Q_{(cfs)} = 2.49 H^{2.48}$ H in (ft)

$\therefore H = \left(\frac{Q}{2.49}\right)^{\frac{1}{2.48}}$

FOR 6.2 cfs FLOW, 1/4 WOULD FLOW THRU EACH OF THE FOUR SIDES OF THE WEIR, OR $6.2/4 = 1.55$ cfs

$H = \left(\frac{1.55}{2.49}\right)^{1/2.48} = .83'$

USE .9' TO SET THE V-NOTCH ELEVATION

WR 502

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N100-203 (1-81)

CALCULATION SHEET

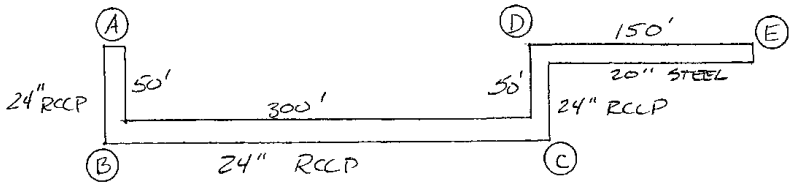
Date 4/21/97

Design by JPK Date ____ Checked by ____ Sheet No. 1 of 3

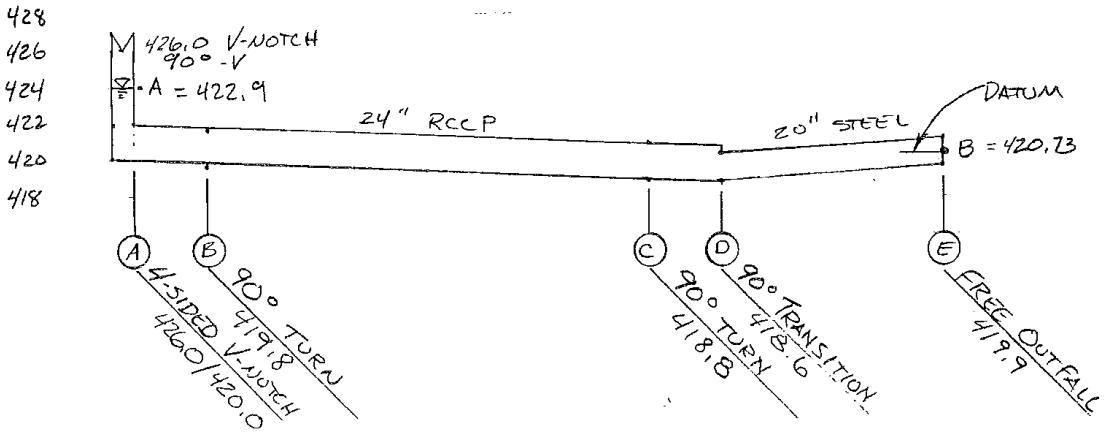
Project WR

Subject OUTFALL FLOW File No. ____

CALCULATE THE HYDRAULIC GRADIENT BACK THROUGH THE EXISTING SYSTEM TO ENSURE FREE FLOW OVER THE V-NOTCH.



PLAN VIEW - OUTFALL PIPING



PROFILE - OUTFALL PIPING

FIND ELEVATION IN STANDPIPE FOR 10 cfs TO ENSURE PROPER V-NOTCH OPERATION

WR 503

DRAFT

N100-203 (1-81) CALCULATION SHEET Date 4/22/97

Design by JDK Date ____ Checked by ____ Sheet No. 2 of 3

Project WR

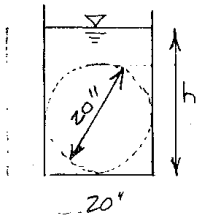
Subject OUT FALL FLOW File No. ____

FROM BERNOULLI

$$Z_A + \frac{P_A}{\gamma_w} + \frac{V_A^2}{2g} = Z_B + \frac{P_B}{\gamma_w} + \frac{V_B^2}{2g} + h_f \qquad \text{SOLVE FOR } Z_A$$

NOTE: CAN ASSUME FULL FLOW FOR THE FOLLOWING REASON:

IF THE PIPE WERE A 20" SHARP CRESTED WEIR THE HEAD WOULD BE



$$Q = 3.33 L h^{3/2}$$

$$h = \left(\frac{Q}{3.33L}\right)^{2/3}$$

$$h = \left(\frac{10.03 \text{ cfs}}{3.33\left(\frac{20}{12}\right)}\right)^{2/3} = 1.48' \approx 18"$$

OBVIOUSLY SINCE THE PIPE IS ROUND AND SMALLER THAN A SHARP CRESTED WEIR, BY INSPECTION, THERE WILL NOT BE A FREE WATER SURFACE IN THE PIPE ∴ FULL FLOW

$$Z_A + \frac{V_A^2}{2g} = \frac{V_B^2}{2g} + h_f$$

$V_A = 10.03 \text{ ft}^3/\text{s} / \pi(1)^2 = 3.19 \text{ ft/sec}$ $\quad \frac{V_A^2}{2g} = .158$

$V_B = 10.03 \text{ ft}^3/\text{s} / \pi(10/12)^2 = 4.60 \text{ ft/sec}$ $\quad \frac{V_B^2}{2g} = .328$

$h_{f①} = \frac{4.727}{(2)^{4.87}}(400)\left(\frac{10.03}{120}\right)^{1.85} = .655'$ 400' Conc Pipe

$h_{f②} = \frac{4.727}{(20/12)^{4.87}}(150)\left(\frac{10.03}{100}\right)^{1.85} = .837'$ 150' Steel Pipe

$h_{f③} = \frac{KV^2}{2g} = .9(3.19)^2/2(32.2) = .142 * 3 = .427'$ 3 90° Turns

$h_{f④} = \left(\frac{1}{.694} - 1\right)^2 \frac{4.160^2}{2(32.2)} = .064'$ Diameter Reduction

$\pi(10/12)^2/\pi(1)^2 = .694 = C_c$

WR504

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by JPK. Date Checked by Sheet No. 383

Project WR

Subject FINAL OUTFALL File No.

$Z_A + .158 = .328 + 1.655 + 1.837 + 1.427 + .064$

$Z_A = 2.153$

EL $Z_A = 2.153 + 420.73 = 422.9$

THE WEIR WILL BE AT 426.0, ∴ THE WEIR SHOULD OPERATE WITH NO PROBLEMS

WR 505

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by JPL Date Checked by Sheet No. 1

Project WR ASH POND

Subject PIPE DESIGN File No.

- NEW FINAL PIPING WILL BE 24" ϕ RCCP, MEETING O. OF ~~THE~~ FOLLOWING SPECIFICATIONS

ASTM	C361
AWWA	C300
AWWA	C301
AWWA	C302

- FROM THE IDOT STANDARD SPECIFICATIONS ~~FOR~~ ROAD & BRIDGE CONSTRUCTION, JULY 1, 1994, ART 542.03 TABLE 1A

USE PIPE TYPE 4, CLASS IV RCCP

(MAX FILL IS 20')

~~THE~~ HDPE PIPE IS DRISCOPIPE TYPE 1000 SDR 13.5

THIS PIPE MORE THAN SATISFIES ~~THIS~~ THE DRISCOPIPE DESIGN REQUIREMENTS ~~FOR~~ FOR OUR BURIAL DEPTHS

WR 506

DRAFT

Leachate Collection System

WR 307

USGS MAPS

DRAFT

LEACHATE COLLECTION SYSTEM

Veneer Stability

The hydraulic performance of the leachate collection system (LCS) has been submitted to the IEPA. That performance information has been assembled by the Illinois Power Environmental Resources Department.

For structural purposes, veneer stability calculations are required to ensure that slip failures will not occur between different materials that constitute the LCS. The following are calculations submitted by Woodward-Clyde Consultants that confirm that a 4H:1V slope is sufficient to withstand sliding of interfaces. Please note that the entire pond system including the LCS components was analyzed for global slope stability, and is included in this report, in the slope stability section.

Sump/Pump Systems

The design calculations fro the LCS sumps and pump systems are included in this section of this report, after the veneer stability calculations. The specifications for these systems are in the construction specification package.

WR 508

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Veneer Stability Calculations

WR 509

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Woodward-Clyde Consultants

Sheet No. 1 Of 3
File 6E05117

Made by DAG Date 11/7/96
Checked by SMO Date 11/7/96

FOR Ill. Power - Wood River

Veneer Stability of Pond Liner System

OBJECTIVE: Perform a stability analysis to estimate the stability of the proposed pond liner system on the pond slopes. This analysis will be preliminary based on literature values of friction angles. Final design will be based on material specific testing.

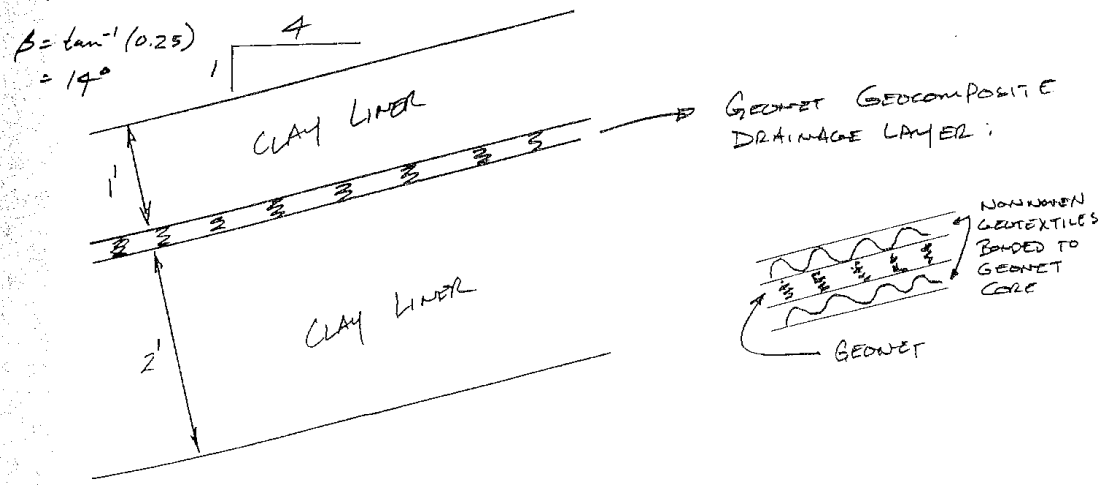
METHOD / REFERENCE: See pg. 492 of "Designing with Geosynthetics", R. M. Koerner, 3rd ed., 1994, Section 5.3.5.2. "Stability of Cover Soil Having Uniform Thickness".

$FS = \tan\delta / \tan\beta$ [Infinite Slope Analysis]

where δ = friction angle between liner and cover soil

β = slope angle

Proposed Liner System on Slopes:



WR 510

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Woodward-Clyde Consultants

File 6E05117

Made by DAG Date 11/7/96

FOR Ill. Power - Wood River

Checked by SMO Date 11/7/96

ASSUMPTIONS: (1) INTERFACE FRICTION ANGLE WILL BE THE SAME ON UPPER & LOWER SIDES OF GEONET GEOCOMPOSITE ∴ NO TENSION SHOULD DEVELOP IN THE GEOSYNTHETIC.

(2) INTERFACE FRICTION ANGLE DATA FOR GEONET GEOCOMPOSITE VS. CLAY LINER SOIL WAS NOT AVAILABLE ∴ ASSUME DATA FOR NONWOVEN GEOTEXTILE VS. CLAY SOIL WILL BE APPLICABLE. (CONSERVATIVE ASSUMPTION SINCE GEONET GEOCOMPOSITE WILL ALLOW SOIL TO INTRUDE INTO CHANNELS TO SOME EXTENT AND ∴ INCREASE δ).

INTERFACE FRICTION ANGLE, δ

VALUES FROM THE LITERATURE WILL BE USED IN THIS ANALYSIS. [NOTE THAT A MINIMUM FRICTION ANGLE MUST BE REQUIRED IN THE SPECIFICATIONS WHICH WILL BE SHOWN BY TESTING PERFORMED ON SAMPLES OF THE MATERIALS PROPOSED FOR USE ON THE SITE, AS DIRECTED BY KOERNER ON Pg. 126 (ATTACHED)].

VARIOUS PUBLISHED AND UNPUBLISHED VALUES FOR δ FOR CLAY SOIL VS. NONWOVEN GEOTEXTILE ARE ATTACHED. VALUES RANGE FROM 15° TO 52°. THE AVERAGE VALUE IS ABOUT 30° IN THIS SET OF LITERATURE. THE LOW FRICTION ANGLES OF 15° AND 17° WERE FOR KAOLINE CLAY W/ A FRICTION ANGLE OF 6°. THE LIKELY SOURCE OF CLAY SOIL FOR THE WOOD RIVER SITE WILL HAVE A HIGHER FRICTIONAL STRENGTH THAN 6°. ALSO, THE NORMAL STR AT THE GEOSYNTHETIC INTERFACE, FOR THE PROPOSED LINER SYSTEM WILL BE RELATIVELY LOW (1' CLAY ≈ 125 PSF); AND, AT LOW NORMAL STRESS, GEOSYNTHETICS HAVE HIGHER FRICTION ANGLES. THEREFORE, IT IS ANTICIPATED THAT THE INTERFACE FRICTION ANGLE FOR THE PROPOSED LINER SYSTEM HERE WILL BE LIKELY TO BE

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Sheet No. 3 Of 3
File GEO8117
Made by DAG Date 11/7/96
Checked by SMO Date 11/7/96

FOR Ill. Power - Wood River

AT LEAST 21° TO 24°. [NOTE THAT THE MITCHELL PAPER ON KETTLEMAN HILLS REPORTS 24° FOR GEOTEXTILE VS. CLAY].

FOR $\delta = 21°$, $FS = \frac{\tan 21°}{\tan 14°} = 1.5$

FOR $\delta = 24°$, $FS = \frac{\tan 24°}{\tan 14°} = 1.8$.

THEREFORE, IT IS REASONABLE TO ASSUME THAT THIS LINER SYSTEM WILL BE STABLE ON A 4:1 SLOPE FOR PRELIMINARY DESIGN.

FOR FINAL DESIGN PURPOSES, A FRICTION ANGLE OF AT LEAST 21° SHOULD BE REQUIRED IN THE SPECIFICATIONS FOR THE GEONET GEOCOMPOSITE VS CLAY LINER.

NOTE: - A MANUFACTURERS STANDARD ANCHOR TRENCH WILL BE REQUIRED, BY SPECIFICATION.

- ALSO, THE FRICTION ANGLES REQUIRED BY SPECIFICATION WILL CALL FOR THE MATERIAL TO BE TESTED WET & DRY, AND THE LOWER VALUE USED FOR THE MATERIAL ~~SHEAR~~ FRICTION ANGLE

JPK 5/2/97

WR 512

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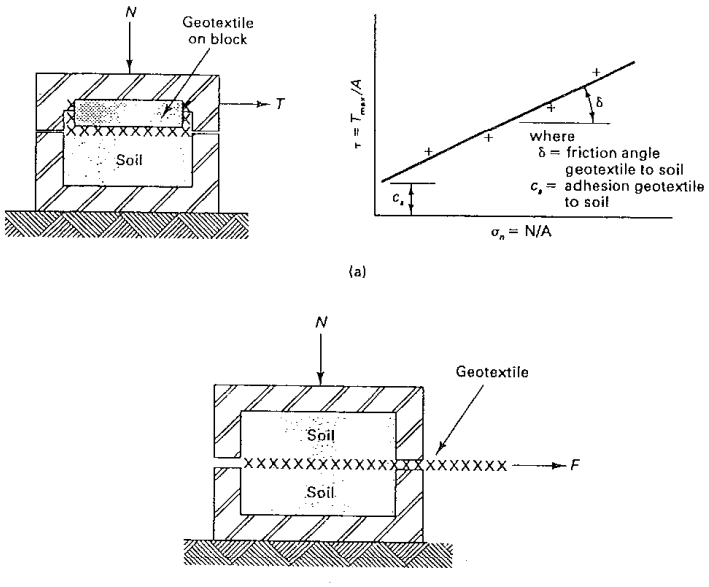


Figure 2.12 Schematic diagrams of test setups for friction and pullout evaluation of geotextiles in soils. (a) Soil-to-geotextile friction test and results. (b) Geotextile pullout (anchorage) test.

Table 2.6 Soil-to-geotextile friction angles and efficiencies (in parentheses) in selected cohesionless soils

Geotextile type	*Concrete sand* ϕ = *30 deg.*	*Rounded sand* ϕ = *28 deg.*	*Silty sand* ϕ = *26 deg.*
Woven, monofilament	26 deg. (84%)	—	—
Woven, silt film	24 deg. (77%)	24 deg. (84%)	23 deg. (87%)
Nonwoven, heat bonded	26 deg. (84%)	—	—
Nonwoven, needle punched	30 deg. (100%)	26 deg. (92%)	25 deg. (96%)

Source: After Martin et al. [29]

Note: Values such as the above should never be used in final design. Site-specific geotextiles and soils must be individually tested and evaluated in accordance with the particular project conditions.

From KOERNER, "DESIGNING WITH GEOSYNTHETICS," 3RD EDITION.

WR 513

Martin, R. P., and Henker, S. R. (1986). "Principles for description and classification of weathered rock for engineering purposes." *Special Publication 2*, Div. of Soil Mech. of Inst. of Engrs., 299–308.
McMahon, B. K., Douglas, D. J., and Burgess, P. J. (1975). "Engineering classification of sedimentary rocks in the Sydney Basin." *Aust. Geomech. J.*, 65(1), 52.

WR 514

DAG

KETTLEMAN HILLS WASTE LANDFILL SLOPE FAILURE. I: LINER-SYSTEM PROPERTIES

By James K. Mitchell,[1] Fellow, ASCE, Raymond B. Seed,[2] Associate Member, ASCE, and H. Bolton Seed,[3] Honorary Member, ASCE

ABSTRACT: A slope-stability failure occurred in a 15 acre hazardous-waste landfill (90 ft high) in which lateral displacements of up to 35 ft and vertical settlements of up to 14 ft were measured. Failure developed by sliding along interfaces within the composite, multilayered geosynthetic-compacted clay liner system beneath the waste fill. The testing, analyses, and related studies made to determine the cause of the failure are the subject of this and a companion paper (Seed et al. 1990). The present paper presents details of a direct shear and pullout testing program undertaken to determine liner-system-interface shear-strength characteristics. The interfaces between the various geosynthetics, and between these materials and the compacted clay in the liner system, are characterized by low frictional resistance, with values of interface-friction angle as low as 8° for some combinations. The most critical interfaces were determined to be those between high-density polyethylene (HDPE) geomembrane and geotextile, HDPE geomembrane and geonet, and HDPE geomembrane and saturated compacted clay. Representative values of interface shear-strength parameters were obtained for use in the stability analyses described in the companion paper. The variations in measured strength parameters for the different interfaces in the liner system indicate the desirability of conducting similar test programs for proposed new facilities to establish design parameters.

INTRODUCTION

Landfill Unit B-19, covering an area of about 36 acres, forms part of a Class I hazardous-waste treatment-and-storage facility at Kettleman City, California. The waste repository essentially consists of a very large, oval-shaped bowl excavated in the ground to a depth of about 100 ft, into which the waste fill is placed. The "bowl" has a nearly horizontal base, and side slopes of 1 on 2 or 1 on 3. To prevent the escape of hazardous materials into the underlying and surrounding ground and the ground water below, the base and sides of the excavation are lined with a multilayer system of impervious geomembranes, clay layers, and drainage layers. An overall view of the facility is shown in Fig. 1.

For operational reasons, the lining of the northern end of the "bowl," designated Phase 1-A and covering approximately 15 acres, was completed first and placement of solid hazardous waste was initiated in this section of the facility in early 1987. At the same time, the liner systems for other phases of the project were being completed. The placement of waste in Phase 1-A may be seen in Fig. 1, in addition to a thin covering of soil over the

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[2]Assoc. Prof. Civ. Engrg., Dept. of Civ. Engrg., Univ. of California, Berkeley, CA.
[3]Deceased, formerly Cahill Prof. of Civ. Engrg., Univ. of California, Berkeley, CA.

Note. Discussion open until September 1, 1990. Separate discussions should be submitted for the individual papers in this symposium. To extend the closing date one month, a written request must be filed with the ASCE Manager of Journals. The manuscript for this paper was submitted for review and possible publication on December 7, 1988. This paper is part of the *Journal of Geotechnical Engineering*, Vol. 116, No. 4, April, 1990. ©ASCE, ISSN 0733-9410/90/0004-0647/$1.00 + $.15 per page. Paper No. 24577.

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Document 5.3

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Table 8. Summary of Interface-Shear-Strength Tests: Kettleman Hills Repository

Interface components (1)	Conditions (2)	Direct Shear Tests: Residual friction angle: ϕ_r (3)	Pullout-Box Tests: Residual friction angle: ϕ_r (4)	Values proposed for stability analyses (5)
HDPE liner/geotextile	Dry, unpolished	9.5° to 12.5°	9.5° (1 Test)	$\phi = 9° \pm 1°$
	Dry, partly polished	9.0° to 11.0°	—	
	Dry, polished	8.5° to 10.5°	8.0° (1 Test)	
	Wet, unpolished	8.0° to 10.0°	7.0° to 10.5°	$\phi = 8° \pm 1°$
	Wet, polished	7.0° to 9.5°	6.5° to 9.0°	
HDPE liner/clay	Dry (as compacted)	11.0° to 14.0°	—	$\phi = 12° \pm 1°$
	Saturated (UU)	(τ_r = 800 to 1,000 psf)	—	τ = 900 psf ± 250 psf
HDPE liner/geonet (transverse shear)	Dry	7.0° to 8.0° (+)	—	$\phi = 8.5° \pm 1°$
	Submerged	7.0° to 10.0°	8.0° to 9.0°	$\phi = 8.5° \pm 1°$
HDPE liner/geonet (aligned shear)	Submerged	5.0° to 8.0°	6.0° to 8.0°	$\phi = 7.0° \pm 1.5°$
Geotextile/clay	Saturated (UU)	~ 24°	—	$\phi \approx 24°$
Geotextile/geonet	Dry	>20°	—	$\phi > 20°$
	Submerged	10° to 14° (+)	—	$\phi > 12°$
HDPE liner/HDPE liner	Dry	6.0° to 13.0°	—	$\phi = 9.5° \pm 3°$
	Submerged	6.0° to 11.0°	7.0° to 13.5°	$\phi = 8.5° \pm 2.5°$

for determination of interface strength.

Most of the interface combinations tested showed a slight tendency for "peaking" in interface-shear strength at very small shear displacement, followed by a slight reduction in shear strength to a slightly lower residual interface-shear strength. The reduction from peak to residual shear strength was relatively small for all interface combinations of interest. Because the peak strengths occurred at very small relative interface-shear displacements (typically less than 0.1 in. shear displacement) that are likely to be exceeded by deformations occurring during construction and fill-placement operations, the residual interface-shear-strength behavior was taken as representative of the interface-shear-strength characteristics of each interface combination for purposes of slope-stability analyses. Values proposed for use in stability analyses are given in column 5 of Table 8.

This residual interface-shear strength was best characterized in terms of the residual friction angle (ϕ_r) for all interface combinations and conditions, with the exception of the HDPE liner/compacted clay interface tested under presoaked, unconsolidated-undrained (UU) conditions. As discussed previously, the shear strength of this HDPE liner/compacted clay under presoaked (saturated UU) conditions was found to be independent of applied total interface-normal stress (σ_n), and was therefore best characterized directly in terms of residual interface-shear strength (τ_r).

The HDPE liner/geonet interface-shear-displacement mode corresponding to "aligned shear" did not occur beneath the Kettleman Hills Unit B-19, Phase I-A landfill. Among the remaining interface combinations and conditions of potential interest, it can be seen in Table 8 that the geotextile/clay interface, the geotextile/geonet interface (both dry and submerged), and the HDPE liner/clay interface (dry only) all have significantly higher residual interface-shear strengths than do the remaining interface combinations

and conditions. The remaining interface combinations and conditions, which are thus of primary interest for the studies of the Unit B-19, Phase I-A slope failure of March 19, 1988, are HDPE liner/geotextile, HDPE liner/geonet, and HDPE liner/clay under presoaked UU conditions.

As shown in Table 8, two of these critical interface combinations have approximately equal residual interface-friction angles under "dry" conditions. These are HDPE liner/geotextile ($\phi_r \approx 9° \pm 1°$) and HDPE liner/geonet ($\phi_r \approx 8.5° \pm 1°$). It is therefore not possible to ascertain with any reasonable degree of certainty which of these two interface combinations represents a more critical potential shear failure mechanism under "dry" conditions within the multilayer liner system of the Phase I-A landfill. Regardless of which of these two interface combinations is most critical, a representative value of $\phi_r \approx 8.5°$ appears reasonable for analysis of shearing within the multilayer liner system under "dry" conditions.

These same two interface combinations also exhibit approximately equal residual interface-friction angles when both are sheared under "submerged" conditions. These residual friction angles are $\phi_r \approx 8° \pm 1°$ for the HDPE liner/geotextile interface, and $\phi_r \approx 8.5° \pm 1°$ for the HDPE liner/geonet interface. Again, it is not possible to ascertain with any reasonable degree of certainty which of these two interface combinations represents a more critical potential failure mechanism within the multilayer liner system underlying the Phase I-A landfill. Regardless of which of these two interface combinations is most critical, a representative value of $\phi_r \approx 8°$ can be used for analysis of shearing within the liner under "submerged" interface conditions.

This evaluation of shear strengths within the multilayer liner system is further complicated by the possibility of shear slippage along HDPE liner/compacted liner clay interfaces in zones where the clay and the HDPE liner/clay interface is "wetted." This wetting may occur as a result of a number of events, including rainfall during construction, squeezing of water from the clay itself during consolidation under large fill overburden, thermal effects leading to collection of water on the underside of the HDPE liner during initial liner placement, and wetting associated with water ponding in the vicinity of the leachate-collection-system sump.

If the clay at the HDPE liner/clay interface became wetted at one or more points beneath the Unit B-19 landfill, then the subsequent dissipation of pore pressures during consolidation would be a very slow process, controlled by a coefficient of consolidation on the order of $c_v \approx 2$ sq ft/yr, which was determined by consolidation tests on compacted liner clay. Based on this low coefficient of consolidation, the rate of consolidation and pore-pressure dissipation within the compacted clay liner layers would be very slow, and for the 3.5 ft thick primary clay liner the pore-pressure dissipation at the HDPE liner/clay interface over a period of one year was estimated to be less than 5%. Accordingly, any zones in which the compacted liner clay became wetted either before or during fill placement can be assumed to be well represented by the interface-shear-strength tests performed on HDPE liner/compacted [illegible] samples under presoaked, unconsolidated-undrained [illegible] strength of $\tau_r \approx 900$ psf

The average [illegible] ditions was about 900 [illegible]. Thus,

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CE-491 – GEOSYNTHETICS
(FALL 1991, WVU)

24-1.16

TABLE 24-1.1
SUMMARY OF DIRECT SHEAR TESTS PERFORMED ON INTERFACE BETWEEN NEEDLEPUNCHED NONWOVEN GEOTEXTILE TO SOIL

Reference	Soil Type	Size of Shear Box (in. by in.)	Interface Friction Angle (d)	Friction Angle of Soil (f)	Efficiency of Transfer (E)
Myles (1984)	Fuel Ash	4" x 4"	38	44	0.86
Myles (1984)	Coarse Sand	4" x 4"	44	45	0.98
Myles (1984)	Coarse Sand	12" x 12"	36	38	0.93
Miyamori, et al. (1986)	River Sand	12" x 12"	41	44	0.93
Miyamori, et al. (1986)	River Sand	12" x 12"	32	35	0.91
Miyamori, et al. (1986)	River Sand	12" x 12"	34	32	1.06
Marin, et al. (1984)	Concrete Sand	4" x 4"	30	30	1.00
Marin, et al. (1984)	Ottawa Sand	4" x 4"	26	28	0.93
Marin, et al. (1984)	Mica Schist	4" x 4"	25	26	0.96
Williams, et al. (1987)	Ottawa Sand	12" x 12"	28	38	0.74
Williams, et al. (1987)	Concrete Sand	12" x 12"	34	36	0.94
Williams, et al. (1987)	Ottawa Sand & 5% Bentonite	12" x 12"	27	36	0.75
Williams, et al. (1987)	Ottawa Sand & 10% Bentonite	12" x 12"	27	36	0.75
Williams, et al. (1987)	Saprolite	12" x 12"	30	36	0.83
Williams, et al. (1987)	Gulf Coast Clay	12" x 12"	45	27	1.67
Williams, et al. (1987)	Glacial Till	12" x 12"	37	38	0.97
Geo Services, Inc. (1990)	Ottawa Sand	12" x 12"	29	Not Given	Not Given
Geo Services, Inc. (1990)	Glacial Till	12" x 12"	31	Not Given	Not Given
Geo Services, Inc. (1990)	Clay	12" x 12"	21	Not Given	Not Given

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INTERFACIAL FRICTION STUDY OF CAP AND LINER COMPONENTS FOR LANDFILL DESIGN

M.M. Koutsourais, Nicolon Corporation, Norcross, GA
C.J. Sprague, Nicolon Corporation, Norcross, GA
R.C. Pucetas, Hoechst Celanese Corporation, Spartanburg, SC

ABSTRACT

The purpose of this research is to extend the data base for interface friction values of the various components of cap and liner systems for proper landfill design with special emphasis on friction under low to moderate normal loads. This relates to periods of cap and liner system construction and long term cap system stability.

Interface friction parameters are presented for three soil types including a conventional sand, kaolinite clay and fly ash; five geotextiles including monofilament, multifilament and slit film wovens, and heatbonded and needlepunched nonwovens; one flexible geogrid; five geomembranes including high density polyethylene (HDPE) with smooth and roughened surfaces, a very low density polyethylene (VLDPE), a chlorosulphonated polyethylene (CSPE) and a polyvinyl chloride (PVC); and one geonet. The various interfaces tested correspond with a typical landfill cross-section. The interface friction results are presented for 71 various interfaces that may exist within a landfill cap or liner system. Finally, detailed descriptions of the method and equipment of the modified direct shear device, as well as a conclusive summary of the analytical results and their pertinence in design are discussed.

INTRODUCTION

One of the greatest social and political challenges that the world, as a whole, faces today and well into the 21st century is the proper disposal of waste products and the prevention of the waste components from entering the environment. The urgency of this issue, coupled with the relatively new yet extensive use of geosynthetic materials as a major component of landfill design, leaves the designer in a state of uncertainty. One of the uncertainties concerning proper landfill design with geosynthetics deals with the interaction of the many components within the cap and/or liner of the landfill. A common failure mechanism of landfills constructed with

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TABLE 3
GEOSYNTHETIC VS. KAOLINE INTERFACE FRICTION

INTERFACE WITH KAOLINE	C_a (PSI)	δ (DEGREE)
KAOLINE	1.75	6°
NONWOVEN, NEEDLEPUNCHED	1.35	15°
NONWOVEN, HEAT BONDED	0.37	17°
MONOFILAMENT	0.9	1°
MULTIFILAMENT	1.3	16°
SLIT FILM	1.25	11°
HDPE - SMOOTH	0.4	5°
HDPE - ROUGH	1.75	11°
CSPE	0.75	4°
VLDPE	0.6	8°
PVC	0.2	6°
FLEXIBLE GRID	1.4	5°

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:16AM FROM ALMES & ASSOC. PGH TO 8564970 P006/012

SUMMARY OF DIRECT SHEAR AND TILT TABLE TESTS ON
GEOSYNTHETIC-TO-GEOSYNTHETIC AND GEOSYNETHETIC-TO SOIL INTERFACES
(Continued)

Interface	Number of Direct Shear Tests Available for this Interface	Average Interface Friction Value from Direct Shear Tests	Minimum Interface Friction Value from Direct Shear Tests	Maximum Interface Friction Value from Direct Shear Tests
Smooth HDPE Geomembrane and Nonwoven Geotextile	12	12	6	23
Smooth HDPE Geomembrane and Woven Geotextile	8	12	6	21
Smooth HDPE Geomembrane and HDPE Geonet	30	15	5	21
Nonwoven Geotextile and Granular Soil	32	32 (Avg. Eff. of Trans = 0.86)	22	44
Nonwoven Geotextile and Cohesive Soil	12	35 (Avg. Eff. of Trans = 1.30)	21	52
Loose Nonwoven Geotextile and HDPE Geonet	11	19	8	29
Nonwoven Geotextile and Nonwoven Geotextile	1	28	28	28

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Joe K.

Supplemental Design Calculations and Commentary

These Modifications affect the IDNR-OWR
permit # 21485
Issued to Illinois Power August 12, 1997

Illinois Power Company
Wood River Power Station

March, 1998

WR58



Joseph P. Kimlinger
3/24/98
EXPIRES 11/30/99

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INTRODUCTION

This permit package revision is to supplement calculations from the 1997 submittal. The changes include a change in geometry of pond #2 of the ash impoundment system, and a modification to the liner system.

In 1997, Illinois Power submitted for a modified permit (# 21485) to the INDR-OWR and IEPA for construction of a lined ash impoundment facility for the company's Wood River Power Station. The scope of the 1997 permit application was to build two lined ponds in the location of the plants existing ponds #2, #3 and #4. Ponds #3 and #4 would be combined to form new pond #3, and new pond #2 would be built in the same location as the existing pond #2.

The liner system was designed with an innovative leachate collection system that would collect pond water leaching through a one foot primary clay liner, and pump that leachate back up into the pond. The environment was protected by a two foot secondary layer that was installed under the leachate collection system. During 1997, the new pond #3 was constructed, as designed, with the leachate collection system, and is performing as planned.

However, the high cost of the leachate collection system liner, the subsequent IEPA permitting of a liner consisting polypropylene overlain on a one foot clay layer at Illinois Power's Havana Power Station, and a major change in plant operations have prompted the company to re-evaluate the design of pond #2.

- The leachate collection system liner, while very effective, was expensive. The expected cost is approximately $100,000 more, per acre, than the polypropylene liner system.

- In 1997, the IEPA permitted a design for Illinois Power Havana Power Station, that consisted of a 1' layer of 1 x 10^{-6} clay, overlain by a polypropylene membrane. This design is in the process of permitting with the IDNR.

- Finally, the Wood River Power Station has decided to collect their fly ash dry, and dispose of it in a dry mode. This greatly reduces the size of the pond required. The bottom ash (which is only about 20% of total ash production) will still be wet sluiced to the ash pond system.

The primary changes in the new configuration are the decreased size of pond #2 and the raising of the top of the dikes for pond #2 to an elevation of 434.0 from 430.0. The size change for pond #2 was decreased due to the plant operation changes, stated above. Only bottom ash will be sluiced into the new pond #2, and the required settling time for this ash is much less than for fly ash. The top elevation of the dikes was increased to allow for a smaller footprint for pond #2. This facilitates construction, since the new pond is in the location of an existing ash pond. Previously deposited ash must be removed before construction of the new pond can commence.

WL59

The modified permit submitted in 1997 was approved with the pond system being Class III. This is consistent with the classification given to the extension of pond #1 to elevation 445.0, in 1993. Even though this pond is becoming significantly smaller than originally designed, this permit is being submitted because the storage capacity is over 50 acre-feet (total volume to the top of dike is approximately 120 acre-feet). However, the drainage area is equal to only the footprint of the pond itself. No additional runoff can enter the pond. Pond filling and maintaining the volume of water through the pond is primarily subject to our control, except for rain events inside the pond area.

This document will modify the original design calculations submitted in 1997. The portion of the submittal entitled "Geotechnical, Structural, Hydrologic and Hydraulic Design" dated April, 1997 will be amended section by section. Additional copies of the original design package may be obtained by contacting Illinois Power Company.

SOIL REPORTS

The SOIL REPORTS section of the original report remains unchanged.

SLOPE STABILITY ANALYSIS/DESIGN

The change in geometry of pond #2 requires another investigation of slope stability. Since the west dike of the #2 pond will be inside the existing #2 (and will remain that way), the worst case slope stability for the new configuration will be on the north dike.

The general configuration in this area is the top of dikes at 434.0, the 4:1 inside slope goes down to an elevation of 426.0, and the outer slope goes down at 3:1 to an elevation of 412.0. The inside of the pond has the one foot clay liner with polypropylene on top of it. The first attached sketch, in Attachment #1, shows the new dike configuration and denotes the different soil locations. All configurations of slope stability runs, and their results are also included in Attachment #1.

All soil properties remained the same, except for the subgrade clay. Since there was a new boring done two years ago (boring B3 in the Soil Reports tab, Plant Soil Borings (Used for On-Site Borrow) section of the original report) that showed material properties for the subgrade clay in this location. The values used for the subgrade clay in this report are identical to those used for embankment in the original report. The seismic coefficient remains unchanged.

The polypropylene does not enter into the slope stability calculations. The phreatic surface was assumed as shown on the attached result sketches. We feel that it is very conservative since the pond has a liner of very low permeability (the polypropylene liner permeability is in the range of $1x10^{-11}$ cm/sec).

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The following load cases were analyzed:

Use of total stresses
Case I End of Construction
Case II Rapid Drawdown

Use of effective stresses
Case III Steady Seepage (No Ash accumulation, water to elevation 431.0)
Case IV Steady Seepage (Ash/Water up to elevation 431.0)

RESULTS

The following are the minimum safety factors, after running all load cases, for each face of the embankment.

Loading Condition	Location	static F. S.	F.S. w/seismic
End of construction	upstream	8.1	N/A
Case I	downstream	3.6	N/A
Rapid drawdown	upstream	6.8	N/A
Case II	downstream	2.7	N/A
Steady seepage, no ash	upstream	1.8	1.0
Case III	downstream	1.5	1.1
Steady seepage, with ash/water	upstream	2.0	1.4
Case IV	downstream	1.5	1.1

The Illinois Department of Natural Resources, Division of Water Resources requirements for minimum safety factors are:

Loading Condition	static	F.S. w/seismic
End of construction	1.3	N/A
Rapid drawdown	1.2	N/A
Steady seepage	1.5	1.0

SUMMARY

The results show that the facility can safely be constructed to an elevation of 434.0 msl.

HYDROLOGIC/HYDRAULIC DESIGN INFORMATION

Plant and storm flow values will not change for this new configuration.

WL lel

The V-notch weir located in pond #3 was set at 426.0 msl. A standpipe in pond #2 will be set at 430.0. The normal pool elevation will therefore be approximately 430.7 based on the flow over the standpipe (see Attachment #2). This makes the freeboard requirement 3.3 feet.

PIPING CALCULATIONS

During construction of pond #3, it was discovered that the final discharge piping for the system was not concrete but ductile iron. Therefore, when the final outfall of pond #3 was set, the extension piping was installed as ductile iron to match existing.

As for piping between pond #2 and pond #3, it was decided to use 24" HDPE, SDR 13.5. This heavy pipe was specified due to the possible abrasion by ash particles passing between ponds. It was butt fused per the manufacturer's recommendations.

The outlet for pond #2 will be changed to a standpipe, as discussed in the Hydrologic/Hydraulic section. Since there is very little head loss in the piping (see original report), there should not be any problem passing water between pond #2 and pond #3, with a water elevation difference of four feet.

DEWATERING CALCULATIONS

The de-watering system remains unchanged for the new permit. The volume in the system is greatly reduced, due to the new size and configuration of pond #2. Therefore, the pump that was purchased for this use is still applicable. We will continue to limit the lowering of the water in the system to less than one foot per day.

FREEBOARD CALCULATIONS

The freeboard calculations have been revised. This revision was due to the new geometry of pond #2, as well as the change to a smooth slope surface (the polypropylene membrane).

The calculations are attached (see Attachment #3), and show that there should not be a problem with the 3.3 feet of freeboard available, as stated in the Hydrologic/Hydraulic section above.

ENERGY DISSIPATION CALCULATIONS

The energy dissipation on the interior slopes of the pond system have been changed from armored riprap, to the polypropylene liner. Illinois Power was asked to address the wave wash erosion, as part of the permit review for the Havana Power Station.

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Attached as Attachment #4, is the response letter to the IDNR from Brett Marshall to Mr. Dennis Kennedy. Note that item #4 addresses this concern. I have also enclosed the same polypropylene membrane information that is discussed in the referenced letter.

CONCRETE AND STEEL CALCULATIONS

The intention of Illinois Power was to utilize an existing floating bridge at the final outfall of the pond system (outfall of pond #3). However, we felt that it would be better utilized at the standpipe of pond #2. The structure was also currently being used at the existing outfall of pond #1.

Therefore, during construction of pond #3, we designed and installed a fixed walkway and platform system to access the V-notch final weir. The details of this structure will be sent to the IDNR upon completion of this pond system.

The floating bridge is therefore going to be used as the access to the standpipe outfall weir from pond #2 to pond #3. The connection foundation details and explanation of this structure can be found in the attached plans and specifications for construction.

LEACHATE COLLECTION SYSTEM

As stated above, the permit modification application does not include a leachate collection system for pond #2 (even though it has been installed for pond #3). Therefore, this section is no longer applicable.

USGS SITE MAP OF PROJECT LOCATION

The USGA site map section remains unchanged, except that the size of pond #2 has been reduced. (See attached plans and specifications).

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ATTACHMENT #1

SLOPE STABILITY CALCULATION INFORMATION

WR 64

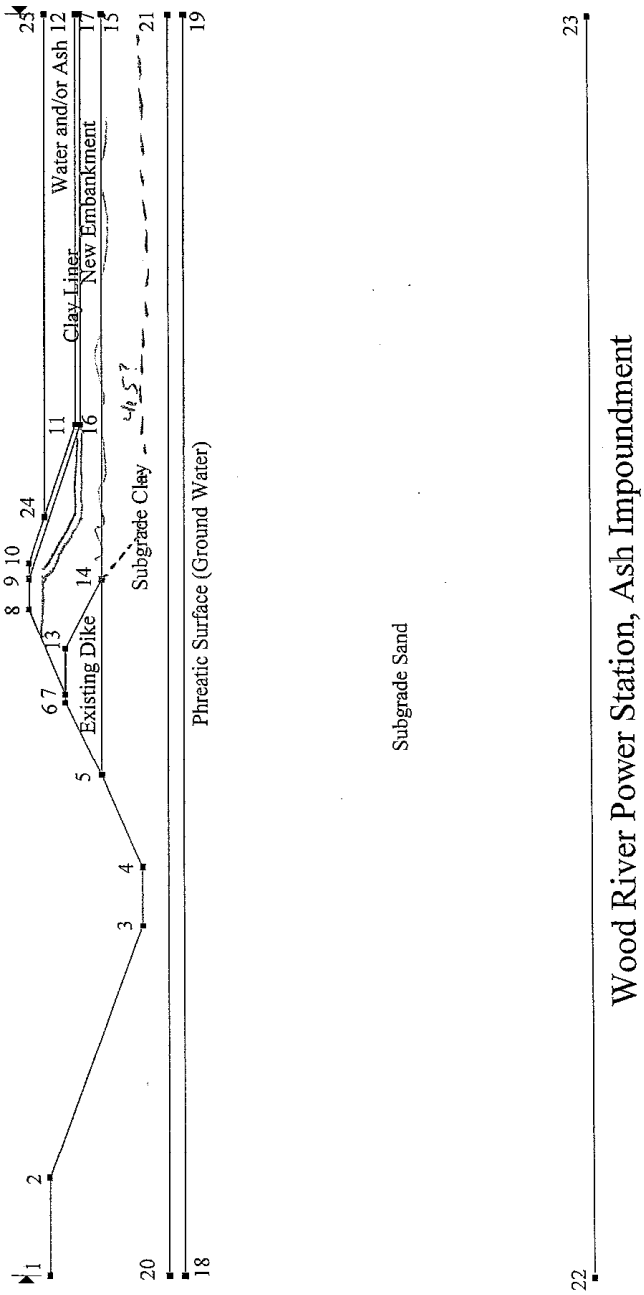
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Coordinate Information for Slope Stability Cross-Section

Point #	X-Coord.	Y-Coord. (Elev.)
1	75	430
2	100	430
3	165	412
4	180	412
5	204	420
6	223	427
7	225	427
8	247	434
9	255	434
10	259	434
11	295	425
12	400	425
13	237	427
14	255	420
15	400	420
16	295	424
17	400	424
18	75	404
19	400	404
20	75	407
21	400	407
22	75	325
23	400	325
24	271	431
25	400	431

WR65

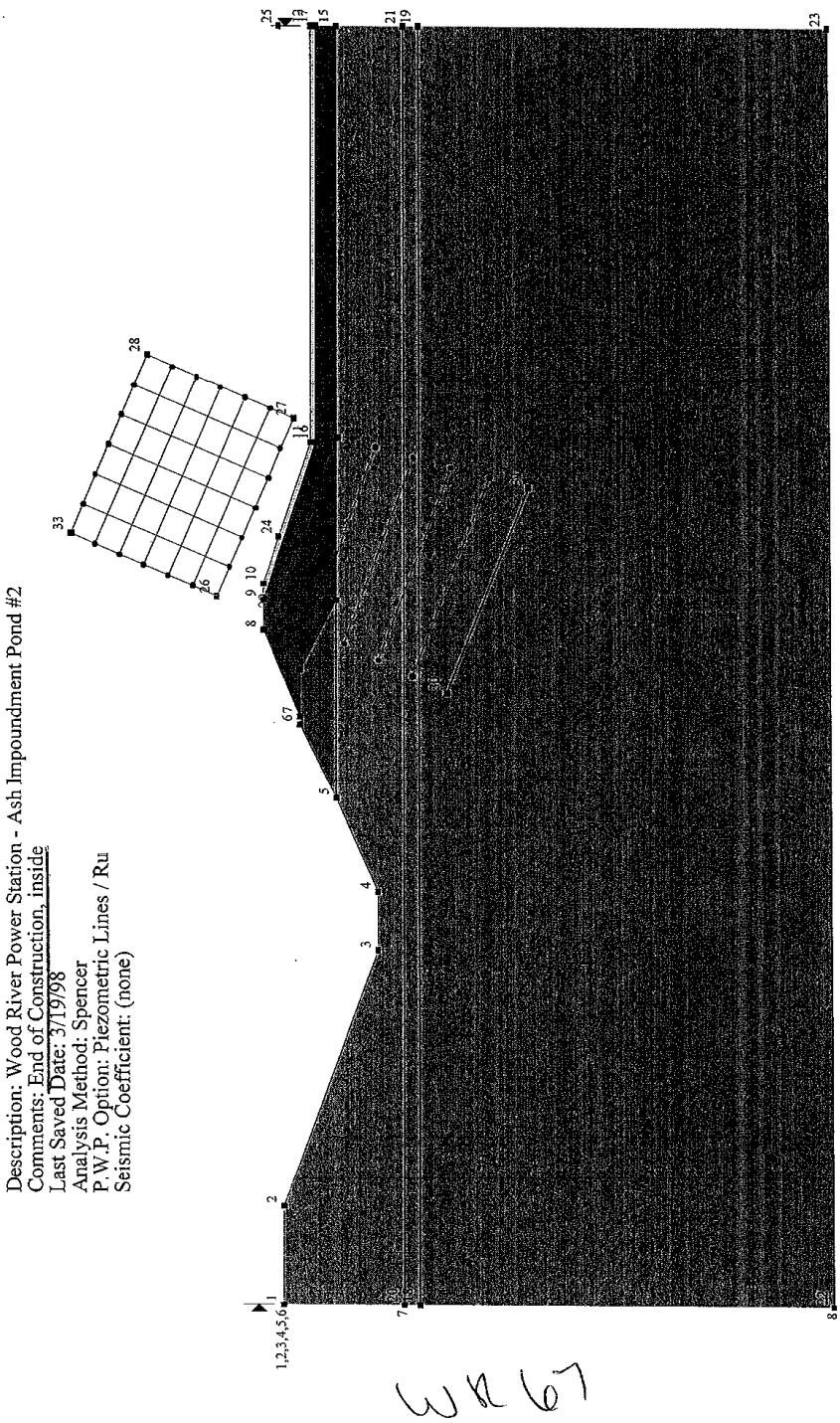
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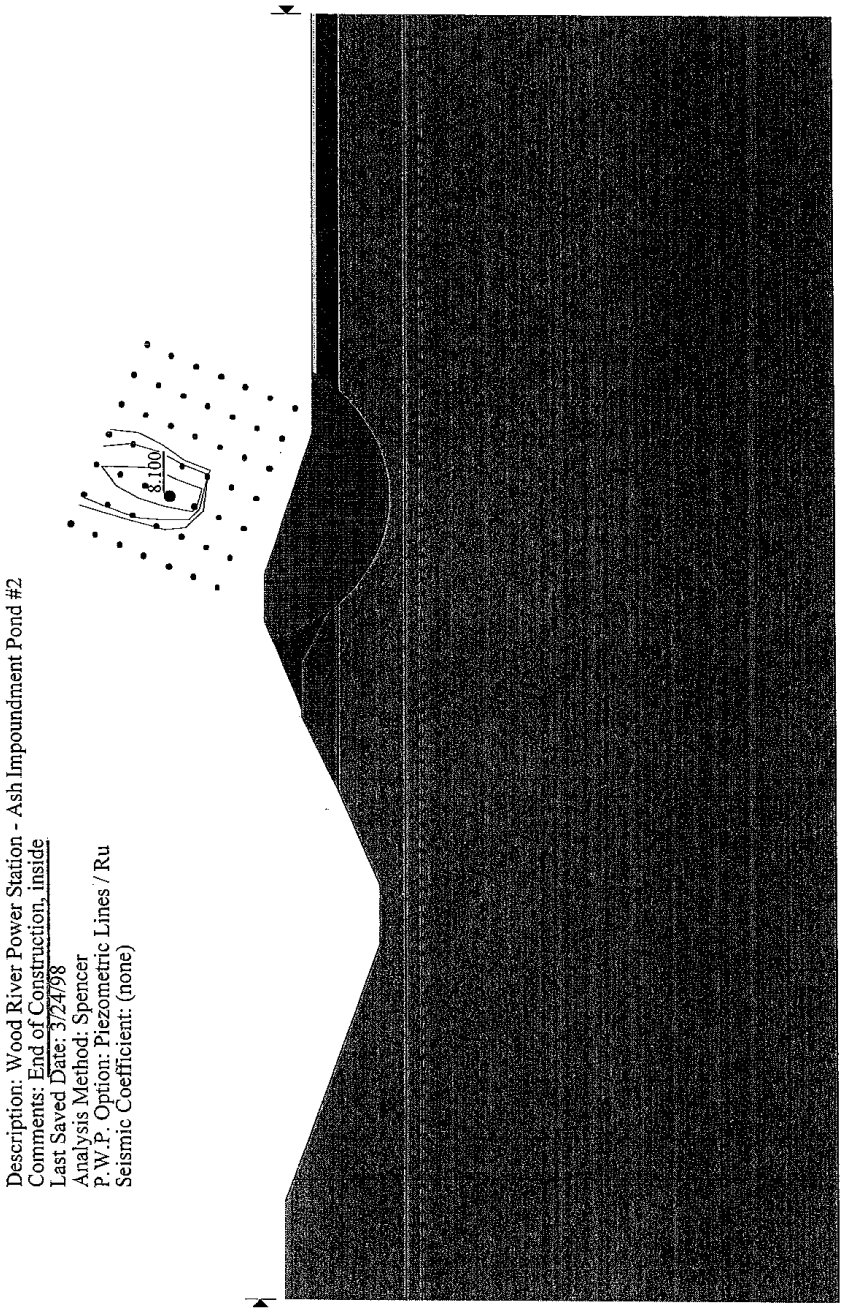
Wood River Power Station, Ash Impoundment

WP 66

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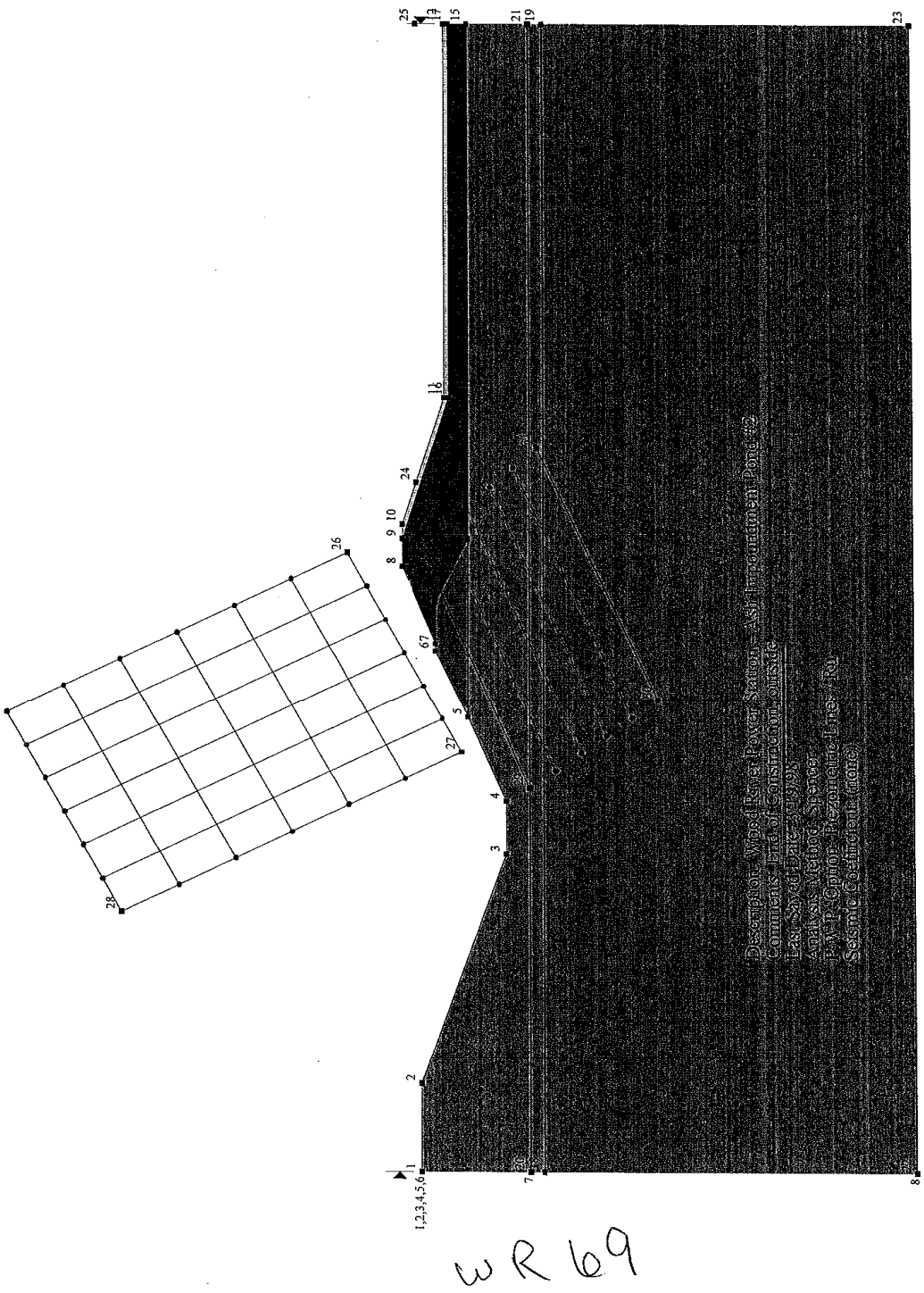

Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: End of Construction, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
1,2,3,4,5,6
7
8
WR67

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Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: End of Construction, inside
Last Saved Date: 3/24/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
8,100

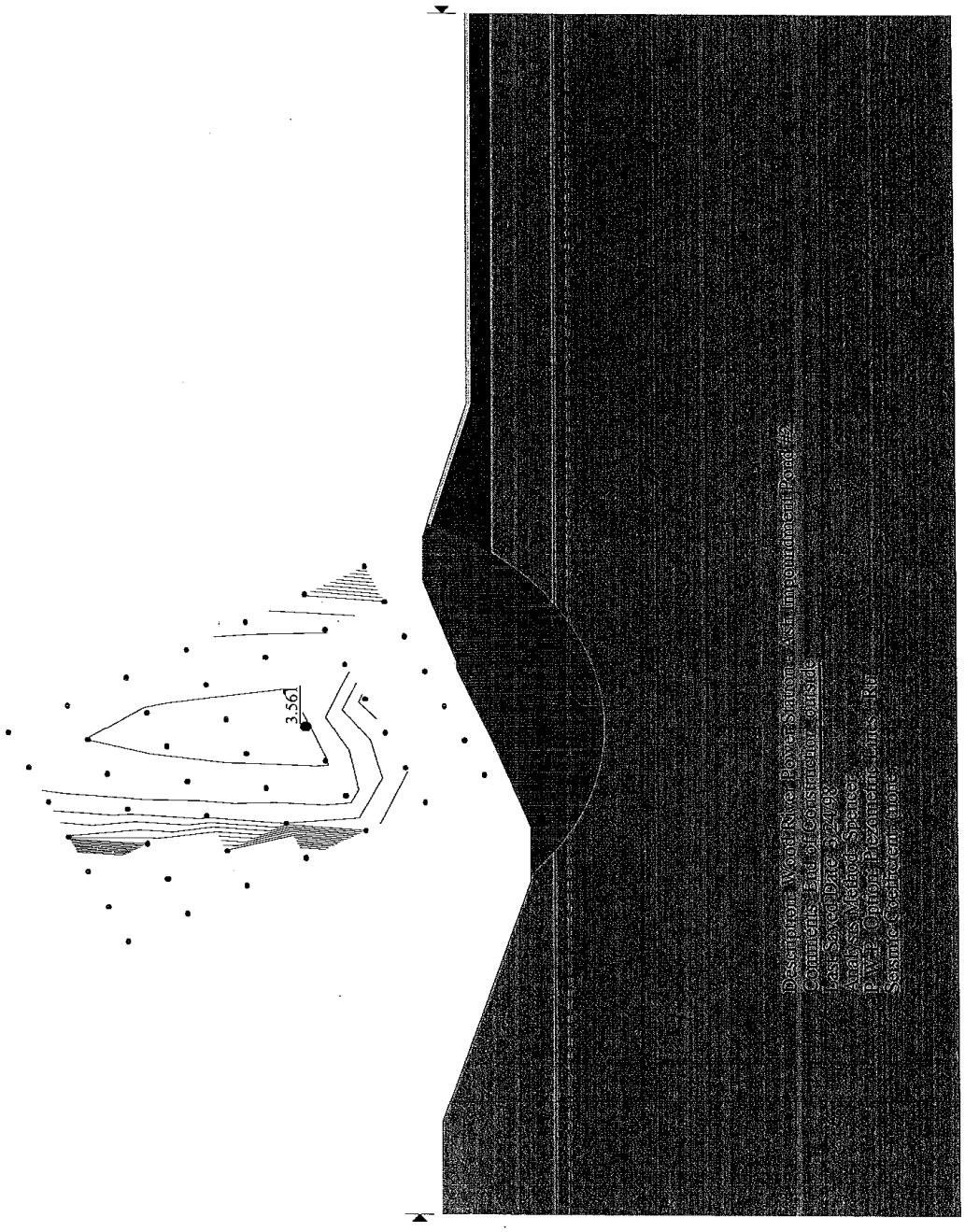
WK68

DRAFT


Description: Wood River Power Station - Asphalt Containment Pond #2
Comments: End of Construction Outside
Last Saved Date: 7/1/97
Analysis Method: Sarma
Failure Direction: Left to Right
Seismic Coefficient: 0.000
1,2,3,4,5,6
7
8

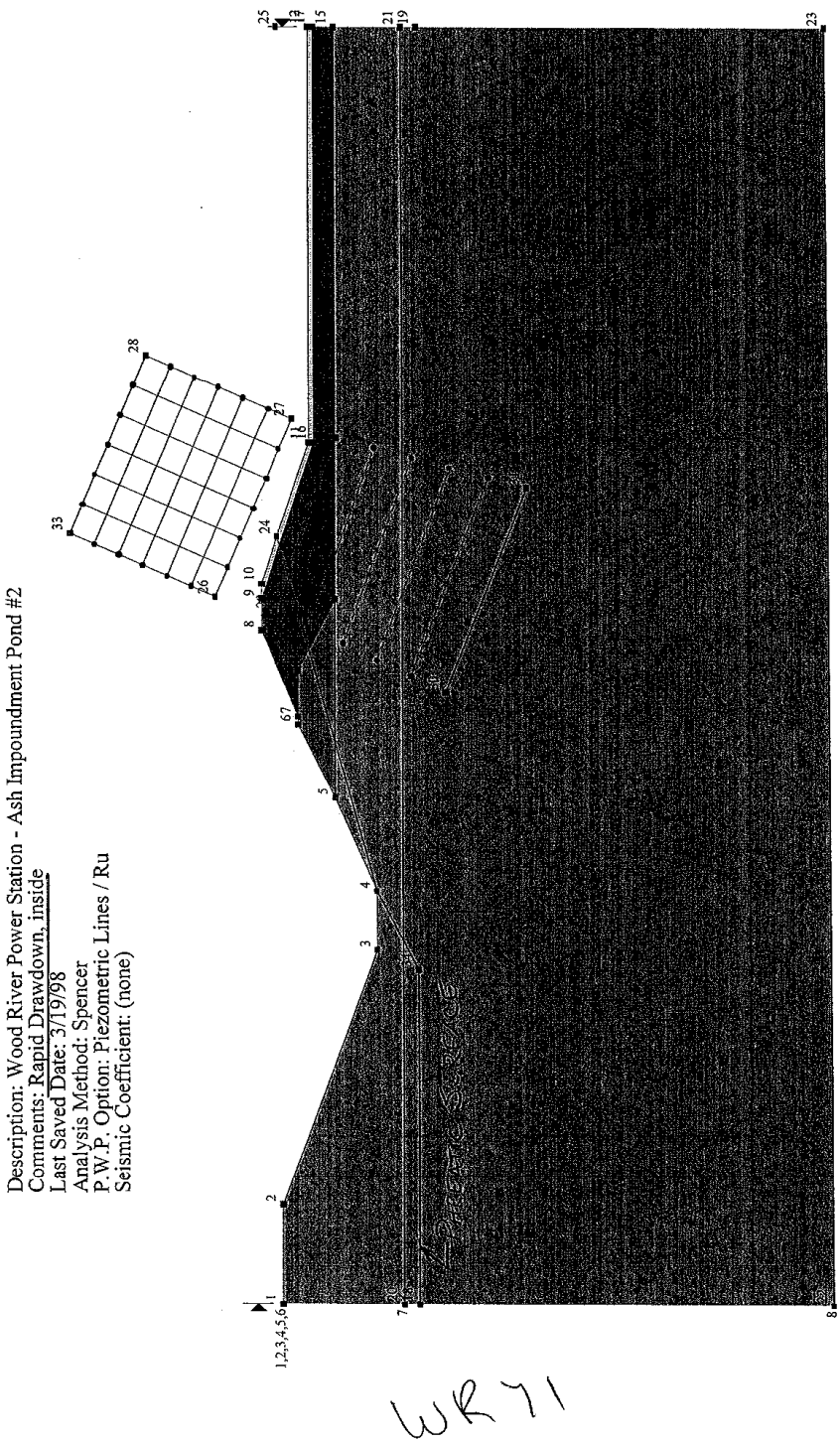
WR 69

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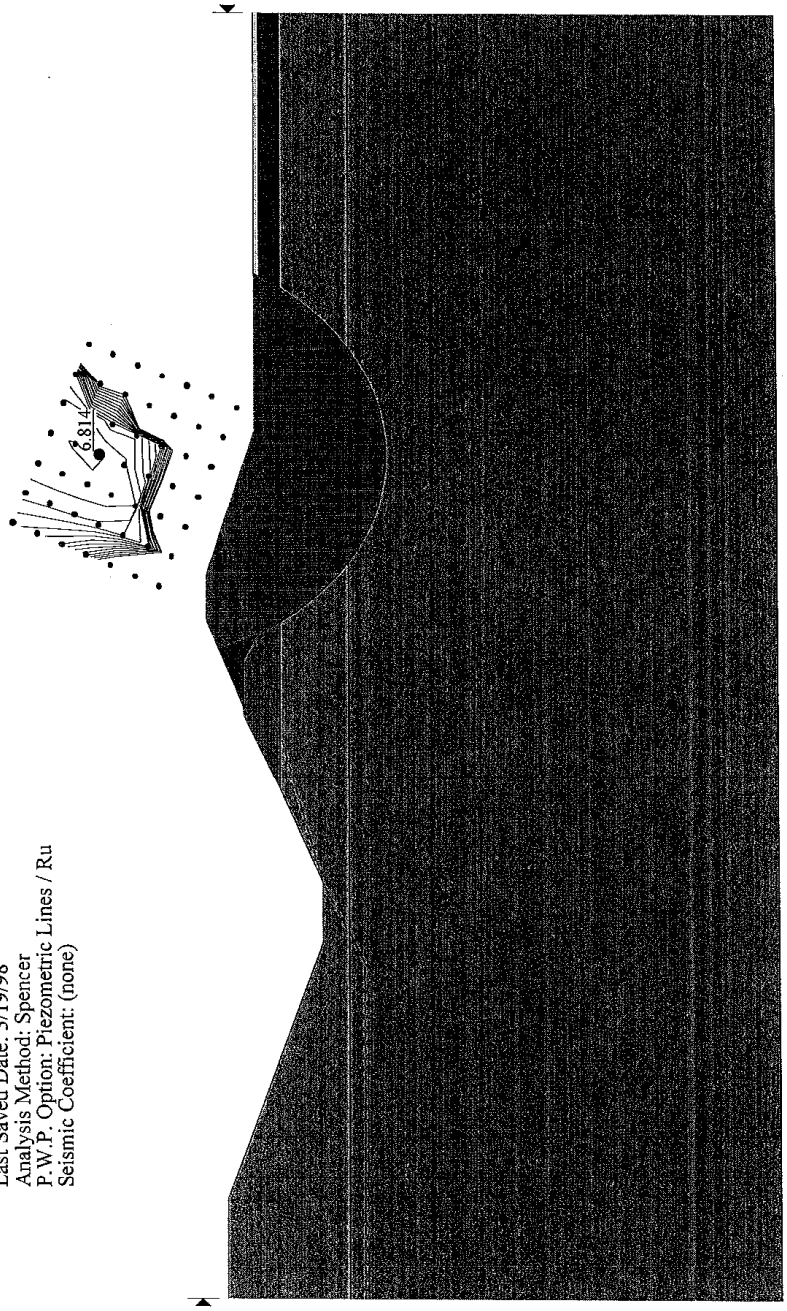

3.561
Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: End of Construction - Static
Last Saved Date: 2-27-07
Analysis Method: Spencer
FWP Option: Pre-Applied Unit Weight
Seismic Coefficient: none

WK 70

DRAFT


Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Rapid Drawdown, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
1,2,3,4,5,6
7
8
WR 71

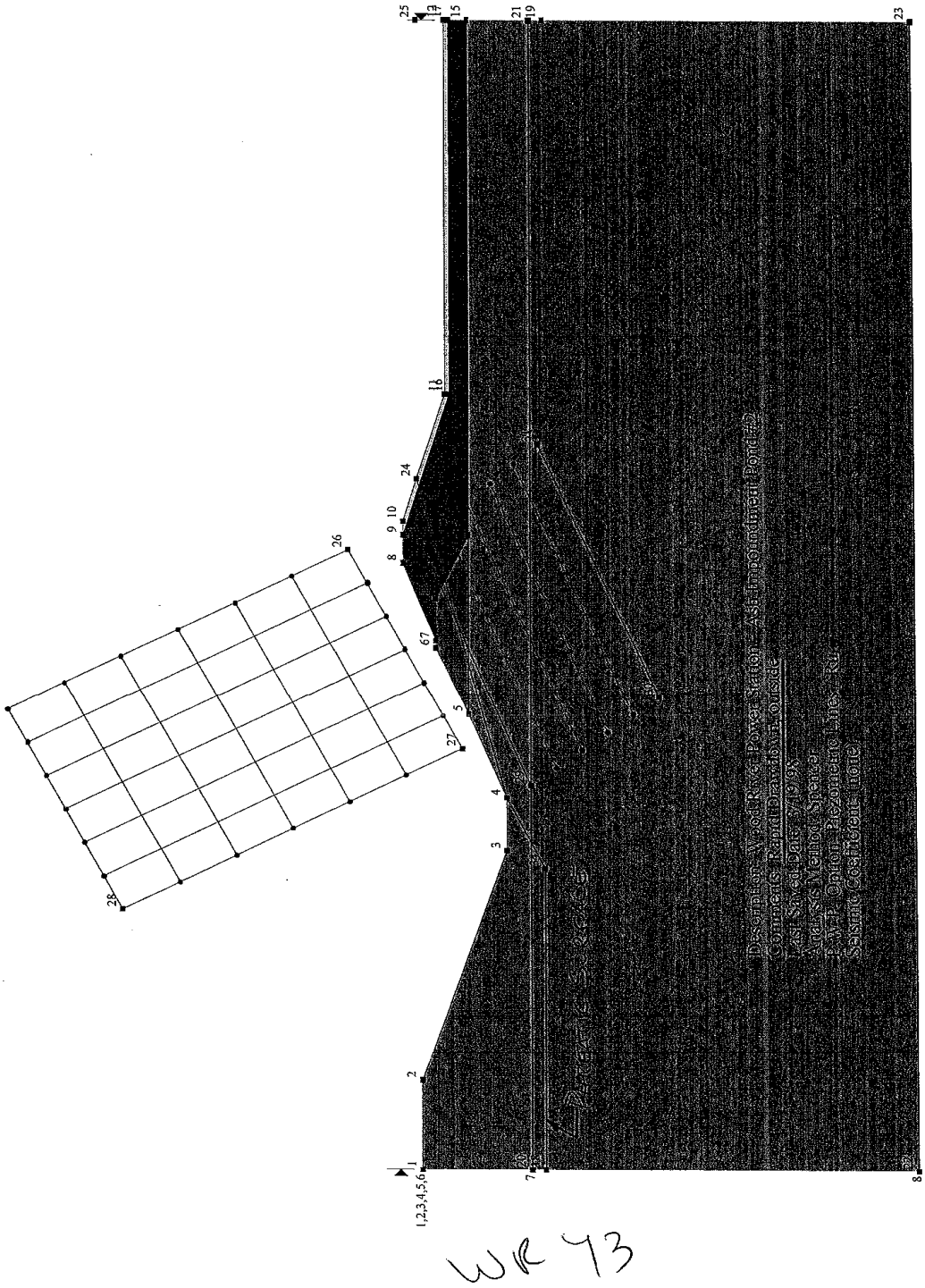
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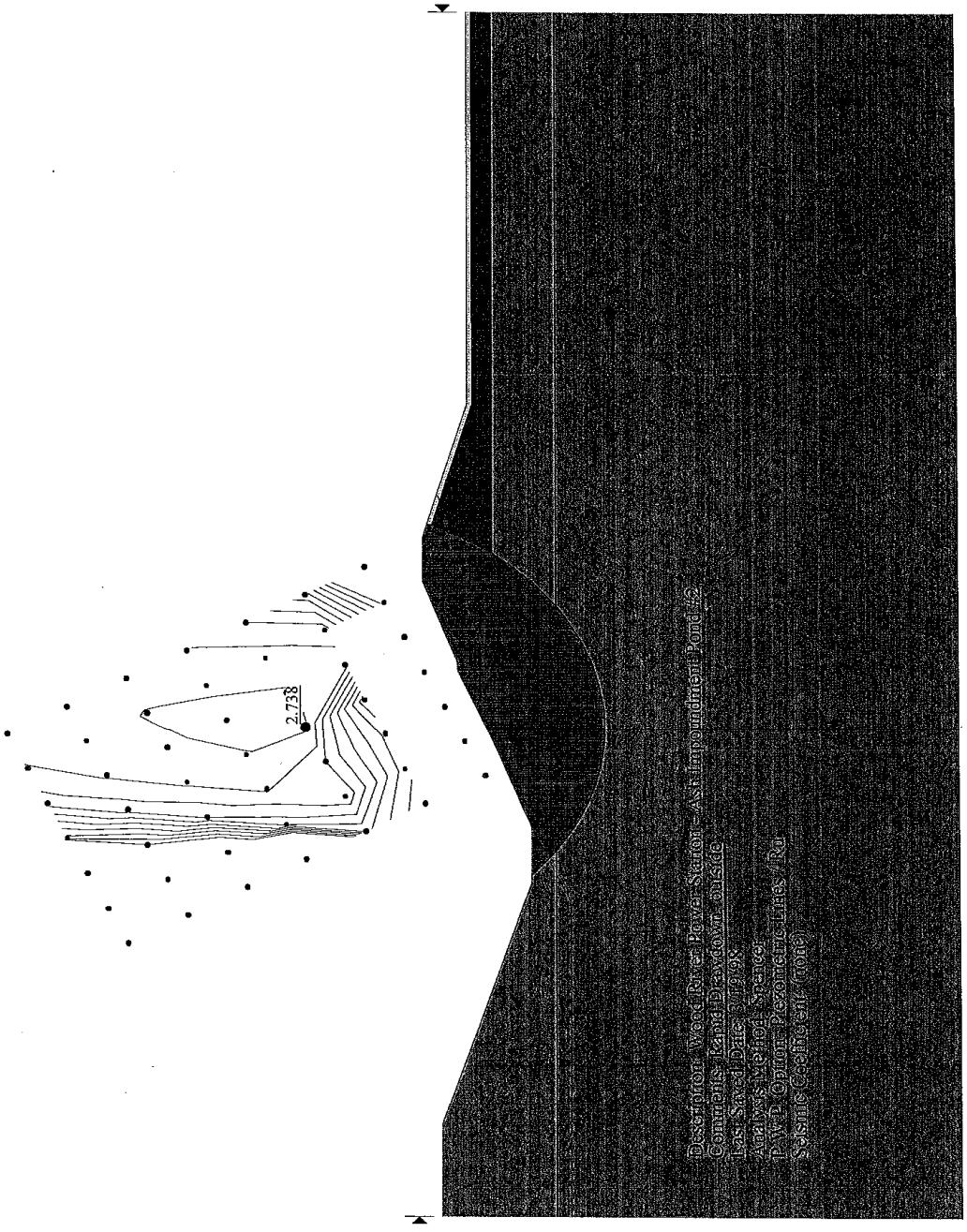
Description:. Wood River Power Station - Ash Impoundment Pond #2
Comments: Rapid Drawdown, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)

WK-72

DRAFT

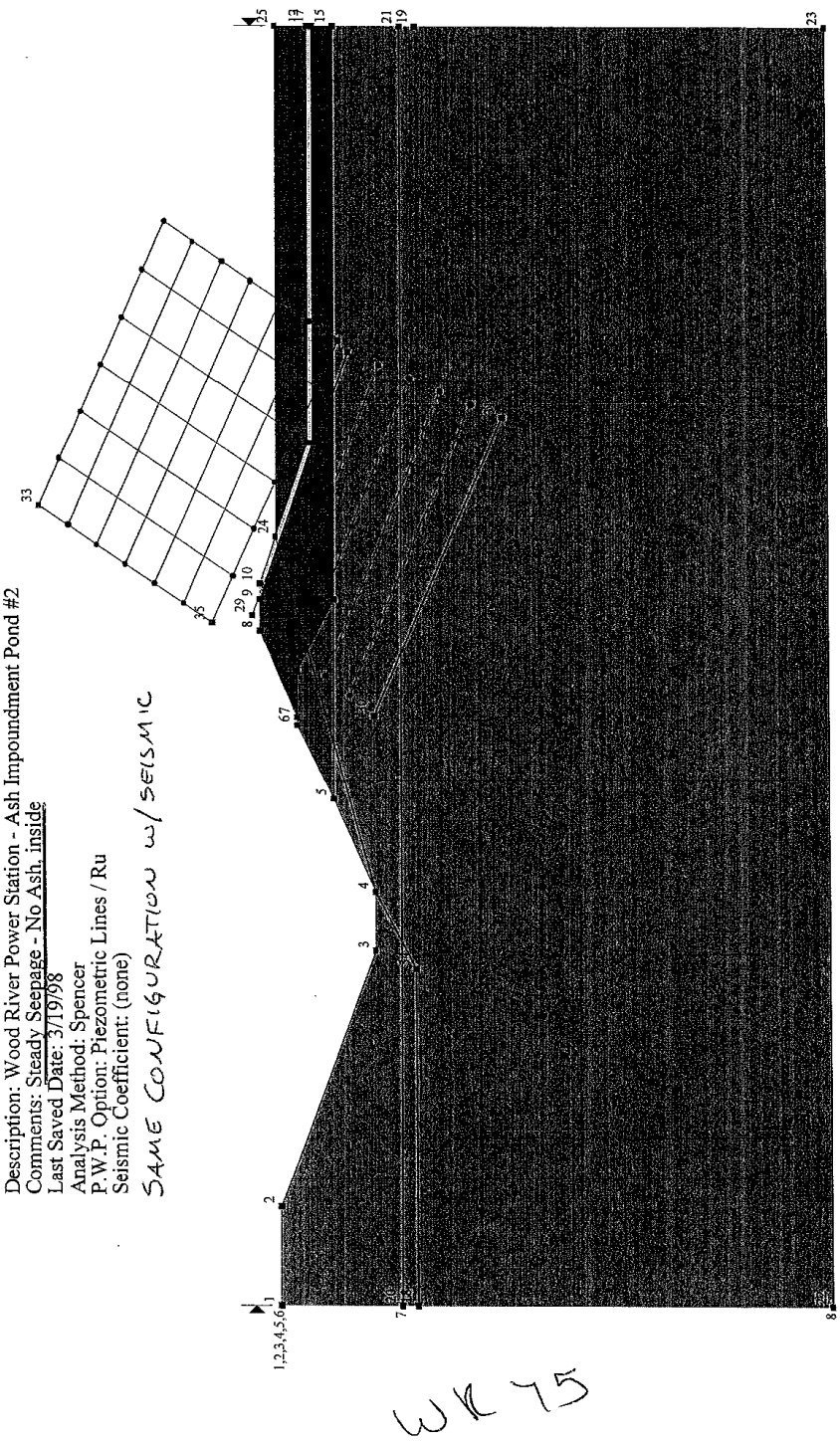

Description: Wood River Power Station - Ash Impoundment Pond #2
Comment: Rapid Drawdown Analysis
Last Saved on: June 7, 1999
Analysis Version: Spencer
Failure Direction: Entire Pond
Seismic Coefficient: 0.0
PHREATIC SURFACE
1,2,3,4,5,6
7
8
WR 63

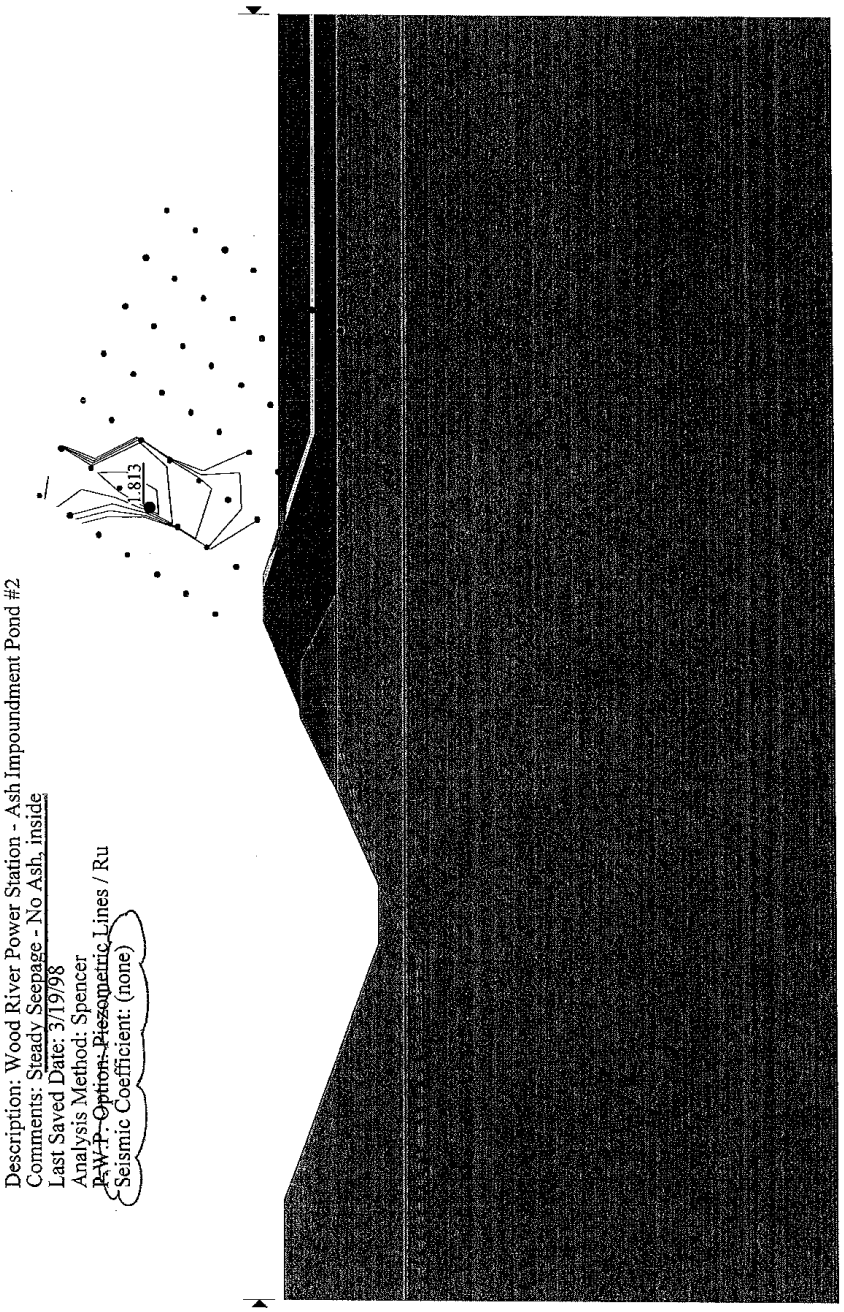
DRAFT


2.738
Description: Woodlot - Power Station - Assimponundment Pond #2
Comments: Land Drawdown
Last Saved Date: 7/7/98
Analysis Method: Seepage
PWP Option: Pezometric Lines / Ru
Seismic Coefficient: none

WR 74

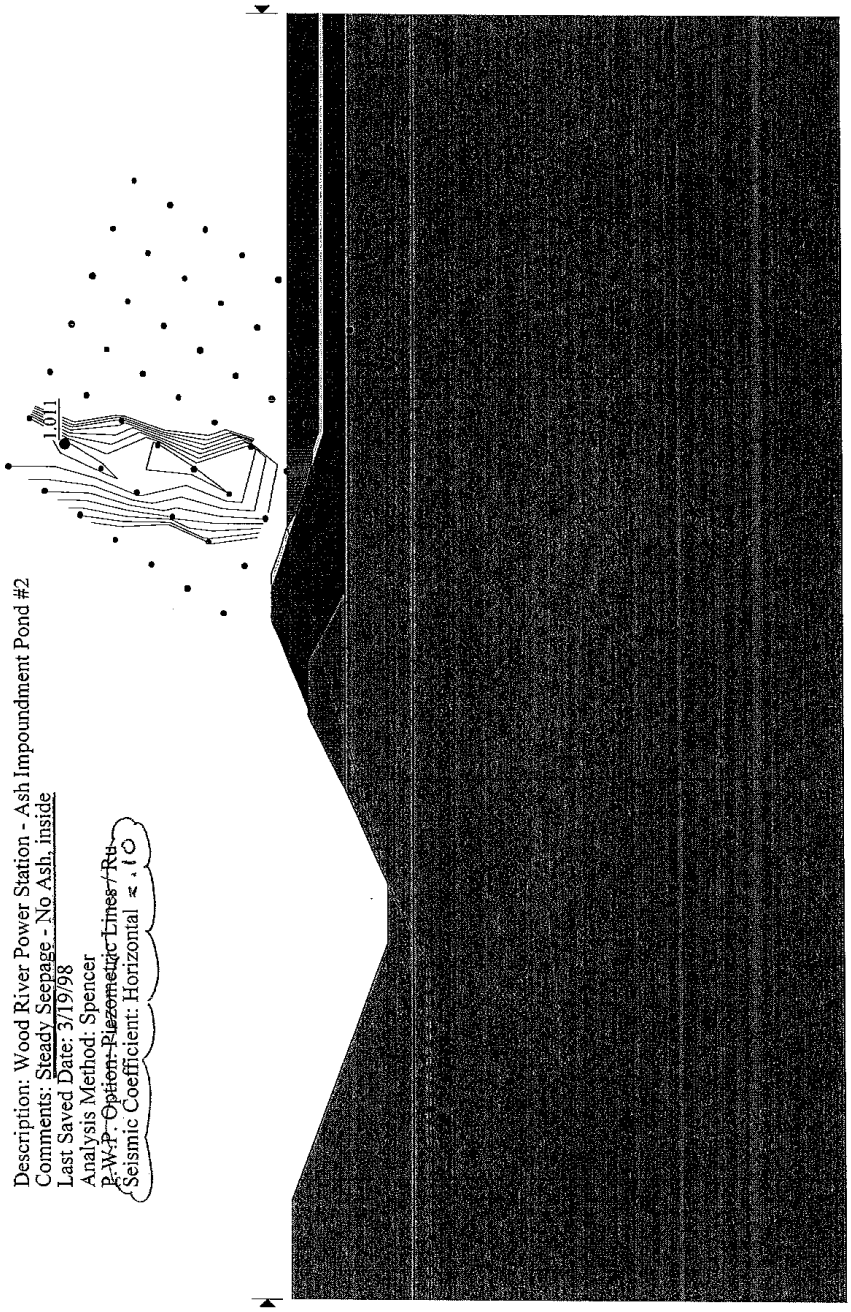
DRAFT


Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - No Ash inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
SAME CONFIGURATION W/ SEISMIC
WR 75


Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - No Ash, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
1813

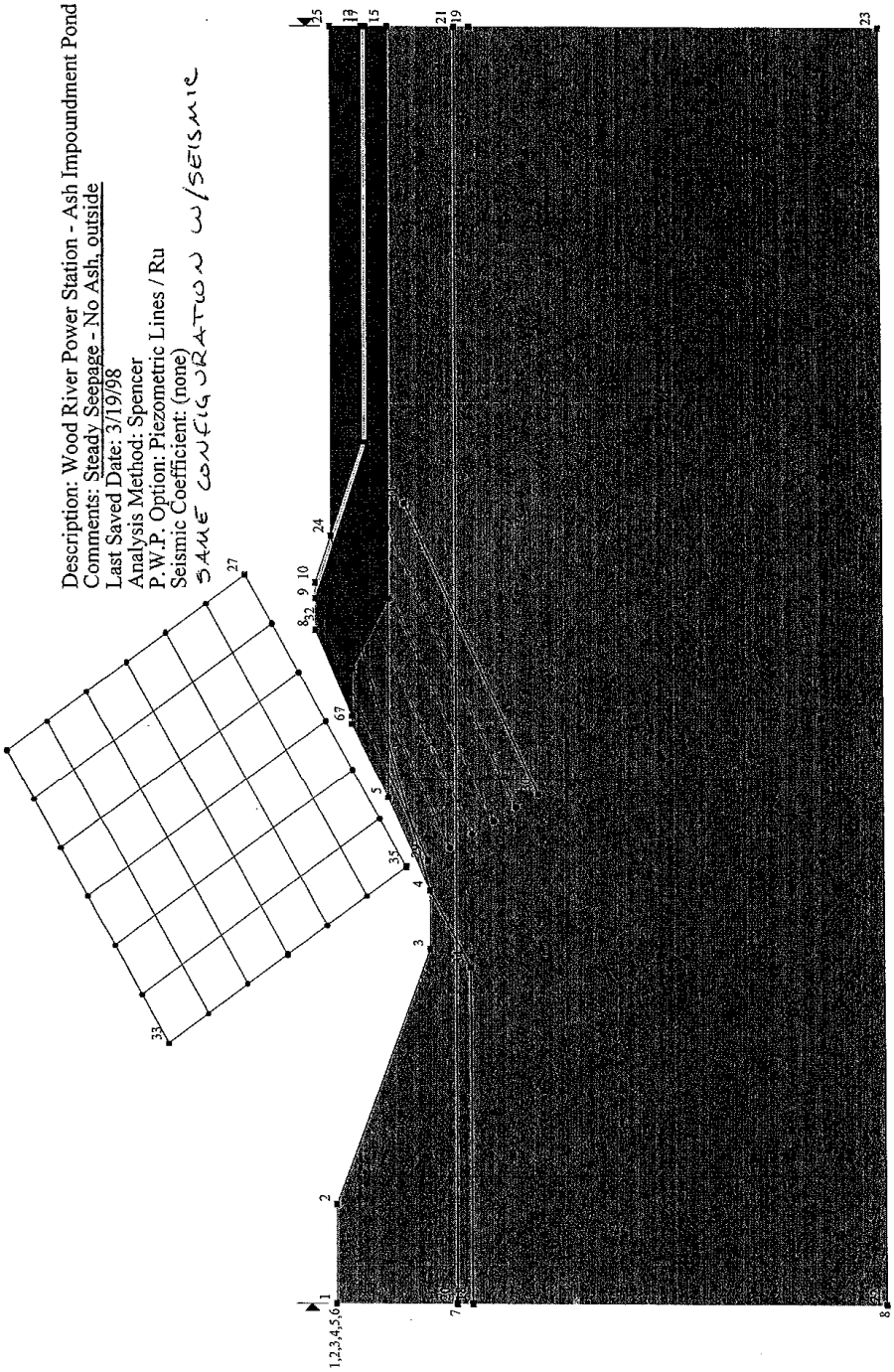
WR 76

DRAFT

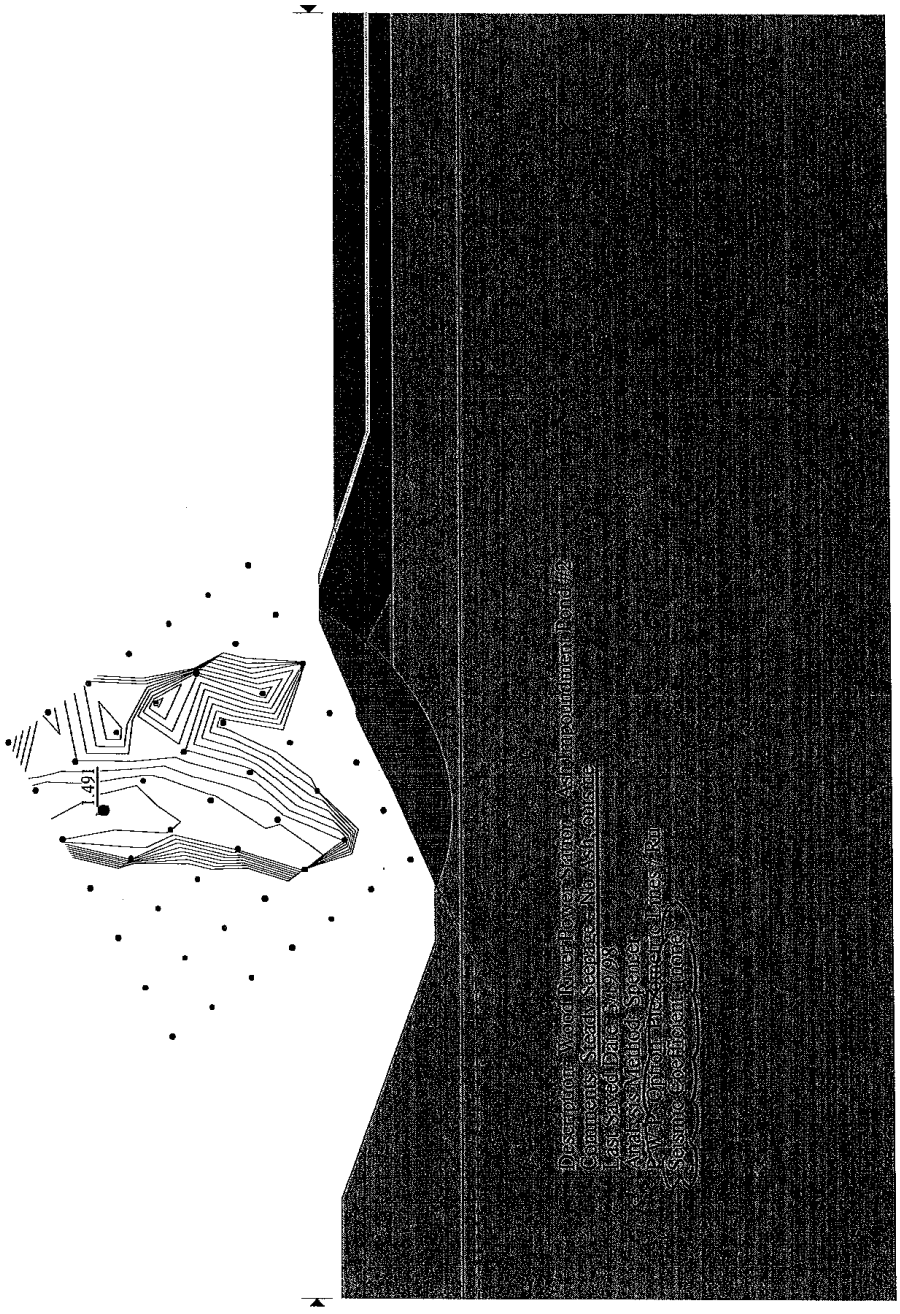

1.0/1.1
Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - No Ash, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P-W-P: Option: Piezometric Lines / Ru
Seismic Coefficient: Horizontal = .10

WE 77

DRAFT

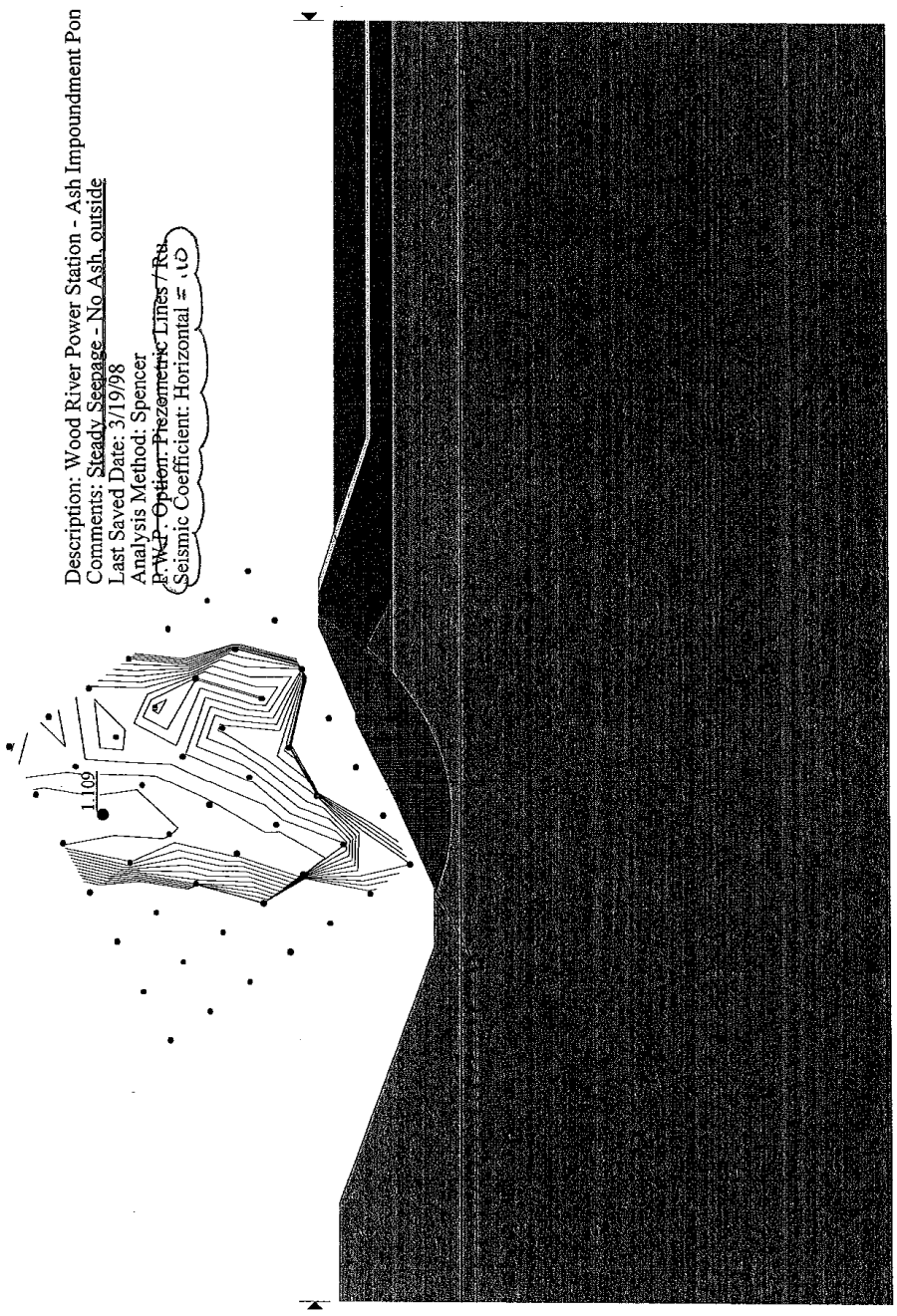

Description: Wood River Power Station - Ash Impoundment Pond
Comments: Steady Seepage - No Ash, outside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
SAME CONFIGURATION W/SEISMIC
1,2,3,4,5,6
7
8
33
WR 78

DRAFT


1.49
Description: Wood River Power Station Ash Impoundment Pond #2
Comments: Steady State Seepage Analysis
Last Saved Date: 3/1998
Analysis Method: Spencer
FS: 1.49 Phreatic Surface: Pool
Seismic Coefficient: none

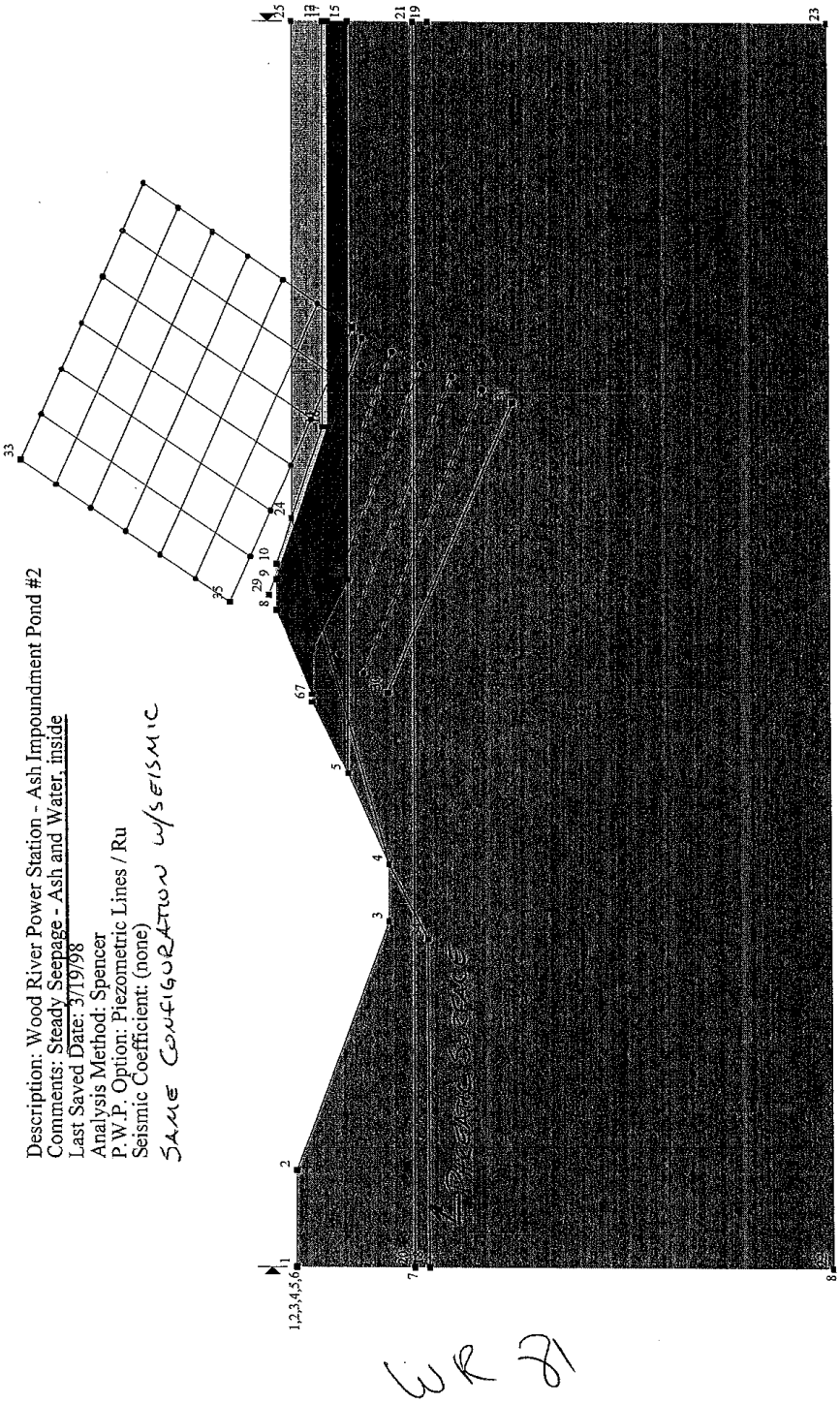
WR-79

DRAFT

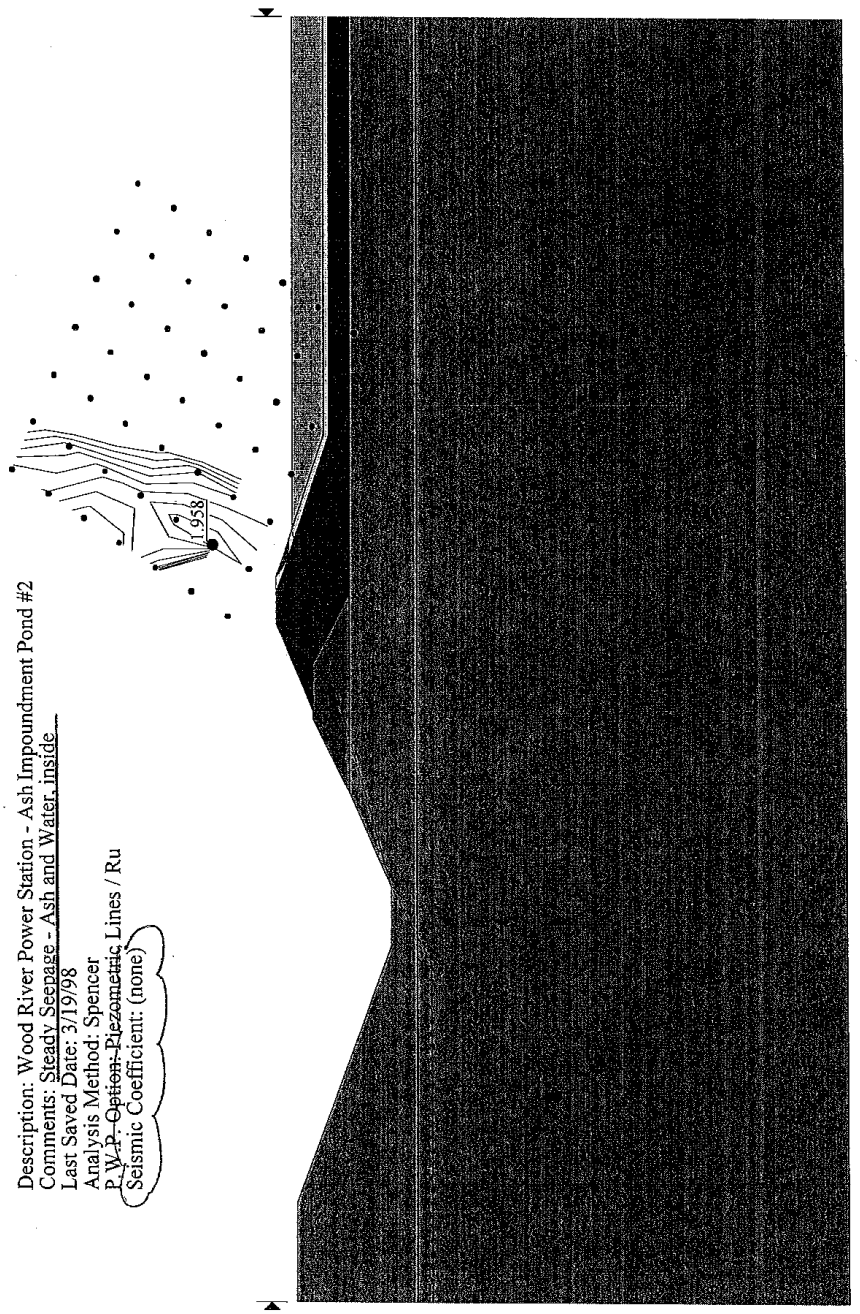

Description: Wood River Power Station - Ash Impoundment Pon
Comments: Steady Seepage - No Ash, outside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: Horizontal = .10
1.109

WR 80

DRAFT

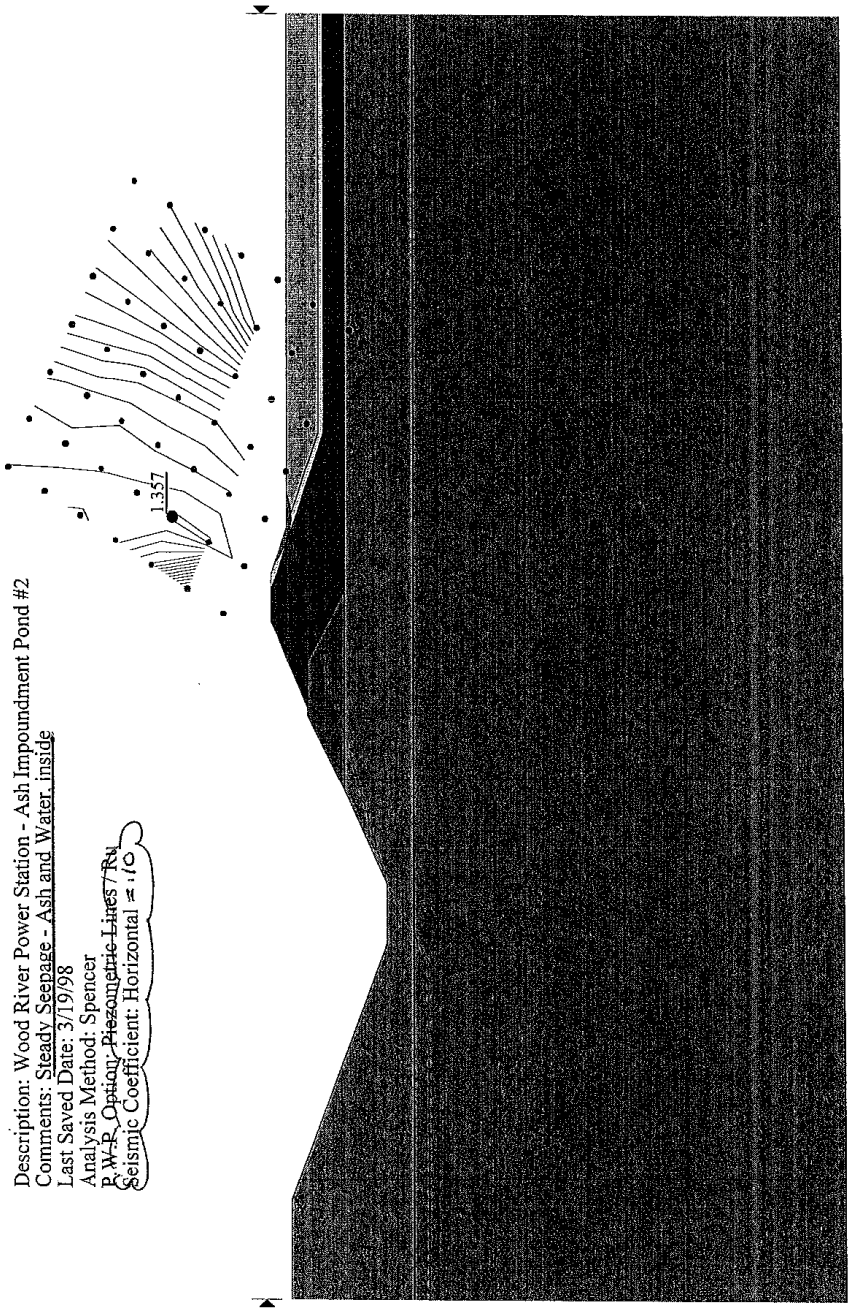

Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - Ash and Water, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
SAME CONFIGURATION W/SEISMIC
1,2,3,4,5,6
WR 21

DRAFT


Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - Ash and Water, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
1958

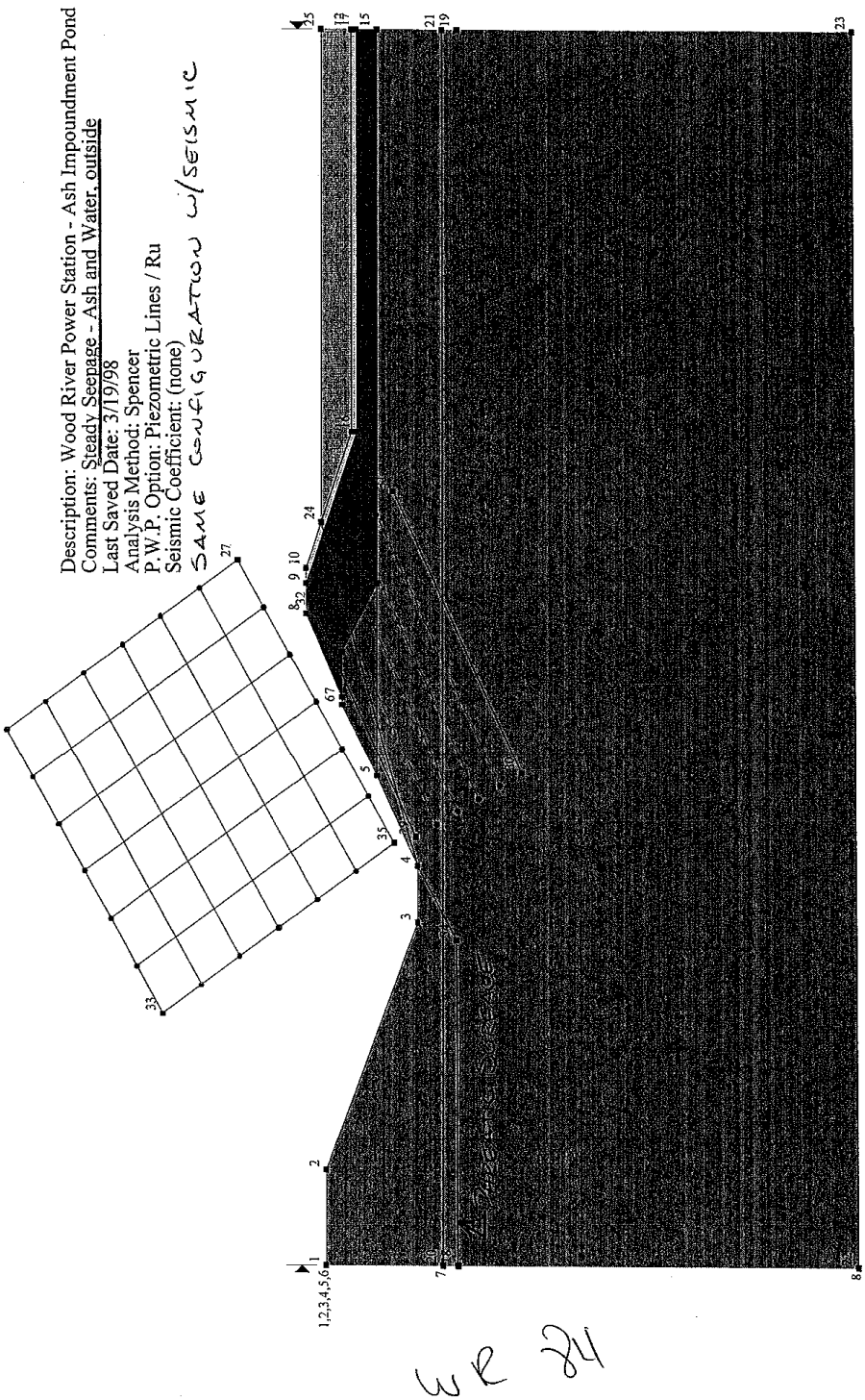
WR 32

DRAFT


Description: Wood River Power Station - Ash Impoundment Pond #2
Comments: Steady Seepage - Ash and Water, inside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: Horizontal = 0.10
1.357

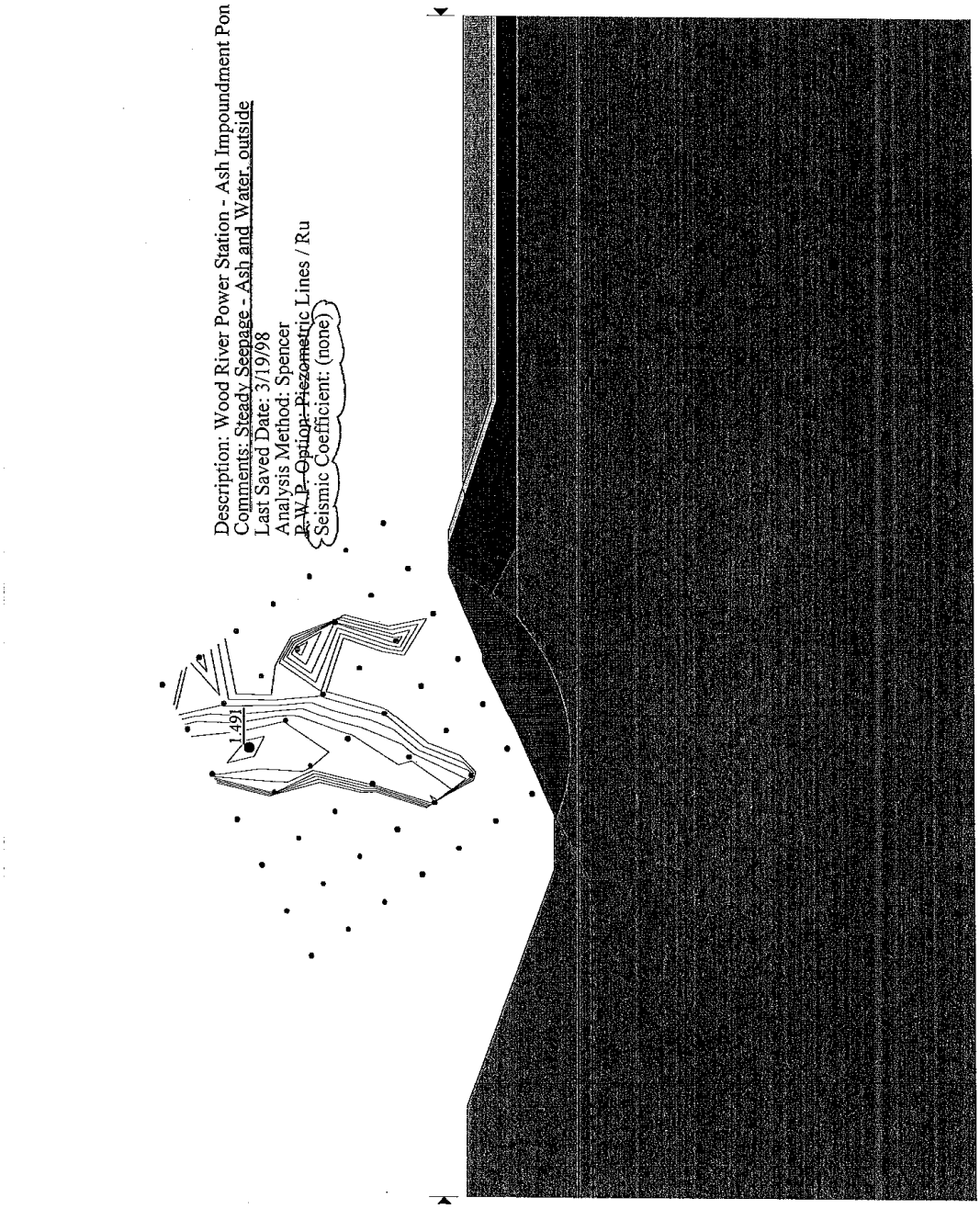
WR 83

DRAFT


Description: Wood River Power Station - Ash Impoundment Pond
Comments: Steady Seepage - Ash and Water, outside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
SAME CONFIGURATION W/SEISMIC
1,2,3,4,5,6
7
8
9 10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
33
35
67

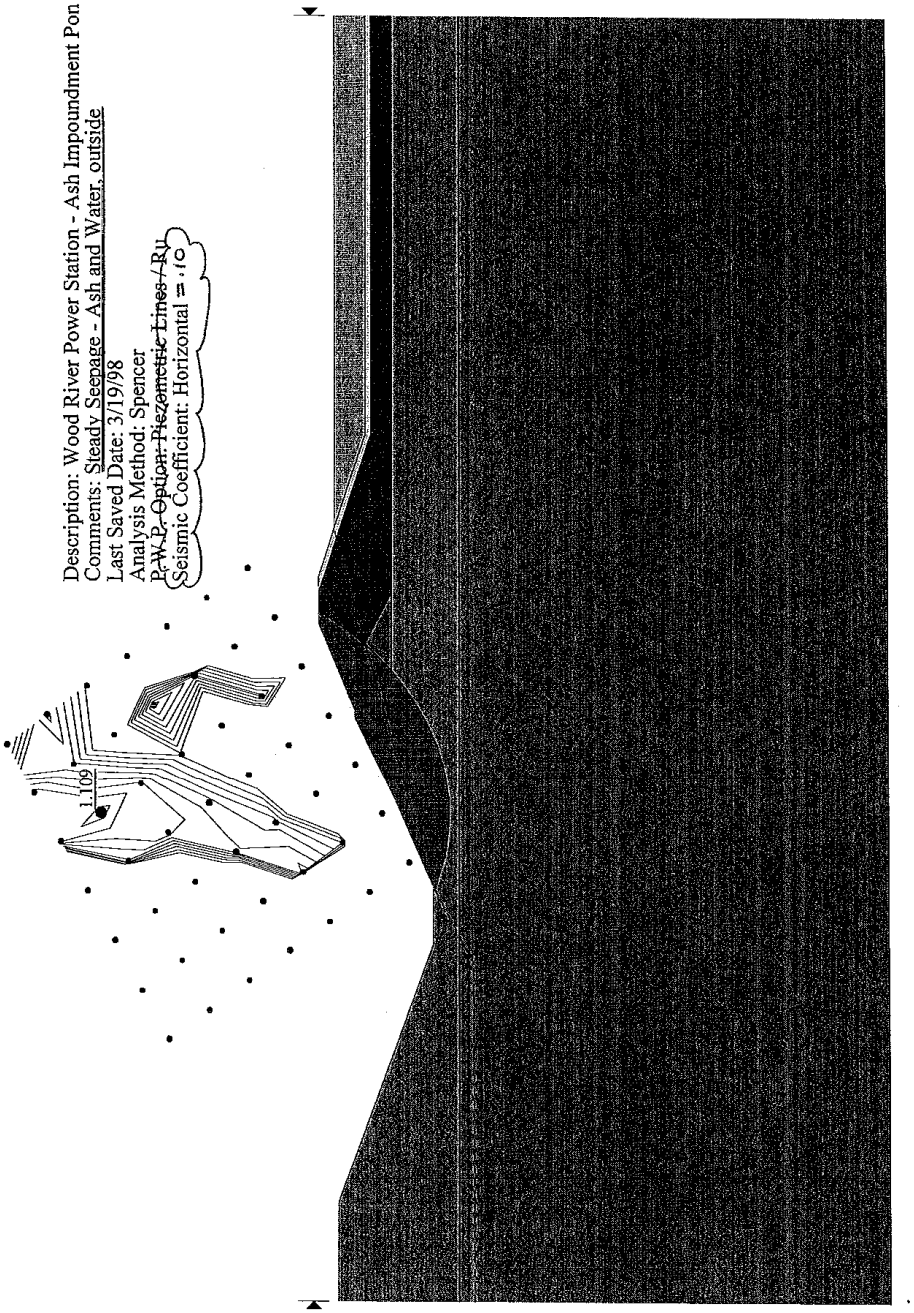
WR 24

DRAFT


Description: Wood River Power Station - Ash Impoundment Pon
Comments: Steady Seepage - Ash and Water, outside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P.W.P. Option: Piezometric Lines / Ru
Seismic Coefficient: (none)
1.491

WR 85

DRAFT


Description: Wood River Power Station - Ash Impoundment Pon
Comments: Steady Seepage - Ash and Water, outside
Last Saved Date: 3/19/98
Analysis Method: Spencer
P-W-P- Option: Piezometric Lines / Ru
Seismic Coefficient: Horizontal = .10
1.109

WR 86

DRAFT

ATTACHMENT #2

STANDPIPE - UNCONTRACTED WEIR CALCULATION

WR 87

DRAFT

Wood River Ash Impoundment System				
Pond #2 Outfall				
Uncontracted Weir				
(Standpipe)				
Pond #2 - Weir Eqs.	Input			
Q = CLH^1.5	D = Dia. (ft)			
L = PI*D	p = Weir Ht. (ft)			
C = 3.22 + 0.4(H/p)	H = Head (ft)			
	E1 = Weir Elev.			
	E2 = Top of Berm Elev.			
	Constants			
	p	D	E1	E2
	4.00	2.00	430.00	434.00
	Elevation (ft)	Head (ft)	C	Q (cfs)
	430.00	0.00	3.22	0.00
	430.20	0.20	3.24	1.82
	430.40	0.40	3.26	5.18
	430.60	0.60	3.28	9.58
	430.80	0.80	3.30	14.84
	431.00	1.00	3.32	20.86
	431.20	1.20	3.34	27.59
	431.40	1.40	3.36	34.98
	431.60	1.60	3.38	42.99
	431.80	1.80	3.40	51.60
	432.00	2.00	3.42	60.79

10 cfs

WR88

Attachment #2

DRAFT

ATTACHMENT #3

FREEBOARD CALCUATIONS

WR 89

DRAFT

N100-203 (1-81) CALCULATION SHEET Date _____

Design by JPK Date 3/3/98 Checked by _____ Sheet No. _____

Project WOOD RIVER

Subject _____ File No. _____

FREEBOARD CALCS FOR NEW POND #2

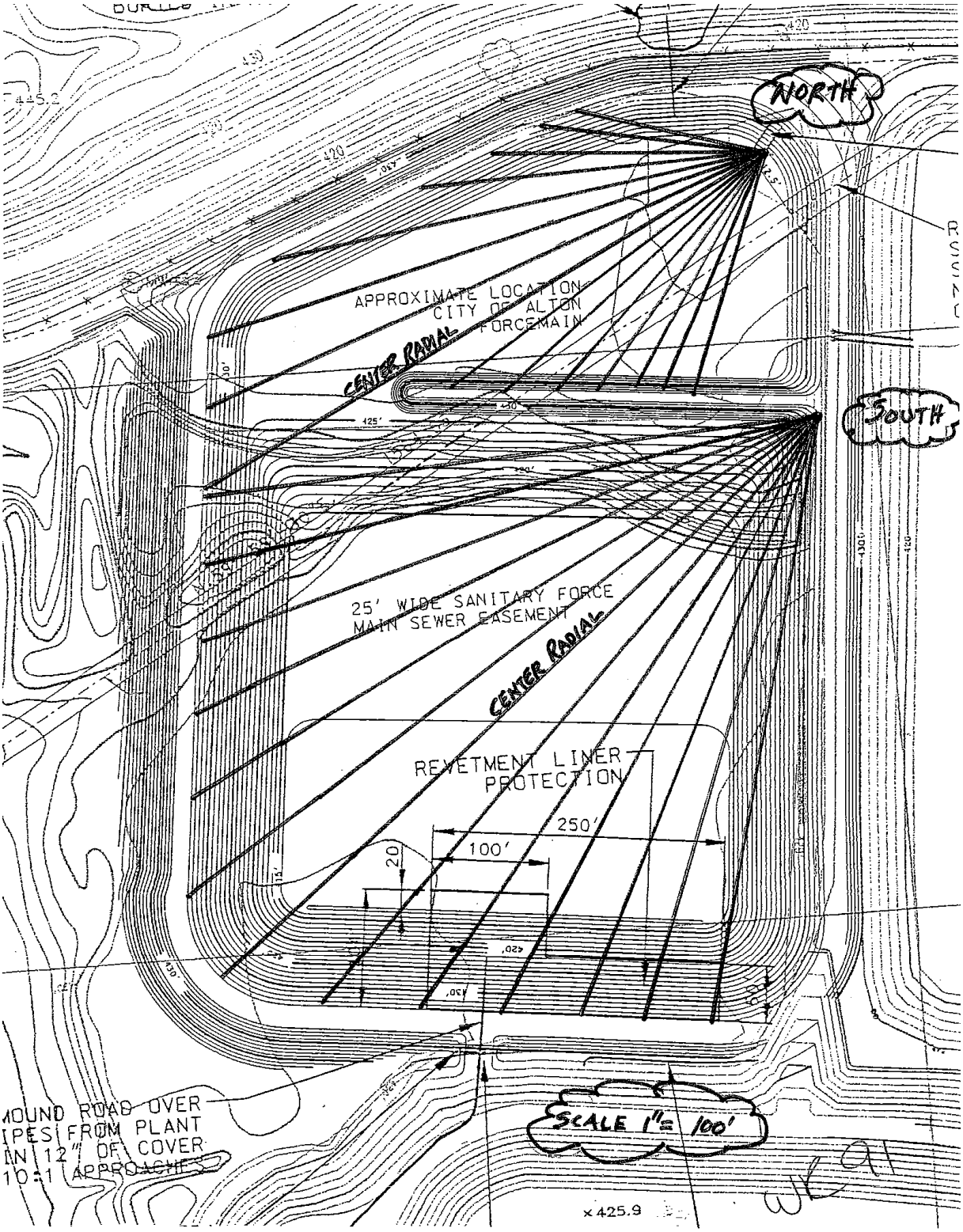
TOP of DAM = 434.0 MSL
$\theta = \tan^{-1} 1/4 = 14.04°$
WIND INFO STAYS THE SAME,
USE DESIGN WIND 65 mph

CALC FREEBOARD FOR NORTH & SOUTH FETCHES

SOUTH	NORTH
Feff = .112 mi	Feff = .062 mi
SEE NEXT 2 SHEETS	
FROM FIG 11 USING 65 MPH WIND & APPLICABLE FETCH:	
H_s = 1.1 ft	H_s = 1.0 ft
DUR = 3.16 min	DUR = 3.5 min
FROM FIG 12:	
PERIOD T = 1.7 SEC	PERIOD T = 1.6 sec
$L_o = 5.12T^2$ = 14.8 ft	$L_o = 5.12T^2$ = 13.1 ft
DEPTH @ TOE = 16 ft	DEPTH @ TOE = 5 ft
SINCE D > .5L_o WAVES NOT AFFECTED BY BOTTOM	SINCE D < .5L_o WAVES AFFECTED BY BOTTOM

THE REMAINING INFO WAS TAKEN FROM "WAVE CHARACTERISTICS, WAVE RUNUP, AND WIND SETUP COMPUTATIONAL MODEL" by B.P. BODINE, COE, SW DIV (1986)

WK 90


NORTH
SOUTH
APPROXIMATE LOCATION
CITY OF ALTON
FORCEMAIN
CENTER RADIAL
25' WIDE SANITARY FORCE
MAIN SEWER EASEMENT
CENTER RADIAL
REVETMENT LINER
PROTECTION
250'
100'
20
SCALE 1"= 100'
MOUND ROAD OVER
IPES FROM PLANT
IN 12" OF COVER
10:1 APPROACHE
425.9

Effective Fetch Calculations

SOUTH FETCH

alpha	cos(alpha)	xi	xi*cos(alpha)
42	0.743	510	379.00
36	0.809	530	428.78
30	0.866	545	471.98
24	0.914	560	511.59
18	0.951	585	556.37
12	0.978	620	606.45
6	0.995	670	666.33
0	1.000	710	710.00
-6	0.995	690	686.22
-12	0.978	645	630.91
-18	0.951	600	570.63
-24	0.914	570	520.72
-30	0.866	550	476.31
-36	0.809	535	432.82
-42	0.743	530	393.87
Σ =	13.511	Σ =	8041.99

Feff = 595.2213 feet
= 0.112731 miles

NORTH FETCH

alpha	cos(alpha)	xi	xi*cos(alpha)
42	0.743	220	163.49
36	0.809	230	186.07
30	0.866	240	207.85
24	0.914	255	232.95
18	0.951	270	256.79
12	0.978	310	303.23
6	0.995	345	343.11
0	1.000	570	570.00
-6	0.995	530	527.10
-12	0.978	505	493.96
-18	0.951	435	413.71
-24	0.914	300	274.06
-30	0.866	240	207.85
-36	0.809	190	153.71
-42	0.743	165	122.62
Σ =	13.511	Σ =	4456.50

Feff = 329.8443 feet
= 0.062471 miles

DRAFT

DRAFT

N100-203 (1-81) CALCULATION SHEET Date

Design by JPK Date Checked by Sheet No.

Project WR

Subject File No.

SOUTH NORTH

$L_{SHALLOW} = T\sqrt{gd}$
$= 1.16\sqrt{32.2(5)} = 20.3$ ft

RUNUP FOR SMOOTH SLOPES (EQ 16 of REF.)

$R = H_s \sin\theta (5.95 \tan\theta + 1.5)\left(\frac{1.123L}{L}\right)^a$

where $a =$

$\sqrt{H/d}\,(1.58 - 2.35\tan\theta + .092\cot\theta - .26)$

$\sqrt{H/d}\,(1.58 - 2.35\tan 14.04 + .092\tan(90 - 14.04) - .26)$

$\sqrt{H/d}\,(1.100)$

$R = \sqrt{1.1/16}\,(1.1) = .288$ $R = \sqrt{1.10/5}\,(1.1) = .778$

$R_u = 1.5R = .432$ ft $R_u = 1.5R = 1.17$ ft

$SETUP = \frac{U^2F}{1400D}$

$S = \frac{65^2(.112)}{1400(16)} = .021$ $S = \frac{65^2(.062)}{1400(5)} = .037$

100 yr STORM = .68'

TOTAL FREEBOARD

$.432 + .021 + .68 = 1.113$ $1.17 + .037 + .68 = 1.88$

AVAILABLE FREEBOARD IS 3.3ft ∴ OK ✓

WK 93

DRAFT

ATTACHMENT #4

IDNR LETTER WITH ATTACHMENTS - POLYPROPYLENE MEMBRANE

WR 94

DRAFT

Illinois Power Company
P.O. Box 511
Decatur, IL 62525-0511

ILLINOIS POWER
An Illinova Company

March 3, 1998
BJM98005

Illinois Department of Natural Resources
Office of Water Resources
524 So. Second St.
Springfield, IL 62701-1787

Attn: Mr. Dennis L. Kennedy, P.E.
Senior Water Resources Engineer

Mr. Kennedy:

Havana Power Station
New East Ash Pond Cell No. 2
IP's Response to IDNR's January 22, 1998 Letter

On September 26, 1997 Illinois Power (IP) submitted an application for an IDNR OWR Small Class 1 Dam Construction, Operating, and Maintenance Permit for a new flyash and bottom ash deposition cell at our Havana Power Station. This new cell (cell no. 2) would become the primary ash deposition cell for the station after the current primary east ash deposition cell (cell no. 1) becomes filled with ash. In your response to our application, you expressed several concerns and requested certain additional information of me in a letter dated January 22 of this year. Mr. David Gaskins (IP's Civil Engineer on this project) and Tom Davis (IP's environmental engineer on this project) have reviewed your letter. The additional information you requested and our response to the concerns expressed in your letter follow in the sections below.

As IP would like to construct the new cell this summer, your expeditious review of our response would be very much appreciated. I understand that Mr. Gaskins and Mr. Davis have already discussed the enclosed information and our responses with Mr. Michael Diedrichsen of your staff. Messrs. Gaskins and Davis and Mrs. Natalie Locke would like to meet with you at your earliest convenience to review our response. I understand that a meeting with you and Mr. Diedrichsen at your offices has been scheduled for Wednesday, March 4 for such a purpose.

Item 1

A copy of the construction and material specification is attached as you requested.

WR 95

DRAFT

Item 2

IP would prefer to use revetment fabric for controlling erosion beneath the auxiliary spillway, rather than a concrete slab. Mr. Diedrichsen indicated, during a recent conversation with Mr. Gaskins, that the IDNR had little information on the performance of revetment fabric for slope protection. IP has had very good success using revetment fabric for erosion control on other projects. Mr. Gaskins has requested that I include data from one manufacturer of revetment fabric for your review. We would like to further discuss the use of revetment fabric for slope protection on this project with you when we meet this week.

Item 3

Calculations are enclosed that show that dewatering one-half of cell no. 2 in seven days with pumps would require a total pump capacity of approximately 8,850 gpm (12.7 MGD). IP believes that providing pumps of this capacity is excessive because the cell will begin to fill with ash as soon as it is put into service. As the cell fills with ash, the pumping requirements for dewatering half the pond will decrease. The pond will be full of ash in approximately seven years assuming normal operations at the plant. Therefore, IP is requesting the Office of Water Resources to consider allowing us a longer dewatering period for the initial no-ash condition. If a longer period would be allowed, smaller, more economical pumps could be used.

IP owns a trailer-mounted, eight-inch pump it purchased for dewatering an old ash pond at our Wood River Station. This pump and its piping/hoses could be quickly transported to Havana should its ash pond need to be dewatered. This pump has a capacity of approximately 3,200 gpm (4.6 MGD) (see attached pump data sheets). IP is requesting the OWR to allow IP to use this pump for dewatering cell no. 2 should that ever become necessary.

Item 4

Wave wash erosion protection on the inside face of the embankments will be provided by the 45-mil reinforced polypropylene geomembrane liner. This material has excellent UV and chemical resistance and sufficient mechanical strength for this application. Polypropylene geomembranes are marketed specifically for exposed applications. This material has been successfully used for many years on a wide variety of pond projects. Mr. Gaskins has asked me to attach product information provided by the manufacturer which identifies various geomembrane physical properties and lists some of the projects in which this material has been used.

WRC96

DRAFT

Item 5

The outside face of the embankment will be protected from erosion by the same type of vegetative cover (primarily grass) that is currently protecting cell no. 1 and the polishing pond (cell no. 3). The attached project specifications give the seeding mix and planting requirements. Since this vegetative cover has performed well for the past several years, we expect similarly good performance on cell no. 2.

Emergency Spillway Pipes

After item 5 in your letter, you indicated that the emergency spillway pipes already installed in cell no. 1 require a modification of the existing permit. IP did not consider the installation of the internal emergency spillway pipes to be a major modification of the existing permit since these pipes are internal to the structure and do not affect any of the structural and hydraulic calculations originally submitted. In other words, the presence of the internal berm is not significant to the safety calculations of the facility. We have included as-built plans of these internal pipes so that your records are current and an explanation to address your concern of erosion on the berm around the pipes is provided below.

The emergency spillway pipes were installed in early 1997 as a precaution due to scaling of the standpipe in the cell no. 1 effluent structure. The standpipe was cleaned and no flow has gone through the emergency pipes since. The attached sketch shows the installation of these pipes. Erosion protection of the bank is provided by a concrete slab on both sides. The concrete slabs patch all areas of the original concrete revetment wave wash protection that was damaged during installation of the pipes.

As shown on the attached sketch, the emergency spillway pipes are nearly one foot above the operating level of cell no 1. Therefore, we do not expect any flow through them in the future. They do encroach on the original freeboard requirements for cell no. 1; however, IP believes that cell no. 1 no longer requires the same freeboard. Ash is at or slightly above water level over approximately two thirds (2/3) of the pond surface. Much of the remaining free water is shallow. From observations of cell no. 1, IP does not believe waves of one-foot height can be generated. Even if waves this high occurred, they would not be able to enter the spillway pipes because of the skimming devices around the inlets. If any water would flow through the spillway pipes, it would safely discharge into cell no. 3 without risk of erosion.

Modification of Existing Permit No. 20748

IP is herein withdrawing its request for a new Small Class 1 dam permit for cell no. 2 and is requesting that Permit No. 20748 be modified for the construction of cell no. 2. This would mean only one IDNR OWR permit would be issued for the east pond system of the station, rather than two.

WR 97

DRAFT

Modification of the Emergency Action Plan

IP does not believe it is necessary at this time to modify the format of its existing Emergency Action Plan to conform to the format recommended by the Interagency Committee on Dam Safety (ICODS). IP understands this format is not currently mandatory and IP believes the current format of its plan is adequate and much easier for the plant personnel to understand.

IP trusts that this information adequately addresses the concerns in your January 22, 1998 letter. Messrs. Gaskins and Davis, and Mrs. Locke will discuss this information with you in detail on Wednesday, March 4. In the meantime, please feel free to contact me (424-6833), Tom Davis (424-7322), or David Gaskins (424-7023) if you have questions about our response.

Sincerely,

ILLINOIS POWER COMPANY

Brett J. Marshall

Brett J. Marshall
Group Leader - Water
Environmental Resources Department
Mail Code: A-17

Enclosures

cc: F.E. Rosenberger - S-05
J.E. Lamb/D.M. Gaskins - C-25
T.L. Davis - A-17/N.E. Locke - T-33
B.J.Marshall/R.L. Willmore - A-17

WK 98

DRAFT

KELRON Environmental

LOG OF BORING MW39

ast Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SW/NE/SW

Date Started/Finished : 6/14 – 6/15/2004
Hole Diameter : 8.5 / 3.875 inch
Drilling Method : Hollow Stem / Rotary
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Crovens (Kel
Land Surface Elevation: 437.3
X,Y Coordinates : 510737, 801409

Depth In Feet	DESCRIPTION	Surf. Elev. 437.3	Samples	Recovery Inches	Blow Count	Qp TSF	USCS	GRAPHIC
75	SAND (fine to medium, trace coarse), well graded	362						
80		357						
			28	16	9 20 22 24			
85		352					SW	
90		347						
			29	17	9 16 19 27			
95		342						
100								

GW314

DRAFT

KELRON Environmental

LOG OF BORING MW39

(Page 5 of 5)

East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SW/NE/SW

Date Started/Finished : 6/14 - 6/15/2004
Hole Diameter : 8.5 / 3.875 inch
Drilling Method : Hollow Stem / Rotary
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 437.3
X,Y Coordinates : 510737, 801409

Depth in Feet	DESCRIPTION	Surf. Elev. 437.3	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
100		337					SW	
	Sandy SILT, fine to coarse sand, trace fine gravel, light gray, moist		30	24	15 25 21 27	2.25		
105	SILT, trace fine sand and gravel, light gray, moist	332					ML	
110		327						
	Silty CLAY, trace sand and fine gravel (subangular to rounded), larger clasts are limestone and quartz, very hard, moist. Diamicton.							
115		322					CL	
120		317	31	24	12 22 29 38	>4.5		
125	END BOREHOLE AT 124 FEET BLS							

WR315

DRAFT

KELRON Environmental

LOG OF BORING MW40M

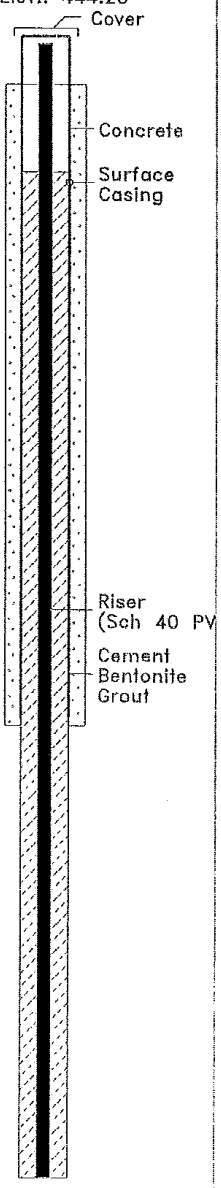
East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/10 – 6/14/2004
Hole Diameter : 12.5 / 8.5 Inches
Drilling Method : Hollow Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 441.05
Top of Casing Elevation: 444.20
Coordinates : 510477, 800633

Depth In Feet	DESCRIPTION	Surf. Elev. 441.05	Samples	Recovery Inches	Qp TSF	Blow Count	USCS	GRAPHIC
0	FILL – Gravel (coarse), sand, clay, brown, dry	441	1	21	0.5	7 7 8	FL	
	FLYASH, trace coal, medium to dark gray, moist		2	18	0.5	9 9 13		
5	– wet – moist – bottom ash with flyash seams – flyash	436	3	22	1.0	3 4 1 2		
	– bottom ash with trace coal, moist to wet		4	22	1.5	3 7 3 10	FL	
			5	24	1.75	11 11 8 10		
10	– flyash, wet	431	6	24	<0.5	9 8 1 2		
	Note: Surface Casing = 10.75 inch O.D. PVC installed to 14.5 feet below grade.		7	24	2.0	1 1 0 0		
	Silty CLAY, few roots, low to medium plasticity, dark gray, moist					1 4 5	CL	
	SILT, dark gray, wet					7	ML	
15	SAND (fine to medium) with clay, well graded, brown, moist	426	8	21	>4.5	14	SW CL	
	Silty CLAY, low plasticity, light ray, moist					15 3 8 11		
	SAND (fine to medium) with clay, trace fine gravel, well graded, light brown, moist		9	18		13 4 9 11	SW	
			10	18		14 5 8 10		
20	SAND (fine), poorly graded	421	11	19		10 2 6 20	SP	
	– fine to coarse, well graded		12	20		31	SW	
	– fine, poorly graded						SP	
25								

Well: MW40M
Elev.: 444.20



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KELRON Environmental

LOG OF BORING MW40M

East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/10 – 6/14/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 441.05
Top of Casing Elevation: 444.20
N,E Coordinates : 510477, 800633

Well: MW40M
Elev.: 444.20

Depth in Feet	DESCRIPTION	Surf. Elev. 441.05	Samples	Recovery inches	Qp TSF	Blow Count	USCS	GRAPHIC
25		416				2 9 19 18	SP	
30	– fine to medium, well graded, wet	411	13	19			SW	
	CLAY, Clayey SILT, and Silty CLAY in alternating layers		14	22	0.75	1 1 2 2 0 1 2 3	CH–ML	
35	– Clayey SILT at 34.75 to 35 feet has trace roots, black organics, non–plastic, olive gray	406	15	21	1.0			
	SAND (fine), poorly graded, olive gray, wet		16	23		0 0 2 4 0 1 1	SP	
	Silty CLAY, non to high plasticity, olive gray, moist		17	24	1.0	8	CL	
40	SAND (fine to medium), trace coarse sand, well graded, olive gray, wet	401					SW	
	SAND (fine), poorly graded		18	24	0.75	0 1 2 4	SP	
	Silty CLAY, high plasticity, moist						CH	
	SAND (fine), poorly graded, medium gray, wet		19	24		0 3 4 6 1 1 2	SP	
45		396	20	24		3		
	CLAY with silt, high plasticity, olive gray, moist		21	14	1.0	1 1 2 4 0 1 3	CL	
	wr 3/7		22	0		5	SW	
50								

Cement Bentonite Grout
Riser (Sch 40 PVC
Bentonite Grout

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LOG OF BORING MW40M

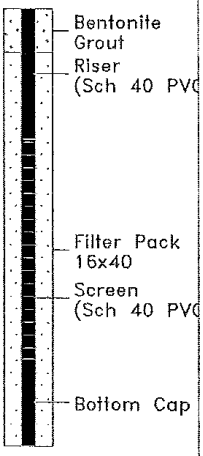
East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/10 – 6/14/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 441.05
Top of Casing Elevation: 444.20
N.Y. Coordinates : 510477, 800633

Depth in Feet	DESCRIPTION	Surf. Elev. 441.05	Samples	Recovery inches	Qp TSF	Blow Count	USCS	GRAPHIC
50	SAND (fine to medium), well graded, dark gray, wet	391	23	5		3 4 6 6		
55		386	24	15		1 5 13 23	SW	
60	END BOREHOLE AT 60.0 FEET BLS	381	25	13		3 6 18 23		
65		376						
70		371						
75								

Well: MW40M
Elev.: 444.20



WR318

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KELRON Environmental

LOG OF BORING MW41

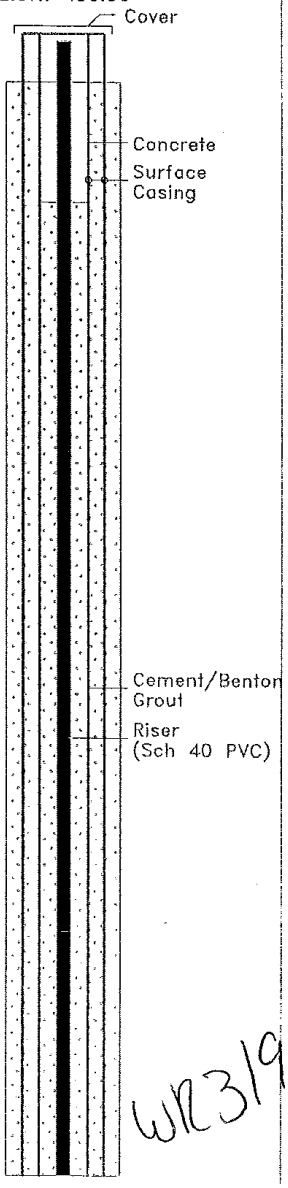
Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/21 - 6/23/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 448.11
Top of Casing Elevation : 450.96
X,Y Coordinates : 509910, 800592

Depth in Feet	DESCRIPTION	Surf. Elev. 448.11	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
0	FLYASH, medium gray, moist	448	1	20	2 3 5 8			
5	Note: Surface Casing = 10.75-inch O.D. PVC installed to 24.5 feet below grade. Cement-bentonite grout around surface casing extends to 30 feet below grade.	443						
	- wet		2	24	8 12 12 11	2.5	FL	
10		438						
	- moist							
	- bottom ash, trace coal, wet		3	18	1 5 8 5	0.5		
15		433						
	- alternating layers of bottom ash and flyash, light to medium gray, moist to wet		4	21	7 9 7 7	1.0		
20								

Well: MW41
Elev.: 450.96



WR319

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KELRON Environmental

LOG OF BORING MW41

(Page 2 of 3)

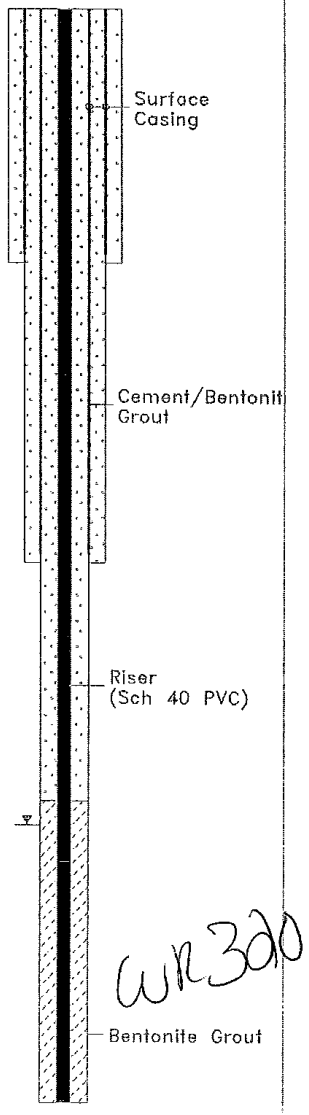
:ast Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/21 – 6/23/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 448.11
Top of Casing Elevation : 450.96
N, E Coordinates : 509910, 800592

Depth in Feet	DESCRIPTION	Surf. Elev. 448.11	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
20		428	5	20	5 7 7	1.5		
			6	21	5 5 8	1.0		
			7	22	7 6 6	1.5	FL	
25	– bottom ash, dark gray, wet	423			13 13 8			
	– flyash		8	7				
	CLAY, few roots, high plasticity, dark gray, wet		9	21	0 2 3 3	2.25		
30		418						
	Silty CLAY, high plasticity, light gray, moist							
	– dark gray		10	23	0 2 2 3	1.0	CH	
35		413						
	CLAY, few silt, high plasticity, medium gray w/ intermittent brown mottling							
			11	24	1 3 3 5	1.75		
40								

Well: MW41
Elev.: 450.96



WR320

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KELRON Environmental

LOG OF BORING MW41

(Page 3 of 3)

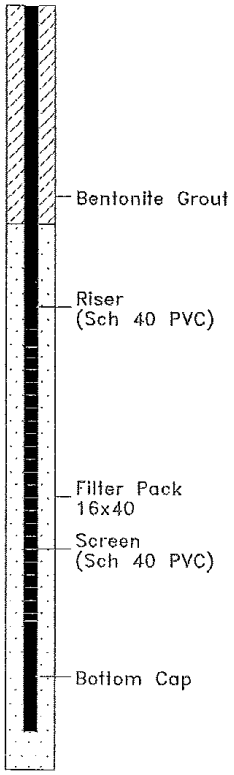
East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SE/SW/SW

Date Started/Finished : 6/21 - 6/23/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 448.11
Top of Casing Elevation : 450.96
N,E Coordinates : 509910, 800592

Depth in Feet	DESCRIPTION	Surf. Elev. 448.11	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
40		408	12	24	2 2 2 2 2	1.75	CH	
	SILT, brown, wet		13	24	12 16 17	1.5	ML	
	SAND (fine), few silt, poorly graded, light grading to medium brown, wet				3		SP	
45	CLAY, trace silt, medium gray, moist	403	14	24	8 12 16		CL	
	SAND (fine to medium), trace coarse sand and fine gravel, well graded, light brown, wet		15	20	0 6 13 15			
	- medium brown							
50		398					SW	
	- medium brown-gray		16	15	8 10 8 7			
	END BOREHOLE AT 54 FEET BLS							
55		393						
60								

Well: MW41
Elev.: 450.96



WR 391

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BORING LOGS

DYNEGY WOOD RIVER EAST ASH POND EXPANSION TO EL. 453

Prepared for

Dynegy Midwest Generation
No. 1 Chessen Lane
Alton, IL 62002

February 8, 2005

URS

21561435.00000

WR 257

DRAFT

BORING LOGS

TABLE OF CONTENTS

SECTION 1 URS SOIL BORING LOGS

SECTION 2 URS CPT SOUNDINGS LOGS

SECTION 3 SHIVELY SOIL BORING LOGS

SECTION 4 KELRON MONTORING WELL BOING LOGS

UR 258

DRAFT

Figure No.

LOG of BORING No. B-5-04-1

Sheet 1 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Grass and organic soil	435.8									Boring advanced using 4.25" I.D. Hollow stem augers
		3	89	Loose, moist, dark gray, fly ash FILL with gray silty clay	0.3									
		3												
		5												
		4	100	Becomes moist to wet										
5		4												
		3												
		WH	100	Becomes very loose and wet										
		WH												
		WH												
		P	17											
10														Begin Mud Rotary drilling
		WH	50											
		WH												
15		WH		Becomes very soft to very loose										
					419.0									
				Medium stiff, wet, gray, low plastic sandy silty CLAY (CL-ML)	17.0									
		WH	100				1.3			23				
		1												
20		2												
														Drillers accidentally put a spiltspoon on rods

Completion Depth: 65.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.
Logged by: G. Jones

Water Depth: 6 ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR259

DRAFT

Figure No.

LOG of BORING No. B-5-04-1

Sheet 2 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25	P		100	Becomes soft to medium stiff, tan/gray, sand grades out			0.8							
					408.0									
		WH		Medium stiff, wet, tan/gray, high plastic,	28.0									
		WH	100	Silty CLAY (CH)			1.8			36	79	25		
30		1												
	P		100				1.5							
35														Losing mud in hole: approximately 20 gallons
					398.0									
				Very soft, wet, gray, low plastic sandy	38.0									
	5		100	CLAY (CL)	397.0									
	6			Medium dense, wet, gray, fine grained	39.0									
40	7			SAND (SP)										
	11		83	Becomes medium grained						21				
	16													
45	13													
					389.0									
				Medium dense, wet, gray, fine grained silty	47.0									
	6		83	SAND (SP-SM)										
	12													
	13													

Completion Depth: 65.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 6 ft., After ATD hrs.
ft., After hrs.
ft., After hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY GPJ

URS

WR 260

DRAFT

Figure No.

LOG of BORING No. B-5-04-1

Sheet 3 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50					384.0									
				Medium dense, wet, gray, fine to medium grained SAND (SP)	52.0									
		10	72											
		11												
55		10												
		3	100	Becomes loose										
		4												
60		5			373.0									
				Medium dense, wet, gray, well graded SAND (SW)	63.0									
		12	56											
		13												
65		15			371.0									
				Bottom of boring at 65'	65.0									Approximately 30 to 40 gallons of mud lost
70														

Completion Depth: 65.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 6 ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR261

DRAFT

Figure No.

LOG of BORING No. B-5-04-2

Sheet 1 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0		3 6 6	67	Medium dense, moist, dark gray, fly ash FILL										Boring advanced using 4.25" I.D. Hollow stem augers
		P	100				2.0							
5		1	100		429.5		0.8							
		WH WH		Soft, moist, gray, low plastic clayey SILT to silty CLAY (CL-ML)	6.5									
		1 WH WH	0											
10														Begin Mud Rotary drilling
		1 WH WH	67	Becomes very soft, plasticity increases			0.5							
15														
		P	100				0.5			29				
										28				
20										27			1.2	
										27	28	15		
					414.0					25				
		1 1 WH	100	Medium stiff, wet, gray, low plastic, clayey sandy SILT (ML) with some soft seams	22.0		1.0							

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: N/A ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.
Logged by: G. Jones

B/10/04 WCCXS 21561435 DYNEGY GPJ

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DRAFT

Figure No.

LOG of BORING No. B-5-04-2

Sheet 2 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25														
		WH	100	Becomes very soft			0.5							
		WH		Becomes medium stiff, plasticity increases,			0.75							
30		WH		sand grades out										
					404.5									
				Stiff, moist to wet, gray, high plastic, Silty CLAY (CH)	31.5									
		P	100				1.3			56				
										39				
										43				
35										56	84	19	1.3	
				Becomes moist, silt grades out										
		WH	100				1.0							
		WH												
40		WH												
		WH	100				1.3							
		WH												
45		WH												
		WH	100				1.3			55	74	26		
		WH												
		WH												

Completion Depth: 60.0 Ft. Water Depth: N/A ft., After ATD hrs.

Project No.: 21561435.00000 _____ ft., After _____ hrs.

Project Name: Dynegy Wood River _____ ft., After _____ hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS WR 263

DRAFT

Figure No.

LOG of BORING No. B-5-04-2

Sheet 3 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 436.0 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50														
		WH	100	Becomes low plastic			1.8							
		WH												
55		1												
		WOH	100				1.8							
		2			376.2									
60		7		Medium dense, wet, gray, fine grained SAND (SP)	59.8 376.0									Approximately 5 gallons of mud lost
				Bottom of boring at 60'	60.0									
65														
70														

Completion Depth: 60.0 Ft.
Water Depth: N/A ft., After ATD hrs.
Project No.: 21561435.00000 ft., After hrs.
Project Name: Dynegy Wood River ft., After hrs.
Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS WR 204

Figure No.

LOG of BORING No. B-5-04-3

Sheet 1 of 3

DATE 6/4/04 SURFACE ELEVATION, FT 435.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Grass and organic soil	435.4									
		1 1 1	100	Very loose, dry to moist, gray, fly ash FILL	0.3									Boring advanced using 4.25" I.D. Hollow stem augers
		WH WH 1	44	Becomes moist to wet										
5		WH 1 1	89	Becomes wet ▽										
		1 1 1	100											
10														Begin Mud Rotary drilling
		WH 2 1	100		420.6									
15				Stiff, moist, brown / gray, low plastic sandy silty CLAY (CL)	15.0									
		P	100				1.8							
20		P	100											
		WH 1 2	100	Becomes wet, brown/tan, low to medium plastic, sand grades out			1.5							

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 6 ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

wl 265

Figure No.

LOG of BORING No. B-5-04-3

Sheet 2 of 3

DATE 6/4/04 SURFACE ELEVATION, FT 435.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25		P	100				1.5							Environmental Sample Shelby Tube
		P	100	Becomes medium stiff to stiff			1.0			52 33 35 38	40	16	1.3	
30														
		WH WH WH	100	Becomes stiff, low plastic			1.3							
35					398.6									
				Medium dense loose, wet, gray, fine grained silty SAND (SP / SM)	37.0									
		4 6 5	94							35				
40					392.6									
		10 15 17	89	Dense, wet, gray, medium grained SAND (SP)	43.0									
45														
		6 9 17	67	Becomes medium to coarse grained										

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 6 ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR 266

DRAFT

Figure No.

LOG of BORING No. B-5-04-3

Sheet 3 of 3

DATE 6/4/04 SURFACE ELEVATION, FT 435.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50					383.6									
				Dense, wet, gray, well graded SAND (SW)	52.0									
		12	67											
		15												
55		17												
					378.6									
				Medium dense, wet, gray, fine grained SAND (SP)	57.0									
		9	67											
		11												
60		14			375.6									
				Bottom of boring at 60'	60.0									Approximately 25 gallons of mud lost
65														
70														

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 6 ft., After ATD hrs.
ft., After hrs.
ft., After hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR247

DRAFT

Figure No.

LOG of BORING No. B-5-04-4

Sheet 1 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 446.1 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Medium dense, moist, gray, fly ash FILL										Boring advanced using 4.25" I.D. Hollow stem augers
		3	100											
		7												
		6												
		2	83											
		3		Becomes loose										
5		6												
		1	100	Becomes moist to wet										
		1												
		4												
		3	100											
		2			▽									
10		1		Becomes wet										Begin Mud Rotary drilling
		WH	100											
		1												
15		WH												
		P	75							50			1.2	
										49				
20										54			2.0	
										59				
		WR	100	Becomes very soft, with some coal fragments										

Completion Depth: 65.0 Ft. Water Depth: 9.5 ft., After ATD hrs.

Project No.: 21561435.00000 ft., After hrs.

Project Name: Dynegy Wood River ft., After hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY GPJ

URS

WR 268

DRAFT

Figure No.

LOG of BORING No. B-5-04-4

Sheet 2 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 446.1 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25					419.1									
				Very stiff, wet, gray / tan, low plastic sandy silty CLAY (CL)	27.0									
		1 4 5	100				3.5			20	28	19		
30														
		P	0											
35														
		1 1 1		Becomes moist, sand grades out			2.0							
40														
		P	100											
					401.1									
45				Loose to medium dense, wet, brown, fine grained silty SAND (SM)	45.0									
		5 4 12	72	Becomes medium dense, fine to medium grained										

Completion Depth: 65.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 9.5 ft., After ATD hrs.
ft., After hrs.
ft., After hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

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Figure No.

LOG of BORING No. B-5-04-4

Sheet 3 of 3

DATE 6/7/04 SURFACE ELEVATION, FT 446.1 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50														
		11	89											
		15												
55		12												
		6	56											
		6												
60		5												
					383.1									
		9		Dense, wet, fine to coarse grained silty SAND (SW) with some soft, gray silty clay seams	63.0									
		11												
65		30			381.1									
				Bottom of boring at 65'	65.0									Approximately 10 gallons of mud lost
70														

Completion Depth: 65.0 Ft. Water Depth: 9.5 ft., After ATD hrs.

Project No.: 21561435.00000 ft., After hrs.

Project Name: Dynegy Wood River ft., After hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

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DRAFT

Figure No.

LOG of BORING No. B-5-04-5

Sheet 1 of 3

DATE 6/8/04 SURFACE ELEVATION, FT 443.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Grass and organic soil	443.7									
		2	100	Loose, moist, gray, fly ash FILL	0.3									Boring advanced using 4.25" I.D. Hollow stem augers
		3												
		3												
		2	89											
		3												Rods are wet
5		2		▽										
		P	71							17				
										33				
		1	94	Becomes medium dense										
		3												
10		8												Begin Mud Rotary drilling
		5	78	Becomes soft and wet										
		3												
15		2												
		1	94											
		2												
20		3												
		1	100											
		WH												
		WH												

Completion Depth: 70.0 Ft. Water Depth: 5 ft., After ATD hrs.

Project No.: 21561435.00000 ft., After hrs.

Project Name: Dynegy Wood River ft., After hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS WR-271

Figure No.

LOG of BORING No. B-5-04-5

Sheet 2 of 3

DATE 6/8/04 SURFACE ELEVATION, FT 443.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25					416.9									
				Very stiff, moist, brown / gray, low plastic sandy silty CLAY (CL)	27.0									
		3	100				2.5			27				
		2												
30		3												
		P	0											
35					405.9									
		4	83	Loose, wet, brown, fine grained silty SAND (SM)	38.0 404.9									
		3		Very stiff, moist, brown, low to medium	39.0									
40		4		plastic sandy silty CLAY (CL)	404.2									
				Loose, wet, brown, fine grained silty SAND (SM)	39.8									
		8	56	Becomes medium dense, fine to medium grained						26				
		11												
45		12												
					396.9									
				Medium dense, wet, fine to coarse grained SAND (SW)	47.0									
		7	72											
		9												
		14												

Completion Depth: 70.0 Ft. Water Depth: 5 ft., After ATD hrs.

Project No.: 21561435.00000 ft., After hrs.

Project Name: Dynegy Wood River ft., After hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS WR272

Figure No.

LOG of BORING No. B-5-04-5

Sheet 3 of 3

DATE 6/8/04 SURFACE ELEVATION, FT 443.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50					391.9									
				Medium dense, wet, gray, fine to medium grained silty SAND (SM)	52.0									
		9	89											
		10												
55		11												
		7	50	Becomes fine grained										
		8												
60		12												
		16	67	Becomes dense, fine to medium grained										
		19												
65		16												
					376.9									
				Dense, wet, fine to coarse grained silty SAND (SW)	67.0									
		15	61											
		20												
70		17			373.9									
				Bottom of boring at 70'	70.0									Approximately 70 gallons of mud lost

Completion Depth: 70.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.
Logged by: G. Jones

Water Depth: 5 ft., After ATD hrs.
____ ft., After ____ hrs.
____ ft., After ____ hrs.

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

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DRAFT

Figure No.

LOG of BORING No. B-5-04-6

Sheet 1 of 3

DATE 6/2/04 SURFACE ELEVATION, FT 441.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Loose, moist, gray, fly ash FILL										Boring advanced using 4.25" I.D. Hollow stem augers
		1 5 5	100											
		1 7 6	100											
5		1 1 WH	100	Becomes wet										
		P	71							40 38 41 37				Begin Mud Rotary drilling
10		WH WH 1	100											
15														Rods are grinding
		1 WH 3	89											
20					418.6									
		1 2 3		Very stiff, moist, brown / tan, medium plastic silty CLAY (CL)	23.0		2.3			26	36	17		

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: _____ ft., After _____ hrs.
_____ ft., After _____ hrs.
_____ ft., After _____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR274

Figure No.

LOG of BORING No. B-5-04-6

Sheet 2 of 3

DATE 6/2/04 SURFACE ELEVATION, FT 441.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25		P	92		414.6									
				Medium, wet, tan / gray, fine grained silty SAND (SM)	27.0									
		5	100											
		7												
30		5			409.6									
				Soft to medium stiff, wet, tan / brown, silty CLAY (CH)	32.0									
		WH	100				0.5			39	57	15		
		WH												
35		3												
		P	67		401.6									
40				Medium dense, wet, tan, fine grained silty SAND (SM)	40.0									
		15	94											
		8												
45		18			394.6									
				Medium dense, tan wet, well graded SAND (SW)	47.0									
		11	67											
		6												
		11												

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: _____ ft., After _____ hrs.
_____ ft., After _____ hrs.
_____ ft., After _____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

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Figure No.

LOG of BORING No. B-5-04-6

Sheet 3 of 3

DATE 6/2/04 SURFACE ELEVATION, FT 441.6 DATUM NGVD LOCATION See Figure 1

DEPTH, ft	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50														
		8	56	Becomes gray										
		7												
55		7												
					384.6									
				Medium dense, wet, gray, coarse grained SAND (SP)	57.0									
		12	50											
		12												
		13			381.6									
60				Bottom of boring at 60'	60.0									Approximately 50 to 60 gallons of mud lost
65														
70														

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.
Logged by: G. Jones

Water Depth: _____ ft., After _____ hrs.
_____ ft., After _____ hrs.
_____ ft., After _____ hrs.

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URS WR-276

DRAFT

Figure No.

LOG of BORING No. B-5-04-7

Sheet 1 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 439.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Soft, moist, dark gray, fly ash FILL										Boring advanced using 4.25" I.D. Hollow stem augers
		2 1 1	89											
		2 1 2	100	Becomes loose, black and gray bottom ash and fly ash FILL										
5		P	100							18 14 32 17			0.3 1.4	
		4 7 9	72	Becomes medium dense, bottom ash grades out										
10					429.4									
		7 11 9	72	With same bottom ash	10.5									
		4 8 13	89	Hard, dry, brown, low plastic, sandy Silty CLAY (CL)	425.9 14.0		>4.5							
15														Begin Mud Rotary drilling
		2 4 6	78	Becomes moist										
20					417.9									
		P	100	Very stiff, moist, gray, high plastic CLAY (CH)	22.0		2.5			25 26				

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: N/A ft., After ATD hrs.
ft., After hrs.
ft., After hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

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DRAFT

Figure No.

LOG of BORING No. B-5-04-7

Sheet 2 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 439.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25					412.9					37 38	90	20	1.7	
				Loose, moist, brown and tan, fine grained silty SAND (SM)	27.0									
		2 2 3	83											
30					407.9									Stop drilling (6/1/04) Resume drilling (6/2/04)
				Stiff, wet, brown, medium plastic sandy silty CLAY (CL)	32.0									
		WH 2 2	83				1.5							
35														
		P	0											
40					397.9									
				Dense, wet, brown, fine grained silty SAND (SM) with gravel fragments	42.0									
		11 17 16	89											
45					392.9									
				Dense, wet, brown, well graded SAND (SW) with gravel fragments	47.0									
		13 18 13	94											

Completion Depth: 60.0 Ft. Water Depth: N/A ft., After ATD hrs.

Project No.: 21561435.00000 ft., After hrs.

Project Name: Dynegy Wood River ft., After hrs.

Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

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DRAFT

Figure No.

LOG of BORING No. B-5-04-7

Sheet 3 of 3

DATE 6/1/04 SURFACE ELEVATION, FT 439.9 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50														
		6 8 9	56	Becomes medium dense, gravel grades out										
55														
		5 11 18	67		380.4									
60				Medium dense, wet, gray, coarse grained SAND (SP)	59.5 379.9									Approximately 50 gallons of mud lost
				Bottom of boring at 60'	60.0									
65														
70														

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: N/A ft., After ATD hrs.
_____ ft., After _____ hrs.
_____ ft., After _____ hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS WR279

Figure No.

LOG of BORING No. B-5-04-8

Sheet 1 of 3

DATE 6/3/04 SURFACE ELEVATION, FT 441.5 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
0				Medium dense, moist, gray, fly ash FILL										Boring advanced using 4.25" I.D. Hollow stem augers
		3 7 9	100											
		2 3 2	100	Becomes loose										
5		1 1 WH	100	Becomes very loose										
		WH WH 1	100	Becomes wet ▽										Begin Mud Rotary drilling
10														
		P	75							59 60 53 59			1.5 1.4 3.1	
15														
		1 WH 1	100											
20														
					418.5									
		1 1 2	100	Very stiff, wet, gray, medium plastic silty CLAY (CL)	23.0									

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.
Logged by: G. Jones

Water Depth: 9 ft., After ATD hrs.
_____ ft., After _____ hrs.
_____ ft., After _____ hrs.

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URS

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Figure No.

LOG of BORING No. B-5-04-8

Sheet 2 of 3

DATE 6/3/04 SURFACE ELEVATION, FT 441.5 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
25		P	100											
		WH	100	Becomes stiff, low plastic, with some sand			1.3			29				
		WH												
30		WH												
		P	100											
35		P	100											
					404.5									
				Dense, moist to wet, brown, fine grained silty SAND (SM)	37.0									
		13	100											
		15												
40		16												
		11	89	Becomes medium dense, wet										
		14												
45		12												
		10	89											
		11												
		11												

Completion Depth: 60.0 Ft.
Water Depth: 9 ft., After ATD hrs.
Project No.: 21561435.00000 ft., After hrs.
Project Name: Dynegy Wood River ft., After hrs.
Drilling Contractor: Harriss Drilling Co. Logged by: G. Jones

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URS

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DRAFT

Figure No.

LOG of BORING No. B-5-04-8

Sheet 3 of 3

DATE 6/3/04 SURFACE ELEVATION, FT 441.5 DATUM NGVD LOCATION See Figure 1

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	PID, ppm	FIELD Qu, KSF	NMC, %	LL	PI	Qu, KSF	NOTES
50				Becomes gray	388.5									
		9	61	Dense, wet, gray, fine to medium grained SAND (SP)	53.0									
		15												
55		18												
		5	61	Becomes fine grained										
		11			381.5									
60		22		Bottom of boring at 60'	60.0									
65														
70														

Completion Depth: 60.0 Ft.
Project No.: 21561435.00000
Project Name: Dynegy Wood River
Drilling Contractor: Harriss Drilling Co.

Water Depth: 9 ft., After ATD hrs.
ft., After hrs.
ft., After hrs.
Logged by: G. Jones

8/10/04 WCCXS 21561435 DYNEGY.GPJ

URS

WR 282

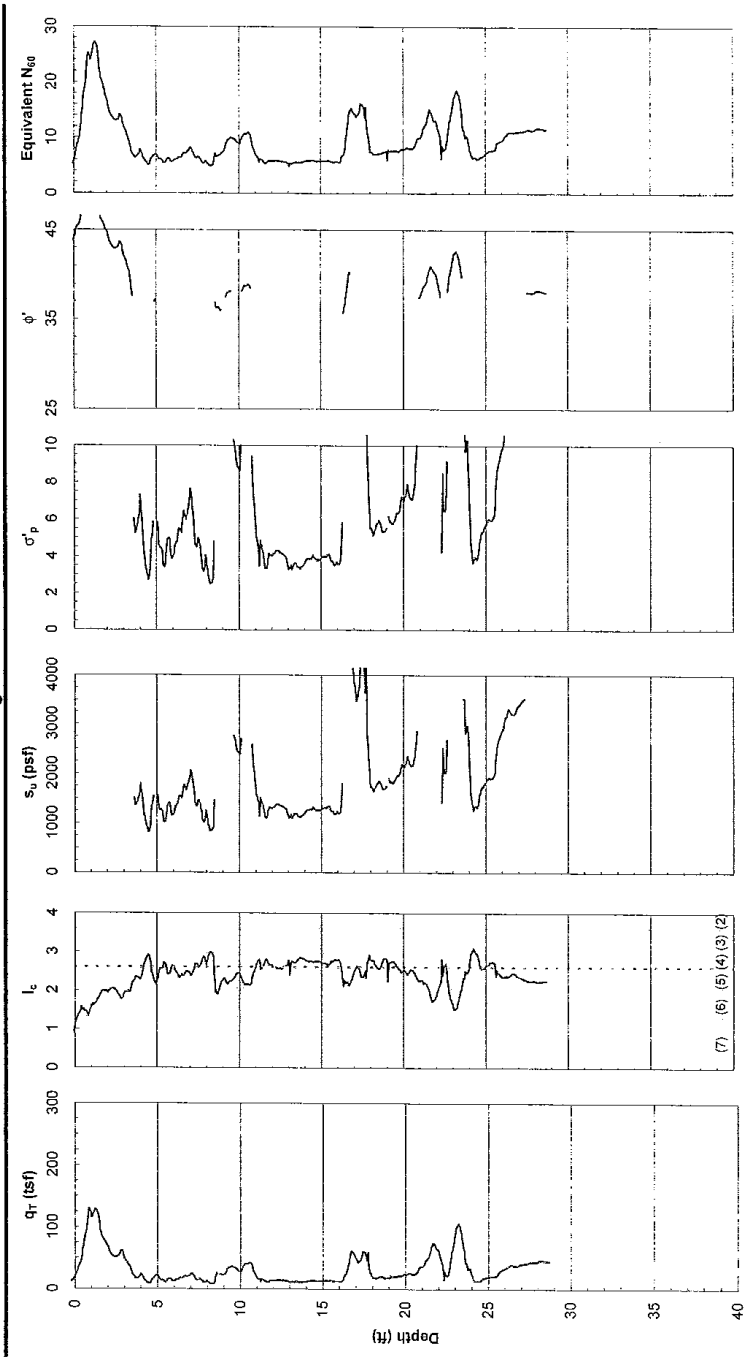
DRAFT

Dynegy Wood River Project

FIGURE 1. CPT Data Correlations

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	9.5	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/25/04				A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv: N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-1



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 283

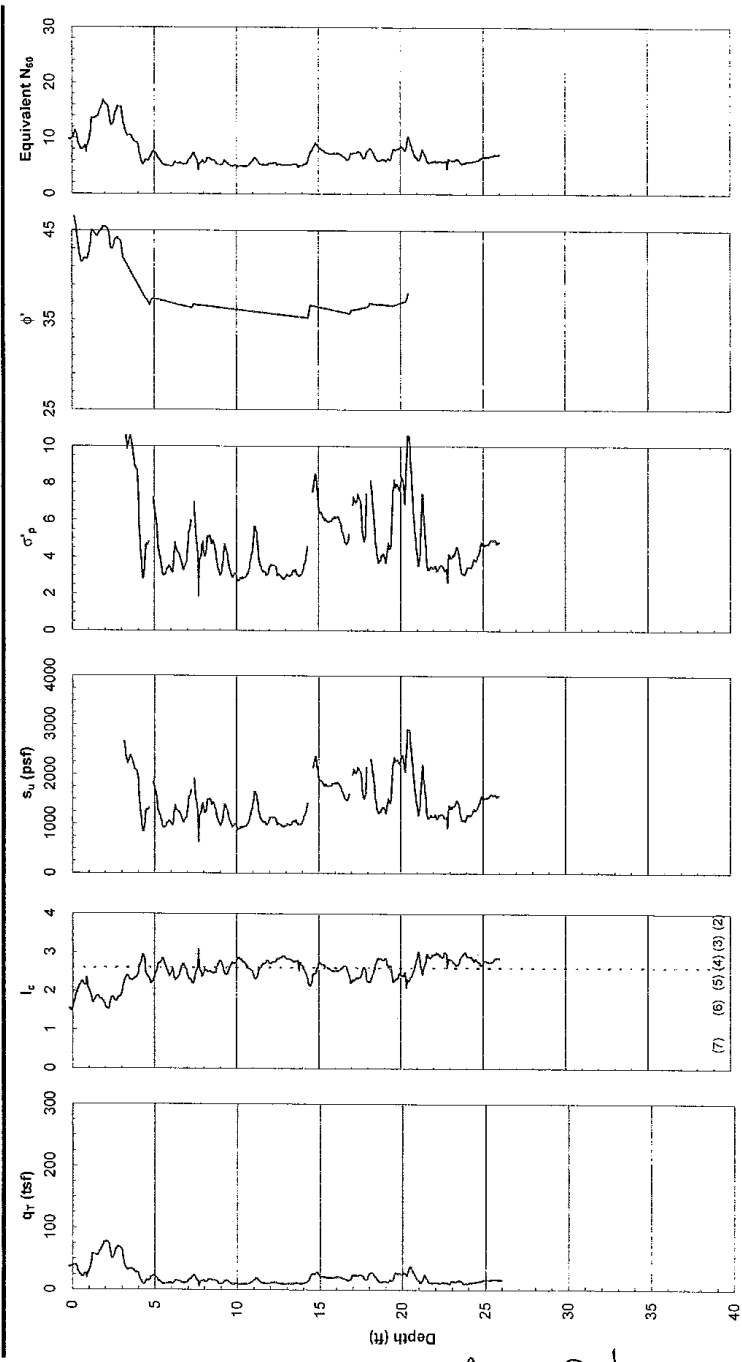
DRAFT

Dynegy Wood River Project

FIGURE 2. CPT Data Correlations

General Information	Soil Information	Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t: 90 pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth: 7 ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/25/04		A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
			Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-2



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 284

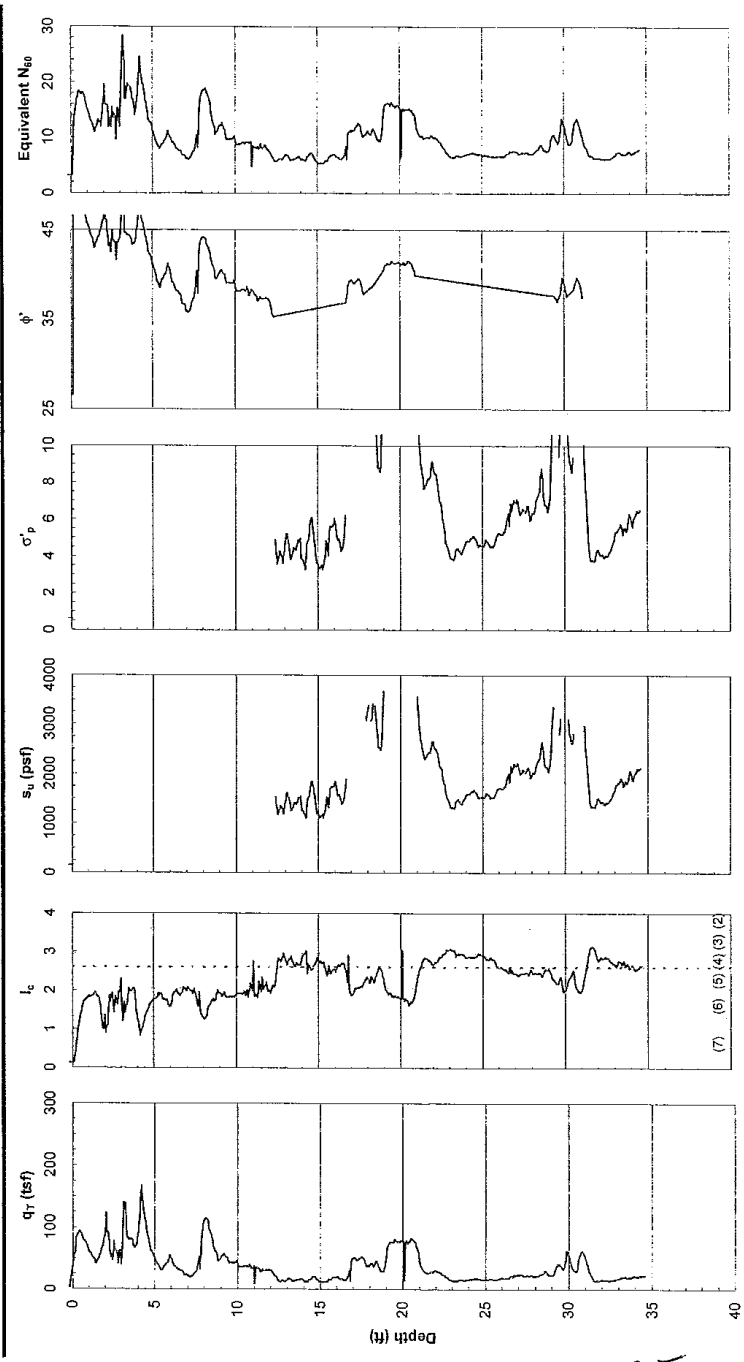
DRAFT

Dynegy Wood River Project

FIGURE 3. CPT Data Correlations

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	9	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/25/04				A_n: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-3



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 285

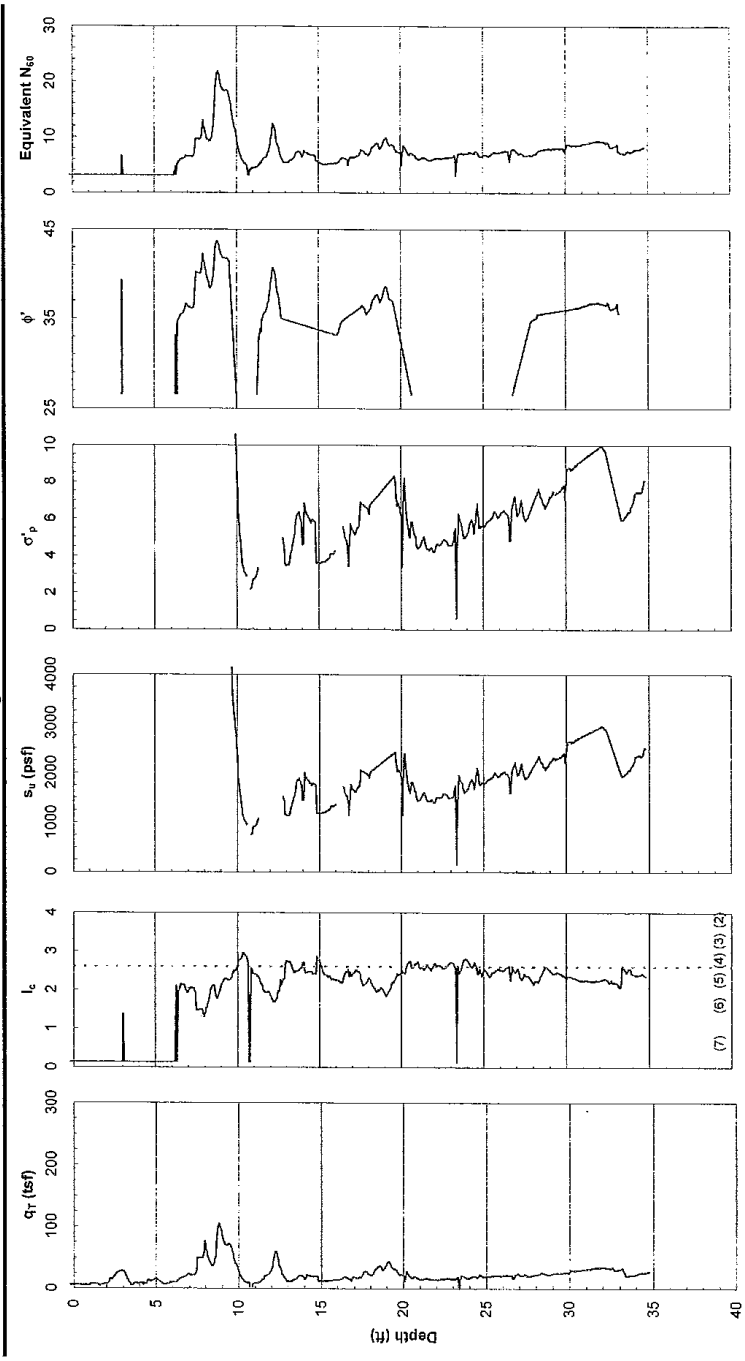
DRAFT

Dynegy Wood River Project

FIGURE 4. CPT Data Correlations

General Information	Soil Information		Sounding Information	Correlations
Location: Wood River, Illinois	Average γ: 90 pcf		Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth: 8.5 ft		Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/25/04			A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
				Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-4



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 286

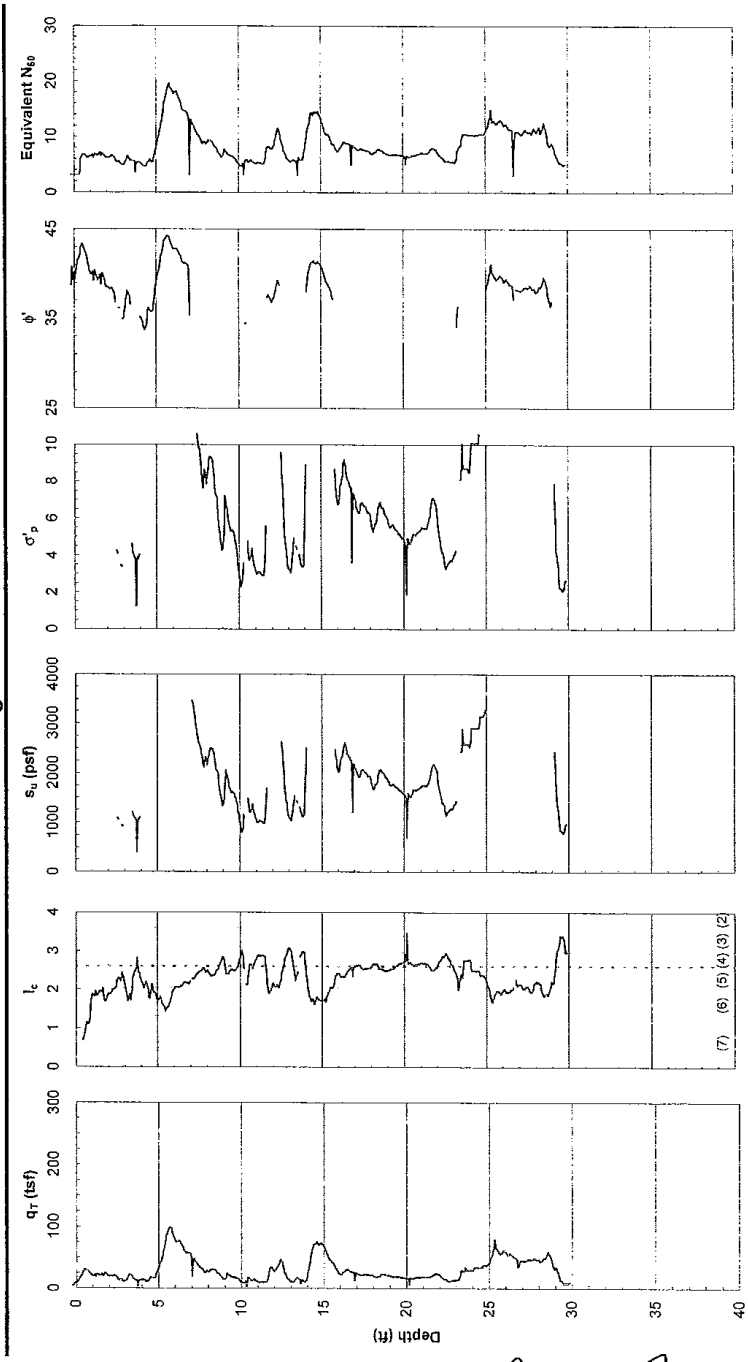
DRAFT

Dynegy Wood River Project

FIGURE 5. CPT Data Correlations

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	9	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/26/04				A_c: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-5a



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR287

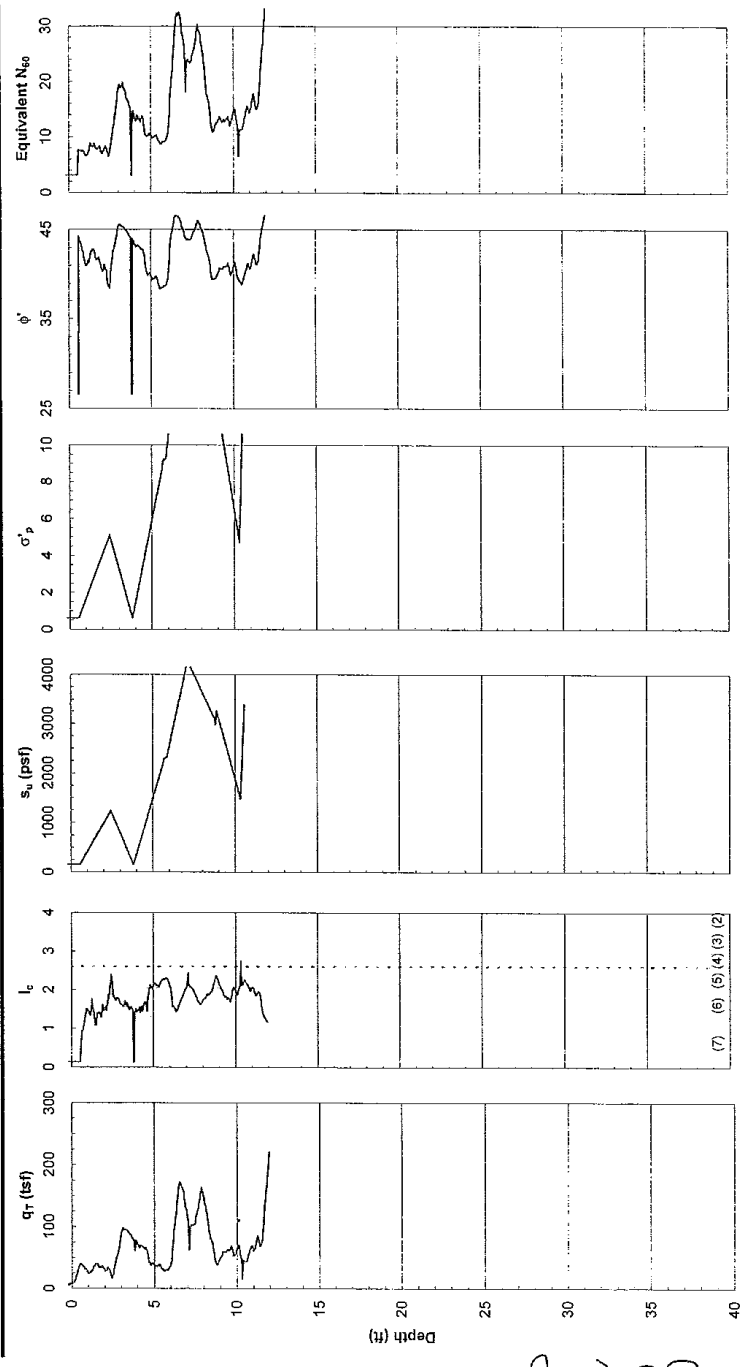
DRAFT

Dynegy Wood River Project

FIGURE 6. CPT Data Correlations

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	10	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/27/04				A_n: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-6



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 288

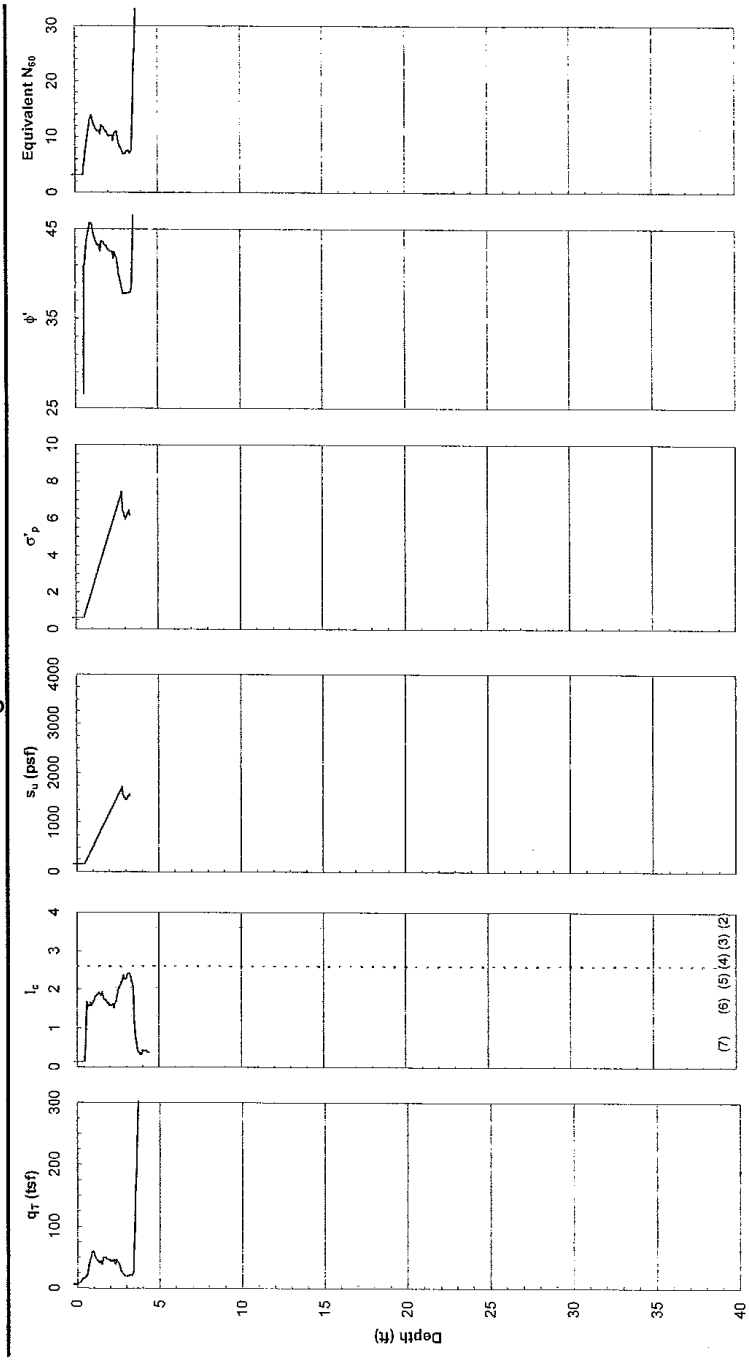
DRAFT

FIGURE 7. CPT Data Correlations

Dynegy Wood River Project

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_i:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	10	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/26/04				A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-7c



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 289

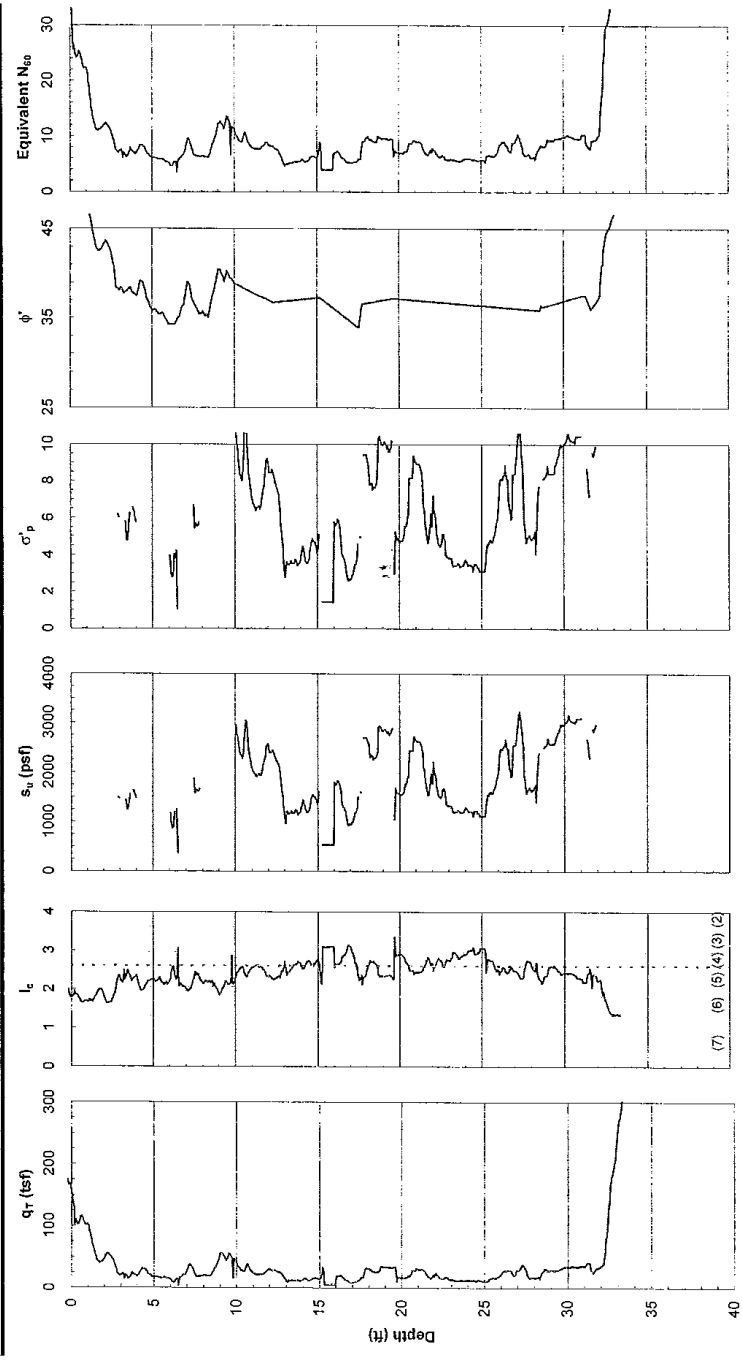
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Dynegy Wood River Project

FIGURE 8. CPT Data Correlations

General Information	Soil Information		Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t: 90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth: 10	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/26/04			A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
				Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-8



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 290

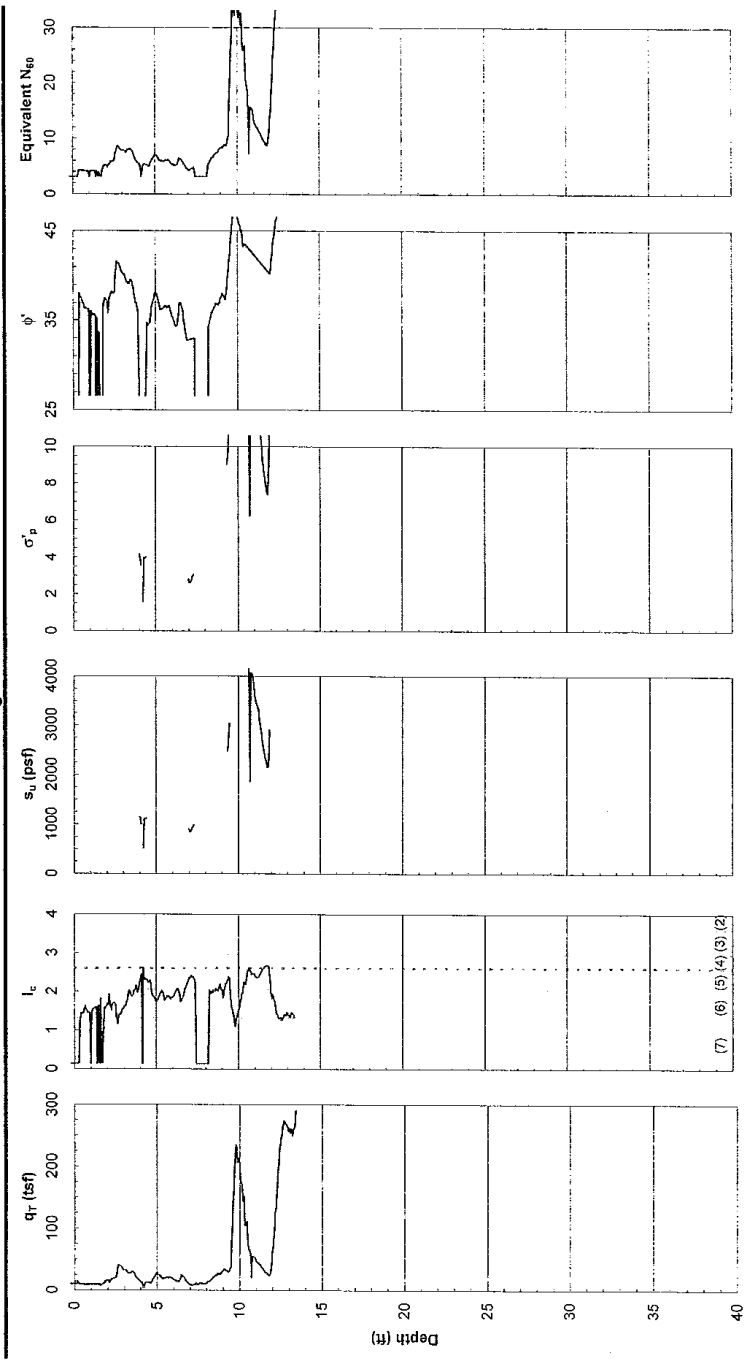
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Dynegy Wood River Project

FIGURE 9. CPT Data Correlations

General Information	Soil Information			Sounding Information	Correlations
Location: Wood River, Illinois	Average γ_t:	90	pcf	Operator: Kleinfelder (J.Santos)	s_u: Ladd (1991)
Project No. 21561435.00000	GWT depth:	10	ft	Cone: Geoprobe (3121)	σ'_p: Kulhawy & Mayne (1990)
Date: 05/26/04				A_r: 0.58	ϕ': Kulhawy & Mayne (1990)
					Equiv. N_{60}: Jefferies & Davies (1993)

Sounding CPT-5-04-9



Approximate soil types from Ic: (7) gravelly sand to sand; (6) clean sand to silty sand; (5) sand mix - silty sand to sandy silt; (4) silt mix - sandy silt to clayey silt; (3) clays - silty clay to clay; (2) organic soils.

WR 291

LOG OF BORING B - 08

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 432.0 Feet (Approximate)

Date Drilled: 1/16/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0 / 430	6 10 10	16/18		TOPSOIL Gray FLYASH, FILL			25	
5 / 425	5 11 17	15/18		-with Bottom Ash below 4.0 Feet		1.3 Qp	32	
	15 25 22	17/18		Dark Gray BOTTOM ASH, with Flyash, FILL			15	
10 / 420	3 6 6	17/18	CL	Dark Gray Silty CLAY, trace Bottom Ash, FILL		4.5 Qp	17	
	2 1 2	13/18	CL-ML	Brown Clayey SILT		1.3 Qp	25	
15 / 415				-Gray-Brown below 17.0 feet				
20 / 410	1 2 3	18/18				0.8 Qp	27	
25 / 405				TD - 20.0 Feet				
30								

Notes:

GROUNDWATER
▽ First Observed During Drilling - Dry
▽ At Completion - Dry

Piezometer Installed: No

Shively

Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 292

DRAFT

LOG OF BORING B - 11

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 426 Feet (Approximate)

Date Drilled: 1/16/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	CD (pcf)	UCHS (tsf)	MC (%)	Remarks
425		15/18		TOPSOIL Gray FLYASH, FILL			70	
420		17/24	CL	Dark Gray-Brown Silty CLAY	99	1.5 QP	24	UU=0.45 TSF
		15/18		-Gray-Brown below 5.5 Feet			28	
415		18/18					26	
				TD - 10.0 Feet				
410								
405								
400								
395								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - 2.3 Feet
- 1 days After Completion - 2.5 Feet
- 5 days After Completion - 2.4 Feet

Piezometer Installed: No

Hively Test Pits, Inc.
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/24/03

WR293

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DRAFT

LOG OF BORING B - 12

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 428.0 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0				TOPSOIL				
425		18/18		Gray FLYASH, FILL			69	
5		9/18		-with Organics 3.0 to 8.0 Feet			56	
420		15/18				0.4 Qp	35	
10		21/24			87	0.4 Qp	34	UU = 0.20 TSF
415				TD - 10.0 Feet				
15								
410								
20								
405								
25								
400								
30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 4 days After Completion - 4.5 Feet

Piezometer Installed: No

Shively
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/24/03

WP 294

LOG OF BORING B - 13

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 449 Feet (Approximate)

Date Drilled: 1/16/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0	1 3 3	12/18		TOPSOIL Gray FLYASH, FILL		1.2 Qp	26	
445 5	7 12 17	9/18					24	
		14/17		-trace Bottom Ash below 5.5 Feet			29	
440 10	3 4 4	12/18					34	
435 15	4 5 5	17/18				0.5 Qp	28	
430 20	2 5 6	NSD/18		TD - 15.0 Feet		1.8 Qp	37	
425 25								
420 30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 1 days After Completion - Dry
- 5 days After Completion - dry

Piezometer Installed: No

Shively

Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/24/03

WR 295

DRAFT

LOG OF BORING B - 14

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 448.5 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0	6 9 10	13/18		TOPSOIL Gray FLYASH, FILL			22	
445	1 3 3	14/18					25	
5		13/24			60		28	
440	1 3 4	14/18				1.6 Qp	38	
10								
435	1 1 2	13/18				0.5 Qp	43	
15				Dark Gray FLYASH and BOTTOM ASH, FILL				
430	0 1 6	17/18				0.5 Qp	40	
20				TD - 20.0 Feet				
425								
25								
420								
30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 4 days After Completion - Dry

Piezometer Installed No

Shively Geotechnical Services

Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554CINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 296

LOG OF BORING B - 15

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 444 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0				TOPSOIL				
		21/24		Dark Gray FLYASH, with Bottom Ash, FILL	75		13	
440 5	1 1 2	16/18					20	
	13 30 37	18/18		Dark Gray-Brown BOTTOM ASH and BOILER SLAG, trace Flyash, FILL			11	
435 10	1 1 2	15/18		Gray FLYASH, FILL		1.7 Qp	39	
430 15	4 8 9	18/18		TD - 15.0 Feet		0.7 Qp	43	
425 20								
420 25								
415 30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 4 days After Completion - Dry

Piezometer Installed: No

Shively

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Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 297

LOG OF BORING B - 16

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 440 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
440—0		14/18		TOPSOIL Gray FLYASH, trace Bottom Ash, FILL		1.7 Qp	30	
435—5		15/18				0.7 Qp	32	
		18/18				1.4 Qp	30	
		15/24			54		44	
430—10				TD - 10.0 Feet				
425—15								
420—20								
415—25								
410—30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 4 days After Completion - Dry

Piezometer Installed: No

Shively Geotechnical Inc.
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 255-GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 298

LOG OF BORING B - 17

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 440 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
440 – 0				TOPSOIL				
	1 1 3	18/18		Gray FLYASH, trace Boiler Slag, FILL		0.9 Qp	29	
435 – 5		22/24		Gray BOTTOM ASH and BOILER SLAG, trace Flyash, FILL	86		11	
	1 1 1	18/18		Gray FLYASH, FILL -with Bottom Ash 5.5 to 8.0 Feet		0.9 Qp	58	
430 – 10	6 6 5	18/18				2.4 Qp	45	
				TD - 10.0 Feet				
425 – 15								
420 – 20								
415 – 25								
410 – 30								

Notes:

GROUNDWATER
- ▽ First Observed During Drilling - 6.0 Feet
- ▼ At Completion - Dry
- ▼ 4 days After Completion - Dry

Piezometer Installed: No

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Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOGS 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 299

DRAFT

LOG OF BORING B - 18

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 442.5 Feet (Approximate)

Date Drilled: 1/17/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0 / 440	6 11 8	10/18		Base ROCK, FILL				
				Brown Silty CLAY, with Sand, Crushed Limestone, FILL			5	
5 / 435	2 7 8	8/18		Gray BOTTOM ASH, with Flyash, FILL		3.2 Qp	16	
	10 26 26	17/18				4.5+ Qp	19	
10 / 430		23/24			78		20	
15 / 425				TD - 10.0 Feet				
20 / 420								
25 / 415								
30								

Notes:

GROUNDWATER
- First Observed During Drilling - Dry
- At Completion - Dry
- 4 days After Completion - Dry

Piezometer Installed: No

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BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

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DRAFT

LOG OF BORING B - 21

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 440 Feet (Approximate)

Date Drilled: 3/11/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
440 — 0	0 2 7	13/18		Dark Gray FLYASH, FILL		0.9 Qp	29	
	2 2 8	10/18		-trace Bottom Ash 3.0 to 5.5 Feet		1.2 Qp	43	
435 — 5	6 10 12	15/18		-with Bottom Ash 5.5 to 8.0 feet		1.0 Qp	17	
	1 1 1	17/18					60	
430 — 10								
	0 1 1	16/18					56	
425 — 15			CL	Dark Gray-Brown Silty CLAY, Possible FILL				
	2 3 4	16/18				1.6 Qp	27	
420 — 20				TD - 20.0 Feet				
415 — 25								
410 — 30								

Notes:

GROUNDWATER
First Observed During Drilling - 8.5 Feet
At Completion - Dry

Piezometer Installed. No

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Illinois (618) 398-1414

BORING LOG 2554/GINTRILE.GPJ SHIVELY.GDT 4/21/03

WR 301

LOG OF BORING B - 22

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 437.5 Feet (Approximate)

Date Drilled: 3/11/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
435	0 1 2	10/18		TOPSOIL Very Dark Gray FLYASH, FILL -trace Bottom Ash to 5.5 Feet		2.1 Qp	42	
		24/24			70	1.2 Qp	36	
430	1 3 1	8/18		-Dark Gray, with Boiler Slag 5.5 to 8.0 Feet		0.8 Qp	18	
		24/24		-Gray below 8.0 Feet	60		58	
425	2 4 5	18/18				1.2 Qp	24	
420	1 1 3	18/18	CL	Dark Gray-Brown Silty CLAY		1.9 Qp	28	
415	1 2 3	18/18	CH	Gray-Brown CLAY		1.8 Qp	46	
410				TD - 25.0 Feet				

Notes:

GROUNDWATER
▽ First Observed During Drilling - Dry
▼ At Completion - 18.5 Feet

Piezometer Installed: No

Shively Geotechnical Inc.
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

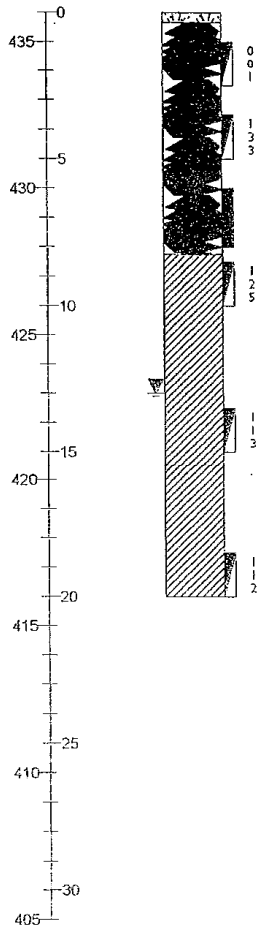
WR 302

DRAFT

LOG OF BORING B - 23

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 436 Feet (Approximate)

Date Drilled: 3/11/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella



Elevation/ Depth (feet)	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
	14/18		TOPSOIL Gray FLYASH, FILL			45	
	11/18					48	
	23/24			63		46	
	15/18	CL	Dark Gray-Brown Silty CLAY		1.4 Qp	22	
	18/18				0.5 Qp	27	
	17/18					25	
			TD - 20.0 Feet				

Notes:

GROUNDWATER
▽ First Observed During Drilling - Dry
▽ At Completion - 13.0 Feet

Piezometer Installed: No

Shively
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 303

LOG OF BORING B - 24

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 428 Feet (Approximate)

Date Drilled: 3/11/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0	1 0 1	14/18		TOPSOIL Dark Gray FLYASH, FILL			58	
425	6	7/18		-trace Bottom Ash 3.0 to 5.5 Feet			36	No Recovery in Shelby Tube, Pushed Split-Spoon Sampler
5	0 1 1	12/18		-with Bottom Ash below 5.5 Feet			25	
420		24/24	SC	Dark Gray-Brown Fine SAND, with Clay	108	0.5 Qp	25	CU
10			CL	Dark Gray-Brown Silty CLAY				
415	0 1 2	16/18					29	
15			CH	Dark Gray CLAY				
410	1 1 2	15/18				0.8 Qp	47	
20								
405	0 1 1	18/18					51	
25				TD - 25.0 Feet				
400								
30								

Notes:

GROUNDWATER
▽ First Observed During Drilling - Dry
▽ At Completion - 6.7 Feet

Piezometer Installed: No

Shively Engineering
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/24/03

WR 304

LOG OF BORING B - 25

Project Name: Dynegy Rail Loop
Project Location: Wood River, Illinois
Project Number: SG9-2554
Elevation: 428 Feet (Approximate)

Date Drilled: 3/11/03
Drilling Contractor: Meyer Drilling, Inc.
Drilling Method: Hollow Stem Auger
Logged By: Meyer/Kinsella

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0 / 425	0 1 1	9/18		Dark Gray FLYASH, trace Bottom Ash, FILL		0.2 Qp	46	
5	0 1 1	16/18	CL	Dark Brown Silty CLAY, with Sand			25	
420		24/24			110	0.4 Qp	22	
10	0 0 1	17/18	SM	Gray-Brown Silty SAND			30	
415	0 1 1	16/18	CL	Dark Gray Silty CLAY, with Sand		0.2 Qp	28	
410 / 20	0 1 2	17/18	CH	Dark Gray-Brown CLAY			51	
405 / 25				TD - 20.0 Feet				
400 / 30								

Notes:

GROUNDWATER
▽ First Observed During Drilling - Dry
▼ At Completion - 7.3 Feet

Piezometer Installed: No

Shively Geotechnical Inc.
Missouri (314) 770-1001
Illinois (618) 398-1414

BORING LOG 2554GINTFILE.GPJ SHIVELY.GDT 4/21/03

WR 305

DRAFT

KELRON Environmental

LOG OF BORING MW37

(Page 1 of 2)

Last Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
Location: Twp 5N, Rng 9W, 20 NE/SW/NW

Date Started/Finished : 6/10/2004
Hole Diameter : 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 429.29
Top of Casing Elevation : 432.44
N,E Coordinates : 510008, 803263

Depth in Feet	DESCRIPTION	Surf. Elev. 429.29	Samples	Recovery Inches	Blow Count	Qp TSF	USCS	GRAPHIC
0	Silty CLAY, trace fine sand and gravel, roots; non-plastic, brown, moist (FILL)	429	1	19	1 3 5	2.25		
	– brown-gray				5 0 3		CL	
2	– low plasticity, mottled w/ red-brown Fe-oxidation	427	2	19	5 6 2	3.5		
4	– little fine sand, trace fine gravel	425	3	20	3 4 5	2.0	SP	
	SAND, fine, poorly graded, light gray (FILL)							
6	Silty CLAY, little sand, trace gravel; low plasticity, light brown-gray (FILL)	423	4	17	1 2 4	1.5	CL	
	– trace wood, medium plasticity							
8	Clayey SAND with silt, fine, poorly graded; medium gray (FILL)	421	5	17	4 0 2	1.25	SC	
10	Silty CLAY, trace fine sand and gravel; medium plasticity, tan to brown-gray (FILL)	419	6	19	3 4 1	3.25	CL	
	SAND, trace silt and clay, fine grained, poorly graded, brown (FILL)				4 8 10		SP	
12	– 1/2-inch shard of porcelain at 11.17 feet BLS							
	Sandy SILT, some clay, low plasticity (FILL)	417	7	22	2 5 3	1.25	ML	
14	Silty CLAY, little sand; low plasticity, brown-gray							
	– medium plasticity, medium brown w/ red-brown Fe-oxidation mottling, wet	415						
	– low plasticity, light gray, moist							
	CLAY, medium to high plasticity, light brown-gray		8	24	4 0 0 2	0.75	CL	
16					3		ML	

Well: MW37
Elev.: 432.44
Cover
Concrete
Riser (Sch 40 PVC)
Bentonite Chips

WR306

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KELRON Environmental

LOG OF BORING MW37

(Page 2 of 2)

East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
Location: Twp 5N, Rng 9W, 20 NE/SW/NW

Date Started/Finished : 8/10/2004
Hole Diameter : 8.5 Inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 429.29
Top of Casing Elevation: 432.44
X,Y. Coordinates : 510008, 803263

Well: MW37
Elev.: 432.44

Depth in Feet	DESCRIPTION	Surf. Elev. 429.29	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
16	Clayey SILT, non-plastic, light brown – little sand, medium gray, wet	413	9	20	1 1 1	0.75	ML	
18	CLAY with silt, high plasticity, medium gray, wet – moist	411	10	24	1 0 0	0.75	CH	
20		409	11	18	1 2 2	0.75		
22	SAND, fine to medium, well graded, brown, wet	407	12	19	4 7 8		SW	
24		405	13	18	2 3 6			
26		403	14	24	7 2 5			
28	SAND, fine, poorly graded	401	15	24	11 15 1		SP	
30		399			3 6 8			
32	END BOREHOLE AT 31 FEET BLS							

Bentonite Chips
Riser (Sch 40 PVC)
Filter Pack 16x40
Screen (Sch 40 PVC)
Bottom Cap

WR 307

DRAFT

KELRON Environmental

LOG OF BORING MW38

ıst Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ı_lion: Twp 5N, Rng 9W, 20 NW/NE/SW

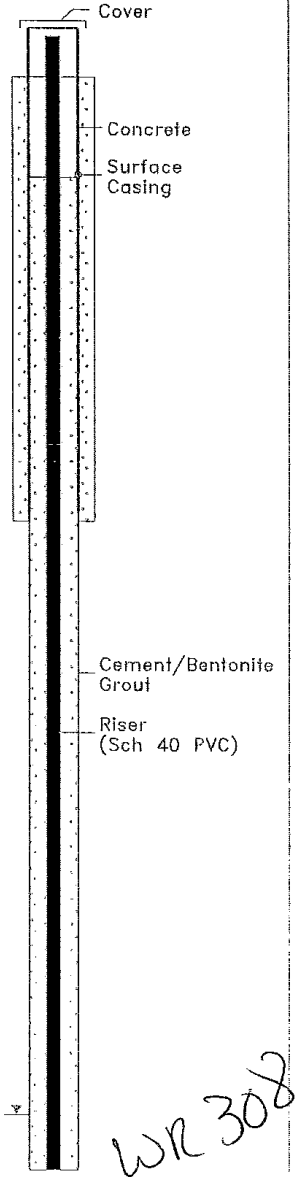
Date Started/Finished : 6/18 – 6/24/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 434.49
Top of Casing Elevation : 437.09
N, E Coordinates : 510770, 802284

Depth in Feet	DESCRIPTION	Surf. Elev. 434.49
0	Silty CLAY, with sand, roots, brown, moist	434
	FLYASH, trace coal, light gray, wet	
5	Note: Surface Casing = 10.75-inch O.D PVC installed to 10 feet below grade.	429
	Silty CLAY, with few wood, roots, organics; low plasticity, dark gray with black mottling, wet	
	– no roots or wood, light-medium gray, moist	
10	– trace sand and gravel, few wood, olive gray	424
	Silty CLAY; high plasticity, medium gray, wet	
15		419
	Silty SAND, with clay, fine sand; medium brown to gray	
	SILT to Sandy SILT, find sand; light gray	
	Silty CLAY, trace fine sand; light gray w/ brown mottling	
20	Silty SAND, fine; poorly graded, light brown	414
	SAND, fine; poorly graded, medium brown grading to medium gray	
25		

Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
1	24	2 1 1 1 2	0.75	FL	
2	19	0 0 0 0 0	<0.5		
3	24	0 0 0 0 0	<0.5		
4	18	0 1 0 0 0	<0.5		
5	24	0 0 0 3 8	1.75	CL	
6	22	0 0 0 0 0	0.5	CH	
7	24	2 2 2 2 2	2.0	SM / ML / CL / SM	
8	18	0 0 0 0 0	0.75	SP / CL	

Well: MW38
Elev.: 437.09



WR 308

DRAFT

KELRON Environmental

LOG OF BORING MW38

ast Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
Location: Twp 5N, Rng 9W, 20 NW/NE/SW

Date Started/Finished: 6/18 – 6/24/2004
Hole Diameter : 12.5 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 434.49
Top of Casing Elevation: 437.09
N, E Coordinates : 510770, 802284

Well: MW38
Elev.: 437.09

Depth in Feet	DESCRIPTION	Surf. Elev. 434.49	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
25	Silty CLAY, with silt and fine sand; low to medium plasticity, medium gray, moist to wet	409					CL	
	SAND, fine; poorly graded, medium gray, wet						SP	
	CLAY, fat, high plasticity, medium gray, moist		9	21	0 1 2 2	1.5		
30		404						
	– olive gray – trace shells (1/2-inch intact shell at 34.58 feet)		10	24	1 2 2 3	1.0		
35		399						
	– no shells		11	24	0 0 0 0	1.0	CH	
40		394						
			12	24	0 0 0 0	1.0		
45		389						
			13	23	0 0 0 0	1.0		
50								

Cement/Bentonite Grout

Riser (Sch 40 PVC)

WK309

DRAFT

KELRON Environmental

LOG OF BORING MW38

Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
Location: Twp 5N, Rng 9W, 20 NW/NE/SW

Date Started/Finished : 6/13 - 6/24/2004
Hole Diameter : 12.0 / 8.5 inches
Drilling Method : Hollow-Stem
Sampling Method : Split-Spoon
Drilling Company : Haliss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 434.49
Top of Casing Elevation: 437.09
N,E Coordinates : 510770, 802284

File: P:\GEOTECHNICAL\DYNEGY - WOOD RIVER 2004\DRAWINGS\AND SURVEY\

Depth in Feet	DESCRIPTION	Surf. Elev. 434.49	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
50		384						
	– dark gray grading to light gray		14	24	0 0 0 2	1.25	CH	
55		379						
	– olive gray		15	24	0 0 1 2	1.25		
60		374						
	SAND, fine to medium; well graded, dark gray, wet		16	2				
65	– trace coarse sand	369	17	17	6 10 11 12		SW	
70		364						
	– fine to coarse sand, trace fine gravel, medium gray		18	9	10 12 12 14			
75	END BOREHOLE AT 74 FEET BLS							

Well: MW38
Elev.: 437.09

Cement/Bentonite Grout
Bentonite Grout
Riser (Sch 40 PVC)
Filter Pack 16x40
Screen (Sch 40 PVC)
Bottom Cap

WR 310

DRAFT

KELRON Environmental

LOG OF BORING MW39

st Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ion: Twp 5N, Rng 9W, 20 SW/NE/SW

Date Started/Finished : 6/14 - 6/15/2004
Hole Diameter : 8.5 / 3.875 inch
Drilling Method : Hollow Stem / Rotary
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation : 437.3
X,Y Coordinates : 510737, 801409

pth in Feet	DESCRIPTION	Surf. Elev. 437.3	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
0	Silty CLAY, trace gravel, roots, dk brown, moist	437	1	24	5 5 5 4 2 1 1 1 0 0 1 2 1 1 0 0 1 1 2 4 3 4 5 5 1 3 3 4 1 2 2 2 2 2 2 3 4 0 2 4 5 2 3 5 7 0 3 7 11 4 5	1.25	FL	
	FLYASH, trace coal, light to medium gray, moist							
	– dark gray, wet							
	NO WELL INSTALLED SEE BORING LOGS FOR NESTED WELLS MW39S AND MW39M FOR WELL DIAGRAM AND CONSTRUCTION		2	6		<0.5		
5	– moist	432	3	18		1.0	FL	
			4	8		<0.5		
	– wet							
	Silty CLAY, medium plasticity, light brown, moist		5	18		<0.5		
10	CLAY, trace roots, light to medium gray with orange-brown mottling	427						
	– dark gray		6	24		3.0	CL	
	– 1/2 inch sandy clay seams at 12.42 and 13.25 feet							
	Silty CLAY, dark gray		7	24		1.25		
	Clayey SAND (fine), poorly graded, moist						SC	
	Silty CLAY, high plasticity, dark gray; 1/2 inch sand						CH	
15	seam at 14.63 feet	422	8	17		1.0	SC	
	Clayey SAND (fine) with silt, poorly graded, medium gray							
	Silty CLAY w/ few wood (maxium size 3 by 10 mm) high organics, high plasticity, dark gray, moist		9	13		1.5		
	– olive gray		10	21		1.5	CH	
20	– with orange-brown mottling	417						
			11	22		2.5		
	Sandy CLAY							
			12	20		2.5		
	SAND (fine) with silt, medium gray, wet							
	– light brown		13	19			SP-SM	
25	– light gray							

WR 311

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KELRON Environmental

LOG OF BORING MW39

East Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SW/NE/SW

Date Started/Finished : 6/14 – 6/15/2004
Hole Diameter : 8.5 / 3.875 inch
Drilling Method : Hollow Stem / Rotary
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 437.3
X,Y Coordinates : 510737, 801409

Depth in Feet	DESCRIPTION	Surf. Elev. 437.3	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
25		412	13	19	8 9		SP–SM	
			14	20	2 2	1.0		
	Silty CLAY, trace leaves and wood, trace shells (<2 mm), high plasticity, olive gray, moist		15	24	2 2 0 0	1.25	CH	
30	Clayey SILT grading to SILT, trace fine sand, trace shells (<2 mm), light brown, wet	407	16	15	4 7 4 6	0.75	ML	
	SAND (fine to medium), trace fine gravel, well graded, wet		17	17	8 8 6 11 14 17		SW	
35	SAND (fine), few silt, poorly graded, medium gray, wet	402	18	15	6 6 8 10			
			19	20	6 8 11 13			
			20	19	6 12 13 13			
40		397	21	17	7 11 13 14		SP	
			22	14	6 9 16 21			
45		392						
	SAND (fine to medium, trace coarse), well graded		23	15	11 13 15 15		SW	
50								

WR 312

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KELRON Environmental

LOG OF BORING MW39

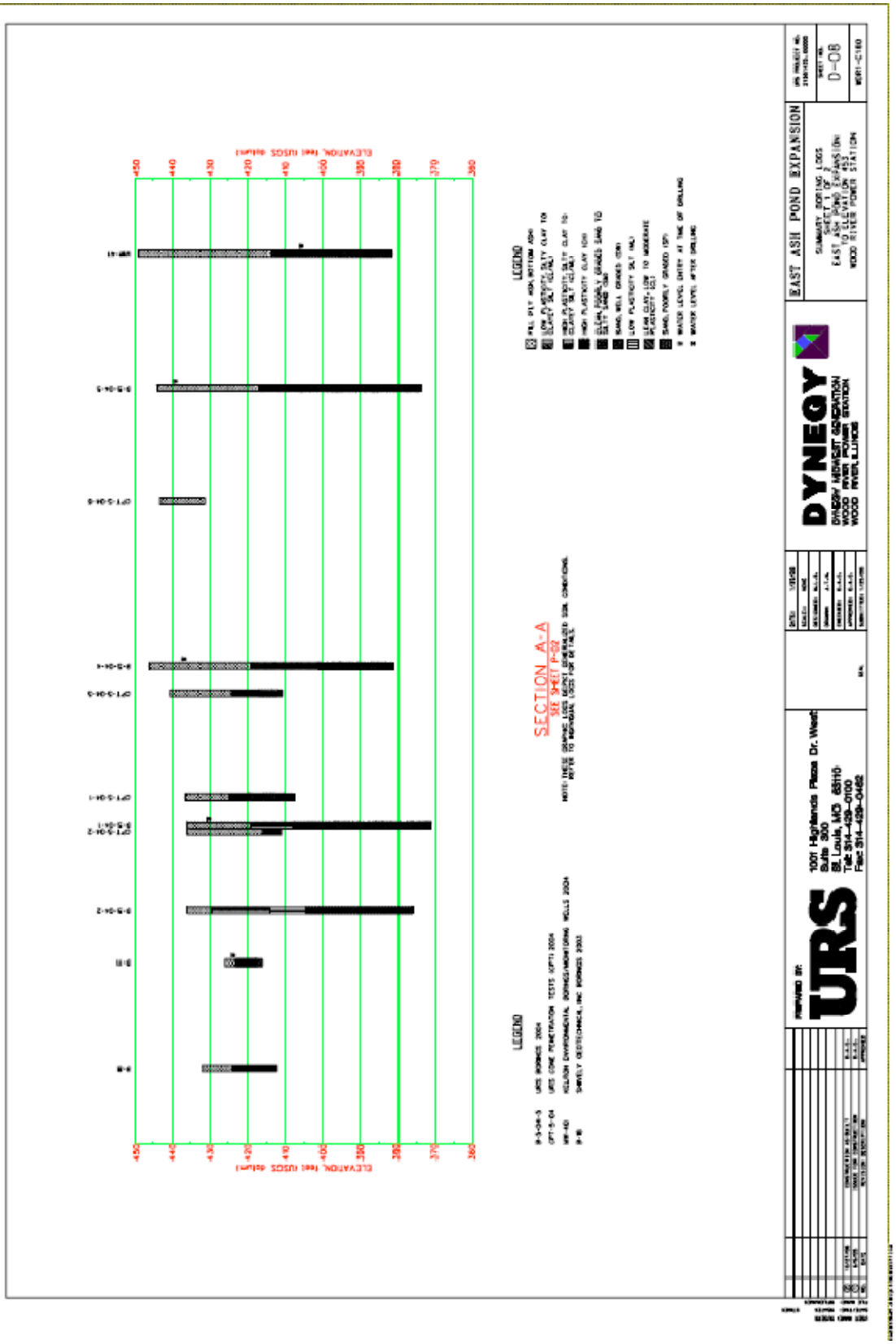
Ash Pond Hydrogeologic Investigation
Wood River Power Station
Dynegy Midwest Generation, Inc.
ation: Twp 5N, Rng 9W, 20 SW/NE/SW

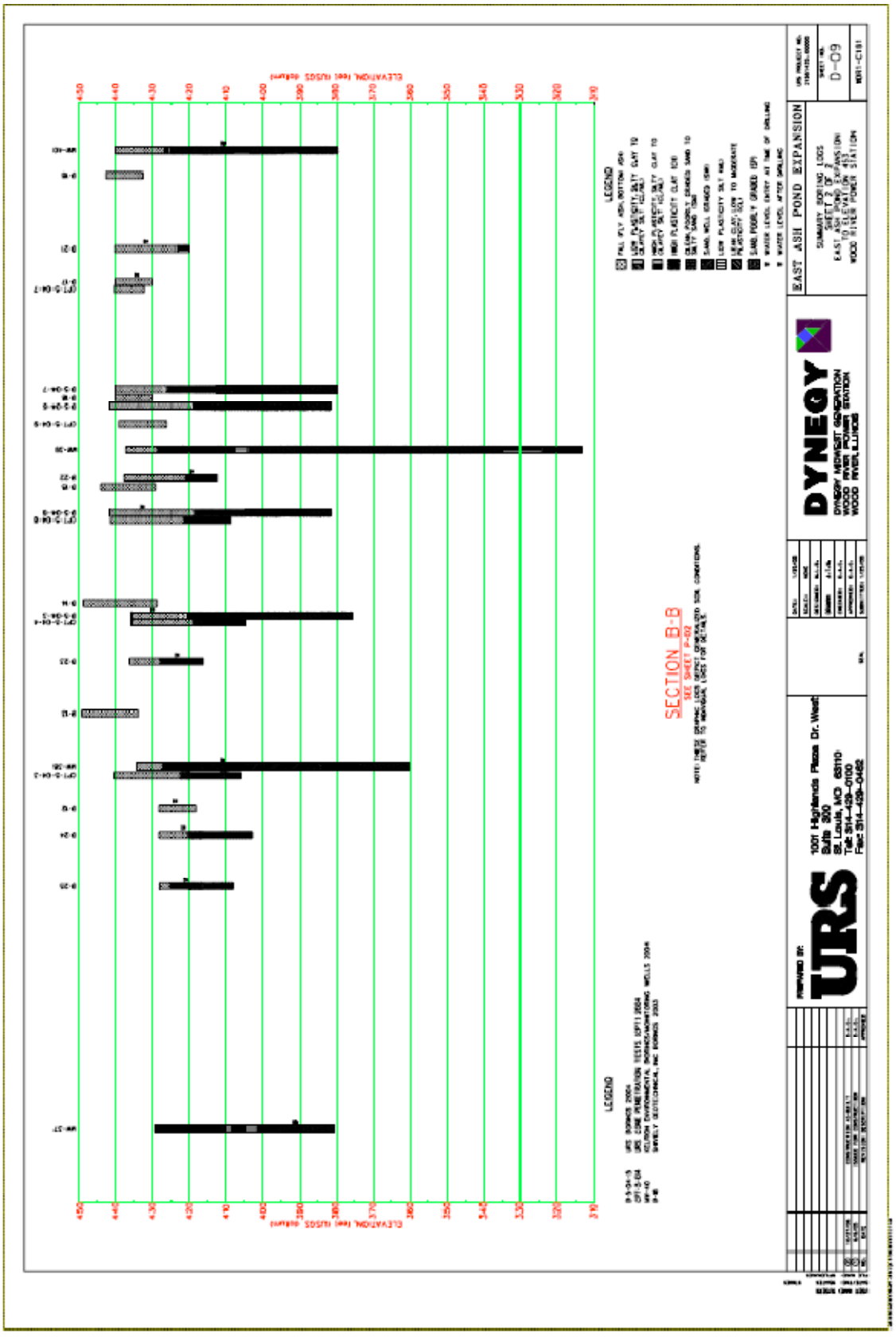
Date Started/Finished : 6/14 – 6/15/2004
Hole Diameter : 8.5 / 3.875 inch
Drilling Method : Hollow Stem / Rotary
Sampling Method : Split-Spoon
Drilling Company : Harriss Drilling Services, Inc.

Driller : John McMullan
Geologist : Stuart Cravens (Kel
Land Surface Elevation: 437.3
X,Y Coordinates : 510737, 801409

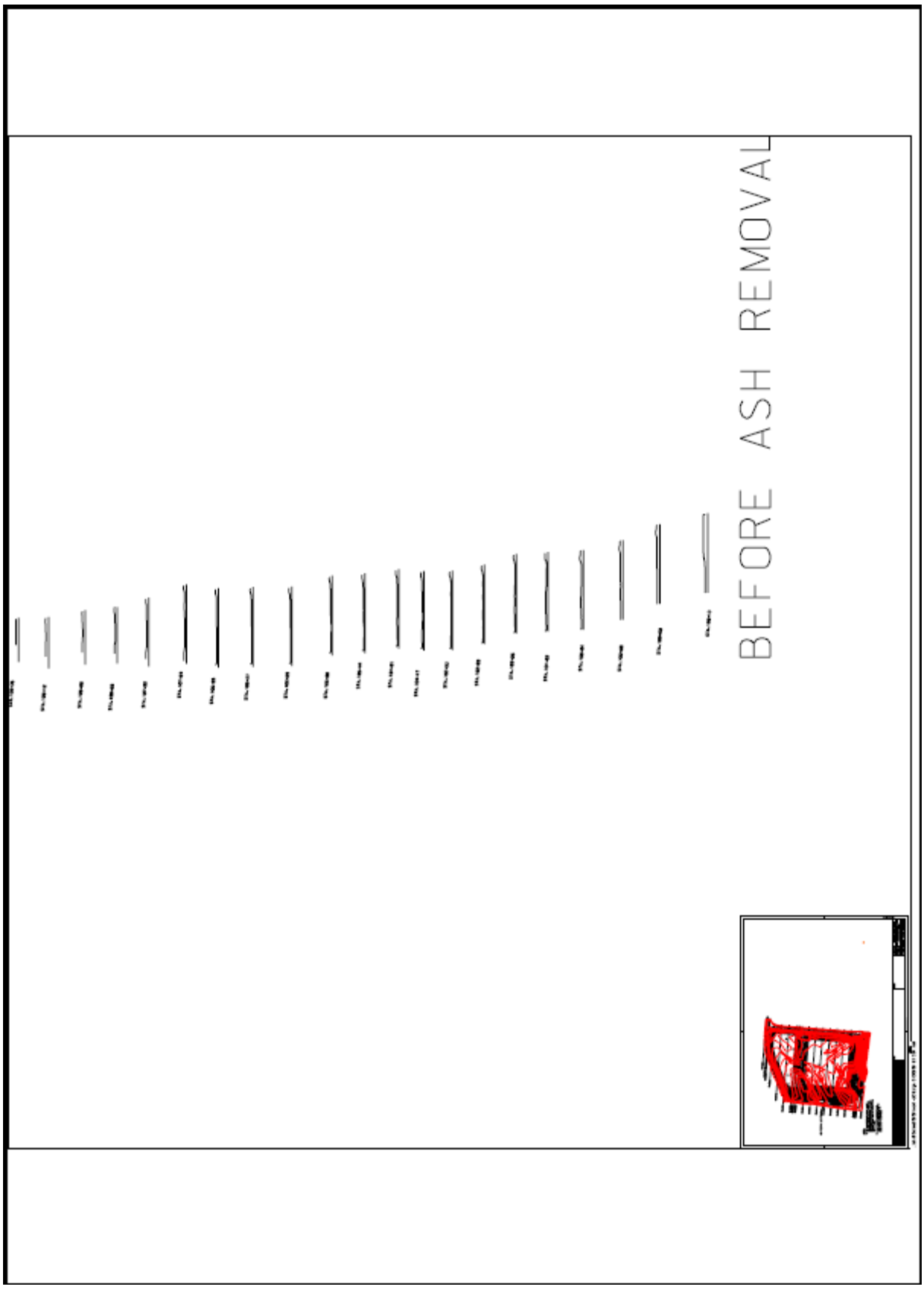
Depth in Feet	DESCRIPTION	Surf. Elev. 437.3	Samples	Recovery inches	Blow Count	Qp TSF	USCS	GRAPHIC
50	SAND (fine to medium, trace coarse), well graded							
			24	17	9 20 45 52			
55		382						
60		377	25	13	6 10 11 11		SW	
65		372						
	– fine to coarse, trace fine gravel, light gray		26	16	5 7 11 15			
70		367						
			27	14	8 12 15 20			
75								

WL 313


EAST ASH POND EXPANSION
SUMMARY BORING LOGS
ASH POND 2
EAST ASH POND EXPANSION
TO ELEVATION 453
WOOD RIVER POWER STATION
D-08
DYNEGY
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER, ILLINOIS
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
SECTION A-A
SEE SHEET P-02
LEGEND
LEGEND
ELEVATION, feet (USGS datum)
ELEVATION, feet (USGS datum)

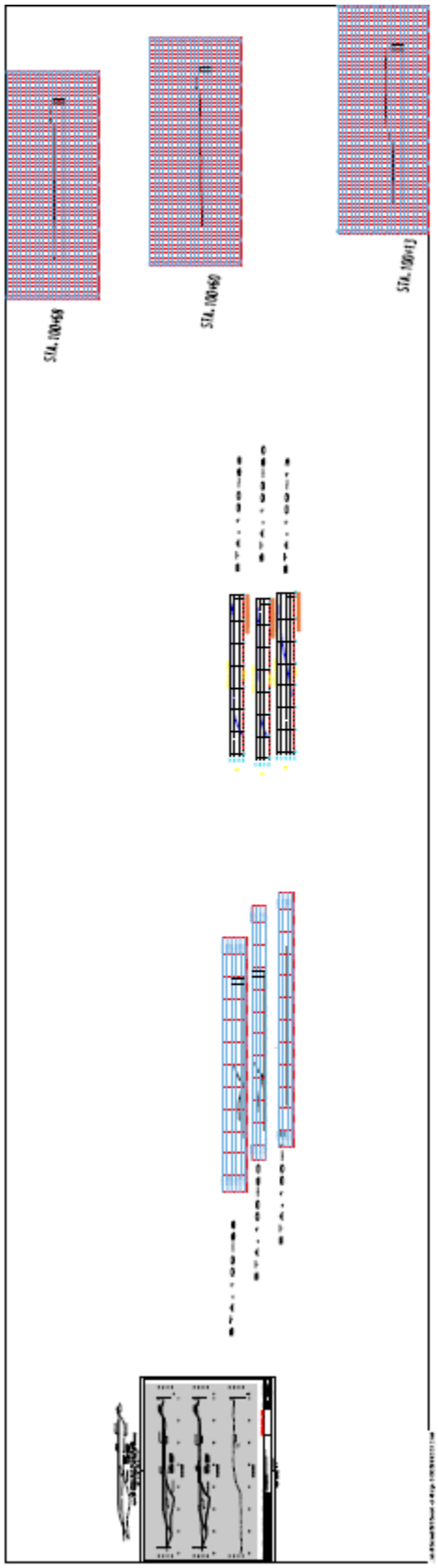

EAST ASH POND EXPANSION
SUMMARY BORING LOGS
SHEET 2 OF 2
EAST ASH POND EXPANSION
D-09
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
DYNEGY
PREPARED BY:
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462
SECTION B-B
SEE SHEET P-02
LEGEND
LEGEND
ELEVATION (feet ISSDS datum)

DRAFT

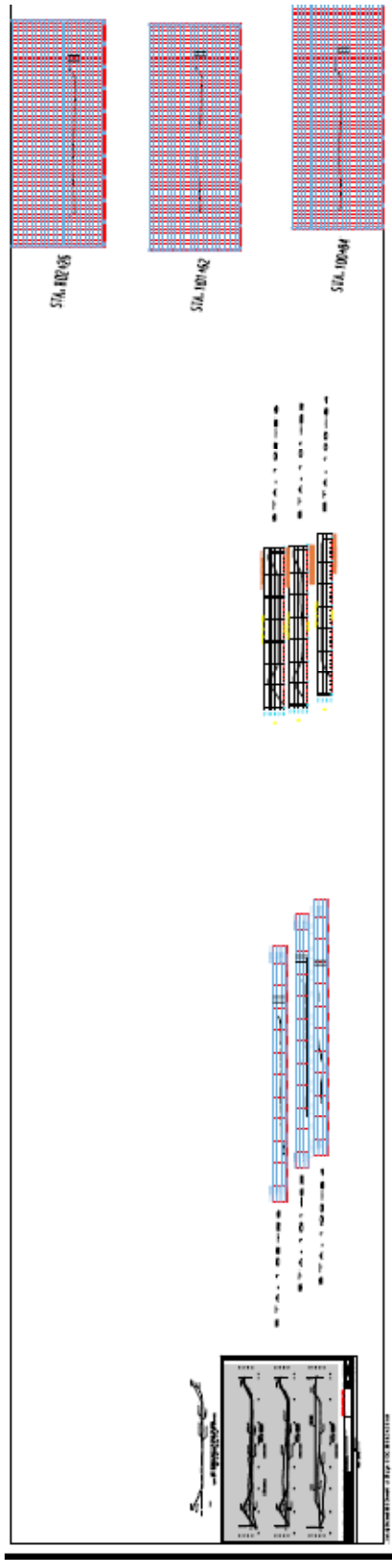


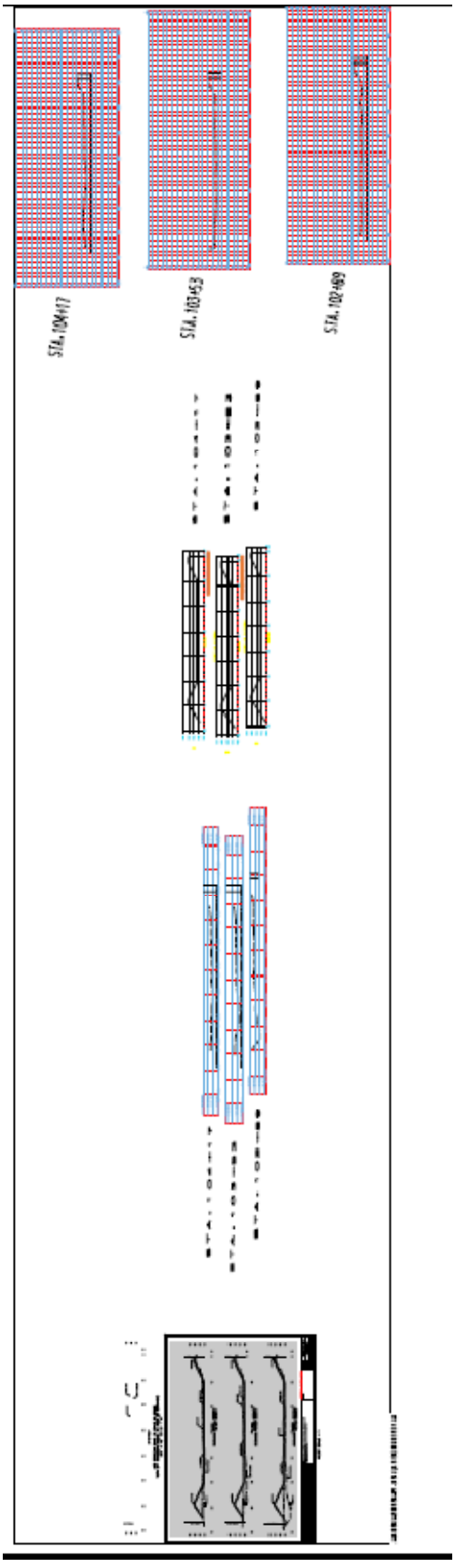
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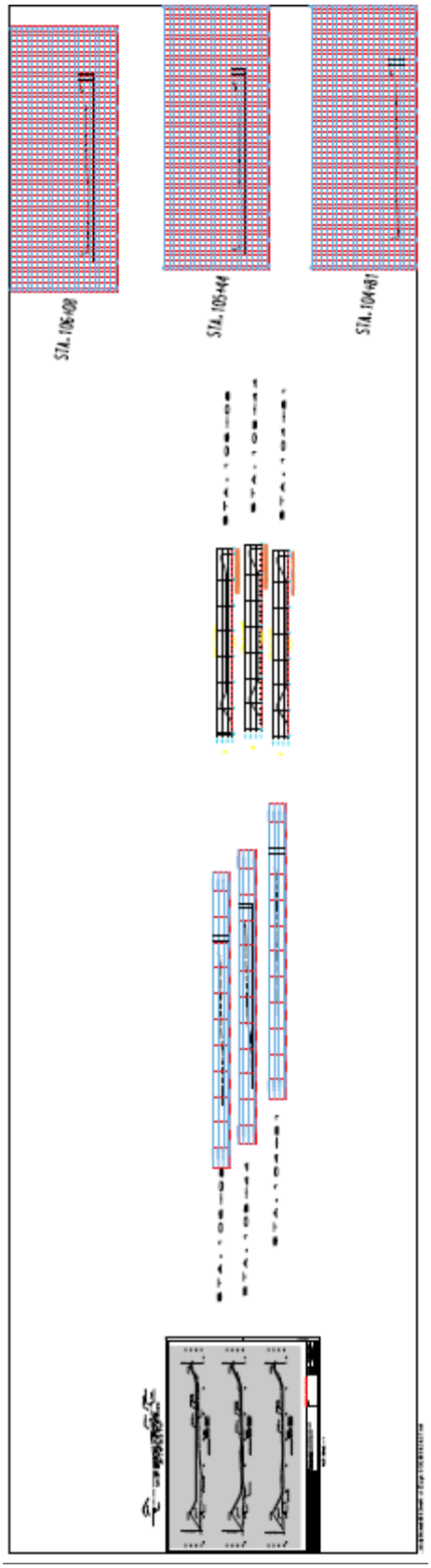


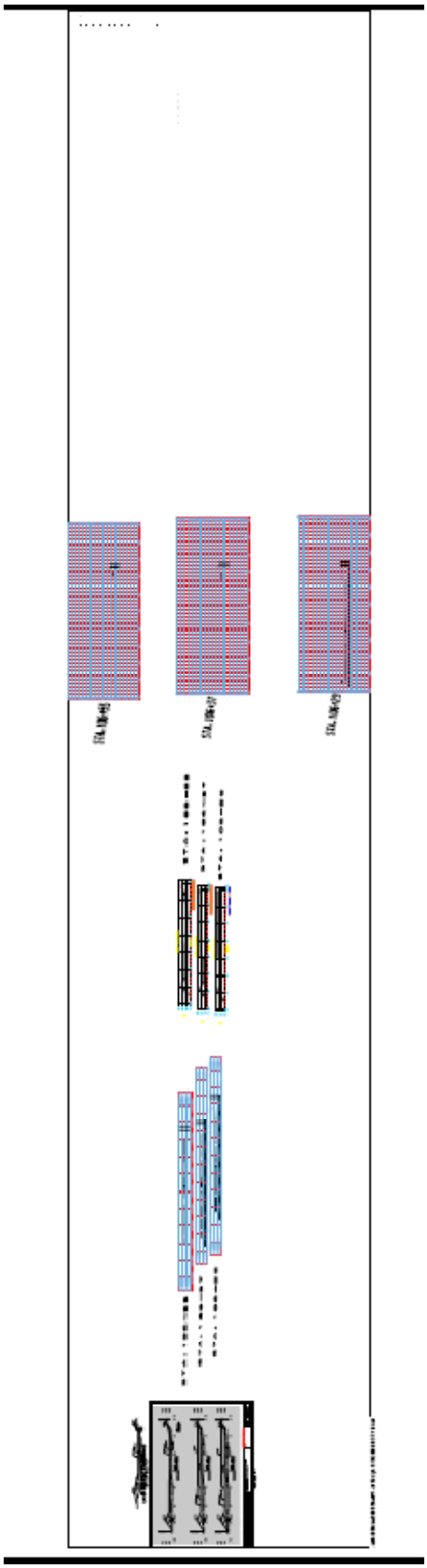
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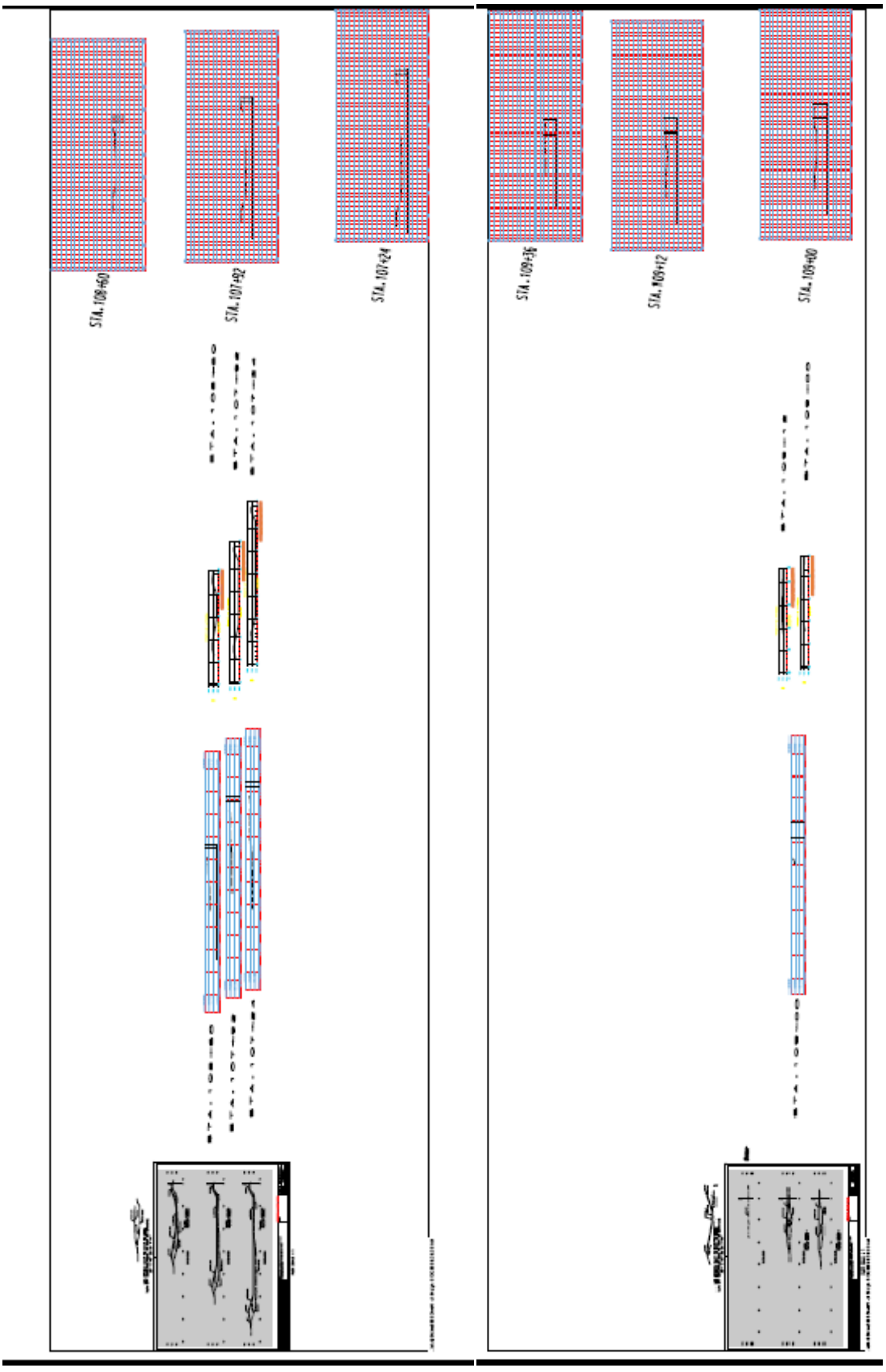


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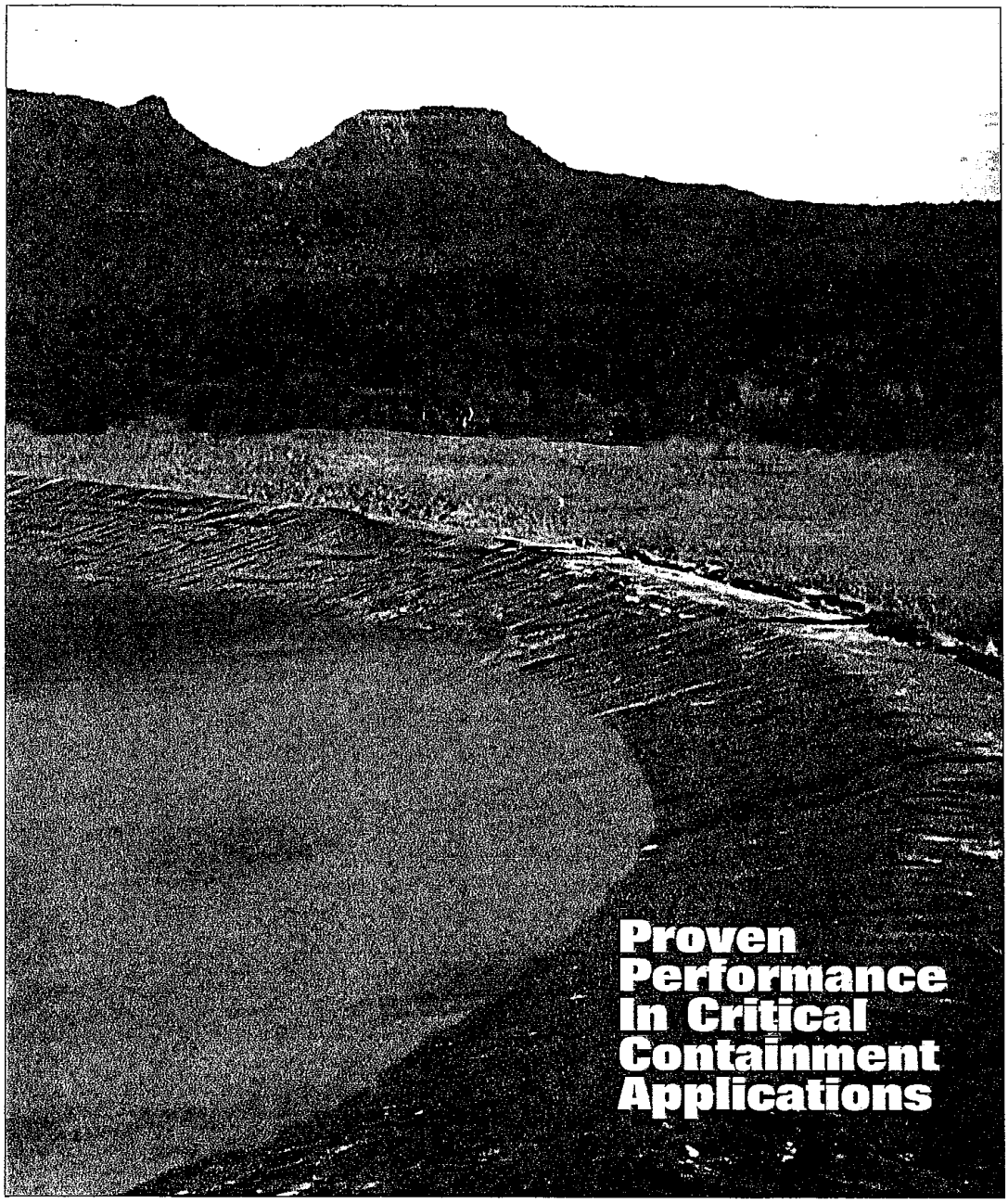


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COOLEY POLYPROPYLENE GEOMEMBRANES

Cooley
ENGINEERED MEMBRANES INC.



WR 99

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COOLEY POLYPROPYLENE GEOMEMBRANES

Engineered for Critical Applications.

Cooley polypropylene geomembranes excel under some of the most demanding conditions on earth. Polypropylene geomembranes meet and exceed the critical challenges of liquid containment and pollution control.

Scrim-reinforced polypropylene liners are lightweight with a specific gravity of just 0.9, allowing the flexibility to fabricate very large panels while minimizing field seaming. Compared to other synthetic geomembranes, this advantage leads to significant quality and cost benefits.

Cooley's expertise in applied polymer research has resulted in numerous technical advantages for their geomembranes. Our polypropylene liners exhibit excellent dimensional stability and lay-flat characteristics as well as superior cold temperature resistance and no environmental stress cracking.

"We harness the explosion of knowledge coming from the chemical industry and make it work in the form of advanced reinforced polymer materials."

— P. Robert Siener
Cooley Chairman

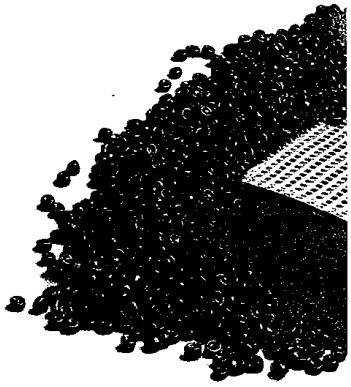
Rugged Construction.

The flexibility and toughness of our polypropylene is a result of superior reinforcing fabrics, scrims and substrate grids. Cooley utilizes a reactor-modified polypropylene resin (cattaloy process), which expands the range and capabilities of the polypropylene sheets. The Cooley-manufactured fabrics and scrims are designed to achieve the tear strength, tensile strength, puncture resistance and other physical properties required by the containment industry.

Optimized Manufacturing, Optimized Results.

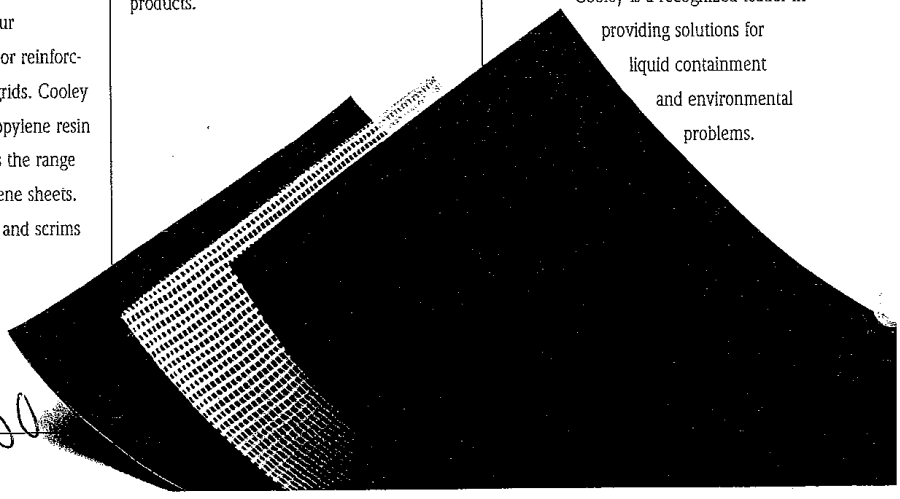
We take an integrated approach to engineering and production. In fact, Cooley developed the extrusion process for the application of polymers to its fabrics. The unique screw designs, heat and cooling zones, customized dies and computerized controls were designed by our own engineering staff and fine tuned by our experienced operators.

We've optimized our high-capacity polypropylene geomembrane manufacturing top to bottom. At Cooley you'll find computer-controlled mixing and extruding processes. Nuclear scanning capability. Complete fabric manufacturing operations. Everything is under the watchful eye of statistical QA/QC and SPC systems. All to ensure the highest quality products.



The Inside Story on Cooley Geomembranes.

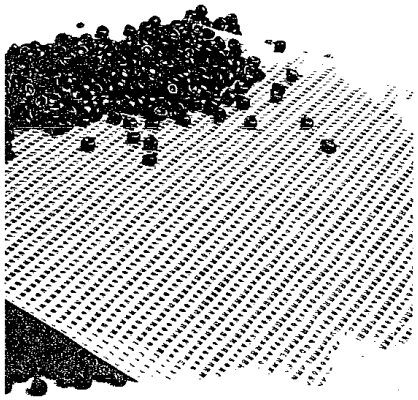
Since 1926 Cooley has been a leader in the development and manufacturing of high-performance fabrics and films for thousands of transportation, medical, agricultural, industrial, chemical and environmental applications. Cooley offers the widest variety of synthetic geomembranes available: polyvinyl chloride (pvc), polyurethane, Elvaloy® (KEE), Hytrel® and polypropylene. With millions of square feet of geomembrane liners in service throughout the world, Cooley is a recognized leader in providing solutions for liquid containment and environmental problems.



WR100

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Cooley ENGINEERED MEMBRANES INC



Characteristics of Cooley Polypropylene Geomembranes.

Durable and stable — scrim reinforcing provides a high ratio of strength to thickness, resulting in exceptional puncture and tear resistance.

High & low temperature tolerance — with superior tolerance to temperature extremes, brittleness is virtually eliminated even at -65°F. With a low coefficient of thermal expansion and contraction, polypropylene exhibits excellent dimensional stability. In addition, the film edge prevents any potential for wicking.

Easily seamed — thermal seaming can be done on-site either hot air or hot wedge. With our product, seams are as strong as the surrounding material.

UV resistant — advanced UV blockers provide superior weathering characteristics, allowing long-term exposed applications. Exceptional ozone resistance also.

Excellent containment characteristics — resistant to most acids, liquids, solid wastes, waste water and industrial chemicals.

Superior flexibility/lay-flat capability — conforms to subgrades, reducing seam and sheet stress. Low crystallinity eliminates environmental stress cracking (ESC).

Inherently safe — free of plasticizers and other components that leach out. Safe for most uses, including potable water.

EPA 9090 for MSW — suitable for solid waste applications.

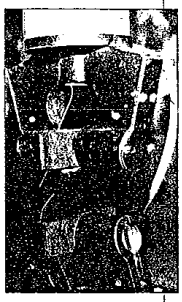
Variety of thicknesses and colors — Cooley polypropylene product is available 20 to 120 mils. A broad range of colors is also possible.

Strong warranty — Cooley offers up to a 20-year product warranty in exposed applications.

Putting it to the Test.

We subject our geomembranes to rigorous ASTM and FTMS tests for tear strength, low temperature flexibility, UV resistance and more — ensuring that consistent high quality is synonymous with the Cooley name.





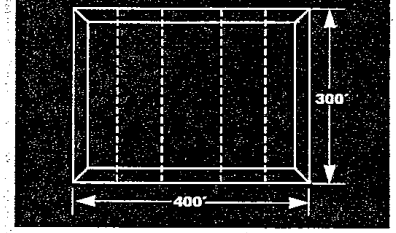
Credentials? We're a Department of Defense; Defense Supply Agency qualified testing laboratory for chemical, physical and biological testing (QLL #5220).

Bottom line, you don't have to take our word for Cooley quality — the proof is in the tests at our plant, our stringent quality control standards and, ultimately, at installations in the most demanding applications worldwide.

And Installation from the Ground Up.

Cooley polypropylene geomembranes can be fabricated cost effectively into panels up to 50,000 square feet. On-site, the panels can be easily thermally welded using hot air and wedge welding for leak-tight installations and long-term seam integrity.

Polypropylene Panel Configuration for 400' x 300' Pond.



Thanks to the panel's vast size, both seam length and installation costs are minimized. Because Cooley geomembranes retain their excellent seaming characteristics, any modifications or repairs can nearly always be accomplished using hand-held hot air tools on-site using your own maintenance personnel — no costly transport or special equipment needed.

Cooley Expertise — Always Available.

Cooley technical assistance can provide you with the answers you need to avoid any pitfalls and help ensure the best possible installation. Call today to make your project a long-term success.

800-444-4023

Nine 83' x 310' panels create just 1240' of seams. Compare that to a typical small-panel polyethylene configuration with 6510' of seams.

WR 101

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COOLEY POLYPROPYLENE GEOMEMBRANE PROPERTIES

PROPERTY	TEST METHOD	VALUES* (Metric) 30 MIL	45 MIL
Gauge, Nominal (mils)	ASTM-D751	30± 10% (0.76mm)	45± 10% (1.14mm)
Plies Reinforcing		1	1
Breaking Strength (lbs. min.)	ASTM-D751 Method A	250 lbs. x 200 (1.11kn x .89kn)	300 lbs. x 250 (1.33kn x 1.11kn)
Tear Strength (lbs. min.)	ASTM-D751 Tongue Tear	100 lbs. (.44kn)	100 lbs. (.44kn)
Low Temperature Degrees F	ASTM-D2136 1/8" Mandrel - 4 hrs.	-65°F (-54°C)	-65°F (-54°C)
Dimensional Stability (percent change max.)	ASTM-D1204 (180°F/1 hr.)	1%	1%
Hydrostatic Resistance (psi min.)	ASTM-D751 Method A	300 psi (2.07MPa)	350 psi (2.41 MPa)
Ply Adhesion (lbs./in. min.)	ASTM-D413	20 lbs./in. (3.5kn/m)	20 lbs./in. (3.5kn/m)
Puncture Resistance	FTM-101B Method 2031	250 lbs. (1.11kn)	250 lbs. (1.11kn)
Water Absorption (max. % weight change 70°F)	ASTM-D471	<1%	<1%
UV Resistance	ASTM-G26 Xenon Arc @ 80°C	12,000 hrs. +	12,000 hrs. +
Resistance to Soil Burial (% tensile retention)	ASTM-D3083 (Part. 9.5)	90% min.	90% min.

*Also available in 20 mil and 36 mil as standard products in both 64.5" and 76" widths. Contact Cooley for product specification sheets. Custom gauges, widths and reinforcements are available. Minimum orders do apply.

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45 MIL POLYPROPYLENE
PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	VALUES
Gauge, Nominal (Mils)	ASTM-D751	45 ± 10%
Plies Reinforcing		1
Breaking Strength	ASTM-D751, Method A	300 x 250 lbs.
Tear Strength (lbs. Min.)	ASTM-D751, Tongue Tear	100 lbs.
Low Temperature(° F)	ASTM-D2136, 1/8" Mandrel - 4 hrs.	-65°F
Dimensional Stability (% Change Max.)	ASTM-D1204 (180°F/1 hour)	1%
Hydrostatic Resistance (psi Min.)	ASTM-D751, Method A	350 psi
Ply Adhesion (lbs./in. Min.)	ASTM-D413	20 lbs.
Puncture Resistance	FTM-101B, Method 2031	250 lbs.
Water Absorption (Max. % Weight Change)	ASTM-D471	< 1%
U. V. Resistance	ASTM G-26 Xenon Arc @ 80°C	Pass @ 12,000 hours +
Resistance to Soil Burial (% Tensile Retention)	ASTM-D3083 (Part. 9.5)	90% Min.

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COOLEY ENGINEERED MEMBRANES, INC.

ENVIRONMENTAL LININGS

Guideline Specification
for
Polypropylene Geomembrane Installation

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POLYPROPYLENE GUIDE SPECIFICATION

1.0 GENERAL

1.01 SCOPE OF WORK

The work covered by these specifications consists of installing a 20-60 mil thick fabric reinforced Polypropylene (PP) geomembrane, in the areas shown on the project drawings. All work shall be done in strict accordance with the project drawings, these specifications and the Fabricator's approved shop drawings.

Sufficient material shall be furnished to cover all areas as shown on the drawings including seam areas, anchor trenches and appurtenances as required. The Fabricator/Installer of the liner shall allow for any anticipated or planned shrinkage or wrinkles in the field panels, installing the membrane free of stress or tension.

1.02 MANUFACTURER/FABRICATOR/INSTALLER INFORMATION

The following shall be the minimum information submitted at the time of the bid, relating to the PP Manufacturer, proposed Fabricator and Installer: Name, Address, Phone, Fax, Qualifications of the individuals who will personally be assigned to the project.

1.03 PRODUCTS

The geomembrane material shall be a 20, 30, 36, 45 or 60 mil thick, scrim-reinforced, Polypropylene as manufactured by Cooley Engineered Membranes, Inc., of Pawtucket, RI. The geomembrane shall be manufactured by the extrusion/calendering process, consisting of first quality ingredients, suitably compounded of which PP is the principal resin. The finished compound shall be uniform in color, thickness, size and surface texture.

The finished membrane shall consist of two (2) plies of Polypropylene (PP) laminated over one (1) ply of reinforcing scrim. The reinforcing scrim shall be a 9 x 9 - 1000 denier polyester fabric to create an open-type weave that permits strike-through of the PP.

The PP shall fully encapsulate the scrim and shall extend a minimum of 1/8" beyond the reinforcing scrim roll edges. Exposed fabric along the longitudinal edges of the roll stock shall not be permitted. The finished membrane shall meet or exceed the "physical properties" values as shown on the following page:

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1.04 SUBMITTALS

The PP roll goods shall be factory fabricated into large panels. The Fabricator shall furnish a proposed geomembrane panel layout to be approved in writing by the Engineer prior to material shipment. The drawings shall show: the direction of factory seams, the size of panels, and the location of field seams, consistent with the requirements of the project drawings. These details shall include the recommended termination details of the geomembrane. Except for special requirements due to configuration and/or terminating the geomembrane, maximum use of large size panels shall be made to reduce field seaming to a minimum

1.05 FACTORY FABRICATION

The Fabricator shall be an experienced firm customarily engaged in factory-fabricating individual widths of scrim-reinforced geomembranes roll stock into large panels. The fabricator shall have experience in fabricating a minimum of 5,000,000 square feet of geomembranes by thermal fusion methods.

Prior to factory seaming, all roll goods shall be inspected. All factory seams shall be made by thermal fusion methods. All factory seams shall have a minimum scrim-to-scrim overlap of one and one-fourth inches (1 1/4") when fabricated. All seams shall be made so that thermal fusion bond extends fully to the top edge of the sheet so that no loose edges are present on the top side of the panel.

1.06 INSPECTION AND TESTING OF FACTORY SEAMS

1.06.1 Inspection

All sheets and seams shall be 100% visually inspected during fabrication. No defective seams or exposed scrim will be allowed. All exposed scrim edges shall be sealed with an approved PP edge caulk or capped with a strip of PP. All indicated repairs shall be made by the geomembrane Fabricator before the panels are packaged for shipment.

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1.06.2 Testing

In addition to visual inspection, a 48 inch (1.2M) sample shall be taken from each factory seam welding unit used in this work at the beginning of every work shift an every four hours of production thereafter. Samples shall be non-destructive, not requiring patching of fabricated panels. Test specimens shall be cut at quarter points from each 48 inch seam sample (a total of three places) and tested for seam strength and peel adhesion. The shear seam strength shall be tested in accordance with ASTM D751 as modified in Annex A of ANSI/NSF 54. The peel adhesion shall be tested in accordance with ASTM D413 as modified in Annex A of ANSI/NSF 54.

A log shall be maintained showing the date, time, panel number and test results. Failure of the material and/or seams to meet all the requirements of these specifications may be cause for rejection of the PP material and/or seams as appropriate. The Fabricator shall provide the test results to the Owner or Engineer upon request.

1.07 CERTIFICATION AND TEST REPORTS

Prior to installation of the PP panels, the Fabricator/Installer shall provide the Engineer with the following certification and test reports:

1.07.1 Written certification that the material meets all of the requirements of Section 1.03.
1.07.2 Written certification that the factory seams were inspected and tested in accordance with Section 1.06.

1.08 PP PANEL PACKAGING AND STORAGE

Each factory fabricated panel shall be rolled and/or accordion-folded and placed onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each panel shall be given prominent and unique identifying markings indicating the proper direction of unrolling and/or unfolding to facilitate layout and position in the field. The panels shall be suitably packaged, enclosed and protected to prevent damage during shipment and each package shall be prominently marked in the same fashion as the panels within. Until needed, packaged factory fabricated panels shall be stored in their original unopened containers in a dry area, and protected from the direct heat of the sun, where possible. Pallets should not be stacked.

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2.0 POLYPROPYLENE (PP) INSTALLATION AND SEAMING

2.01 SUBGRADE PREPARATION (New Excavation)

The surfaces on which the lining is to be placed shall be maintained in a firm, clean, dry and smooth condition during the lining installation. All surfaces shall be compacted and smooth graded with anchor trenches provided as required and detailed. All surfaces to be lined shall be free of rocks, roots, gravel, grade stakes or debris that may puncture the geomembrane. The subgrade shall be compacted to a minimum of 95% of the dry density (as determined by ASTM D398 Standard Proctor Method) on the engine specification. Geotextiles may be used as a cushioning agent. All vegetation, if present, shall be removed and if required by the Engineer, a soil sterilant applied. The soil sterilant shall be selected for the geographical area and native grasses and growth.

If groundwater is present within 12 inches below the surface to be lined, the General Contractor shall dewater the area prior to and during installation of the liner.

Immediately prior to the installation of the PP geomembrane, a complete and detailed inspection of the embankments shall be performed by the Field Engineer, Earthwork Contractor and the Geomembrane Installer to determine acceptance of the finished subgrade and elevations. Any erosion or other damage to the base material which has occurred since placement shall be corrected by the Earthwork Contractor.

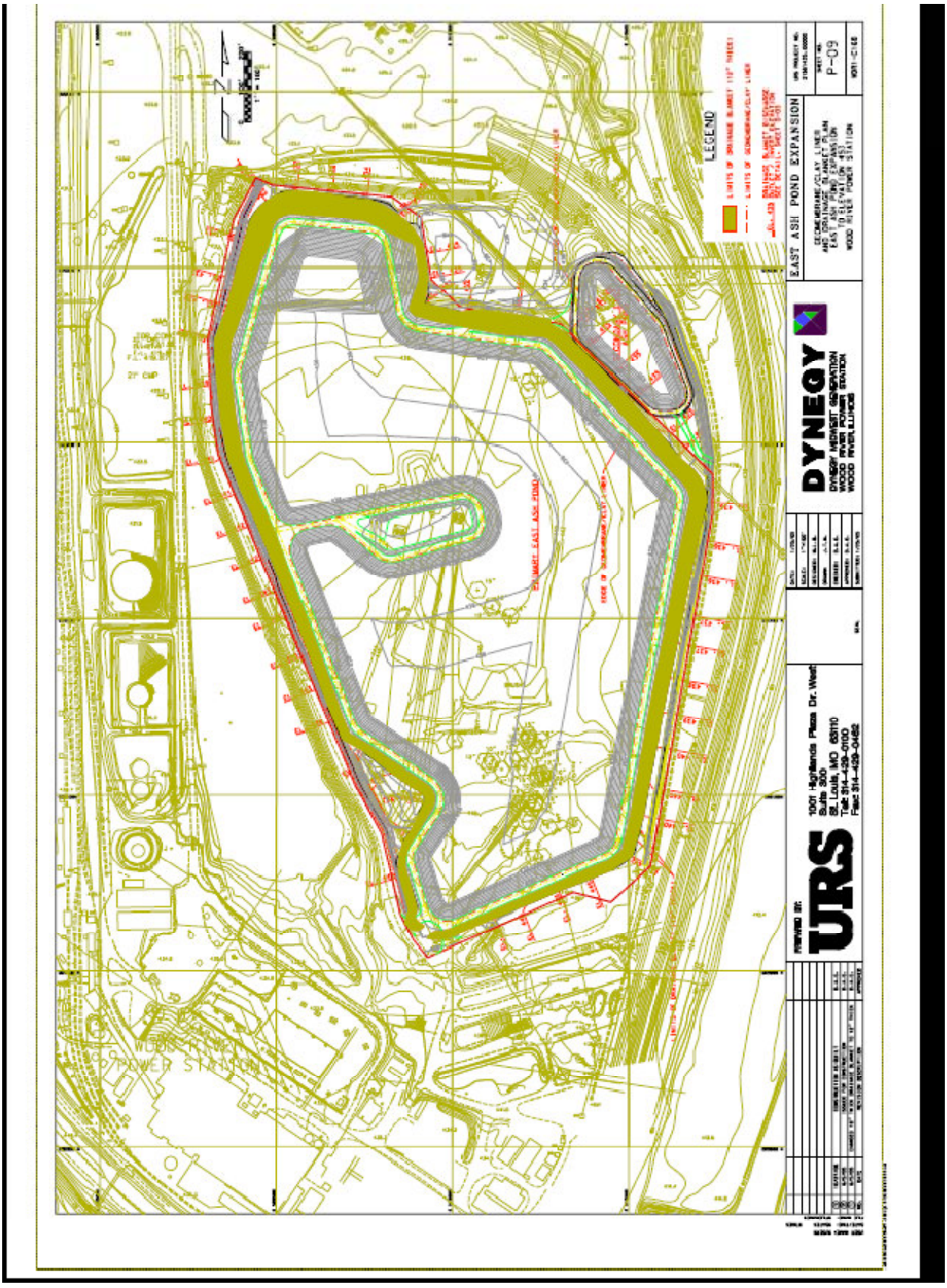
2.02 PP GEOMEMBRANE INSTALLATION

The surface of the existing excavation shall be prepared in accordance with the Engineers requirements as specified in the drawings or specification documents. The surface must be acceptable to the installation contractor and the recommendations of the liner manufacturer.

The geomembrane shall be placed over the prepared surfaces in such a manner as to insure minimum handling and in accordance with the approved shop drawings. The lining shall be sealed to all concrete structures and other openings in accordance with details shown on the plans and shop drawings. The geomembrane lining shall be closely fitted and sealed around all inlets, outlets and other projections through the lining, using prefabricated fittings where possible as shown in the construction details. Liner sheets, damaged from any cause, shall be repaired or covered with additional sheeting. Only those sheets of lining material which can be anchored and seamed together the same day shall be unpackaged and placed into position. In areas that high wind is prevalent, the lining installation should begin on the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags sufficient to hold it down during high winds. The leading edges of the liner material left exposed after the day's work shall be anchored to prevent damage or displacement due to wind.

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LEGEND
EAST ASH POND EXPANSION
DECEMBERMINE/CLAY LINER
AND DRAINAGE BLANKET PLAN
EAST ASH POND EXPANSION
DYNEGY MIDWEST GENERATION
WOOD RIVER POWER STATION
WOOD RIVER POWER STATION
P-09
DYNEGY
URS
1001 Highlands Plaza Dr. West
Suite 300
St. Louis, MO 63110
Tel: 314-429-0100
Fax: 314-429-0462

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DYNEGY MIDWEST GENERATION, INC.

Wood River Power Station
Alton, Illinois

Madison County

East Ash Disposal System

Small Class I Dam

IDNR Permit No. DS2005052

Operation and Maintenance Plan

WR49

Revised: November 2007

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1.0 General

1.1 Responsible Party

The Wood River Station Manager and his/her staff are responsible for the operations and maintenance of the Wood River East Ash Pond System.

1.2 General Description

The function of the Wood River East Ash Pond System is for ash disposal for the Wood River Power Station. This station is staffed with a full operation crew 24 hours/day, 365 days per year. The following maintenance procedures are provided to insure the structural integrity of the Wood River Power Station East Ash Pond facility, which is classified as a *Small* Class I dam by the Illinois Department of Natural Resources, Office of Water Resources, Division of Water Resources, Dam Safety section.

The Wood River East Ash Pond System is an ash disposal and water treatment facility with a foot print of approximately 38 acres. The impoundment has the capacity to store approximately 483 acre-feet of water and ash at a maximum nominal depth of 15 feet. The embankments are constructed out of previously disposed ash, with a soil cover on the outside and a composite liner on the inside. The composite liner consists of 1.5 feet of clay, overlain by a HDPE geosynthetic liner.

The water shed for the impoundment is limited to the impoundment itself, it does not receive any stormwater from outside of it's perimeter. The only inflow to the facility, other than precipitation falling directly into the system, is miscellaneous Station water flows with the primary flow being ash sluice water. The outfall of the impoundment is directed into a CMP culvert under the rail loop which is termed an unnamed tributary to Wood River Creek. From there it discharges into the Wood River Creek and then into the Mississippi River.

2.0 Operating Plan

2.1 Normal Operating Procedures

The Wood River East Ash Pond is operated as a wastewater treatment facility. Since the drainage runoff area is nearly similar to the size of the facility, the only inflow (other than precipitation falling directly on the facility) will be flows pumped from the Station. Except during times of initial filling, or when the water elevation is changed (an infrequent occurrence) the facility will be at a steady-state, flow-through condition. Average flows through the facility will be approximately 2 million gallons per day.

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Normal pool elevation of the primary cell will change during the life of the facility since the pool will be staged at four elevations. The first stage will be approximately 440.5, the second stage will be approximately 444.5, the third stage will be approximately 447.0, and the final stage will be at the top of the discharge structure of 450.0. The valves for each associated discharge pipe will be closed when it is determined the water level should be raised to maintain water over the deposited ash.

The final cell is operated in one stage at 432.0, with the pass-through flows being the same as through the primary cell.

2.2 *Inspections and Surveillance*

2.2.1 Daily Surveillance

During the normal course of business, Station Operations personnel make a routine surveillance of the plant property, including the ash impoundments. During this time, station personnel should look for any unusual conditions, and if discovered, report them to the Station Environment and Chemistry Manager.

2.2.2 Weekly Inspections

Weekly inspection shall be made of the dam, embankments and outfall structures. A check should be made for seepage at and around the embankments.

2.2.3 Semiannual Inspection

Inspections shall be made twice each year approximately six months apart by Station personnel to determine the general condition of the dam and embankments. During these inspections, embankment erosion, tree growth, and embankment seepage shall be monitored. Seepage shall be observed for change in quantity and coloration.

2.2.4 Annual Inspection and Surveillance

The annual inspection of the dam and embankments shall be made in the **fall** of each year (**prior to October 31**) by a professional civil engineer experienced in performing such inspections. This inspection shall be followed by a verbal and written list of recommendations. Based on the findings and recommendations of the inspection, corrective action shall be taken by the Station staff, as required, to assure safe and continued operation of the impoundment.

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Procedures and the methods of correction shall be performed in accordance with the recommendations of the professional engineer and as outlined in the maintenance portion of this report. Copies of this engineer's report, along with a listing of the corrective action taken, shall be forwarded to the Operations Environmental Compliance Group in DMG's Decatur, Illinois office who shall then submit the report to the Illinois Department of Natural Resources, Office of Water Resources, Division of Water Resources Management, in Springfield, IL.

2.2.5 Annual Statement

An annual statement on forms furnished by IDNR/OWR certifying compliance with this operations and maintenance plan shall be submitted to IDNR/OWR/Dam Safety section.

3.0 Maintenance Plan

3.1 General

Regular inspections and repairs as required of the dam, outlet structures, and embankments shall be made as discussed in this report. These inspections, along with the review and recommendations made by the professional civil engineer, shall be the basis for all maintenance activities.

3.2 Operable Equipment

The only operable equipment within the primary cell (excluding environmental sampling equipment) is the plug valves in the three discharges pipes of the primary pond outfall structure. Up to the time when each particular valve is closed to raise the pool elevation (proceed to the next pool stage), each valve should be operated once per year from the fully open to the fully closed position, and back to the fully opened position. If any problems occur during the operation, the valve should be lubricated and repaired accordingly.

The 6" emergency draw-down pipe in the secondary cell also has a plug valve. This valve should be tested once per year to ensure that the valve moves. However, it should not be fully opened since the water in the secondary cell is to discharge over the top of the structure, per the NPDES permit requirements.

3.3 Vegetation

In order to protect and retain vegetation on the slopes of the dam and embankments, fertilizing and reseeding shall take place in damaged or barren areas. This shall be conducted as soon as appropriate after being discovered. The seeding mixture shall consist of 30 lbs./acre of Brome grass and 40 lbs./acre of Oats, to match the original seeding mixture.

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Trees and shrubs observed during semi-annual inspections shall be cut and removed from the dam, embankments, and spillway areas.

Routine mowing should maintain grass cover at the 8-10 inch height to facilitate inspections.

3.4 Maintenance of Spillway Outlet

The outlet works from this impoundment flows in a buried pipe and discharges in a CMP pipe that takes water under the rail loop at the Station. The outlet areas inside the pond, as well as the areas around the CMP pipe shall be inspected to ensure there are no problems with the flow of outlet water from the impoundment. Problems may include pluggage or obstructions in the flow paths, erosion around the piping structures or weak or damaged equipment.

3.5 Animal Damage and Repairs

Animal burrows and holes discovered during inspections shall be filled with grout. Special attention shall be given to animal burrows in the embankments and dam.

3.6 Restriction of Unauthorized Vehicles

The embankments and dam approaches shall be fenced, and signs shall be posted to prevent unauthorized travel on the roadways and slopes. The operations of the gates, etc. shall be under the control of the Wood River Power Station staff.

4.0 Emergency Action Plan

A separate Emergency Action Plan has been developed for this facility. Response to any emergency condition shall be as set forth in the Plan.

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5.0 Inspection Checklists

The following Inspection checklists should be used during the weekly and semi-annual inspections.

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Wood River Power Station
New East Ash Pond
***Weekly* Inspection Form**

Dam Location: Wood River Power Station; Madison County
Owner: Dynegy Midwest Generation, Inc; Wood River Power Station
Permit No.: DS2005052 **Class of Dam:** Small Class I
Type of Dam: Earth and Ash Embankment for Ash Impoundment
Type of Spillway: Drop Inlet for Primary and Secondary Ponds

Date Inspected: _____

Weather Conditions: _____

Pool Elevation: _____

Inspection Personnel:

_____ _____
Name / Title **Signature**

Inspection Item	Conditions	Location of Problem and Recommended Remedial Measures and Implementation Schedule
Vertical and Horizontal Alignment of Crest		
Unusual Movement or Cracking at or Beyond Toe		
Seepage		
Vegetative Cover		
Embankment Erosion		
Structural Cracking		
Outfall Structures		
Other		

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Wood River Power Station
New East Ash Pond
***Semi-Annual* Inspection Form**

Dam Location: Wood River Power Station; Madison County
Owner: Dynegy Midwest Generation, Inc; Wood River Power Station
Permit No.: DS2005052 **Class of Dam:** Small Class I
Type of Dam: Earth and Ash Embankment for Ash Impoundment
Type of Spillway: Drop Inlet for Primary and Secondary Ponds

Date Inspected: _____

Weather Conditions: _____

Pool Elevation: _____

Inspection Personnel:

_____ _____
Name / Title **Signature**

Inspection Item	Conditions	Location of Problem and Recommended Remedial Measures and Implementation Schedule
Vertical and Horizontal Alignment of Crest		
Downstream Fill Slopes		
Upstream Fill Slopes		
Unusual Movement or Cracking at or Beyond Toe		
Seepage (Condition/Color)		
Vegetative Cover (Tree growth)		
Animal Damage		
Embankment Erosion		
Water Passages		
Structural Cracking		
Outfall Structures		
Other		

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Dynegy Midwest Generation, Inc.

Wood River Power Station
Alton, Illinois

East Ash Impoundment Dam

IDNR Dam Safety Program

Emergency Action Plan

Permit No. DS2005052

Distribution List:

- ☐ Copy 1 – DMG Wood River – Shift Supervisor
- ☐ Copy 2 – DMG Wood River – Plant Manager
- ☐ Copy 3 – DMG Wood River – Production Manager
- ☐ Copy 4 – DMG Wood River – Environment and Chemistry Manager
- ☐ Copy 5 – DMG Wood River – Safety Manager
- ☐ Copy 6 – Madison County Emergency Management Agency
- ☐ Copy 7 – Village of E. Alton – Fire Chief
- ☐ Copy 8 – City of Alton – Fire Chief
- ☐ Copy 9 – E. Alton 911 – c/o E. Alton Police Chief
- ☐ Copy 10 – Dynegy Midwest, Operations Environmental Compliance
- ☐ Copy 11 – Illinois Dept. of Natural Resources – Dam Safety

May 2009

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Wood River New East Ash Pond Emergency Action Plan Contact List

Plan #	O&M	Title	Name	Address	Phone	Email
1		WR Shift Supv.	N/A	#1 Chessen Lane, Alton, IL 62002	618-462-9251 X293	N/A
2	Y	WR Plant Manager	Robert Crowe	#1 Chessen Lane, Alton, IL 62002	618-433-0111	bob.crowe@dynegy.com
3	Y	WR Production Mgr.	John Muehlenkamp	#1 Chessen Lane, Alton, IL 62002	618-433-0112	john_muehlenkamp@dynegy.com
4	Y	WR Env./Chem. Mgr.	Don Crone	#1 Chessen Lane, Alton, IL 62002	618-433-0110	donald_crone@dynegy.com
5		WR Safety Mgr.	Dan Shirley	#1 Chessen Lane, Alton, IL 62002	618-433-0194	daniel.l.shirley@dynegy.com
6		Madison Cnty. EMA	Larry Ringering	157 N. Main St., Suite 33, Edwardsville, IL 62025-1962	618-692-0537	
7		Fire Chief - Vill. of E. Alton	Randy Mortland	209 N. Shamrock, East Alton, IL	618-259-2984	eafire@charter.net
8		Fire Chief - City of Alton	Greg Bock	333 E. 20th St., Alton, IL 62002-6816	618-463-3565	firechief@alton-il.com
9		East Alton 911 (PSAP) c/o E. Alton Police Chief	Dwynn Isringhausen	119 W. Main Street East Alton, IL 62024	618-259-2279	eapolice@charter.net
10	Y	OEC - O'Fallon	Susan McVety	604 Pierce Blvd	618-206-5930	susan_mcvety@dynegy.com
11	Y	IDNR - OWR	Paul Mauer	One Natural Resources Way, Springfield, IL 62702	217-782-4427	PMAUER@dnrmail.state.il.us
No	Y	WR Coal Yard Leader - Day	Barney Podner	#1 Chessen Lane, Alton, IL 62002	618-433-0123	barney_podner@dynegy.com
No		Alton WWTP	Dan Cote or Bob Roth	19 Chessen Lane, Alton, IL 62002	cell Nos:618-781-1452	
No		Madison Cnty. Sheriff	Robert Hertz	405 Randle St., Edwardsville, IL 62025	618-463-3558 618-692-7040 X4801	sbhertz@co.madison.il.us

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5/21/2009

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1.0 Notification Information

1.1 Emergency Notification Information

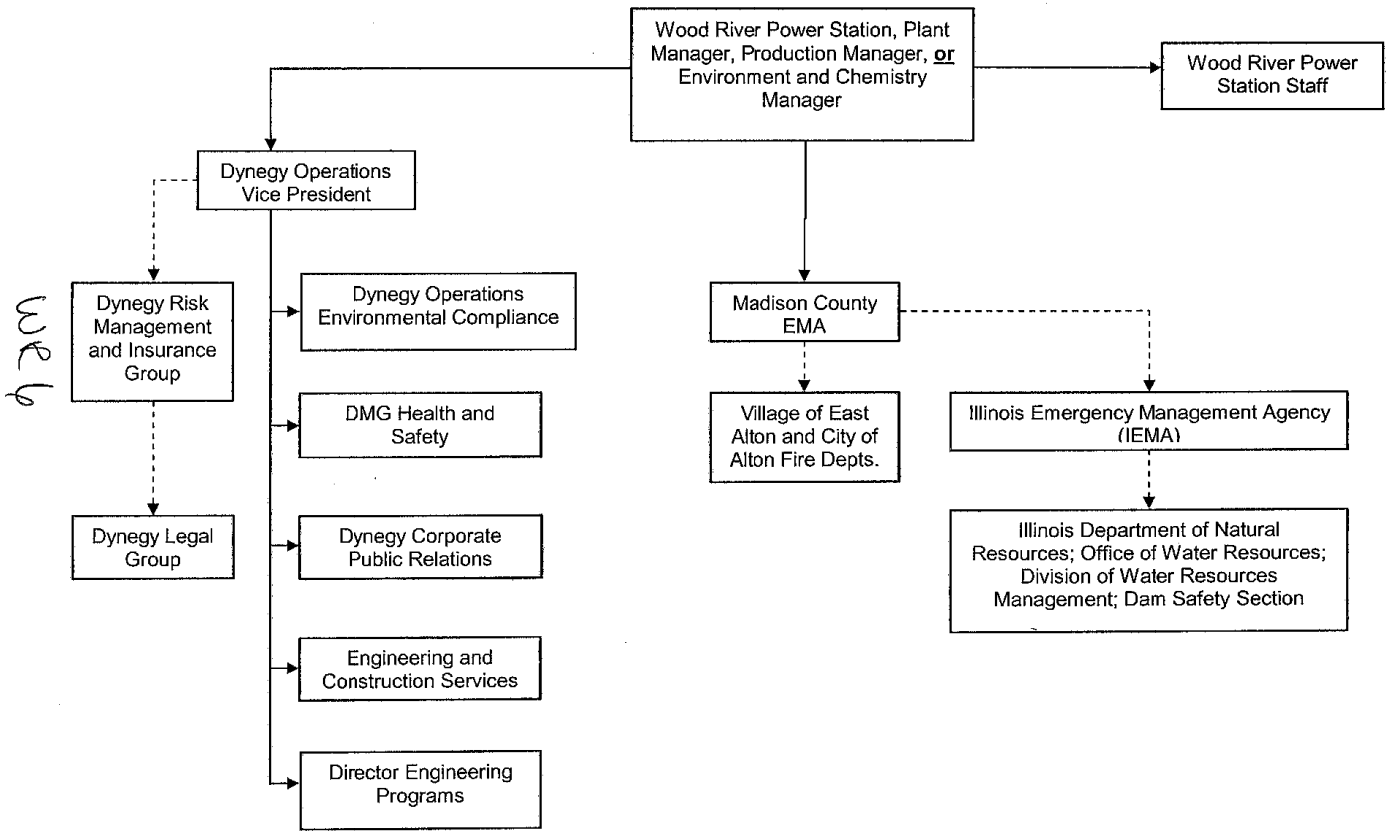
The **emergency notification procedure** is listed in **Section 1.2**. The **emergency response organization** is shown in **Figure 1-1**, located on the next page. If the person discovering an embankment failure is a Station employee, that employee should first notify the Shift Leader on duty. The Shift Leader on duty would then notify either the Plant Manager, Production Manager, or the Environment and Chemistry Manager. The Shift Leader would immediately assume the initial responsibility for managing the overall response to the emergency until the Plant Manager, the Production Manager, or the Environment and Chemistry Manager arrives, and takes over responsibility. The Shift Leader's initial responsibility would include making the emergency notifications listed in **Section 1.2** if neither the Plant Manager, Production Manager, nor Environment and Chemistry Manager can quickly come to the Station.

The Madison County Emergency Management Agency (EMA) as well as the Village of East Alton PSAP (911) and Fire Departments and the City of Alton Fire Department, have been given copies of this Emergency Action Plan. If overtopping of the embankments with water or embankment failure is first noticed by the public and the County EMA or other agency are notified through a "911" call, the county organizations have been instructed to call the Shift Leader (who is always on duty 24 hours/day, 7 days/week) at the first telephone number listed on **Section 1.2**.

The Wood River Power Station, at the direction of the Madison County EMA personnel, will assist response organizations in contacting nearby occupants of residences and commercial or industrial establishments if an evacuation of those occupants is determined necessary, if embankment failure or overtopping of the embankments appears imminent. The persons and businesses identified in **Section 1.3** will be contacted by going door-to-door. Addresses and telephone numbers for those requiring contact are also listed in the same section. **Section 1.4** Contains a listing of engineers and contractors that may be contacted for further assistance, should it be deemed necessary.

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Figure 1-1 – Emergency Response Organization



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1.2 Emergency Notification Procedure Flowchart

1. Person Discovering Pond Embankment Failure Shall Notify:

A. Wood River Power Station - Shift Leader (24 hrs.)
(618) 462-9251, ext. 0 – "Ask for Shift Leader"
AND ALSO dial 911 if failure appears imminent!

2. The Shift Leader Shall Then Notify One of the Following Individuals:

A. Plant Manager – Robert Crowe
Office: (618) 433-0111
Home: (618) 768-4505
Cell: (618) 223-0849

B. Production Manager – John Muehlenkamp
Office: (618) 433-0112
Home: (314) 843-3153

C. Environment and Chemistry Manager – Don Crone
Office: (618) 433-0110
Home: (618) 288-6459

3. The Plant Manager, Production Manager, or Environment and Chemistry Manager Shall Then Contact:

A. Madison County Emergency Services & Disaster Agency (ESDA)
Mr. Larry Ringering
Office: (618) 692-0537

B. Dynegy, Inc – Operations Environmental Compliance (***a required contact***)

DMG 24-Hour Pager
Pager/email: tom.davis@dynegy.com
Cell: (217) 519-1446

or Director of OEC – Rick Diericx
Office: (618) 206-5912
Pager/email: rick.diericx@dynegy.com

or Environmental Professional – Susan McVety.
Office: (618) 206-5930
Home: (618) 935-5878
Cell: (217) 412-6604

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C. Corporate Communication:
Office: (713) 767-8288
Home: (713) 569-7631
Pager/email: david.byford@dynegy.com

4. The Madison County EMA personnel may contact the following Police, Fire and Sheriff's office. They will contact the landowners and site managers listed in Section 1.3 and any other State agency as they see fit. They may work with Wood River Power Station personnel to contact engineers or contractors listed in Section 1.4, if deemed necessary.

A: Madison County Sheriff
Mr. Robert J. Hertz
Office: (618) 692-6087

B: East Alton 911 (PSAP) c/o E. Alton Police Chief
Mr. Dwynn Isringhausen
Office: (618) 259-2279

C: East Alton Fire Dept.
Mr. Randy Mortland
Office: (618) 259-6212

D: Alton Fire Dept.
Mr. Greg Bock
Office: (618) 463-3565

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1.3 Adjacent Landowners and Occupants

1. Commercial or Industrial Occupants:

A. BOC Gasses Site (DMG Property) - UNOCCUPIED
Address: N/A
Name: N/A
Office: N/A

B. City of Alton – Waste Water Treatment Plant
Address: 19 Chessen Lane
Alton, IL 62002
Name: Bob Roth or Dan Cote
Cell Nos: 618-781-1452 or 618-463-3558
Description of Location: The City of Alton WWTP is located directly north of the Wood River Station property, and north of the unoccupied former BOC site. The offices are located within the site, with signs clearly directing visitors where to go.

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1.4 Engineer and Contractor Emergency Contacts

1. Engineers:

A. Inspecting Professional Engineer – Thomas L. Davis, P.E.
Office: (618) 206-5931
Blackberry: (217) 519-1446

B. VP, DMG Engineering & Construction Services – Ken Pollmann
Office: (618) 206-5801
Home: (618) 257-3733
Mobile: (618) 410-7338

2. Contractors:

A. Helmkamp Construction
Address: #1 Helmkamp Dr.,
Wood River, IL 62095
Office: (618) 251-2600 (Wood River)
Office: (314)355-2808 (St. Louis)

B. Freesen, Inc.
Address: P.O. Box 350
Bluffs, IL 62621
Office: (217) 754-3304
Office: (217) 754-3427 (alternate)

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2.0 Statement of Purpose

This Emergency Action Plan (hereinafter referred to as the "Plan") identifies the statutory and regulatory purposes, objectives, responsibilities, and procedures for the safe operation and management of the Wood River Power Station East Ash Impoundment.

2.1 Reasons for This Emergency Action Plan

The Federal Emergency Management Agency (FEMA) as part of its National Dam Safety Program recommends all owners and operators to prepare an **Emergency Action Plan** (EAP) whenever there is the potential for loss of life or damage to property that might occur as the result of a failure of a dam. An EAP is a formal document that identifies the potential emergency conditions at a dam and specifies preplanned actions to be followed to minimize property damage and loss of life. The EAP specifies actions dam owner/operators should take to moderate or alleviate the problems at the dam. It should contain procedures and information to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency situation. It also should contain inundation map(s) to show the emergency management authorities of the critical areas for action in case of an emergency.

The Illinois Rivers, Lakes, and Streams Act (615 ILCS 5 1994 State Bar Edition) Paragraph 70a includes the statement "The Department (Illinois Department of Natural Resources) is authorized to carry out inspections of any dam within the state, and to establish standards and issue permits for the safe construction of new dams and the reconstruction, repair, operation and maintenance of all existing dams."

Similarly Part 3702 of the 92 Illinois Administrative Code, Chapter I entitled the "Construction and Maintenance of Dams" details the requirements to obtain a permit for the construction, operation, and maintenance of a dam. Wastewater treatment impoundments such as ash ponds, sewage treatment lagoons, etc., are required by the IDNR to comply with the provisions of the dam safety program because of the regulatory definition of a dam. 92 Illinois Administrative Code 3702.10 defines a dam as "all obstructions, walls, embankments, or barriers, together with their abutments and appurtenant works, if any, constructed for the purpose of storing or diverting water or creating a pool."

As part of the Permit Number DS2005052, the IDNR is requiring the Wood River Power Station to prepare, submit, and have approved an Emergency Action Plan, including a breach inundation map, consistent with current standards.

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3.0 Description of the East Ash Impoundment

3.1 Location

The Wood River Power Station East Ash Impoundment is located on the Wood River Power Station property in Alton, Illinois. The Station is at the southernmost end of Chessen lane, and is bordered by levees for the Wood River Creek and Mississippi River on the east and south sides, respectively. There is a low-lying area to the west of the station, and a railroad to the north. The entire Station is in Madison County, Illinois, and is on the East bank of the Mississippi River at River Mile 199.6.

The ash impoundment is located on the east portion of the property between the Wood River Creek levee and Chessen lane. It is just north of the Power Station. To the north is the currently unoccupied structures of the former BOC Gasses plant, and then immediately to the north is the Alton Wastewater Treatment Plant. The impoundment is located on the **Columbia Bottom (MO/IL)** USGS 7.5 minute quadrangle map in Section 19, Township T48N, Range R9W of the 3rd Principal Meridian. The impoundment system is located at approximately latitude 38° 52' north and longitude 90° 08' west.

Figure 3-1 through **Figure 3-4** identify the location of the Wood River Power Station and the East Ash Impoundment relative to the city of Alton and the Mississippi River.

Note that there is another ash impoundment system called the West Ash Impoundment System on the west side of the railroad tracks, which are west of Chessen Lane. This ash system is classified as having a Class III, small dam system, and therefore does not require an EAP. *The West Ash Impoundment System is not covered in this Plan.*

3.2 Description of Dam and Appurtenances

The impoundment consists of one large water and ash storage impoundment that is approximately 1000 feet wide and 2000 feet long. The primary purpose of the pond is to provide settling of ash from water used to sluice the bottom ash and fly ash from the Station. There is no runoff from adjacent areas into the system. Inflow is limited to ash transport waters, other miscellaneous low-volume wastes from the Station, and precipitation falling directly into the system. The pond is constructed of an embankment made of ash and local soils.

The maximum dam height is approximately 33 feet. The outfall structure from the second pond discharges into a an unnamed tributary of Wood River Creek, which ultimately discharges into the Mississippi River.

Additional descriptive information is summarized on **Table 3-1**.

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3.3 Hazard and Size Classification

The dam for the Wood River Power Station East Ash Impoundment system is classified as a high-hazard **Class I, Small** dam. It is a Class I dam, since a catastrophic failure of the embankment at certain locations could potentially cause loss of life or substantial economic loss, in excess of what would probably ever occur naturally.

3.4 Purpose of East Ash Impoundment System

The primary purpose of the Wood River East Ash Impoundment is to provide water treatment, and ash disposal volume for the Dynegy Midwest Generation – Wood River Power Station. Since there is no local runoff into the impoundment, the inflows will primarily be from the Wood River Station processes. Contributing streams may include, but are not limited to: ash sluice water; boiler blow down; water treatment regenerant wastes; and local precipitation. Discharges from the system are released into a CMP culvert under the rail loop, and then are subsequently discharged to the Mississippi River. All discharges are subject to the effluent limitations and monitoring requirements set forth in an NPDES permit issued by the Illinois Environmental Protection Agency (IL0000701).

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Figure 3-1 – Wood River Ash Impoundment Map

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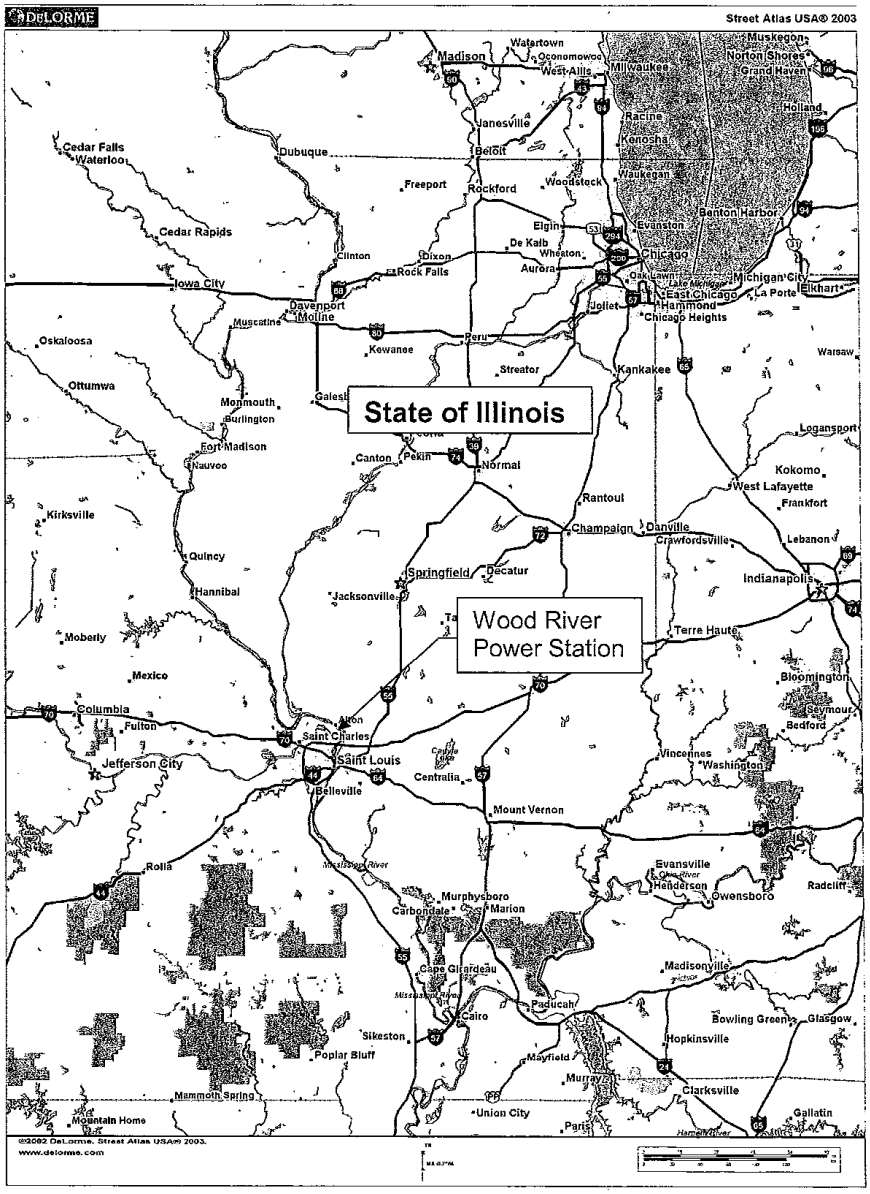


Figure 3-2 – Relative Location in Illinois

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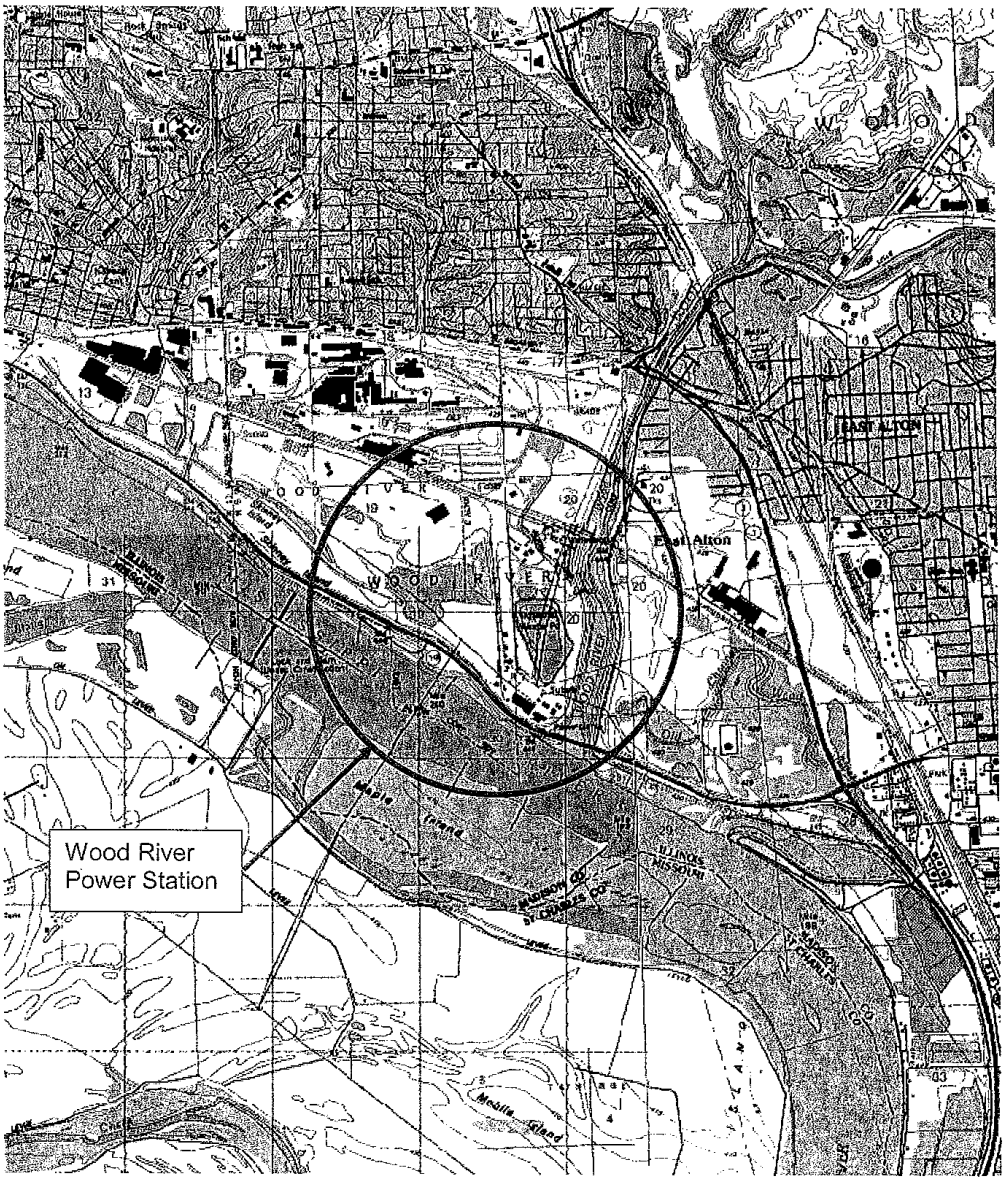


Figure 3-3 – Topographic Map of Immediate Area

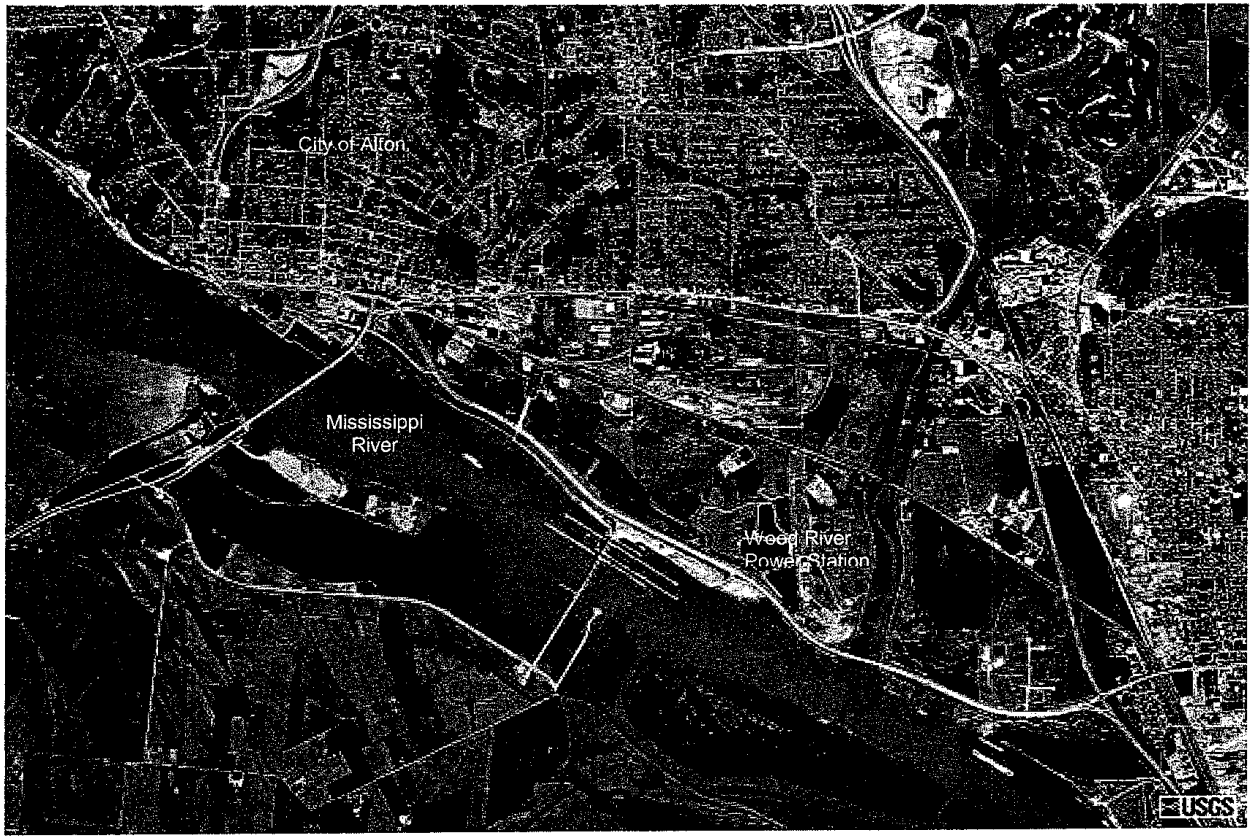


Figure 3-4 – Aerial Photo of Alton Area

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Table 3-1 – Wood River East Ash Impoundment Pertinent Data

Parameter	Units	Primary Cell	Secondary Cell
Drainage Area	Acres	36	2
Dam			
Type		Earth Embankment	Earth Embankment
Elevation, Top of Dam	Feet (NGVD)	453	435
Height above Lowest Surrounding Elev.	Feet	33	12
Upstream Slope	Horizontal : Vertical	3:1	3:1
Downstream Slope	Horizontal : Vertical	3.5:1	3.5:1
Perimeter	Feet	5315	1167
Top Width	Feet	20	15
Streambed Elevation	Feet (NGVD)	Not Applicable	Not Applicable
Impoundment			
Elev. Max Normal Pool	Feet (NGVD)	450	432
Stor. Max Norm. Pool	Acre-Feet	422.5	13
Elevation, PMF Pool	Feet (NGVD)	451.5	432.5
Storage, PMF Pool	Acre-Feet	469	13.7
Length, PMF Pool	Miles	Not Applicable	Not Applicable
Storage, Top of Dam	Acre-Feet	517	17.7
Principal Spillway			
Type		Concrete Outfall Structure w/3 inlet pipes and open top	Concrete Outfall Structure with V-Notch Weir at top
Size	Feet	5 x 5	5 x 5
Elevation, Inlet Invert	Feet (NGVD)	Pipes at: 439.0, 443.0, and 447.0; open top at 450.0	431.0 at bottom of V-Notch weir
Elevation, Outlet Invert	Feet (NGVD)	432	417
Length	Feet	15 (vertical drop within structure)	11 (vertical drop within structure)
Length of Conduit	Feet	679	566
Auxiliary Spillway		None	None
Outlet Conduit			
Type		HDPE Pipe	HDPE Pipe
Size	Feet	2.5 diameter	3.0 diameter
Stilling Basin		None	None
Emergency Spillway			
Type		Principle spillway also serves as emergency spillway.	Principle spillway also serves as emergency spillway.

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4.0 Emergency Detection, Evaluation, Classification and Response

4.1 Emergency Detection, Evaluation, and Actions

Table 4-1 identifies typical problems which may occur at the embankments of the Wood River East Ash Impoundment system, how to make a rapid evaluation of the problem, and actions which might be taken to correct the problem. The Plant Manager or his/her designee will be responsible for assuring these actions are taken.

4.2 Emergency Condition Descriptions

The emergency notification procedure is listed in detail in **Section 1.0**. This Section identifies the procedures to be followed in the event of a heavy rainfall or a dam failure. Three types of emergency conditions have been considered in this plan, those being (***"Condition A"***) failure of the dam is imminent or has occurred, (***"Condition B"***) a potential failure situation is developing, and (***"Condition C"***) a non-failure emergency. For a ***"Condition A"***, immediate contact with the emergency authorities is essential, for a ***"Condition B"*** or ***"Condition C"***, there may be time to take remedial or corrective actions to reduce the impact of a potential failure.

During a ***"Condition A"*** emergency, the Madison County EMA and station personnel will work together to notify the contacts listed in **Section 1.3** and **Section 1.4**. This includes the local landowners and the industrial or commercial entities in the flood inundation area, as well as the engineers and contractors.

During a ***"Condition B"*** emergency, station personnel will commence the notification procedure listed in **Section 1.0**, notifying the contacts in **Section 1.2**. At this time, the notifications will be limited to Dynegy contacts and the Madison County EMA.

During a ***"Condition C"*** emergency, no notification will be made to the emergency authorities. However, the station personnel will undertake corrective action and increased observations of the dam, as noted herein.

Table 4-1, contains a list of potential dam problems, how they can be identified and evaluated, and what types of remedial activities should be commenced to reduce or eliminate the problem. Each problem, and the varying degrees of that problem have a suggested emergency condition shown in the '**Action to be Taken**' column. In the absence of more thorough information, the corresponding emergency condition should be used for that problem, however, some judgment is appropriate in determining the emergency condition.

Similar to **Table 4-1**, **Table 4-2** contains various potential problems with the Wood River East Ash Impoundment dam. However, the problems in **Table 4-2** are listed based on the water elevation in the Facility. Emergency conditions may be declared solely based on rising water elevation. Notifications and evacuations should be performed based on the appropriate emergency condition.

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4.3 Emergency Response

During any emergency condition, other emergency response actions may be required by Dynegy personnel. These actions may include, but are not limited to the following list.

Immediately stop all pumping of ash sluice water from the Wood River Power Station to the impoundment, and as quickly as reasonably possible, stop all other controllable inflows from the station to the Pond. Visually monitor embankment conditions continuously.

The Plant Manager, Production Manager, or Environment and Chemistry Manager shall determine what immediate corrective action should be taken, how repairs shall be accomplished, and whether gradual or emergency (rapid) dewatering of the Impoundment is necessary. The Plant Manager, Production Manager, and Environment and Chemistry Manager have full authority to commit the resources of the Station and Dynegy Midwest Generation, Inc. to respond to the emergency.

Coordinate all corrective actions and maintain communications with the Madison County EMA. If asked, assist local EMA and/or Sheriff's office personnel in contacting the addresses of the residents in the potential flood inundation area (**see Section 1.3**). Note: the Madison County EMA and Sheriff offices also have a copy of this Plan and these pages.

If gradual dewatering of the Impoundment is deemed appropriate, dewatering should be accomplished by utilizing the Station mobile pump systems to remove water from the impoundment and route it through the secondary cell, to the maximum extent possible.

4.4 Special Conditions for a Seismic Event

Due to the fact that the Wood River East Ash Impoundment is located in a moderate to high seismic zone due to the New Madrid Fault, Wood River personnel shall notify one of the engineers in **Section 1.4** should a seismic event occur near the location, regardless of the presence of any visual problems.

The facility should be inspected by a registered Professional Engineer using the Guidelines for Inspection of Dams After Earthquakes, as published by the United States Society on Dams (USSD). A copy of the book is located with Mr. Joseph Kimlinger whose contact information is listed in **Section 1.4**. A ***"Condition B"*** situation shall be in effect, at a minimum, until the dam has been inspected by the registered Professional Engineer. However, other more stringent emergency conditions may develop and must be responded to in an appropriate manner. Note that many of the same problems that are listed in **Table 4-1** may develop from a seismic event, and Wood River Station personnel should be careful to watch for signs of developing or imminent problems.

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Table 4-1 – Potential Failure Problems, Possible Indicators, Suggested Evaluations, and Recommended Actions

Problem	Indicator	How to Evaluate the Problem	Action To Be Taken
Whirlpooling Water	Water flowing in a swirling circular motion in an area on the upstream side of the dam.	**This situation is critical and failure of the pond may be imminent, especially if there is evidence of water on the downstream face.**	Notify the Emergency Management Agency Office for evacuation of the dam breach area. Take the actions noted under "piping". ***"Condition A"***
Burrow Holes	**Holes** in the embankment varying in size from about one inch in diameter to one foot in diameter caused by animals.	If the holes do not penetrate through the embankment the situation is usually not serious. Some animal holes will have soil pushed out around the hole in a circular fashion which may look like a boil. Watch for the movement of water and soil particles from these holes to determine whether they are boils.	Backfill as deeply as possible with impervious material. If rodents become a nuisance, an effective rodent control program as approved by the IDNR District wildlife biologist should be implemented. ***"Condition C"***
Cracks	**Longitudinal Cracking**: Cracking along the length of the dam	This form of cracking can indicate the beginning of a slide or be an uneven settlement of the embankment.	Monitor the crack for future changes and contact a qualified engineer for assistance in the evaluation of the crack and recommended repairs. ***"Condition B"***
	Transverse Cracking: Cracking across the dam from upstream to downstream surfaces.	This form of cracking can indicate uneven settlement or the loss of support below the crack. Such cracks usually occur over an outlet conduit, near the abutments, or in the taller portion of the embankment.	If the crack does not extend completely across the dam and the pond water elevation is more than 10 feet below the base of the crack, monitor the crack for future changes and contact a qualified engineer for assistance in the evaluation of the crack and recommended repairs. ***"Condition C"*** If the crack extends across the dam or the pond water level is less than 10 feet below the base of the crack, both the upstream and downstream sides of the dam should be protected with a plug and an inverted filter as described under "seepage". The Emergency Management Agency office should also be notified of the situation so they may be prepared to act if the condition worsens. ***"Condition B"***

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Table 4-1 **(continued) – Potential Failure Problems, Possible Indicators, Suggested Evaluations, and Recommended Actions**

Problem	Indicator	How to Evaluate the Problem	Action To Be Taken
Slides	Movement of a portion of the embankment, either the upstream or downstream slope, toward the toe of the dam.	Condition 1: The slide does not pass through the crest and does not extend into the embankment more than five feet measured perpendicular to the slope.	A qualified engineer should be consulted before any repairs are initiated to determine the cause of the slide and to recommend any modifications to prevent future slides. The downstream side of the dam should be watched for the emergence of any water either through or opposite the slide. If water is discharging, the area should be treated as a seepage location and monitored as noted below. ***"Condition B"***
		Condition 2:The slide passes through the crest and that the water elevation is more than 10 feet below the lowered crest.	Use the same actions as noted above and notify the Emergency Management Agency of the situation so they may be prepared to act if the condition worsens. ***"Condition B"***
		Condition 3: The slide passes through the crest and the water elevation is less than 10 feet below the lowered crest.	This condition is critical and failure of the pond should be considered imminent. Notify the EMA office for evacuation of the dam breach area. Armor the crest of the lowered portion of the embankment and try to restore the lost freeboard. If seepage is also occurring, take the appropriate actions noted above. ***"Condition A"***
Seepage	**Wet area** on downstream embankment slope (or any other area downstream of the embankment) with very little or no surface water, or very minor seeps.	This condition may be caused by infiltration of rain water which is not serious, or may be the start of a serious seepage problem, which would be indicated by a quick change to one of the conditions noted below.	No immediate action required. However, the location of the seepage should be noted and observed for future comparison. ***"Condition C"***
	Same **wet area** as above with moderate seeps of clear or relatively clear water with rate of flow not increasing.	Measure the flow of water periodically and note any changes in clarity.	No immediate action required. Note the location, flow rate, and clarity of the seepage for future comparison. During increases in pond elevation, the seepage area should be watched for any changes. ***"Condition C"***
	Same **wet area** as above with moderate seeps of clear or relatively clear water with rate of flow increasing.	Measure the flow periodically and note any changes in clarity. Inspect downstream areas for any new seeps.	Contact a qualified engineer for an immediate inspection. Observe the condition constantly for any further changes in flow rate or clarity unless notified otherwise by the engineer. ***"Condition B"***

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Table 4-1 **(continued) – Potential Failure Problems, Possible Indicators, Suggested Evaluations, and Recommended Actions**

Problem	Indicator	How to Evaluate the Problem	Action To Be Taken
Seepage (cont.)	**Piping** (seepage with the removal of material from the foundation of the embankment) with moderate to active flows of cloudy to muddy water.	If the water is cloudy to muddy and the rate of flow is increasing, this condition could lead to failure of the dam. **If, along with the piping, there is an upstream whirlpool caused by water passing through the embankment, failure of the dam may be imminent.**	Immediate action is necessary. If no whirlpool is noted on the upstream side of the dam, try to reduce the loss of material from the embankment by placing an "inverted filter" over the seepage area. The filter should consist of a three to five feet thick blanket of material graded from coarse sand and pea gravel at the interface with the seepage area to 3-inch stone at the resulting outer face. If needed, use larger stones on the top of the filter. Use filter cloth at the bottom of the filter if available. Do not try to "plug" or stop the flow of water from this location. Notify the EMA offices for evacuation of the dam breach area. ***"Condition A"*** If a whirlpool is noted on the upstream side of the dam, notify the EMA offices for evacuation of the dam breach area. Attempt to construct the inverted filter or boil ring over the seepage area on the downstream side of the dam as noted above. The thickness of the section will generally be greater than five feet. Plugging of the upstream entrance of the piping failure should also be attempted using large rock or anything else that is available. If the large material placed in the hole appears to have reduced the flow, follow with progressively smaller material in an attempt to seal the entrance. ***"Condition A"***
	Boils (soil particles deposited around a water exit forming a cone varying from a few inches in diameter (spaced two to three feet apart) to isolated locations several feet in diameter in the floodplain downstream of the dam).	Evaluation of the problem is the same as noted above for the various flow conditions, i.e. clear and constant, clear and increasing, and cloudy or muddy and increasing.	***"Evaluate as above for emergency condition."***

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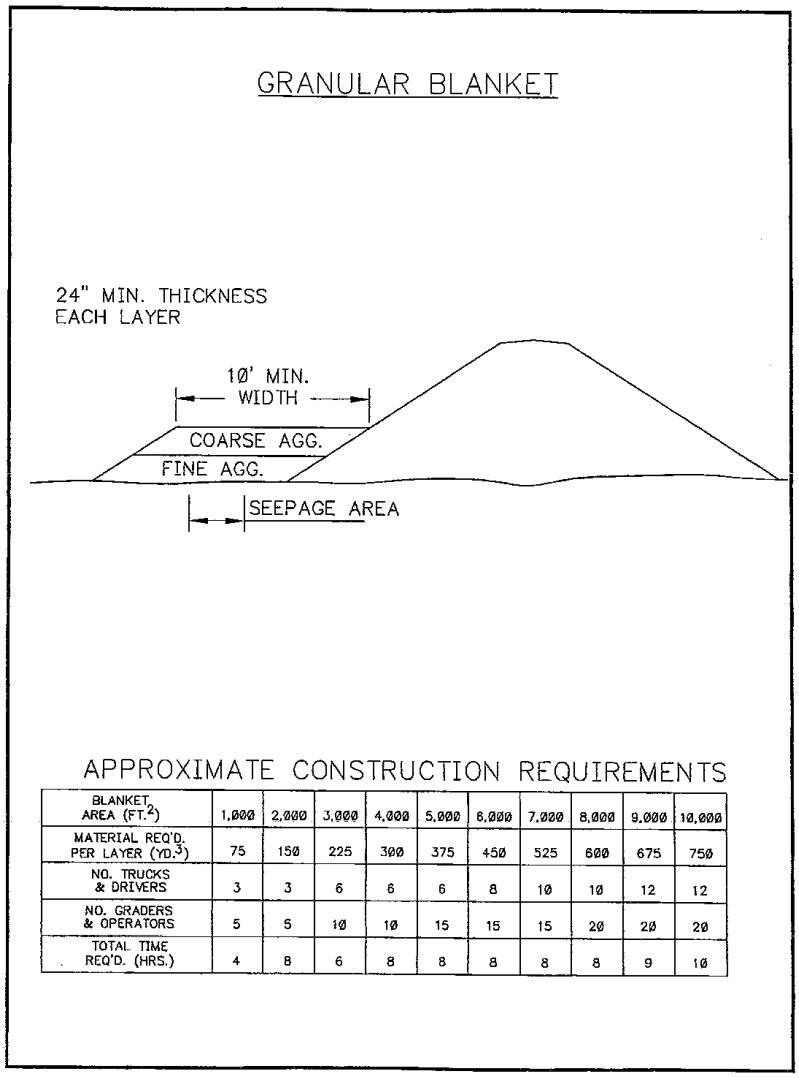
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Table 4-2 – Impoundment Level Elevations and Emergency Actions

Suggested Surveillance Action	Pond Elevation
When the water level in the Wood River East Ash Impoundment is less than or equal to the noted elevation, only normal surveillance as called for in the Operation and Maintenance Plan need be performed. ***There is no emergency condition.***	**<450.75**
During and immediately following unusual storm and flood events, which causes the water level in the impoundment equal to or greater than the noted elevation, Wood River personnel will make visual inspections of the impoundment and its appurtenances at 1-hour intervals if it is presently raining and at 12-hour intervals if it is not currently raining. **Stop all pumping from the Station into the** impoundment. ***This is a "Condition C" situation.***	**>=450.75**
When the Wood River East Ash Impoundment water level reaches the noted elevation, the pond and its appurtenances will be inspected at 1-hour intervals if it is presently raining and at 8-hour intervals if it is not presently raining. ***This is a "Condition C" situation.***	**>= 451**
When the Wood River East Ash Impoundment water level reaches the noted elevation, and it is currently raining, Wood River personnel will notify the Madison County ESDA offices that a ***"Condition B" condition exists*** at the Wood River East Ash Impoundment. The impoundment and its appurtenances will be inspected continuously if it is presently raining and at 4-hour intervals if it is not presently raining. If waves are breaking over the dam crest, the downstream face of the dam will be continuously monitored for erosion and/or failure.	**>=451.5**
When the Wood River East Ash Impoundment water level reaches the noted elevation, and it is currently raining, Wood River personnel will notify the Madison County EMA offices that a ***"Condition A" condition exists*** at the Wood River East Ash Impoundment. The pond and its appurtenances will be monitored continuously until the rain has stopped ***and*** the water level falls two feet below the noted elevations ***and*** the emergency condition has been changed to ***"Condition B"*** or ***"Condition C"***. The downstream face of the dam will continue to be monitored for erosion and imminent failure.	**>=452**
When the Wood River East Ash Impoundment water level reaches the noted elevation and it is currently raining, or if water is flowing over any portion of any perimeter embankment, a notice to evacuate all residential, commercial, and industrial occupants in the flood inundation area shall be issued. All occupants within the dam breach wave area are to be evacuated. The impoundment and its appurtenances will be monitored continuously until pond water levels fall 2.25 feet below the noted elevations (i.e. to normal levels) and the rain has stopped. ***This continues to be a "Condition A" situation.*** Occupants of evacuated areas are not to return to the flood wave area until: (1) Water levels fall to normal pool elevations, and (2) The pond and its appurtenances have been inspected by the registered professional civil engineer who typically inspects the pond system (or his designee); and (3) All damages indicating a weakened condition of the pond have been remedied. **At that time, inflow pumping operations may also be resumed, as needed.**	**>=452.25**

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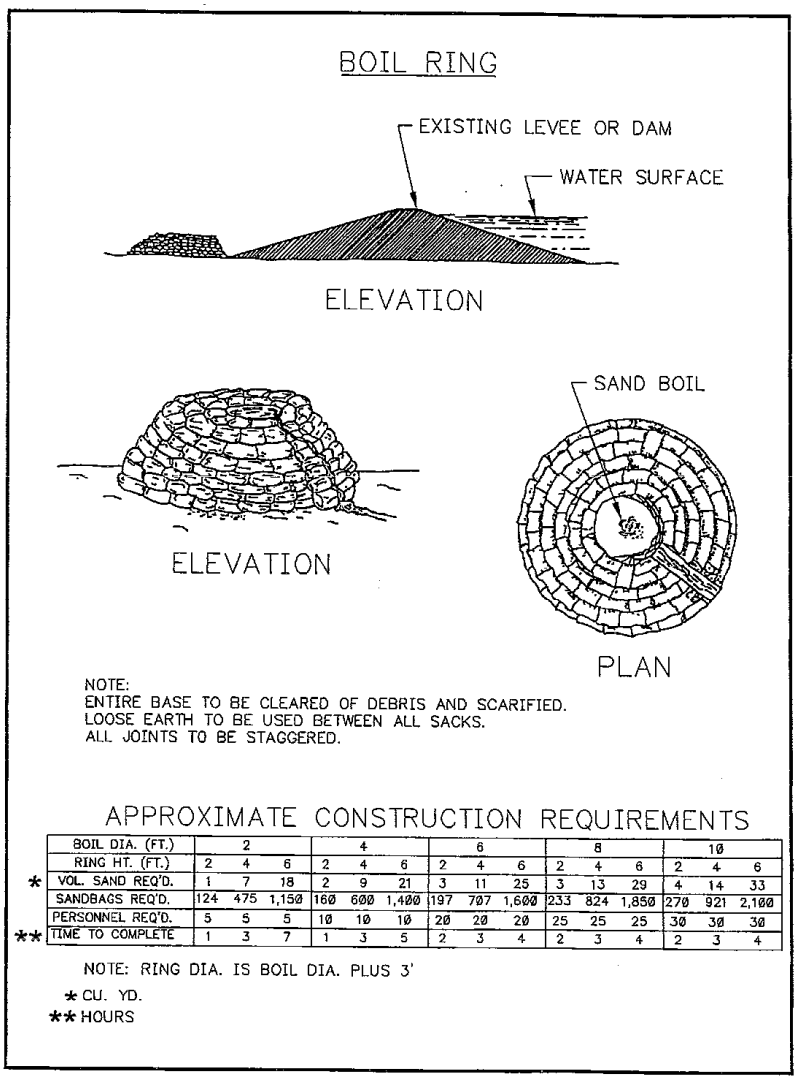


APPROXIMATE CONSTRUCTION REQUIREMENTS

BLANKET AREA ($FT.^2$)	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
MATERIAL REQ'D. PER LAYER ($YD.^3$)	75	150	225	300	375	450	525	600	675	750
NO. TRUCKS & DRIVERS	3	3	6	6	6	8	10	10	12	12
NO. GRADERS & OPERATORS	5	5	10	10	15	15	15	20	20	20
TOTAL TIME REQ'D. (HRS.)	4	8	6	8	8	8	8	8	9	10

Figure 4-1 – Sketch of Inverted Filter Granular Blanket

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	BOIL DIA. (FT.)	2			4			6			8			10		
	RING HT. (FT.)	2	4	6	2	4	6	2	4	6	2	4	6	2	4	6
*	VOL. SAND REQ'D.	1	7	18	2	9	21	3	11	25	3	13	29	4	14	33
	SANDBAGS REQ'D.	124	475	1,150	160	600	1,400	197	707	1,600	233	824	1,850	270	921	2,100
	PERSONNEL REQ'D.	5	5	5	10	10	10	20	20	20	25	25	25	30	30	30
**	TIME TO COMPLETE	1	3	7	1	3	5	2	3	4	2	3	4	2	3	4

NOTE: RING DIA. IS BOIL DIA. PLUS 3'

* CU. YD.

** HOURS

Figure 4-2 – Sketch of Boil Ring

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5.0 General Responsibilities Under the Plan

5.1 Overall Responsibilities of the Wood River East Ash Impoundment

The Plant Manager of the Wood River Power Station has overall responsibility for making certain that the East Ash Impoundment is properly operated and maintained so that the structural integrity of the impoundment is never compromised. The Plant Manager has his/her entire station staff to assist him/her in this endeavor as well as the staffs of Dynegy Midwest Generation, Inc. and Dynegy, Inc. and Dynegy Generation, Inc. (located in Houston, TX).

5.2 Emergency Response Organization

The Plant Manager, the Production Manager, or the Environment and Chemistry Manager have complete authority to initiate and implement the administrative procedures set forth in this plan as well as the identified corrective actions to be taken at the Wood River East Ash Impoundment.

Brief summary statements regarding the responsibilities of all the individuals and organizations who would likely be involved in responding to an emergency at the Wood River East Ash Impoundment are listed in **Table 5-1**. Also included with these descriptions are the names of the individuals who currently hold these positions and the telephone numbers at which they can be reached.

Overall responsibility for responding to a failure rests with the Plant Manager. He/she (or their designee) would initially call upon other station staff to respond to the emergency. The Plant Manager (or designee) would also call upon, to the extent necessary, other organizations within the Dynegy Midwest Generation and Dynegy, Inc. organizational structure for the support needed to respond to the emergency, and to develop and implement subsequent corrective actions. These organizations could include legal, insurance, environmental, engineering, and construction.

The Madison County EMA and the Illinois Emergency Management Agency would in all likelihood be involved in responding to an emergency. Wood River staff would work cooperatively with the staffs of those agencies to respond to, and implement corrective actions. These state and local agencies may also feel it necessary to contact other appropriate state and/or local agencies and organizations during the course of the emergency.

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Table 5-1 – Department/Agency/Organizational Responsibilities

Agency/Organization	Name/Position	Responsibility	Contact Information
Wood River Power Station	Robert Crowe – Plant Manager	Manager of the station. He has full authority to commit manpower and resources to respond to a station emergency.	Office: (618) 433-0111 Home: (618) 768-4505 Cell: (618) 223-0849 Email: bob.crowe@dynegy.com
	John Muehlenkamp – Production Manager	Assistant to the station manager. He also has full authority to commit manpower and resources to respond to a station emergency.	Office: (618) 433-0112 Home: (314) 843-3153 Email: john_muehlenkamp@dynegy.com
	Don Crone – Environment and Chemistry Manager	Responsible for Environmental aspects of the Station. Coordinates response with Decatur and corporate headquarters personnel. He also has full authority to commit manpower and resources to respond to a station emergency.	Office: (618) 433-0110 Home: (618) 288-6459 Email: donald_crone@dynegy.com
Madison County EMA	Mr. Larry Ringering	A necessary contact at the county or local level. The EMA would contact other local agencies (county sheriff; police; fire; hospitals, etc.) as well as local residents that should be evacuated.	Office: (618) 692-0537

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Table 5-1 **(continued) – Department/Agency/Organizational Responsibilities**

Agency/Organization	Name/Position	Responsibility	Contact Information
Illinois Emergency Management Agency		A necessary contact at the state level. IEMA would coordinate contact with all other appropriate state agencies.	Office: (800) 782-7860
Illinois Department of Natural Resources; Office of Water Resources; Division of Water Resources Management; Dam Safety Section		The Illinois agency responsible for the safe design and operation of dams. The IDNR would become involved in an investigative role following a dam failure.	Contact will be by the IEMA
Dynegy Midwest Generation, Inc.	Keith A. McFarland – Vice President – (O'Fallon, IL)	Vice President over all DMG coal fired power stations.	Office: (618) 206-5901 Home: (618) 235-8554 Cell: (618) 410-5908 Email/Pager: keith.mcfarland@dynegy.com
	Joe Cusick – Dir. Operations Health and Safety – (O'Fallon, IL)	Responsible for working with station health and safety personnel in protecting the local public and station employees in responding to the pond failure.	Office: (618) 206-5913 Cell: (618) 410-7970 E-mail: joe.cusick@dynegy.com
	David W. Byford – Sr. Director Public Relations; Corporate Office (Houston, TX)	Responsible for all communications with the media (TV, radio, print) during and following immediate response to the pond failure.	Office: (713) 767-6047 Home Blackberry: (713) 569-7631 Email/Blackberry: david.w.byford@dynegy.com
	Ken Pollmann – Vice President – DMG Engineering & Construction Services (O'Fallon, IL)	Responsible for immediate construction support in responding to the pond failure C&M would also be responsible for the follow-up corrective action or restoration of the failed pond.	Office: (618) 206-5801 Home: (618) 257-3733 Blackberry: (618) 410-7338 Email/Blackberry: ken.pollmann@dynegy.com

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Table 5-1 **(continued) – Department/Agency/Organizational Responsibilities**

Agency/Organization	Name/Position	Responsibility	Contact Information
Dynegy Generation – (O'Fallon, IL)	Rick Diericx – Senior Director, Operations Environmental Compliance	Responsible for overall environmental compliance for DMG stations, including air, land and water issues.	Office: (618) 206-5912 Home: (618) 505-0737 Cell: (217) 519-4034 Email/Pager: rick.diericx@dynegy.com
	Susan McVety - Environmental Professional, Operations Environmental Compliance	Responsible for water quality and permitting issues at Wood River.	Office: (618) 206-5930 Home: (618) 622-8656 Cell: (217) 412-6604 Email: susan.mcvety@dynegy.com
Dynegy, Inc. Corporate Headquarters – (Houston, TX)	Jim Ingram – Vice President, Group General Counsel-Regulatory and Environmental	Responsible for all legal evaluation and legal actions associated with the initial response and subsequent corrective action.	Office: (713) 767-0450 Home: (281) 480-3364 ***or*** (713) 562-7357 Email: jim.ingram@dynegy.com

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6.0 Preparedness

This section describes the routine and emergency inspections and actions (including dewatering) that station personnel would take if a failure appeared imminent or had already occurred at the Wood River East Ash Impoundment.

6.1 Normal Condition Inspections

Normal conditions surveillance consists of various visual inspections of the East Ash Impoundment and its appurtenances on a daily, monthly, semiannual, and annual basis. These routine inspections are conducted when water levels are less than 450.75 feet msl. Items which are to be inspected during these routine inspections are those noted in the Operation and Maintenance Plan for the Wood River East Ash Impoundment. O&M inspection checklists are completed for each type of inspection, if applicable.

6.2 Unusual Condition Inspections

If an emergency condition should occur at the Wood River East Ash Impoundment (such as those items listed in Table 4-1 and Table 4-2), the pumping of water to the East Ash Impoundment from the Wood River Station should be stopped as soon as reasonably possible. Pumping should not resume if the Plant Manager determines that emergency dewatering is necessary to avoid a catastrophe, nor before the time when an emergency condition no longer is in effect.

During a ***"Condition C"*** situation, Wood River personnel will make visual inspections of the impoundment and its appurtenances at 1-hour intervals if it is presently raining, and 12-hour intervals if it is not presently raining.

During a ***"Condition B"*** situation, Wood River personnel will make visual inspections of the impoundment and its appurtenances continuously if it is presently raining, and 4-hour intervals if it is not presently raining.

During a ***"Condition A"*** situation, Wood River personnel will make visual inspections of the impoundment and its appurtenances continuously, until such time as the emergency situation is changed to a ***"Condition B"*** or ***"Condition C"*** situation.

Note that in the event of elevated water levels as listed in **Table 4-2**, more stringent inspections may be required for a given **"Condition"**, than are discussed above.

6.3 Equipment and Materials Locations

Equipment and materials immediately available for responding to an imminent failure of the dam of the Wood River East Ash Impoundment are shown in **Table 6-1**. These pieces of equipment and materials are available at the Wood River Power Station and

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can be immediately accessed. If additional pieces of equipment are required, the contractors listed in **Section 1.4** would be contacted to provide the necessary equipment.

6.4 Communications and Access

The communications methods for each individual contact will not change regardless of the timing of the emergency. Whether the event occurs during regular business hours, on a weekend, at night, or a Holiday, the procedure in **Section 1.0** will remain in effect.

Access to the site will be controlled by Wood River Power Station personnel during an emergency. Certain areas around the pond are secure for station security purposes and will remain secure to the extent possible, however, not to a point where it could affect the stability or safety of the dam. There are multiple access points around the Station, which should provide adequate access to a failure or potential failure location, during all types of weather conditions.

6.5 Annual Program Plan Table-Top Exercise

Once-annually, Wood River Power Station personnel will conduct an exercise (at the Station) with station, Dynegy Midwest Generation environmental, and key community personnel such as the Madison County EMA, Sheriff's offices and the local fire department. The purpose of the exercise will be to make certain these personnel are familiar with the overall scope of this Emergency Action Plan and how various selected provisions of this Plan that would apply to each respective entity. Of importance will be to make certain that all key personnel of these various organizations know their respective roles and responsibilities in the event of an actual emergency.

The initial exercises will likely focus on the totality of the Plan to ensure overall personnel familiarity and preparedness. In subsequent years, the annual exercise may focus just on specific components of the Plan. An exercise plan should be prepared for each annual exercise and a report of each annual exercise should also be prepared. The report should identify deficiencies in the Plan and/or weaknesses in personnel preparedness with recommendations regarding appropriate corrective action and updating of the Plan. Dynegy Environmental shall prepare the report after each annual exercise and route the comments and minutes to all applicable parties.

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Table 6-1 – Emergency Equipment Contacts and Locations

Emergency Equipment	Location	Contact Information
(2) 637 and (1) 637E Scrapers	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
D9R, D8L and D4 LGP Dozers	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
JD 893 ELC Track Hoe	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
Cat 325 Track Hoe	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
Model 84 JD End Loader	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
Ford 545 Tractor	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
8" Godwin Dri-Prime pump on a Trailer	Coal Yard	Environment and Chemistry Mgr. – See Section 1.2.2
Communications Equipment	Station Office	Deb Koenig– Station Administrator Office: (618) 433-0115 Email: debra_koenig@dynegy.com

Note: Station staff communicate with one another by means of a portable two-way radio system.

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7.0 Inundation Map

7.1 Dam Embankment Height Info

Figure 7-1 shows the dam embankment heights for the Wood River East Ash Impoundment, broken down into three categories. The first category is shown in green and are the locations where there is basically no embankment, and therefore no downstream slopes. The yellow sections are sections where the embankment height is between zero feet and fifteen feet in height. The probability of a catastrophic failure in these areas are less likely due to the relative elevation of the water in the pond as compared to the adjacent land. The areas where the embankment is over fifteen feet high are shown in red. These areas have the highest probability of having the most severe failure.

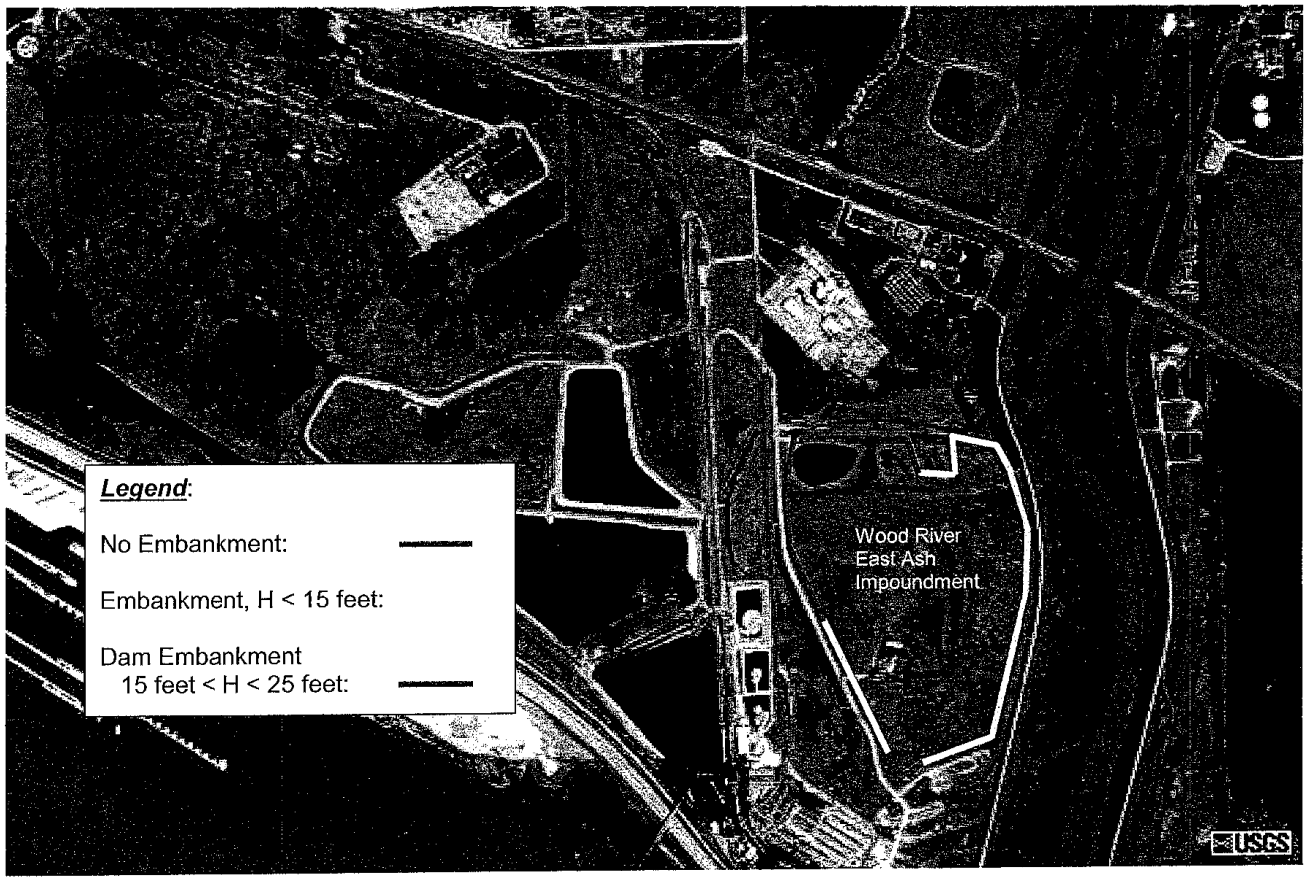
7.2 Flood Inundation Map

Areas which could potentially be impacted by a catastrophic failure of the Wood River East Ash Impoundment are shown in **Figure 7-2**. The inundation area was developed using a "rainy day" static inundation analysis. If all the water in the impoundment was to be released, the area shown would be able to hold the entire volume. This assumes no percolation into the soil, nor any release of water to the ditch that flows around the north side of the West Ash Impoundment System, nor through the normal discharge path through the Wood River Creek Levee. The landowners and commercial or industrial occupants that are within the flood inundation area are listed in **Section 1.3**.

Also note that although the potential flood inundation area shown in **Figure 7-2**, does not include the Wood River Power Station building, it is thought that under certain circumstances, the dynamic flows of water out of the impoundment could actually reach the station. This is an unlikely scenario since the impoundment will be filled in stages, with the water level remaining low for many years. During that time ash will be deposited in the southern portion of the facility, making a free water flow to the south improbable. The potential remains, nonetheless.

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Figure 7-1 – Embankment Information Map

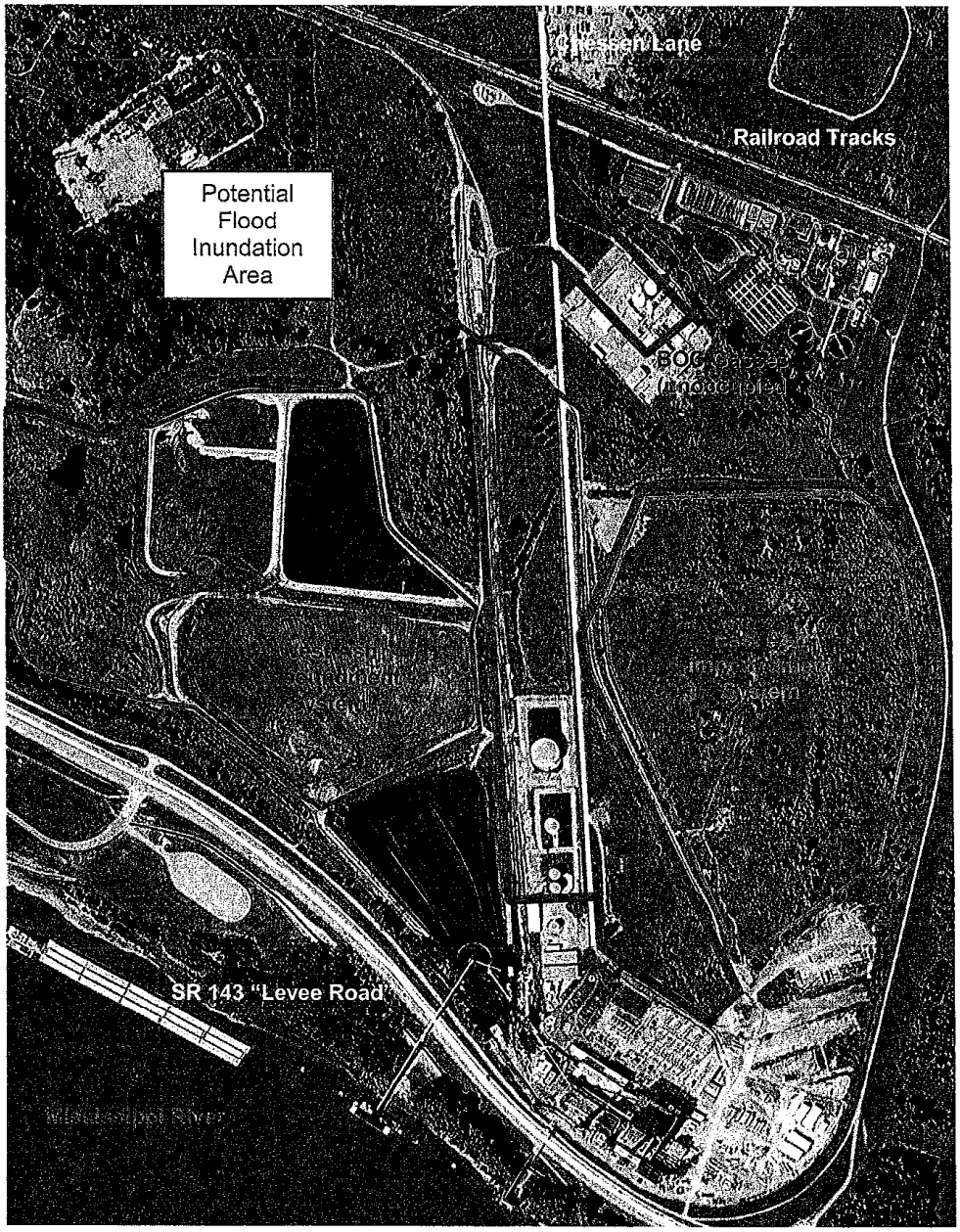


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Figure 7-2 – Flood Inundation Map



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8.0 Emergency Action Plan Approval

We, the undersigned, this date acknowledge this plan as a part of the emergency operation procedures that would be taken to protect life and reduce property damage in case of an emergency due to failure of any of the embankments of the Wood River East Ash Impoundment.

Robert H Crowe
Robert Crowe
Plant Manager – Wood River Power Station

5/29/09
Date

Larry Ringering – Madison County EMA

Date

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Appendix A – Local Emergency Agencies and Organizations

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Local Resources

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EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY EMERGENCY MANAGEMENT AGENCY
157 N. Main Street Suite 33 Edwardsville, IL. 62025-1962
618-692-0537 - 24 Hour

THREAT ADVISORY
ELEVATED
Significant Risk of Terrorist Attacks

Alan J. Dunstan
County Board Chairman

Larry Ringering
Coordinator

Marjorie Witschie
Administrative Assistant

Our Mission

The Madison County Emergency Management Agency identifies hazards and vulnerabilities within the corporate limits of Madison County and provides coordination to effectively prepare for, respond to, and recover from all natural and manmade emergencies and disasters regardless of size, or complexity. This Agency will take appropriate action in accordance with established Emergency Operational Plans to mitigate any harm to the citizens or property in Madison County.

A QUESTION SO OFTEN ASKED...

What is an Emergency Management Agency, and what do they do?

Authority for emergency management in Madison County comes from the Illinois Emergency Management Act (20 Illinois Complied Statutes 3305/1 et seq. January 1, 2002 and 29 Illinois Administrative Code Part 301) that requires each community to appoint an Emergency Management Agency Coordinator as well as the County. At any level of government the EMA Coordinator's duties are to oversee planning, training, and preparing for emergency response during non-disaster times, and to act as the coordinator of emergency operations during disasters.

All levels of government share emergency Management responsibilities. Local government is the front line of emergency management and the County serves as the link between local government and the State.

No area in Illinois, including Madison County, is immune from severe weather, large fires, hazardous material spills, or other disasters. The Emergency Management program represents insurance to the County when disaster strikes by insuring that all emergency response groups are well trained and coordinated.

The Emergency Management Agency is not a replacement for the public, fire, ambulance or other emergency response groups. The Emergency Management Agency coordinates response and recovery in declared disasters when more than one department is responding to a threat; the disaster extends beyond the normal mutual aid boundaries of the affected community, or when several communities are involved.

The importance of the Madison County EMA becomes apparent during times of emergency. After a disaster has happened it is too late to write a comprehensive plan, train personnel, or establish complex emergency communications systems. The County EMA provides guidance, planning models, and workshops on emergency management to local communities and their own EMA staff.

CERT

Madison County HazMat Team News

Tornado Safety

Homeland Security

ILLINOIS AMBER ALERT

IEMA

LEPC ...safety in knowledge

PDFs

Emergency Alert System Registry of Unlisted Numbers (.PDF)

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MADISON COUNTY SHERIFF'S OFFICE



Mission Statement (PDF)

Annual Report 2008 (PDF)

Jail Inspection Report 2008 (PDF)

Sheriff's Administration

Patrol Division

Jail Division

Investigations

Training

Sheriffs of Madison County

Registered Sex Offenders in Madison County

County Government Phone Book

Links

About the Sheriff

Robert J. Hertz was sworn in as the Sheriff of Madison County on December 2, 2002. Sheriff Hertz started work with the Madison County Sheriff's Office on March 1, 1972, recently completing his 37th year of service with the department. Sheriff Hertz started as a uniformed deputy sheriff working the midnight shift in the Patrol Division. In late 1974 he was transferred into the Investigative Division as a Detective, and remained there until 1983 when he was named Chief Deputy Sheriff in the Administration of Sheriff Emil Toffant. In 1986 Sheriff Bob Churchich took office and Hertz served Sheriff Churchich as the Chief of Detectives, Jail Superintendent, Administrative Assistant, and Chief Deputy Sheriff for 6 years.

Sheriff Hertz is 59 years old and lives with his wife of 31 years and three children in Godfrey. In 1977 Sheriff Hertz graduated with a Bachelors Degree in Administration of Justice from McKendree College in Lebanon, Illinois. From 1992 to 2002 Sheriff Hertz worked part-time at night as a criminal justice instructor at Lewis and Clark Community College in Godfrey. Sheriff Hertz is a 1983 graduate from the F.B.I. National Academy in Washington, D.C. and a past Deputy Commander with the Major Case Squad of Greater St. Louis.

He serves as the Chairman of the Board of Directors of the Southwestern Illinois Law Enforcement Commission and serves on the boards of the Major Case Squad, the Madison County Child Advocacy Center, and the Illinois Sheriff's Association. Sheriff Hertz is also currently serving as the Vice Chairman of the Southern Zone of the Illinois Sheriff's Association. During his career with the Sheriff's Office Sheriff Hertz was promoted through the ranks from Sergeant, to Lieutenant, to Captain, and is now the Sheriff.

The Sheriff is the chief law enforcement officer for the County and serves as the acting officer of the Circuit Court, director of safety and administrator of the County Jail. The main function of this Department include:

- Investigation of all crimes of violence and fraud, to arrest suspects, and to recover stolen property and evidence.
- Provide basic police services to the unincorporated areas of the County.
- Maintain a complete record of all traffic accidents, arrests, investigations and complaints.
- Serve warrants issued at the request of the State's Attorney and all writs and summonses issued by the Circuit Court.
- Manage all prisoners confined to the County Jail and to be responsible for delivering prisoners to court for arraignments, bench or jury trials.



Sheriff Robert J. Hertz

Anonymous Tip Hot Line Call (618) 296-3000

STOP GUN VIOLENCE (PDF)

Internet Safety Brochure (PDF) NEW!

405 Randle Street
Edwardsville, IL 62025

Administration:
(618) 692-6087

Investigation:
(618) 692-0871

Police: (618) 692-4433
EMERGENCY Call 911

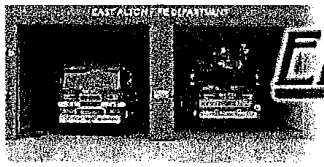
County Jail:
(618) 692-1064

Fax: (618) 656-1210

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EAST ALTON
"THE VILLAGE OF PROGRESS"

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Area Assistance

East Alton Fire Department

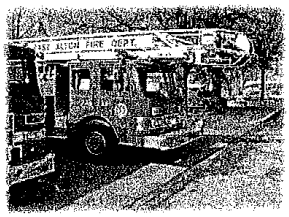


The East Alton Fire Department is a combination Fire Department. Its full time staff includes, Fire Chief, Captain, and two Lieutenants and two Engineers. The Station is staffed 24 hours per day by two personnel. .

The department also is assisted by 12 Paid-On-Call Firefighters, which are called upon to assist in fire responses. These firefighters are trained professionals much like the career members. All Firefighters go through a rigorous training program and become Firefighter II certified by the Illinois State Fire Marshals Office.

The Fire Departments response area is approximately 10 square miles in size. A large part of our jurisdiction includes Olin Manufacturing.

Our Station is located at 209 N. Shamrock and houses our truck fleet of one pumper, one 75-foot Ladder truck, and our heavy Rescue.



The East Alton Fire Department responds to about 800 to 900 calls per year with about 50% being Emergency Medical responses.

The East Alton Fire Department is always looking for anyone who may be able to participate in Paid-On-Call firefighter positions. We require a high level of physical agility and commitment, so, if you think you can make the grade, please stop in or give us a call. We'll be glad to provide you with more information, or, click on the task bar **"Paid-On-Call Firefighters"** to find information on benefits, requirements, and training.

Fire Department
Volunteers
Safety Tips
Hot Shots
Golf Tourn.

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Events | Parks & Recreation | Newsletters | Ice Arena | Village Links

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EAST ALTON
"THE VILLAGE OF PROGRESS"

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- Zoning
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- Employment
- **Community**
- Events
- Parks & Rec.
- Newsletter
- Ice Arena
- Links
- Area Assistance

Officer Profiles



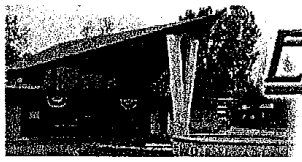
Dwynn D. Isringhausen
Chief

Chief Isringhausen began his career with the Village of East Alton I 1986 as a dispatcher clerk. In June of 1989 he was promoted to the rank of probationary patrolman after successful completion of the testing procedures. Chief Isringhausen was promoted to Sergeant in 1997 and led a shift until his promotion to Major. Chief Isringhausen has been involved with the investigations division as well as the appointment as the special response team commander.

Chief Isringhausen began his criminal justice profession while attending college at the Lewis & Clark Community College. Chief Isringhausen completed his Associates Degree and continued his education by attending classes at Concordia University at the St. Louis Campus. After completion of his Bachelor's Degree in the Administration of Justice, Chief Isringhausen has entered graduate studies at Lindenwood University to work towards a Masters Degree in the Science of Administration.

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EAST ALTON
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Fire Dept.
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Parks & Rec.
Newsletter
Ice Arena
Links
Area Assistance

East Alton Village Directory

Mayor's Office	(618) 259-7714
General Questions	eamayor@charter.net
Notary Service	
Liquor License	
Clerk's Office	(618) 259-7522
Voter Registration	eaclerk@charter.net
Business License	
Notary Service	
Treasurer's Office	(618) 259-7615
Financial Services for all Village Departments	eatreas@charter.net
Water Office	(618) 259-6521
Water & Sewer Service/Billing	eawater@charter.net
Establish/Discontinue Service	

Public Services Departments

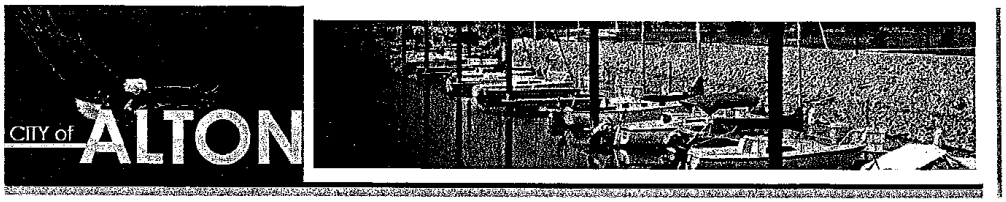
Building & Zoning Department	
Code Enforcement Officer	(618) 259-1185
Abandoned (Junked) Cars	eazoning@charter.net
Building Permits	
Litter, High Weeds, ETC.	
Fire Department	
EMERGENCY	911
Non-Emergency	(618) 259-2984
Fire Chief	(618) 259-2984
	eafire@charter.net
Park & Recreation Division	
Keasler Building	(618) 259-7411
Recreation Programs	
Keasler Building Rental	
Van Preter Park	(618) 259-7951
Police Department	
EMERGENCY	911
Police Department	(618) 259-6212
Police Chief	(618) 259-2279
	eapolice@charter.net
Sewer Division	
Treatment Plant Maintenance	(618) 254-2728
Street Division	
Municipal Garage	(618) 259-8069
Street, Alley & Sidewalk Repair	eastreet@charter.net
Brush/Limb Pick-up	
Dumpster & Recyclables	
Storm & Sanitary Sewer Line	
Animal Control Officer	
Water Division	
Water Plant	(618) 259-4646
	eawtp@charter.net

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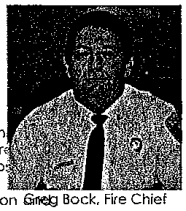
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Fire Department


Greg Bock, Fire Chief

Mission Statement:

"The Alton Fire Department is a paramilitary based organization operating under an established chain of com
whose purpose is to protect the lives and property of the citizens of Alton. The prevention and mitigation of fir
other unsafe conditions in the community shall be considered the primary strategy toward achieving that purpo

The Alton Fire Department consists of 59 uniformed personnel and one secretary. In addition to fire prevention
extinguishment, the department also provides A.L.S. medical service, technical rescue, hazardous materials response,
and other types of community service.

The department operates out of two modern fire stations strategically located, one on each side of town. All me
are certified by the Office of the Illinois State Fire Marshal and the Illinois Department of Public Health.


Bernie Sebold, Deputy Chief

Contact Information
Administrative Offices:

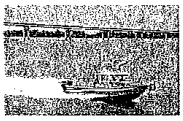
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(16) Engineers	(1) Paramedic Rescue Squads - 2 men
(21) Firefighters	(1) Assistant Chief
(1) Secretary	



Run Statistics: 2006

Structure Fire	49	Vehicle Fire & Boat Fire	18
Fire Other	47	Refuse Fire	7567
Trees, Brush, Grass Fire	37	Hazardous Condition	12
Emergency Medical Call	3,125	Power Line Down	24
Spill/Leak No Ignition	44	Service Call	40
Arcing/Shorted Elec. Equip.	31	Good Intent Call	102
Lock-out	22	Steam, Other Gas or Smoke	12
Smoke Scare	22	Malicious/Mischievous False	7
False Call	241180	Bomb Threat	1
Assist Police	18	Marine Rescue	10
System Malfunction	92	Other	57
TOTAL			4,238



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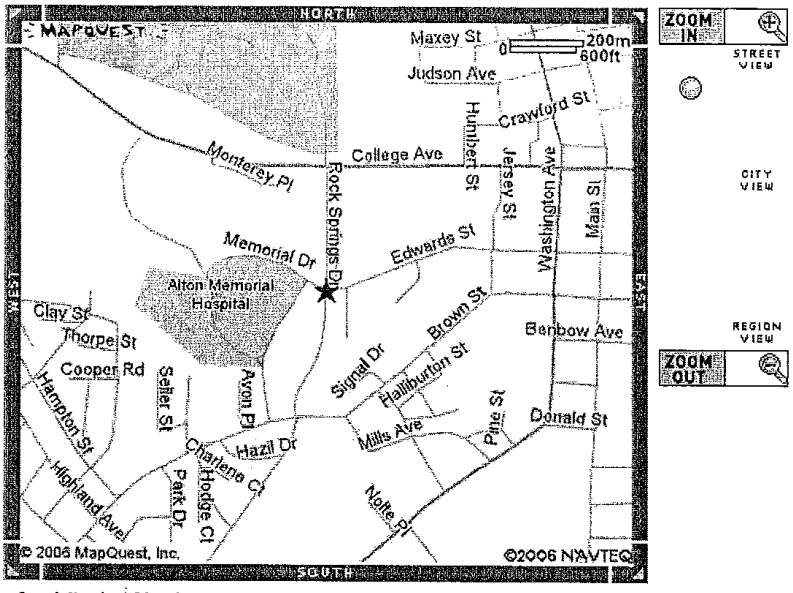
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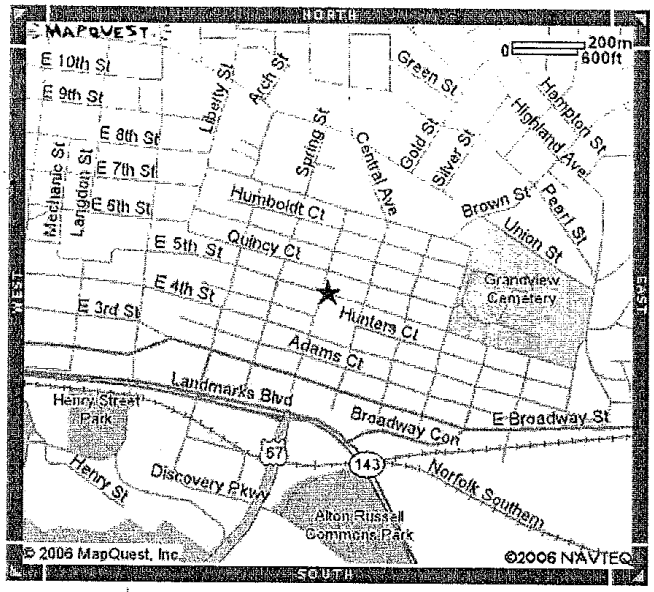
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Closure Work Plan for the West Ash Ponds

Wood River Power Station

September 2000

Environmental Resources
Dynegy Midwest Generation, Inc.
2828 North Monroe Street
Decatur, Illinois 62526-3269

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Closure Work Plan for the West Ash Ponds
Wood River Power Station
Dynegy Midwest Generation, Inc.

Discussion

Dynegy Midwest Generation, Inc. (DMG) is submitting this work plan for the closure of the west ash ponds at the Wood River Power Station. This closure work plan is being submitted in accordance with the following consent orders:

- Consent Decree 89-CH-5 (dated March 2, 1989) requires that DMG close the west ash ponds by December 31, 2000; and,
- Order Modifying Consent Order (dated January 3, 1996) allows the establishment of a groundwater management zone (GMZ) around the west ash ponds if groundwater monitoring indicates noncompliance pursuant to 35 Ill. Admin. Code, Part 620, Subparts B and D. This order also permits alternative closure scenarios to be considered.

Closure of the west ash ponds involves several activities, some of which have already been completed or are ongoing. The completed and ongoing activities are as follows:

- The primary pond was subdivided into two ponds (ponds 1 and 2) in 1993. At that time, the berm surrounding new pond 1 was raised. From 1993 to 1997, sluice water passed through four ponds before discharge at the NPDES permitted outfall.
- During a plant shutdown in 1997, DMG began reconstruction of the ponds. All ash was removed from ponds 3 and 4, and a new double-lined pond (Ash Pond 3, also called New Ash Pond #2) with leachate collection was constructed in their place.
- In 1998 DMG began mining ash from pond 2. After removing all ash from the eastern half of the pond, a new pond (Ash Pond 2E, also called New Ash Pond #1) with a composite clay/synthetic liner was constructed.
- Beginning in 1999, all fly ash was managed through a dry handling system. The dry ash is sold to cement manufacturers for concrete. All bottom ash is sluiced to the lined ponds (ponds 2E and 3) where the ash settles and the sluice water is dicharged via the NPDES permitted outfall.

Ash from ponds 1 (Old Ash Pond #1) and 2W (Old Ash Pond #2) is being mined by DMG and shipped to River Cement as part of a long-term contract with DMG. Although intermittent, this source removal is projected to continue into the future. The following quantities of ash have been mined from ponds 1 and 2W beginning

in 1997: 1997 = 50 tons; 1998 = 13,050 tons; 1999 = 20,784 tons; and, first half 2000 = 13,053 tons.

Because of the long-term nature of the source removal, and in order to expedite closure of the ponds, the modeling studies referred to in this closure work plan assume that the ash is left in-place. Thus, the modeling performed is based on a worst-case scenario that does not consider the source removal currently taking place.

The modeling studies performed by Natural Resource Technology, Inc.[1] (NRT) considered three closure alternatives as follows: a three-foot compacted clay cap with topsoil over a gravel support layer; a three-foot cap constructed from local silty clay soil materials; and, a no-cap scenario where the ash is dewatered but not covered.

The results of the modeling studies demonstrate that all three closure alternatives will result in boron concentrations at the downgradient wells achieving compliance with Class 1 Groundwater Standards within 9 to 32 years after closure. Predicted boron concentrations in groundwater were similar for all three closure scenarios, indicating that the reduction in mass loading due to dewatering of the ponds, rather than capping, is responsible for most of the decrease in predicted concentrations.

Based on the results of the modeling, and taking into consideration the pond reconstruction, dewatering, and ash mining activities that have been completed or ongoing, DMG is requesting in this Work Plan that a GMZ be established of sufficient duration for the entire west ash pond system so that:

- Modeling results can be confirmed;
- Ash can continue to be mined from ponds 1 and 2W;
- The effects of the ash pond closure on the groundwater system can be determined; and,
- Groundwater quality in the downgradient wells affected by the west ash pond achieves compliance with the Class 1 Groundwater Standards for boron, sulfate, and TDS.

Concentrations of boron, sulfate and TDS in wells impacted by the west ash impoundment can be expected to decrease below Class 1 Groundwater Standards. However, concentrations of other parameters (iron, manganese, chloride, and pH) are not predicted to decrease significantly over time because these parameters are associated with an off-site slag pile located northwest of

1 Investigation of Closure Options for the West Ash Impoundment, Wood River Power Station, Madison County, Illinois. Natural Resource Technology, Inc. (Pewaukee, Wisconsin), July, 2000.

the impoundment or are naturally occurring within the materials along the Mississippi River.

A detailed discussion of the site closure options, including modeling results and all supporting data, is provided in the attached NRT report. Groundwater quality contour maps, statistics, and trends for all of the inorganic parameters of concern are included within the report. It is important to note that the NRT report includes an evaluation of inorganic groundwater quality data for all the monitoring wells and parameters monitored at Wood River. This closure work plan only includes discussions and data for wells and parameters that are reported to the IEPA.

In an effort to understand why manganese concentrations in groundwater often remains elevated following ash pond closures, DMG is taking part in a manganese study at several of its power plants, including Wood River, as part of a cooperative study with the Electric Power Research Institute (EPRI). Interim results from this study are projected for the fourth quarter of 2000, with final results forthcoming in 2001.

1 Summary of Modeling Results

The following bullets summarize the pertinent results and conclusions of NRT's investigation of closure options for the west ash ponds.

- The west ash ponds are underlain by a continuous surficial silty clay layer that confines groundwater in the underlying sand and gravel aquifer and retards vertical migration of leachate from the impoundment to the sand and gravel. Saturated ash may occur beneath a small area of pond 2W where the impoundment was constructed over a slough. This would not constitute a significant source of leachate to the sand and gravel because the saturated ash is of limited extent and is separated from the sand and gravel by the silty clay confining layer.

- Groundwater flow in the sand and gravel unit is highly transient, flowing away from the Mississippi River during flood events and toward the river during predominantly base flow stages. Groundwater flow is towards the river approximately two-thirds of the time during an average year.

- There are no known groundwater supply wells between the west ash ponds and the eventual groundwater discharge points at the Mississippi River and Wood River. There is no current risk via ingestion of groundwater impacted by leachate migration from the west ash ponds.

- Most boron and sulfate, and some TDS exceedances of Class 1 Standards are due to leachate migration from the impoundment. All chloride, most TDS, and some boron and sulfate exceedances are associated with leaching from the slag pile located north of pond 2W. The slag pile is typically upgradient or sidegradient of the west ash ponds, depending on the Mississippi River stage.

- Elevated iron and manganese concentrations in groundwater appear to be associated with redox conditions in the river sediments or fill materials used near the river. Field pH readings below the Class 1 standard of 6.50 Standard Units are either natural variations or from some source other than leachate from the west ash ponds. Ash pond leachate doe's not contribute to significant changes in groundwater pH.

- Simulations of percolation from the west ash ponds to groundwater using the Hydrogeologic Evaluation of Landfill Performance (HELP) model resulted in decreases of leachate migration of 85, 90 and 97 percent, respectively, for the no cap, native soil cap, and compacted clay cap closure scenarios. HELP simulations of the lined ponds 2E and 3 suggest percolation decreases greater than 99 percent.

- Simulation of groundwater flow and transport with MODFLOW and MT3DMS indicated that boron concentrations at some wells would increase within ranges previously observed at the site, and then slowly decrease following closure of the unlined ponds. Boron concentrations are predicted to fall below 2 mg/L within 11 to 34 years after closure. The long response time for boron in groundwater is due to the slow, retarded migration of boron through the silty clay confining layer.

- Predicted boron concentrations in groundwater were similar for all three closure scenarios, suggesting that simulated reduction in mass loading due to dewatering, rather than capping, is responsible for most of the decrease in predicted boron concentration.

- Concentrations of sulfate and TDS in wells impacted by the impoundment can be expected to decrease more rapidly than predicted for boron because sulfate has a much lower retardation within the silty clay relative to boron. Sulfate is a major contributor to, and highly correlated with, TDS concentrations; TDS is expected to decrease in tandem with sulfate.

- Concentrations of other elements (iron, manganese, chloride, pH, and in some wells boron and sulfate) are not predicted to decrease over time because they are associated with either the slag pile or are naturally occurring within deposits along the Mississippi River.

- The model results assume the ash remains in place for the entire 35-year model period. However, ash from ponds 1 and 2W is being mined by DMG on an intermittent basis that is projected to continue into the future. The modeling studies were based on a worst-case scenario that assumed no source removal of ash.

2 Groundwater Quality Data Summary

As a supplement to the groundwater quality data presented in the attached report[1], the following presentations of the data are found in Appendix A:

- Statistical summary of all the monitored parameters at the required quarterly monitoring wells;
- Listing of all exceedances of Class 1 groundwater standards since monitoring began through May 2000 (exceedances are listed by both well number and by parameter);
- Concentration versus time graphs for those parameters recommended for removal from routine monitoring (i.e., alkalinity, calcium, chloride, magnesium, and potassium); and,
- Box-and-whisker plots for those parameters recommended for removal from routine monitoring (i.e., alkalinity, calcium, chloride, magnesium, and potassium).

Those parameters exceeding Class 1 groundwater standards are listed by monitoring well number on Table 1. This table is a summary of the exceedances that have occurred between January 1996 and May 2000 for parameters required for reporting to the Illinois Environmental Protection Agency (IEPA); this information is presented in greater detail in Appendix A. Several parameters have no exceedances since there are no corresponding Class 1 standards. As seen on the table, the only three parameters with widespread exceedances are boron, manganese, and pH. Total dissolved solids, chloride, and sulfate exceed their respective Class 1 standards only at Monitoring Well 25, which has been shown to be impacted primarily by the off-site slag pile.

The concentration versus time graphs and the box-and-whisker plots were only prepared for those parameters recommended for exclusion from future groundwater monitoring. The parameters proposed for exclusion are each discussed below.

Alkalinity

The box-and-whisker plots for alkalinity (Appendix A-4) all have median concentrations between 150 and 450 milligrams per Liter (mg/L) with the exception of wells 4 and 25, which have median alkalinities of 680 and 580 mg/L, respectively (Table 2). Well 25 is clearly impacted by the slag pile, as indicated by the large range of values and maximum concentrations exceeding 750 mg/L. Alkalinity concentrations in well 4 have increased (Appendix A-3) since monitoring began in 1995. The upward trend in alkalinity at well 4 is also observed for pH, which will continue to be monitored. There is no Class 1 groundwater standard for alkalinity.

Calcium

Median calcium concentrations in groundwater are between 70 and 170 mg/L at all of the monitoring wells with the exception of well 25, which has a median concentration of 375 mg/L (Table 2). Excluding well 25, which is affected by the

off-site slag pile, calcium concentrations are not changing significantly and show little variability within or between monitoring wells. Calcium is not a contaminant of concern related to the west ash pond system, has no Class 1 groundwater standard, has no upward trend, and shows no significant difference between upgradient versus downgradient wells.

Chloride
Median chloride concentrations in groundwater are between 8 and 100 mg/L at all of the monitoring wells with the exception of well 25, which has a median concentration of 580 mg/L. Excluding well 25, which is affected by the off-site slag pile, chloride concentrations are not changing significantly and show little variability within or between monitoring wells. Chloride is not a contaminant of concern related to the west ash pond system, has no Class 1 groundwater standard, has no upward trend, and shows no significant difference between upgradient versus downgradient wells.

? (700 mg/L)

Magnesium
Median magnesium concentrations in groundwater are between 25 and 57 mg/L at all of the monitoring wells with the exception of well 25, which has a median concentration of 84 mg/L. Excluding well 25, which is affected by the off-site slag pile, magnesium concentrations are either decreasing or not changing significantly. Magnesium concentrations are slightly elevated at wells 4, 12, and 21 relative to other wells around the site; however, these concentrations are declining along with those at other wells, including the background wells 22 and 36. Changes in magnesium concentrations in groundwater do not appear to be related to the ash ponds. Magnesium is not a contaminant of concern in the groundwater at Wood River. Magnesium has no Class 1 groundwater standard, has no upward trend, and shows no significant difference between upgradient versus downgradient wells.

Potassium
Median potassium concentrations in groundwater are between 1.9 and 6.5 mg/L at all of the monitoring wells with the exception of well 25, which has a median concentration of 16.0 mg/L. Excluding well 25, which is affected by the off-site slag pile, potassium concentrations are within a narrow concentration range and are either decreasing or not changing significantly. Potassium is not a contaminant of concern in the groundwater at Wood River. Potassium has no Class 1 groundwater standard, has no upward trend, and shows no significant difference between upgradient and downgradient wells.

3 Physical Delineation of the Groundwater Management Zone (GMZ)

On the basis of the groundwater monitoring data presented in the NRT report, monitoring wells 2, 12, 23, 28, 32, and possibly 31 are being impacted by ash pond leachate from the west ash ponds. Based on this information and the modeling results, DMG is requesting a GMZ be authorized that encompasses the

following area: west ash ponds and impacted monitoring wells, and extends to the property boundaries on the northwest, west, and southwest, extends eastward to Chessen Lane, north along Chessen Lane beyond the north edge of the ponds, and west to the property boundary.

A written description of the GMZ being requested by DMG is enclosed along with a digitized drawing (Appendix B). The total area enclosed within the proposed GMZ is 175.6 acres. The length of the zone's perimeter is 12,133 feet (2.3 miles). DMG is requesting the zone extend from the land surface to bedrock, which consists of the Mississippian-age St. Geneieve limestone. The elevation of the top of the bedrock / base of unconsolidated alluvial deposits is approximately 300 feet above mean sea level. The depth of the bedrock (base of GMZ) is approximately 120 to 135 feet below land surface in the vicinity of the west ash ponds.

4 Proposed GMZ Groundwater Monitoring Plan

The groundwater monitoring plan proposed for the west ash pond system at Wood River is provided on Table 3. Currently, DMG is required to monitor 11 wells on a quarterly basis for 11 parameters, including the field parameters of groundwater elevation and pH. DMG proposes to continue monitoring at 11 wells, but with 3 of the current wells replaced by 3 new wells. The following wells are to be deleted or added to the monitoring program:

Wells to be Deleted or Added to the Monitoring Program (Table 3, Part A)

MW2: Add to program. This well is located at the southeast corner of the west ash ponds. No other monitoring wells are located in this area and monitoring at this location is important for validating the modeling results.

MW3: Delete from program. This well is adjacent to and screened at a greater depth than MW4. The inorganic parameters measured in MW3 have been consistently lower than in MW4;

MW25: Delete from program. Groundwater at this location is predominantly affected by the slag pile. Data from this well does not assist in the interpretation of impacts from the ash ponds. Inorganic parameters of concern at MW25 reflect impacts from the slag pile. This well is being replaced by wells MW28 and MW31, which are closer to and affected by the west ash ponds;

MW28: Add to program. This well is at the northeast corner of the ash ponds and will monitor groundwater quality to the northeast;

MW30: Delete from program. Groundwater at this location has very low inorganic parameter concentrations and offers no value as a compliance well or for ascertaining the accuracy of the groundwater model; and,

MW31: Add to program. This well is south of well MW25 and located just north of the west ash ponds. MW31 will serve as a better indicator of changes to groundwater quality resulting from closure of the west ash ponds than MW25. However, groundwater quality at MW31 is affected by the slag pile, as discussed in the attached NRT report.

Groundwater Monitoring Parameters (Table 3, Part B)

The groundwater parameters proposed for collection, analysis, and reporting to the IEPA include the following:

- field parameters: pH and groundwater elevation; and,
- inorganic parameters: boron, manganese, sulfate, and total dissolved solids (TDS).

Those inorganic parameters previously collected and reported to the IEPA that are proposed for exclusion from future groundwater monitoring are alkalinity, calcium, chloride, magnesium, and potassium. These parameters are not contaminants of concern related to the west ash ponds and were discussed at length in Section 1 (Groundwater Quality Data Summary).

Groundwater Monitoring Frequency (Table 3, Part C)

An extensive set of groundwater chemistry data has been collected, analyzed, and reported for the monitoring wells at the west ash ponds. Based on the long-term trends observed for parameter concentrations in groundwater and the predictive capabilities of the groundwater model calibrated using the site data, it is recommended that groundwater monitoring during the first two years (2001 – 2002) following acceptance of the closure work plan be maintained at a quarterly frequency.

At the conclusion of two years of monitoring, the frequency will be re-evaluated. If the groundwater quality is changing in accordance with model predictions, a proposal for semi-annual monitoring will be presented in the Annual Report along with supporting documentation and statistics. Assuming groundwater quality is changing according to model predictions and that no statistical basis exists for continuing quarterly monitoring, the monitoring frequency in years 2003 to 2005 will be decreased to semi-annual. At the end of year 2005, the groundwater monitoring program will be re-evaluated and recommendations made to the IEPA.

5 Proposed Schedule of Modeling and Reporting Events

The proposed schedule for reporting of groundwater monitoring data, modeling results, and ash mining throughout the term of the GMZ is as follows:

Reporting of Groundwater Monitoring Data: Quarterly

Quarterly monitoring events will be conducted during the first two months of each quarter. DMG will report quarterly parameter concentration data, pH, and groundwater elevation within 60 days of sample collection. The data will be provided in paper format and on diskette (ASCII, comma-delimited). The specific parameters to be sampled are listed in Table 3.

Groundwater Modeling and Reporting of Results: Annually

An annual assessment of the groundwater modeling results for the preceding year shall be conducted and submitted to the Agency by January 31. The assessment shall statistically evaluate the groundwater data, compare parameter concentrations to Class 1 groundwater standards, and re-evaluate the accuracy of the MODFLOW/MT3D predictive modeling.

If groundwater concentrations are not within the upper bounds of the concentration values predicted by the model, Dynegy will investigate the cause of the higher-than-predicted groundwater concentration values. If necessary, additional groundwater monitoring will be performed, field investigation implemented, and recalibration of the predictive modeling performed. Dynegy will transmit recalibrated predictive modeling results to the Agency.

As part of the annual report, DMG will also report the mass of ash removed from the west ash ponds during the preceding 12 months. In its report, DMG will also discuss the effects the ash mining may have on groundwater quality downgradient.

Applying for Alternative Groundwater Standards: Upon Expiration of the Term of the GMZ

If groundwater concentrations have stabilized and no further reductions can realistically be expected prior to achieving Class 1 groundwater standards, DMG will discuss with the Agency additional closure measures. One such additional measure would be to propose alternative groundwater standards for the west ash pond site.

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TABLES

Table 1. Summary of Exceedances of Class 1 Groundwater Standards

Closure Work Plan and GMZ Application: West Ash Ponds
Wood River Power Station

Parameters Submitted to the IEPA for Routine Groundwater Monitoring	Class 1 Standard	unit	Number of exceedances of Class 1 Groundwater Standards between January 1996 and May 2000 (and year of last exceedance)										
			Current Monitoring Wells Monitored Quarterly for Reporting to the IEPA										
			3	4	12	20	21	22[bck]	23	25	30	34	36[bck]
Alkalinity	no Class 1 Standard												
Boron	2.0	mg/L	0	0	**1**$_{(1995)}$	**1**$_{(1998)}$	0	0	**13**$_{(2000)}$	**9**$_{(2000)}$	**1**$_{(1996)}$	0	0
Calcium	no Class 1 Standard												
Chloride	200	mg/L	0	0	0	0	0	0	0	**30**$_{(2000)}$	0	0	0
Magnesium	no Class 1 Standard												
Manganese	0.15	mg/L	**16**$_{(2000)}$	**18**$_{(2000)}$	**24**$_{(2000)}$	0	**5**$_{(2000)}$	0	**10**$_{(1996)}$	**14**$_{(1999)}$	0	**12**$_{(2000)}$	**6**$_{(2000)}$
pH	6.50 / 9.00	Std.	0	**3**$_{(1998)}$	**2**$_{(1998)}$	**12**$_{(2000)}$	**2**$_{(1998)}$	**1**$_{(1996)}$	**15**$_{(2000)}$	**2**$_{(1998)}$	**2**$_{(1998)}$	**1**$_{(1998)}$	0
Potassium	no Class 1 Standard												
Sulfate	400	mg/L	0	0	0	0	0	0	0	**1**$_{(1996)}$	0	0	0
Total Dissolved Solids	1,200	mg/L	0	0	0	0	0	0	0	**23**$_{(2000)}$	0	0	0
Groundwater Elevation	no Class 1 Standard												

[bck] Background monitoring wells.

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Table 2. Statistical Summary of Parameters Proposed for Exclusion from Monitoring

Closure Work Plan and GMZ Application: West Ash Ponds
Wood River Power Station

ALKALINITY

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation
3	16	317.5	295	690	230	106.4
4	18	660.0	680	760	310	101.1
12	24	428.3	425	490	370	30.6
20	30	167.7	160	350	120	40.7
21	29	363.1	370	410	310	28.9
22	30	389.0	380	760	330	74.0
23	30	305.0	310	380	190	43.3
25	30	538.3	580	770	310	122.6
30	26	397.7	385	630	350	52.0
34	12	422.5	435	500	340	47.9
36	6	393.3	375	170	330	53.7

CALCIUM (dissolved)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation
3	16	84.8	80.0	160	68	21.0
4	18	162.8	170.0	190	80	22.7
12	24	150.0	150.0	170	120	12.2
20	30	69.9	71.5	96	23	17.1
21	29	152.9	150.0	240	55	31.9
22	30	139.0	140.0	170	110	14.2
23	30	81.1	79.0	130	49	18.5
25	30	384.0	375.0	660	210	121.3
30	26	123.2	120.0	170	94	16.9
34	12	110.1	110.0	150	86	19.1
36	6	102.3	98.5	120	84	13.4

CHLORIDE

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation
3	16	30.8	28.5	54	21	9.2
4	18	56.3	55.5	86	28	15.8
12	24	38.8	38.5	70	16	12.5
20	30	44.8	47.0	70	13	16.8
21	29	47.7	43.0	100	17	20.4
22	30	13.2	12.0	27	4.1	5.7
23	30	102.5	95.0	170	46	29.2
25	30	581	580	1000	320	198.7
30	26	10.1	8.1	33	3	6.4
34	12	56.3	48.0	120	36	25.1
36	6	43.2	43.0	48	40	2.6

Note: All parameter concentrations are in milligrams per Liter.

gmz_tables.xls

Table 2. Statistical Summary of Parameters Proposed for Exclusion from Monitoring

Closure Work Plan and GMZ Application: West Ash Ponds
Wood River Power Station

MAGNESIUM (dissolved)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation
3	16	26.8	25.0	53	22	7.3
4	18	55.4	57.0	65	26	8.3
12	24	45.8	46.0	53	37	3.3
20	30	29.4	28.0	46	14	6.7
21	29	43.8	43.0	60	35	5.6
22	30	32.0	32.0	39	25	3.4
23	30	28.7	28.5	44	18	6.9
25	30	81.1	84.0	150	41	28.5
30	26	38.8	38.5	49	31	4.0
34	12	38.0	36.5	52	29	7.3
36	6	36.0	36.0	42	28	4.8

POTASSIUM (dissolved)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation
3	16	3.2	3.1	4.2	2.3	0.50
4	18	2.4	2.2	4.2	2.0	0.57
12	24	5.2	5.1	7.0	4.1	0.78
20	30	1.9	1.9	4.4	1.1	0.59
21	29	2.6	2.5	5.4	1.9	0.60
22	30	2.9	2.6	8.9	2.2	1.24
23	30	6.6	6.5	9.0	4.8	1.20
25	30	17.2	16.0	30.0	12.0	4.88
30	26	2.8	2.7	6.3	2.3	0.81
34	12	6.1	6.1	9.2	3.2	1.93
36	6	2.8	3.0	3.3	2.1	0.45

APPENDIX A

A-1: Statistical Summary Tables

A-2: Class 1 Groundwater Standards Exceedance Tables

A-3: Time-Concentration Plots

A-4: Box-and-Whisker Plots

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A-1: Statistical Summary Tables

Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 03
Type:
Class:

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	16	317.500	295.000	690.000	230.000	106.364	0.0720	No / No	0.00
Boron, dissolved	mg/L	16	0.101	0.063	0.650	0.025	0.148	0.0000	No / No	12.50
Calcium, dissolved	mg/L	16	84.813	80.000	160.000	68.000	21.028	0.0090	No / No	0.00
Chloride, total in water	mg/L	16	30.813	28.500	54.000	21.000	9.196	-0.0040	No / Yes	0.00
Magnesium, dissolved	mg/L	16	26.813	25.000	53.000	22.000	7.314	0.0010	No / No	0.00
Manganese, dissolved	mg/L	16	3.304	2.675	9.200	2.200	1.741	0.0000	No / No	0.00
pH (field)	SU	16	7.140	7.100	7.770	6.570	0.356	0.0000	Yes / Yes	0.00
Potassium, dissolved	mg/L	16	3.206	3.100	4.200	2.300	0.495	0.0000	Yes / Yes	0.00
Sulfate, total	mg/L	16	19.950	19.000	59.000	2.500	13.541	-0.0120	No / No	12.50
Total Dissolved Solids	mg/L	16	395.000	365.000	840.000	310.000	127.698	0.0290	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 04 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	18	660.000	680.000	760.000	310.000	101.053	0.0730	No / No	0.00
Boron, dissolved	mg/L	18	0.565	0.595	0.690	0.069	0.135	0.0000	No / No	0.00
Calcium, dissolved	mg/L	18	162.778	170.000	190.000	80.000	22.702	0.0000	No / No	0.00
Chloride, total in water	mg/L	18	56.333	55.500	86.000	28.000	15.759	-0.0100	Yes / Yes	0.00
Magnesium, dissolved	mg/L	18	55.444	57.000	65.000	26.000	8.340	-0.0040	No / No	0.00
Manganese, dissolved	mg/L	18	10.600	9.600	24.000	2.700	4.592	-0.0030	No / No	0.00
pH (field)	SU	18	6.994	6.845	8.020	6.200	0.505	0.0000	Yes / Yes	0.00
Potassium, dissolved	mg/L	18	2.378	2.150	4.200	2.000	0.570	0.0000	No / No	0.00
Sulfate, total	mg/L	18	44.183	38.000	100.000	2.500	32.220	-0.0480	Yes / No	11.11
Total Dissolved Solids	mg/L	18	820.556	890.000	940.000	360.000	176.751	0.0000	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 12 — Type: — Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	24	428.333	425.000	490.000	370.000	30.598	-0.0280	Yes / Yes	0.00
Boron, dissolved	mg/L	24	1.667	1.650	2.200	1.400	0.206	0.0000	Yes / Yes	0.00
Calcium, dissolved	mg/L	24	150.000	150.000	170.000	120.000	12.158	0.0110	Yes / No	0.00
Chloride, total in water	mg/L	24	38.833	38.500	70.000	16.000	12.457	0.0100	Yes / Yes	0.00
Magnesium, dissolved	mg/L	24	45.833	46.000	53.000	37.000	3.319	-0.0020	Yes / Yes	0.00
Manganese, dissolved	mg/L	24	0.699	0.670	1.200	0.559	0.121	0.0000	No / No	0.00
pH (field)	SU	24	7.101	7.130	8.120	5.800	0.489	0.0000	Yes / Yes	0.00
Potassium, dissolved	mg/L	24	5.196	5.050	7.000	4.100	0.777	-0.0010	Yes / Yes	0.00
Sulfate, total	mg/L	24	133.792	135.000	250.000	67.000	48.374	0.0640	Yes / Yes	0.00
Total Dissolved Solids	mg/L	24	707.500	690.000	840.000	630.000	55.580	0.0610	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 20 — Type: — Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	30	167.667	160.000	350.000	120.000	40.742	-0.0070	No / No	0.00
Boron, dissolved	mg/L	30	0.910	0.845	2.600	0.150	0.481	0.0000	No / Yes	0.00
Calcium, dissolved	mg/L	30	69.900	71.500	96.000	23.000	17.137	-0.0020	Yes / No	0.00
Chloride, total in water	mg/L	30	44.767	47.000	70.000	13.000	16.823	0.0010	Yes / No	0.00
Magnesium, dissolved	mg/L	30	29.367	28.000	46.000	14.000	6.718	-0.0050	Yes / Yes	0.00
Manganese, dissolved	mg/L	30	0.019	0.015	0.150	0.003	0.029	0.0000	No / No	76.67
pH (field)	SU	30	6.733	6.675	8.000	6.110	0.531	0.0000	No / No	0.00
Potassium, dissolved	mg/L	30	1.870	1.850	4.400	1.100	0.588	0.0000	No / No	0.00
Sulfate, total	mg/L	30	120.967	120.000	180.000	55.000	34.881	-0.0170	Yes / Yes	0.00
Total Dissolved Solids	mg/L	30	417.667	420.000	550.000	240.000	76.685	-0.0390	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 21 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	29	363.103	370.000	410.000	310.000	28.922	-0.0220	Yes / Yes	0.00
Boron, dissolved	mg/L	29	0.534	0.490	1.100	0.290	0.178	0.0000	No / Yes	0.00
Calcium, dissolved	mg/L	29	152.931	150.000	240.000	55.000	31.946	0.0000	No / No	0.00
Chloride, total in water	mg/L	29	47.655	43.000	100.000	17.000	20.377	-0.0070	No / Yes	0.00
Magnesium, dissolved	mg/L	29	43.828	43.000	60.000	35.000	5.607	-0.0040	Yes / Yes	0.00
Manganese, dissolved	mg/L	29	0.076	0.015	0.450	0.003	0.126	0.0000	No / No	51.72
pH (field)	SU	29	7.034	6.880	8.140	6.380	0.454	0.0000	No / No	0.00
Potassium, dissolved	mg/L	29	2.562	2.500	5.400	1.900	0.599	0.0000	No / No	0.00
Sulfate, total	mg/L	29	141.793	130.000	250.000	97.000	44.387	0.0520	No / No	0.00
Total Dissolved Solids	mg/L	29	683.448	670.000	800.000	560.000	61.078	0.0230	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.
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August 8, 2000
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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 03, 04, 12, 20, 21, 22

Option for LT Pts: x 0.5

Location: 22 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	30	389.000	380.000	760.000	330.000	73.969	-0.0130	No / No	0.00
Boron, dissolved	mg/L	30	0.353	0.350	0.530	0.200	0.102	0.0000	Yes / Yes	0.00
Calcium, dissolved	mg/L	30	139.000	140.000	170.000	110.000	14.227	0.0000	Yes / Yes	0.00
Chloride, total in water	mg/L	30	13.203	12.000	27.000	4.100	5.682	0.0030	Yes / Yes	0.00
Magnesium, dissolved	mg/L	30	32.200	32.000	39.000	25.000	3.428	-0.0040	Yes / Yes	0.00
Manganese, dissolved	mg/L	30	0.015	0.012	0.075	0.003	0.019	0.0000	No / No	86.67
pH (field)	SU	30	7.149	7.015	8.260	6.340	0.465	0.0000	No / No	0.00
Potassium, dissolved	mg/L	30	2.947	2.600	8.900	2.200	1.235	0.0000	No / No	0.00
Sulfate, total	mg/L	30	74.033	74.500	110.000	46.000	19.352	0.0000	Yes / Yes	0.00
Total Dissolved Solids	mg/L	30	549.667	550.000	680.000	450.000	53.529	-0.0250	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 23, 25, 30, 34, 36
Option for LT Pts: x 0.5

Location: 23 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	30	305.000	310.000	380.000	190.000	43.291	0.0130	Yes / No	0.00
Boron, dissolved	mg/L	30	2.641	2.000	8.100	0.440	1.862	-0.0010	No / Yes	0.00
Calcium, dissolved	mg/L	30	81.167	79.000	130.000	49.000	18.475	-0.0010	Yes / Yes	0.00
Chloride, total in water	mg/L	30	102.533	95.000	170.000	46.000	29.235	0.0080	Yes / Yes	0.00
Magnesium, dissolved	mg/L	30	28.667	28.500	44.000	18.000	6.930	-0.0070	Yes / Yes	0.00
Manganese, dissolved	mg/L	30	0.225	0.196	0.820	0.007	0.192	0.0000	No / No	10.00
pH (field)	SU	30	6.686	6.525	7.820	6.030	0.555	0.0000	No / No	0.00
Potassium, dissolved	mg/L	30	6.553	6.500	9.000	4.800	1.204	-0.0010	Yes / Yes	0.00
Sulfate, total	mg/L	30	189.667	190.000	250.000	140.000	31.015	-0.0330	Yes / Yes	0.00
Total Dissolved Solids	mg/L	30	753.000	755.000	880.000	640.000	56.882	-0.0460	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 23, 25, 30, 34, 36

Option for LT Pts: x 0.5

Location: 25 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	30	538.333	580.000	770.000	310.000	122.589	0.0500	No / No	0.00
Boron, dissolved	mg/L	30	1.479	1.100	3.300	0.470	0.858	0.0000	No / Yes	0.00
Calcium, dissolved	mg/L	30	384.000	375.000	660.000	210.000	121.303	0.0070	Yes / Yes	0.00
Chloride, total in water	mg/L	30	581.000	580.000	1,000.000	320.000	198.657	0.0280	Yes / Yes	0.00
Magnesium, dissolved	mg/L	30	81.133	84.000	150.000	41.000	28.542	0.0000	Yes / No	0.00
Manganese, dissolved	mg/L	30	0.202	0.145	0.990	0.003	0.243	0.0000	No / Yes	6.67
pH (field)	SU	30	6.939	6.795	8.010	6.330	0.436	0.0000	No / No	0.00
Potassium, dissolved	mg/L	30	17.200	16.000	30.000	12.000	4.888	-0.0020	No / No	0.00
Sulfate, total	mg/L	30	240.667	220.000	450.000	160.000	60.397	0.0070	No / No	0.00
Total Dissolved Solids	mg/L	30	,766.667	1,750.000	2,900.000	1,100.000	481.616	0.0000	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 23, 25, 30, 34, 36

Option for LT Pts: x 0.5

Location: 30
Type:
Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	26	397.692	385.000	630.000	350.000	52.024	0.0070	No / No	0.00
Boron, dissolved	mg/L	26	0.726	0.505	3.600	0.340	0.698	0.0000	No / No	0.00
Calcium, dissolved	mg/L	26	123.231	120.000	170.000	94.000	16.858	0.0000	No / No	0.00
Chloride, total in water	mg/L	26	10.104	8.100	33.000	2.500	6.429	-0.0010	No / Yes	3.85
Magnesium, dissolved	mg/L	26	38.846	38.500	49.000	31.000	4.027	-0.0040	Yes / Yes	0.00
Manganese, dissolved	mg/L	26	0.013	0.013	0.050	0.003	0.014	0.0000	No / No	73.08
pH (field)	SU	26	7.044	6.815	8.230	6.430	0.558	0.0000	No / No	0.00
Potassium, dissolved	mg/L	26	2.842	2.650	6.300	2.300	0.809	0.0000	No / No	0.00
Sulfate, total	mg/L	26	67.615	58.000	180.000	42.000	31.859	-0.0010	No / No	0.00
Total Dissolved Solids	mg/L	26	531.538	515.000	770.000	450.000	73.086	0.0000	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 23, 25, 30, 34, 36

Option for LT Pts: x 0.5

Location: 34 | Type: | Class: Downgradient

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	12	422.500	435.000	500.000	340.000	47.887	0.0330	Yes / Yes	0.00
Boron, dissolved	mg/L	12	0.222	0.210	0.480	0.100	0.118	0.0000	Yes / Yes	0.00
Calcium, dissolved	mg/L	12	110.083	110.000	150.000	86.000	19.138	-0.0040	Yes / Yes	0.00
Chloride, total in water	mg/L	12	56.333	48.000	120.000	36.000	25.054	-0.0070	No / Yes	0.00
Magnesium, dissolved	mg/L	12	38.000	36.500	52.000	29.000	7.336	-0.0040	Yes / Yes	0.00
Manganese, dissolved	mg/L	12	5.917	5.050	14.000	3.900	2.740	-0.0010	No / No	0.00
pH (field)	SU	12	7.043	6.875	7.900	6.170	0.560	0.0000	No / Yes	0.00
Potassium, dissolved	mg/L	12	6.117	6.100	9.200	3.200	1.925	-0.0020	Yes / Yes	0.00
Sulfate, total	mg/L	12	24.058	12.500	75.000	2.500	22.868	-0.0240	No / Yes	8.33
Total Dissolved Solids	mg/L	12	548.333	540.000	730.000	430.000	86.533	0.0370	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

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Wood River
Statistical Summary for Multiple Locations

User Supplied Information

Date Range: 01/12/1995 to 05/25/2000
Locations: 23, 25, 30, 34, 36

Option for LT Pts: x 0.5

Location: 36
Type:
Class:

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope	Normal / Log Normal	% of Non-Detects
Alkalinity, total (lab)	mg/L	6	393.333	375.000	470.000	330.000	58.878	-0.1380	Yes / Yes	0.00
Boron, dissolved	mg/L	6	0.113	0.110	0.130	0.100	0.010	0.0000	Yes / Yes	0.00
Calcium, dissolved	mg/L	6	102.333	98.500	120.000	84.000	14.706	-0.0410	Yes / Yes	0.00
Chloride, total in water	mg/L	6	43.167	43.000	48.000	40.000	2.858	-0.0070	Yes / Yes	0.00
Magnesium, dissolved	mg/L	6	36.000	36.000	42.000	28.000	5.215	-0.0310	Yes / Yes	0.00
Manganese, dissolved	mg/L	6	3.550	3.550	4.300	2.900	0.513	-0.0030	Yes / Yes	0.00
pH (field)	SU	6	7.677	7.765	8.310	6.860	0.496	-0.0020	Yes / Yes	0.00
Potassium, dissolved	mg/L	6	2.800	2.950	3.300	2.100	0.498	-0.0030	Yes / Yes	0.00
Sulfate, total	mg/L	6	45.833	39.500	78.000	33.000	16.290	-0.0320	No / Yes	0.00
Total Dissolved Solids	mg/L	6	551.667	535.000	660.000	440.000	84.479	-0.4880	Yes / Yes	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.
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A-2: Class 1 Groundwater Standards Exceedance Tables

Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Boron, dissolved	01020	mg/L	0.00	12	05/17/1995	2.200	2.000				
				20	02/26/1998	2.600	2.000				
				23	04/12/1995	8.100	2.000				
					05/19/1995	5.600	2.000				
					09/28/1995	4.700	2.000				
					10/25/1995	4.500	2.000				
					11/29/1995	5.000	2.000				
					12/12/1995	4.800	2.000				
					01/10/1996	3.900	2.000				
					02/28/1996	3.400	2.000				
					03/26/1996	4.100	2.000				
				23	09/19/1996	2.800	2.000				
					02/26/1998	5.000	2.000				
					05/26/1999	2.100	2.000				
					05/24/2000	2.600	2.000				
				25	05/18/1995	2.700	2.000				
					06/08/1995	3.300	2.000				
					07/19/1995	3.000	2.000				
					08/29/1995	2.800	2.000				
					09/28/1995	2.200	2.000				
				25	05/22/1997	2.700	2.000				
					05/20/1998	2.600	2.000				
					08/19/1998	2.200	2.000				
					05/26/1999	2.400	2.000				
				30	06/13/1996	3.600	2.000				
Chloride, total	00940	mg/L	0.00	25	01/12/1995	550.000	200.000				
					04/11/1995	660.000	200.000				
					05/18/1995	320.000	200.000				
					06/08/1995	350.000	200.000				
					07/19/1995	350.000	200.000				
					08/29/1995	450.000	200.000				
					09/28/1995	670.000	200.000				
					10/25/1995	730.000	200.000				
					11/29/1995	690.000	200.000				
					12/12/1995	650.000	200.000				
					01/10/1996	570.000	200.000				
					02/28/1996	520.000	200.000				
					03/27/1996	500.000	200.000				
				25	06/13/1996	320.000	200.000				
					09/19/1996	670.000	200.000				

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Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Chloride, total	00940	mg/L	0.00	25	12/05/1996	1,000.000	200.000				
					02/19/1997	690.000	200.000				
					05/22/1997	320.000	200.000				
					08/12/1997	930.000	200.000				
					11/19/1997	650.000	200.000				
					02/25/1998	630.000	200.000				
					05/20/1998	430.000	200.000				
					08/19/1998	390.000	200.000				
					12/29/1998	860.000	200.000				
					03/10/1999	710.000	200.000				
					05/26/1999	390.000	200.000				
					08/25/1999	590.000	200.000				
					10/20/1999	1,000.000	200.000				
					03/08/2000	490.000	200.000				
					05/24/2000	350.000	200.000				
Manganese, dissolved	01056	mg/L	0.00	03	06/12/1996	2.800	0.150				
					09/18/1996	4.330	0.150				
					12/04/1996	2.750	0.150				
					02/20/1997	2.760	0.150				
					05/22/1997	2.530	0.150				
					08/12/1997	2.600	0.150				
					11/18/1997	3.800	0.150				
					02/25/1998	4.800	0.150				
					05/20/1998	2.400	0.150				
					08/19/1998	2.600	0.150				
					12/21/1998	9.200	0.150				
					05/26/1999	2.200	0.150				
					08/25/1999	2.900	0.150				
					10/20/1999	2.600	0.150				
					03/08/2000	2.200	0.150				
					05/24/2000	2.400	0.150				
				04	05/17/1995	24.000	0.150				
				04	06/12/1996	12.000	0.150				
					09/18/1996	12.000	0.150				
					12/04/1996	11.300	0.150				
					02/20/1997	11.700	0.150				
					05/22/1997	10.500	0.150				
					08/12/1997	9.700	0.150				
					11/18/1997	10.000	0.150				
					02/25/1998	19.000	0.150				

Document II
A-560
DRAFT

Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Manganese, dissolved	01056	mg/L	0.00	04	05/20/1998	9.000	0.150				
					08/19/1998	9.200	0.150				
					12/21/1998	2.700	0.150				
					03/10/1999	9.500	0.150				
					05/26/1999	8.100	0.150				
					08/25/1999	8.300	0.150				
					10/20/1999	8.300	0.150				
					03/08/2000	7.300	0.150				
					05/24/2000	8.200	0.150				
				12	05/17/1995	0.770	0.150				
					09/27/1995	0.760	0.150				
					10/25/1995	0.630	0.150				
					11/28/1995	0.660	0.150				
					12/13/1995	0.650	0.150				
					01/10/1996	0.690	0.150				
					02/29/1996	0.630	0.150				
					03/26/1996	0.670	0.150				
				12	06/14/1996	0.640	0.150				
					09/18/1996	0.559	0.150				
					12/04/1996	0.616	0.150				
					02/19/1997	0.635	0.150				
					05/23/1997	0.764	0.150				
					08/13/1997	0.690	0.150				
					11/19/1997	0.660	0.150				
					02/27/1998	1.200	0.150				
					05/20/1998	0.800	0.150				
					08/19/1998	0.670	0.150				
					12/21/1998	0.720	0.150				
					05/26/1999	0.690	0.150				
					08/25/1999	0.740	0.150				
					10/20/1999	0.660	0.150				
					03/08/2000	0.600	0.150				
					05/25/2000	0.670	0.150				
				21	01/12/1995	0.180	0.150				
					05/19/1995	0.250	0.150				
				21	02/26/1998	0.340	0.150				
					03/08/2000	0.450	0.150				
					05/24/2000	0.410	0.150				
				23	01/13/1995	0.460	0.150				
					04/12/1995	0.820	0.150				
					05/19/1995	0.560	0.150				

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Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Manganese, dissolved	01056	mg/L	0.00	23	09/28/1995	0.420	0.150				
					10/25/1995	0.360	0.150				
					11/29/1995	0.390	0.150				
					12/12/1995	0.330	0.150				
					01/10/1996	0.290	0.150				
					02/28/1996	0.320	0.150				
					03/26/1996	0.370	0.150				
				23	09/19/1996	0.204	0.150				
					12/05/1996	0.188	0.150				
					02/19/1997	0.232	0.150				
					02/26/1998	0.280	0.150				
					12/21/1998	0.180	0.150				
					10/20/1999	0.170	0.150				
					03/08/2000	0.340	0.150				
					05/24/2000	0.280	0.150				
				25	01/12/1995	0.330	0.150				
					04/11/1995	0.230	0.150				
					05/18/1995	0.500	0.150				
					06/08/1995	0.900	0.150				
					07/19/1995	0.990	0.150				
					08/29/1995	0.250	0.150				
					09/28/1995	0.160	0.150				
					12/12/1995	0.250	0.150				
					02/28/1996	0.180	0.150				
				25	06/13/1996	0.280	0.150				
					05/22/1997	0.355	0.150				
					05/20/1998	0.400	0.150				
					08/19/1998	0.290	0.150				
					05/26/1999	0.170	0.150				
				34	12/04/1996	5.720	0.150				
					02/20/1997	7.270	0.150				
					05/22/1997	6.810	0.150				
					08/12/1997	4.000	0.150				
					11/18/1997	5.200	0.150				
					02/25/1998	14.000	0.150				
					05/20/1998	5.000	0.150				
					05/26/1999	4.900	0.150				
					08/25/1999	3.900	0.150				
					10/20/1999	4.400	0.150				
					03/08/2000	4.700	0.150				
					05/24/2000	5.100	0.150				

Document 11
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Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Manganese, dissolved	01056	mg/L	0.00	36	03/10/1999	3.600	0.150				
					05/26/1999	3.900	0.150				
					08/25/1999	4.300	0.150				
					10/20/1999	3.500	0.150				
					03/08/2000	3.100	0.150				
					05/24/2000	2.900	0.150				

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Wood River
Limits Exception Report

Date Range: 01/12/1995 to 05/25/2000

Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
pH (field)	00400	pH	0.00	04	05/22/1997	6.480					
					11/18/1997	6.490					
					02/25/1998	6.200					
				12	11/19/1997	6.450					
					02/27/1998	5.800					
				20	12/12/1995	6.220					
				20	09/19/1996	6.110					
					12/05/1996	6.460					
					02/20/1997	6.290					
					05/23/1997	6.320					
					02/26/1998	6.230					
					08/20/1998	6.250					
					03/10/1999	6.260					
					05/26/1999	6.320					
					08/25/1999	6.230					
					10/20/1999	6.290					
					03/09/2000	6.460					
				21	09/19/1996	6.380					
					02/26/1998	6.470					
				22	12/05/1996	6.340					
				23	01/10/1996	6.470					
				23	09/19/1996	6.400					
					12/05/1996	6.260					
					02/19/1997	6.170					
					05/22/1997	6.030					
					08/13/1997	6.050					
					11/19/1997	6.260					
					02/26/1998	6.350					
					05/20/1998	6.360					
					03/10/1999	6.100					
					05/26/1999	6.250					
					08/25/1999	6.140					
					10/20/1999	6.260					
					03/08/2000	6.410					
					05/24/2000	6.470					
				25	11/19/1997	6.420					
					02/25/1998	6.330					
				30	12/05/1996	6.480					
					02/26/1998	6.430					
				34	02/25/1998	6.170					

Document II

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Wood River
Limits Exception Report

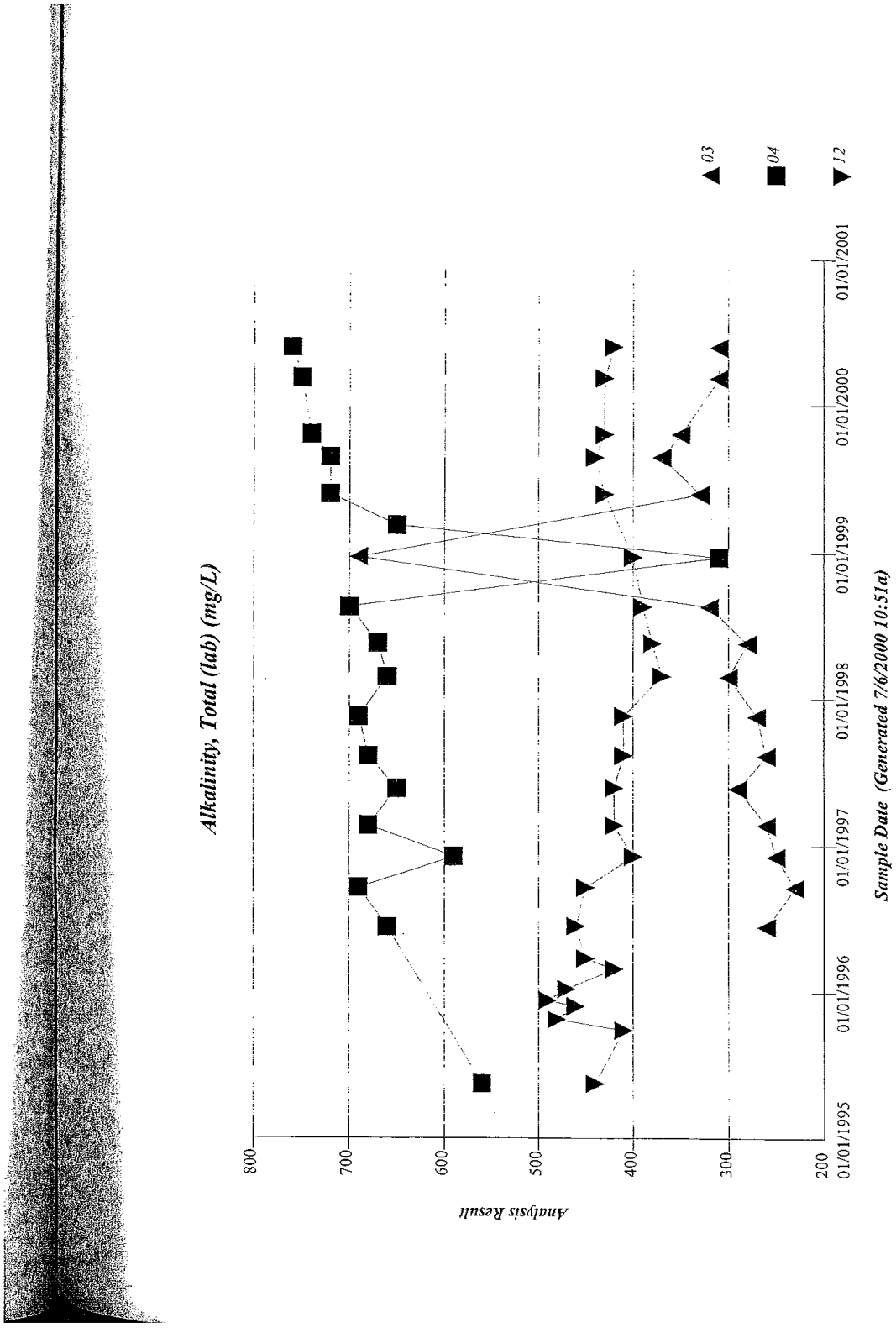
Date Range: 01/12/1995 to 05/25/2000

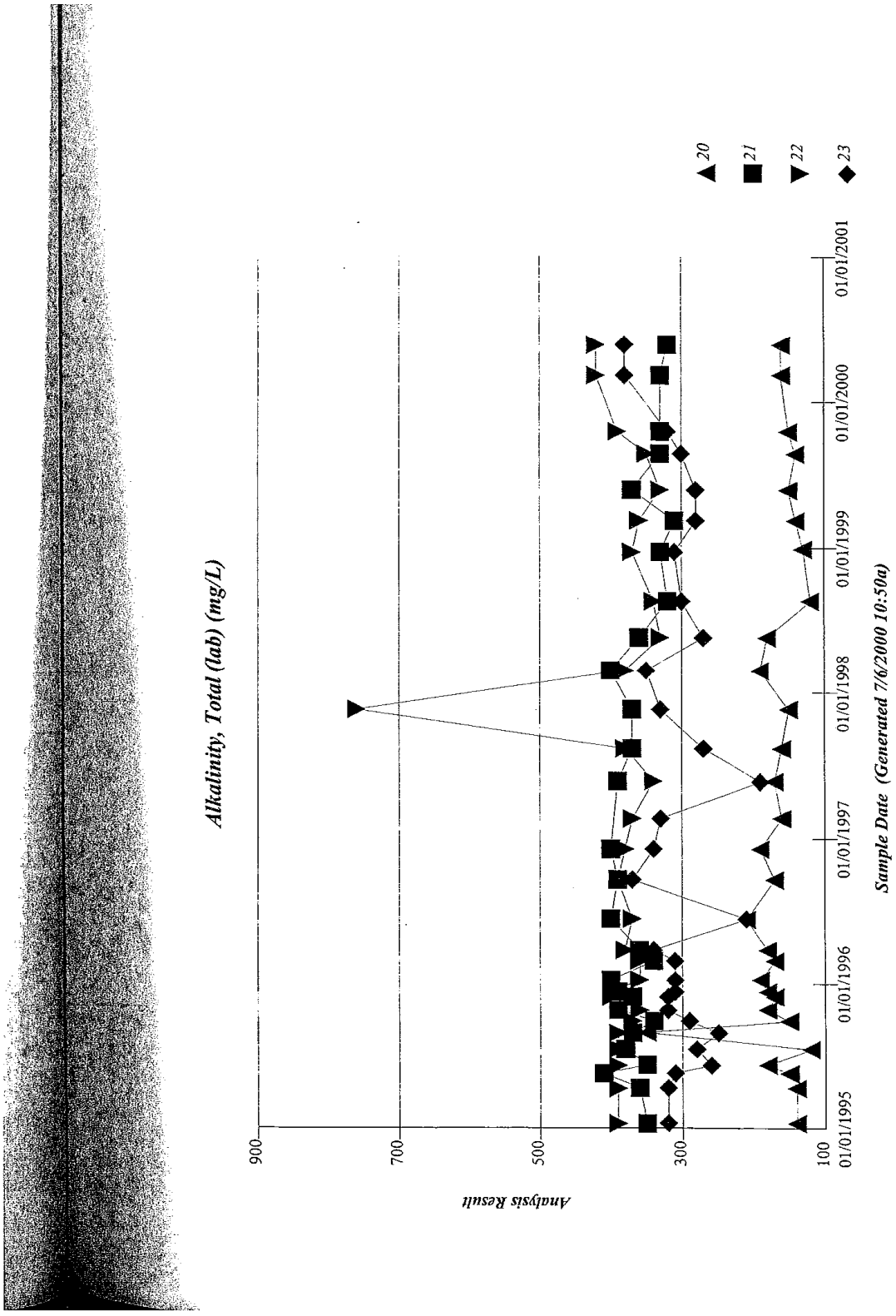
Parameter	Code	Units	Depth, ft	Location	Sample Date	Analysis Result	State Std Limt-1	Not Selected Limit-2	Not Selected Limt-3	Not Selected Limt-4	Not Selected Limt-5
Sulfate, total	00945	mg/L	0.00	25	12/05/1996	450.000	400.000				
Total Dissolved Solids	00515	mg/L	0.00	25	01/12/1995	1,700.000	1,200.000				
					04/11/1995	2,100.000	1,200.000				
					08/29/1995	1,500.000	1,200.000				
					09/28/1995	2,200.000	1,200.000				
					10/25/1995	2,300.000	1,200.000				
					11/29/1995	2,100.000	1,200.000				
					12/12/1995	2,000.000	1,200.000				
					01/10/1996	1,800.000	1,200.000				
					02/28/1996	1,700.000	1,200.000				
					03/27/1996	1,600.000	1,200.000				
				25	09/19/1996	2,400.000	1,200.000				
					12/05/1996	2,900.000	1,200.000				
					02/19/1997	1,900.000	1,200.000				
					08/12/1997	2,100.000	1,200.000				
					11/19/1997	1,700.000	1,200.000				
					02/25/1998	2,200.000	1,200.000				
					08/19/1998	1,300.000	1,200.000				
					12/29/1998	2,200.000	1,200.000				
					03/10/1999	2,000.000	1,200.000				
					08/25/1999	1,800.000	1,200.000				
					10/20/1999	2,500.000	1,200.000				
					03/08/2000	1,600.000	1,200.000				
					05/24/2000	1,300.000	1,200.000				

Document II

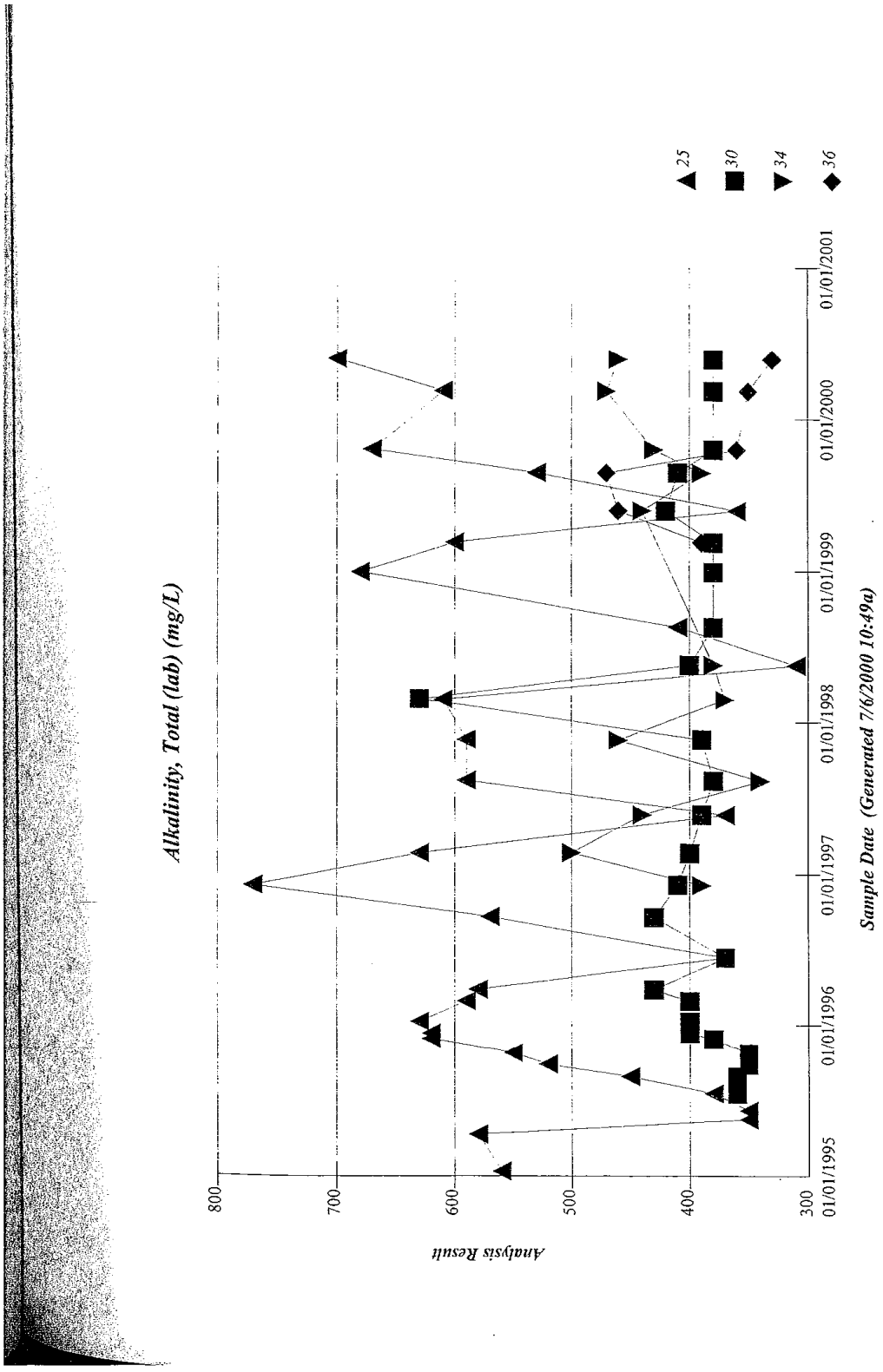
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A-3: Time-Concentration Plots

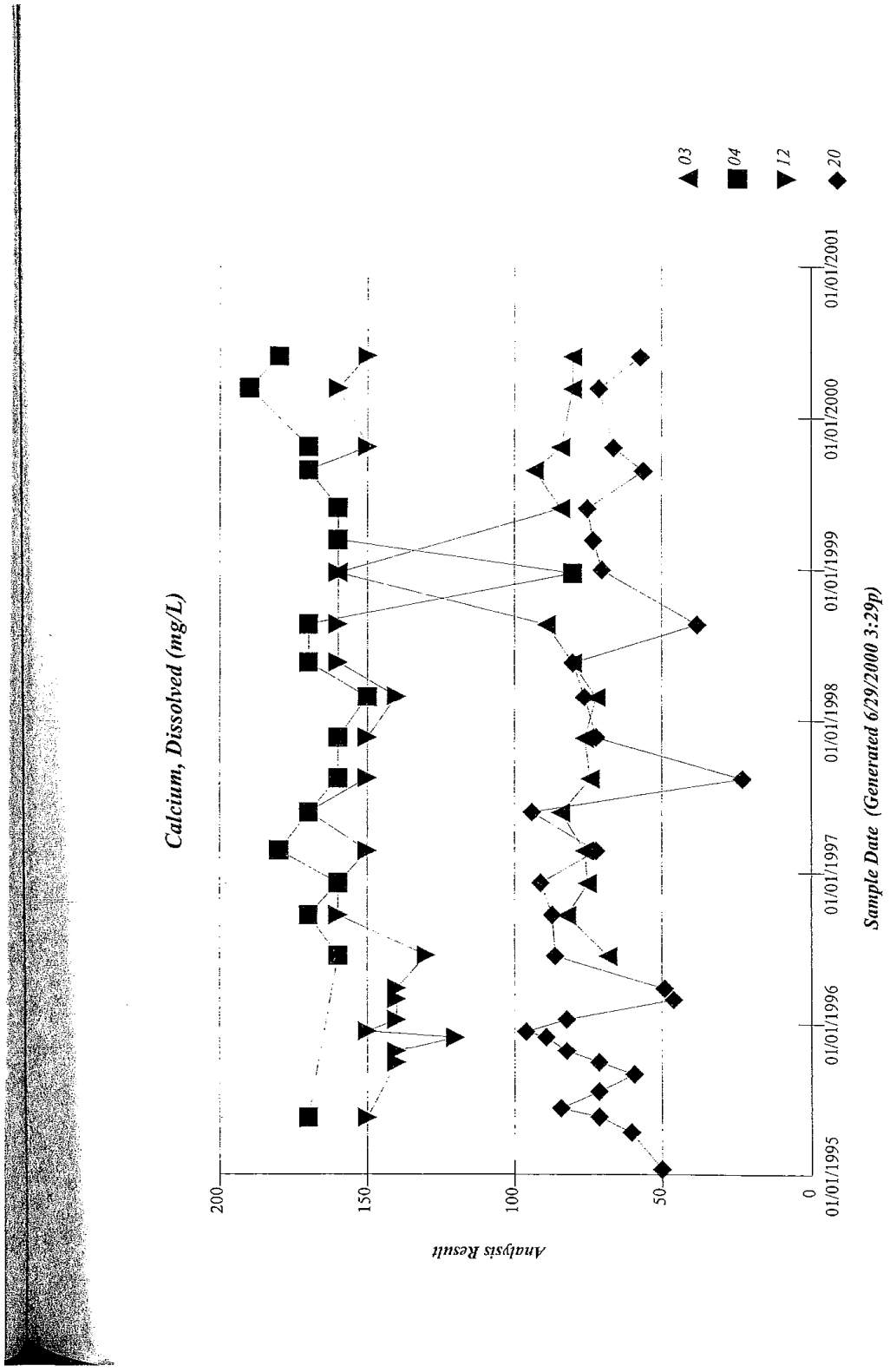

Alkalinity, Total (lab) (mg/L)
Analysis Result
800
700
600
500
400
300
200
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:51a)
03
04
12


Alkalinity, Total (lab) (mg/L)
Analysis Result
900
700
500
300
100
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:50a)
20
21
22
23

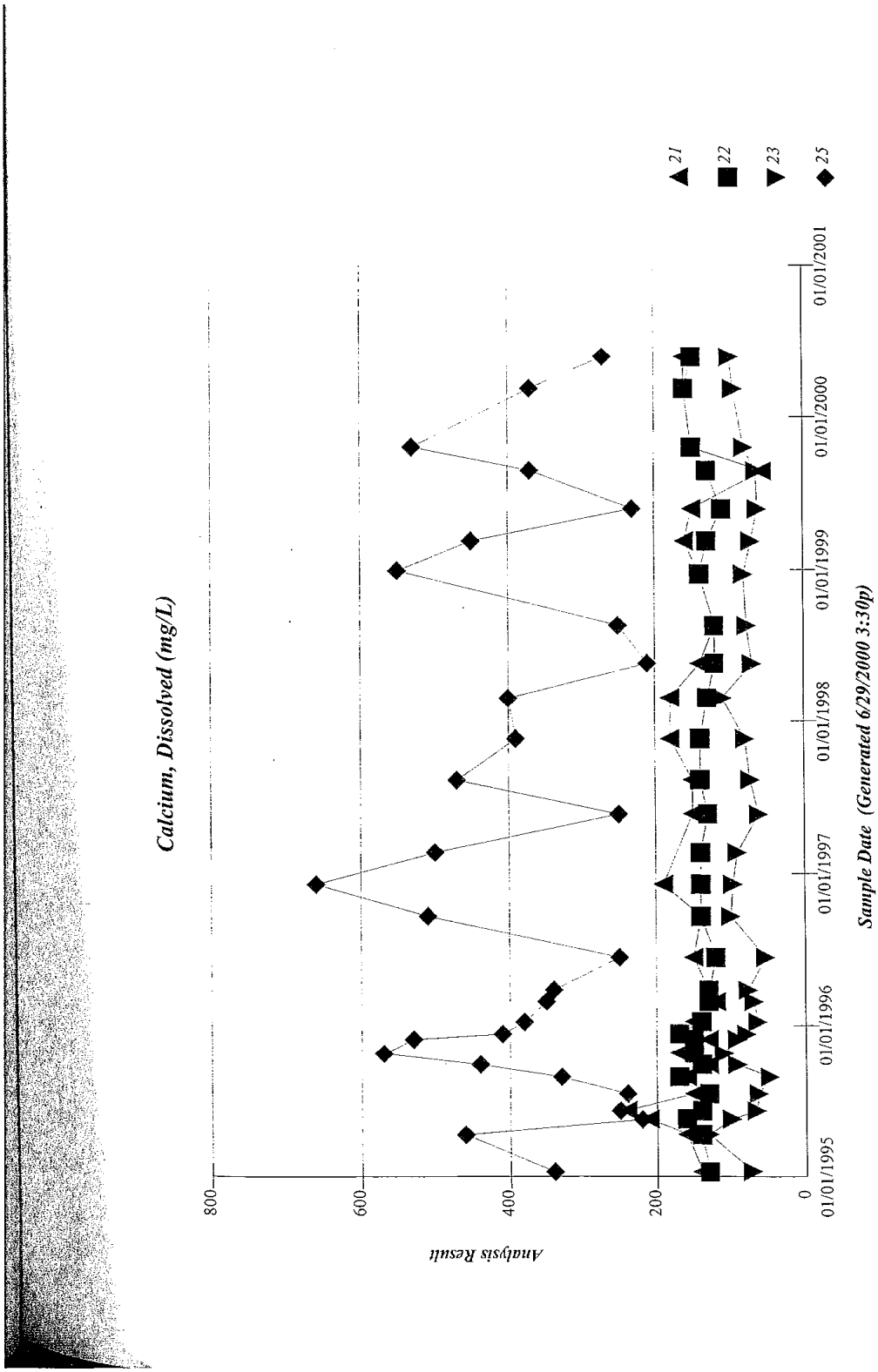
DRAFT

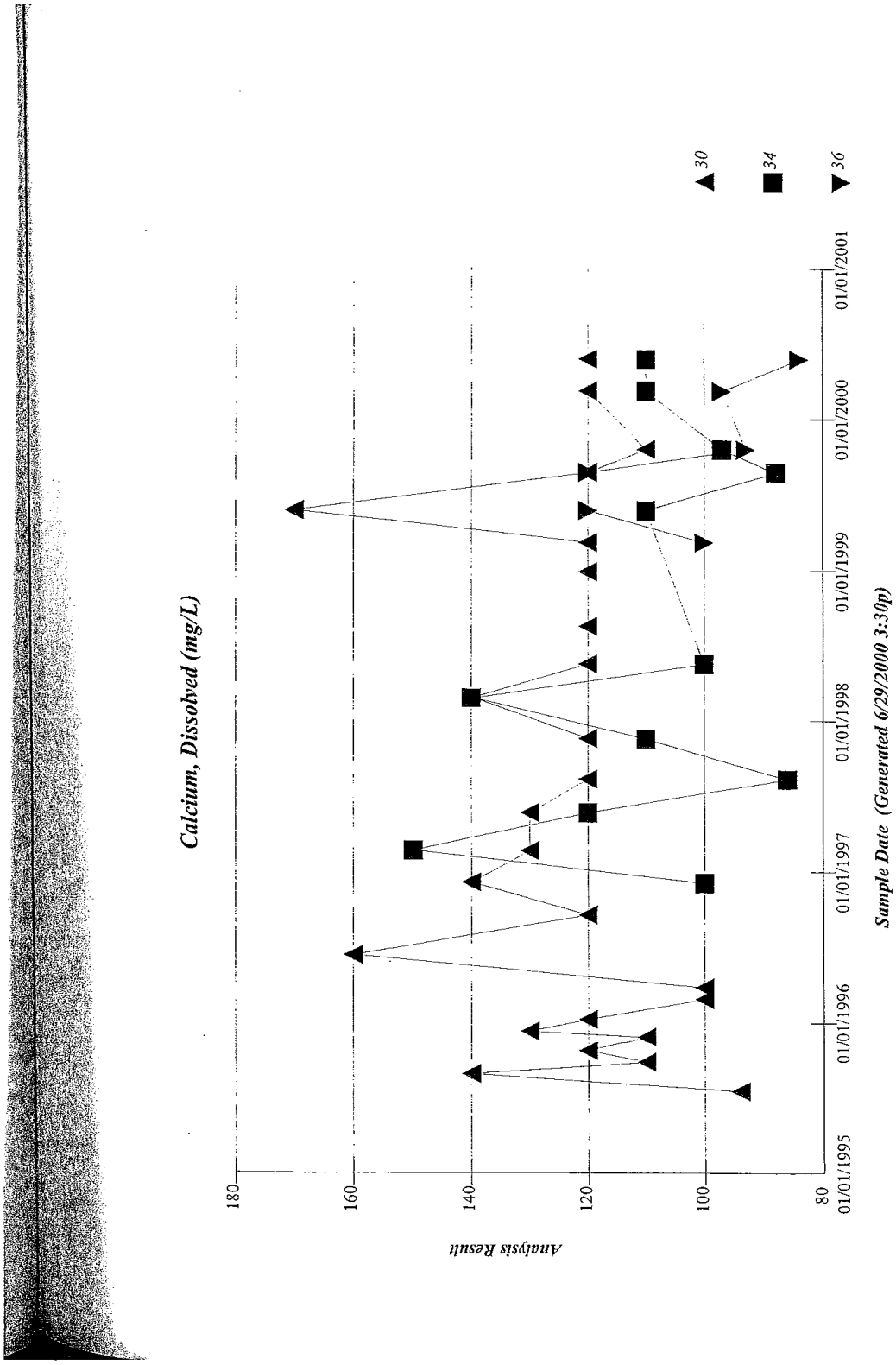

Alkalinity, Total (lab) (mg/L)
Analysis Result
800
700
600
500
400
300
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:49a)
25
30
34
36

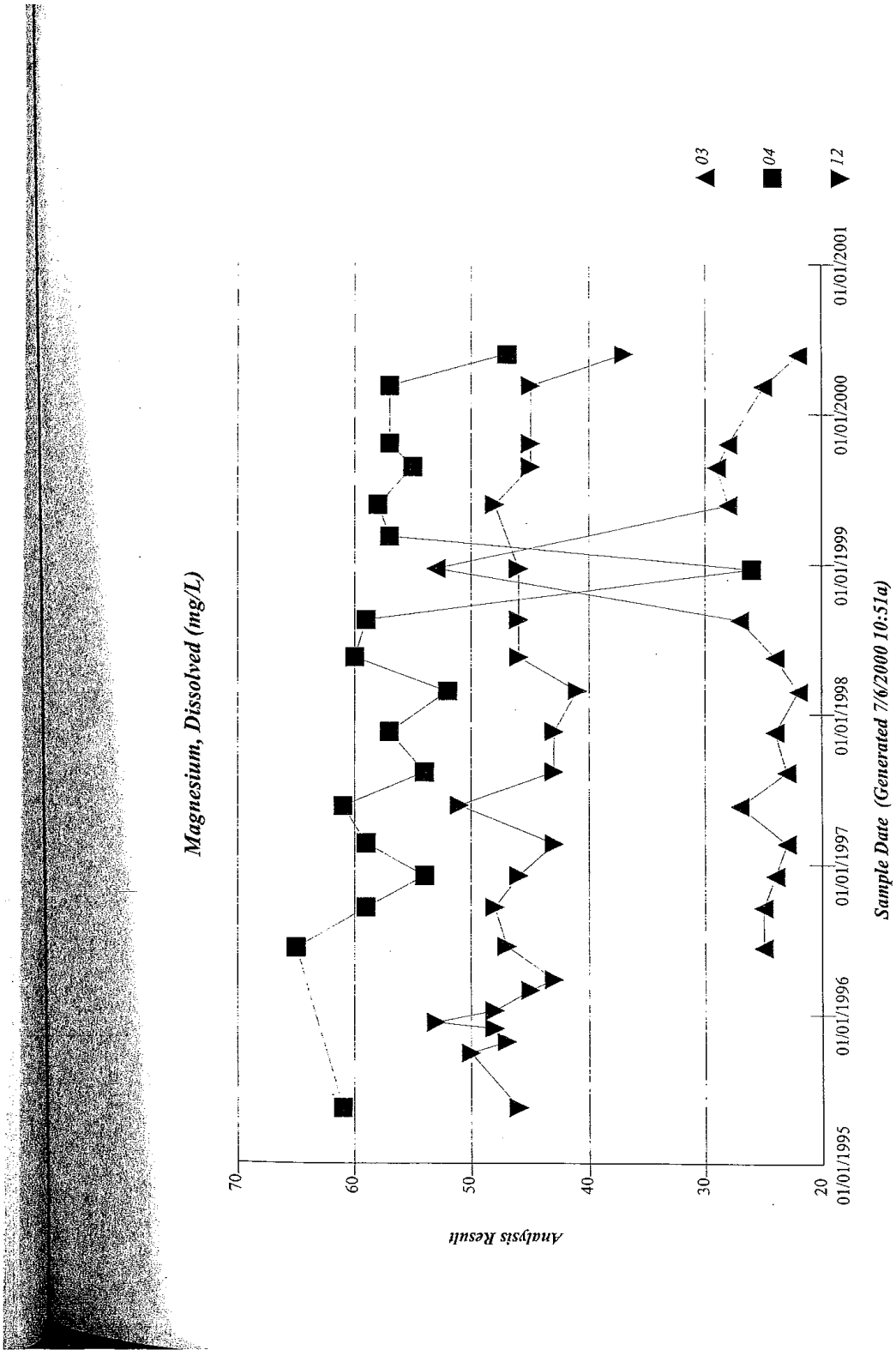
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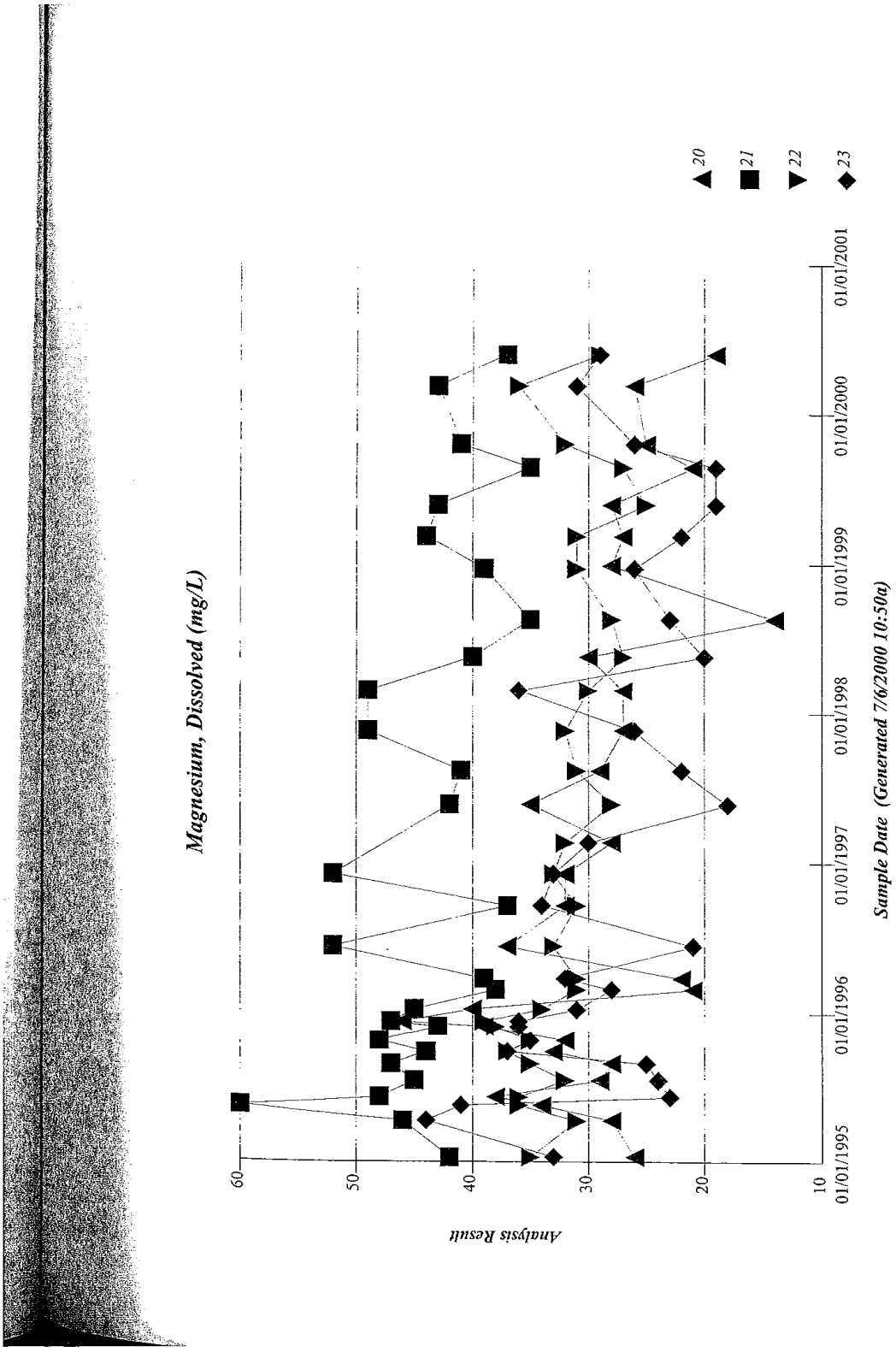

Calcium, Dissolved (mg/L)
Analysis Result
200
150
100
50
0
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 6/29/2000 3:29p)
03
04
12
20

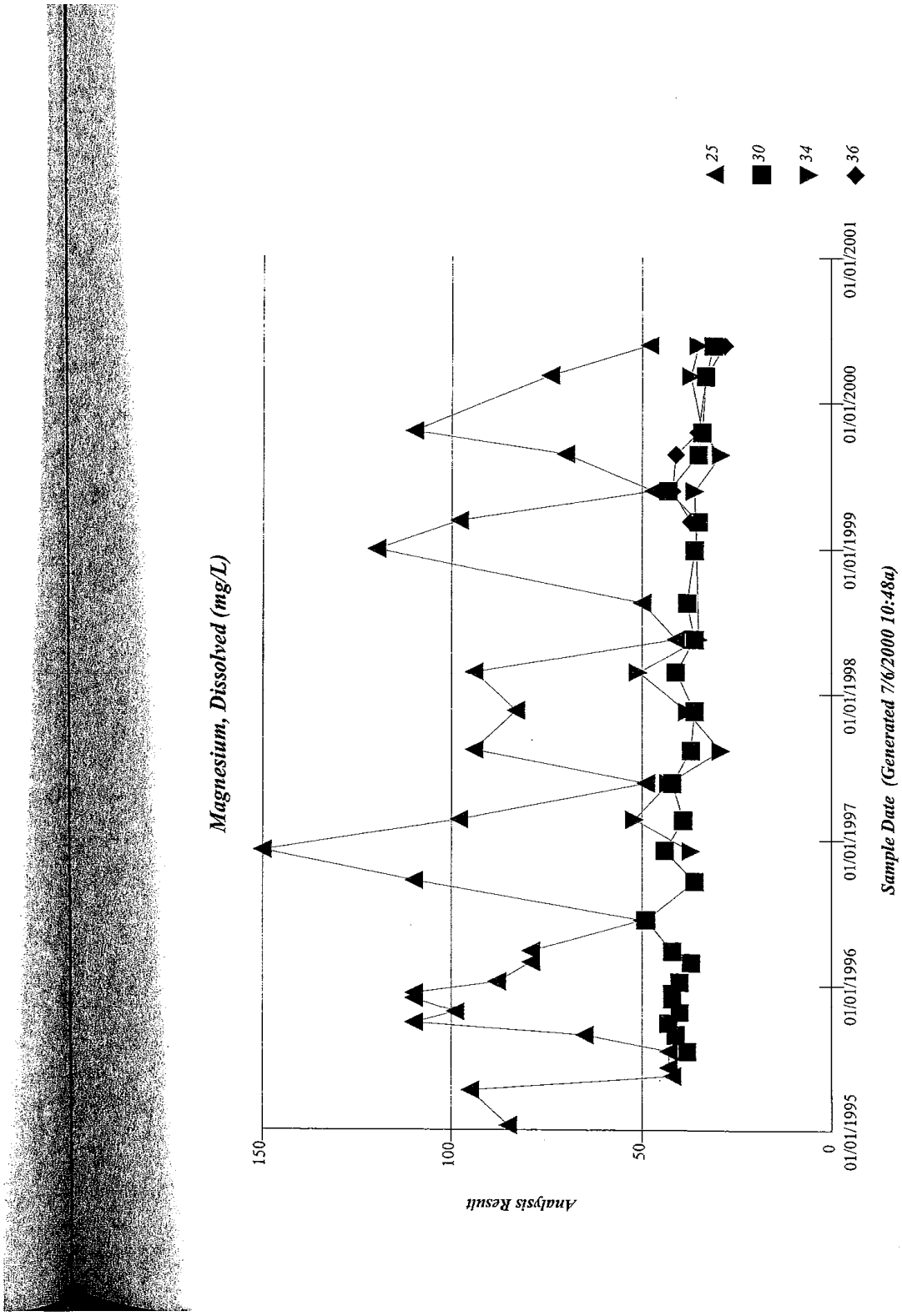
DRAFT

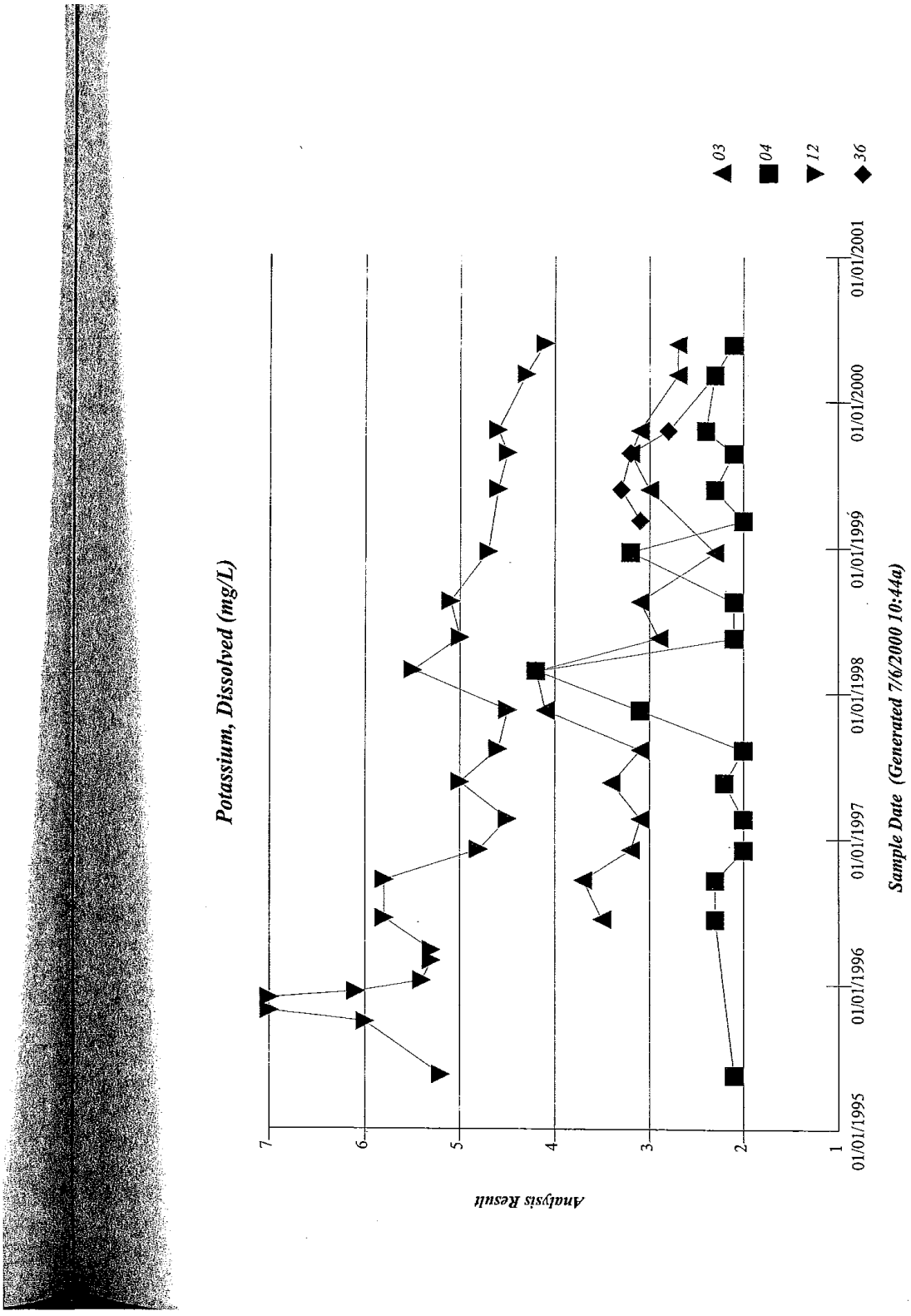

Calcium, Dissolved (mg/L)
Analysis Result
800
600
400
200
0
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 6/29/2000 3:30p)
21
22
23
25


Calcium, Dissolved (mg/L)
Analysis Result
180
160
140
120
100
80
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 6/29/2000 3:30p)
30
34
36

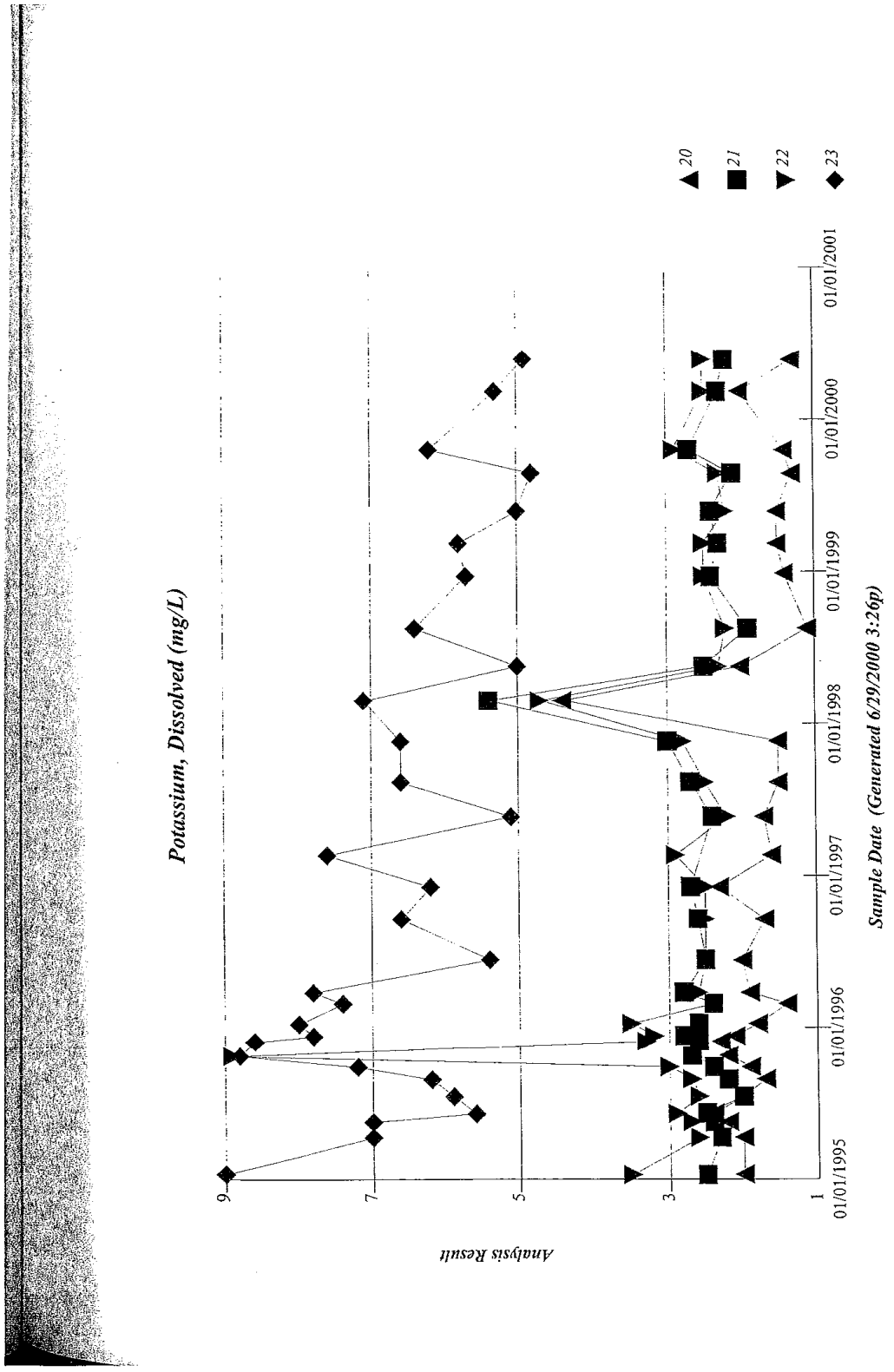

Magnesium, Dissolved (mg/L)
Analysis Result
70
60
50
40
30
20
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:51a)
03
04
12


Magnesium, Dissolved (mg/L)
Analysis Result
60
50
40
30
20
10
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:50a)
20
21
22
23


Magnesium, Dissolved (mg/L)
Analysis Result
150
100
50
0
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:48a)
25
30
34
36


Potassium, Dissolved (mg/L)
Analysis Result
7
6
5
4
3
2
1
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 7/6/2000 10:44a)
03
04
12
36

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Potassium, Dissolved (mg/L)
Analysis Result
9
7
5
3
1
01/01/1995
01/01/1996
01/01/1997
01/01/1998
01/01/1999
01/01/2000
01/01/2001
Sample Date (Generated 6/29/2000 3:26p)
20
21
22
23

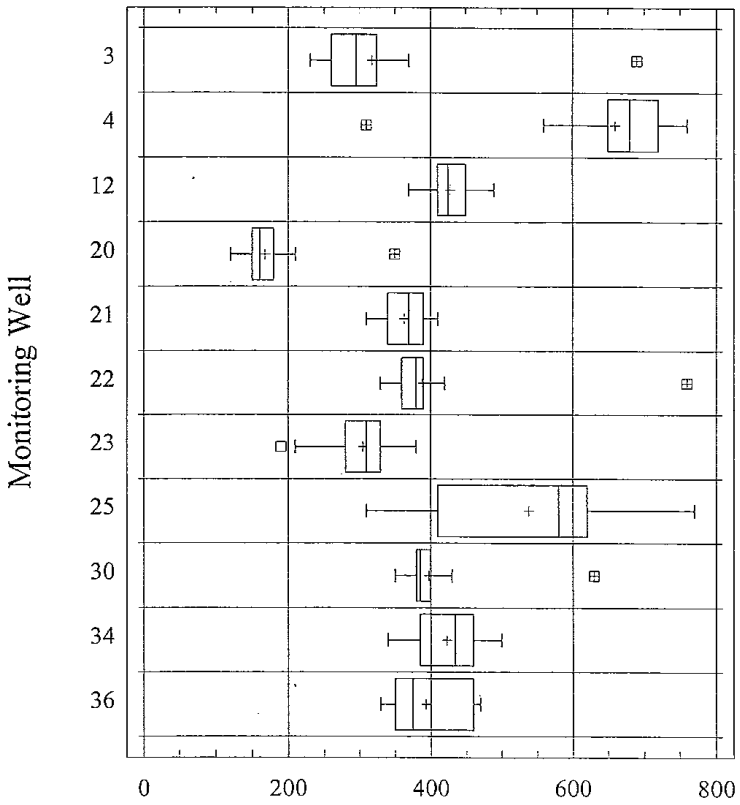
A-4: Box-and-Whisker Plots

Box-and Whisker Plots: Description of the Statistical Method

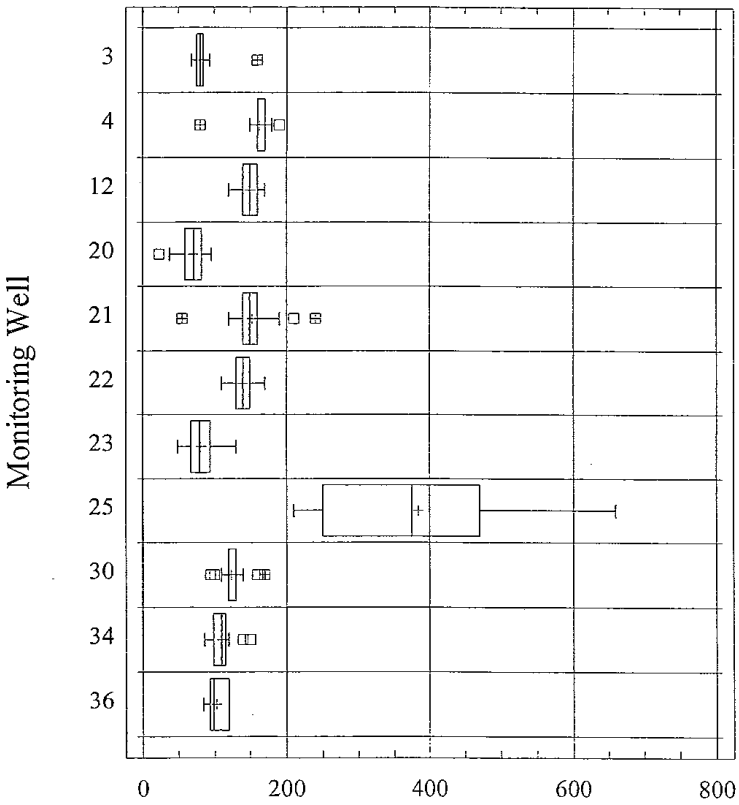
The rectangular part of the plot extends from the lower quartile to the upper quartile, covering the center half of each sample. The center lines within each box show the locations of the sample medians. The plus signs indicate the location of the sample means. The whiskers extend from the box to the minimum and maximum values in each sample, except for any outside or far outside points, which will be plotted separately. Outside points are points which lie more than 1.5 times the interquartile range above or below the box and are shown as small squares. Far outside points are points which lie more than 3.0 times the interquartile range above or below the box and are shown as small squares with plus signs through them. The presence of far outside points may indicate outliers or a highly skewed distribution.



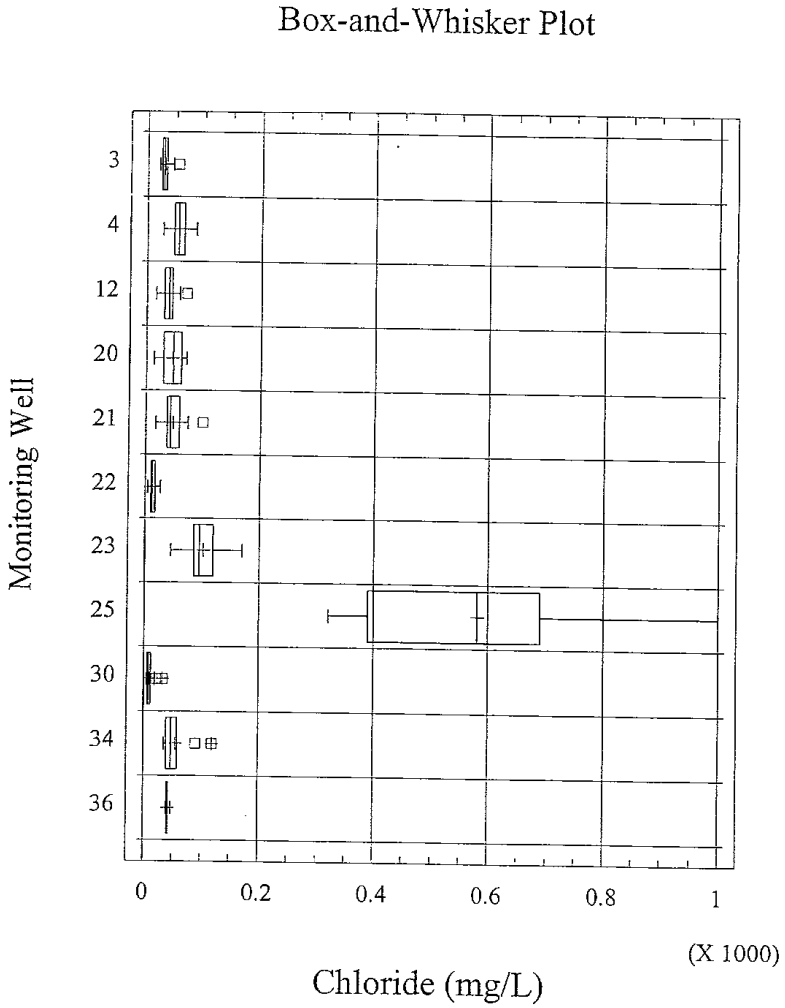
Box-and-Whisker Plot



Box-and-Whisker Plot

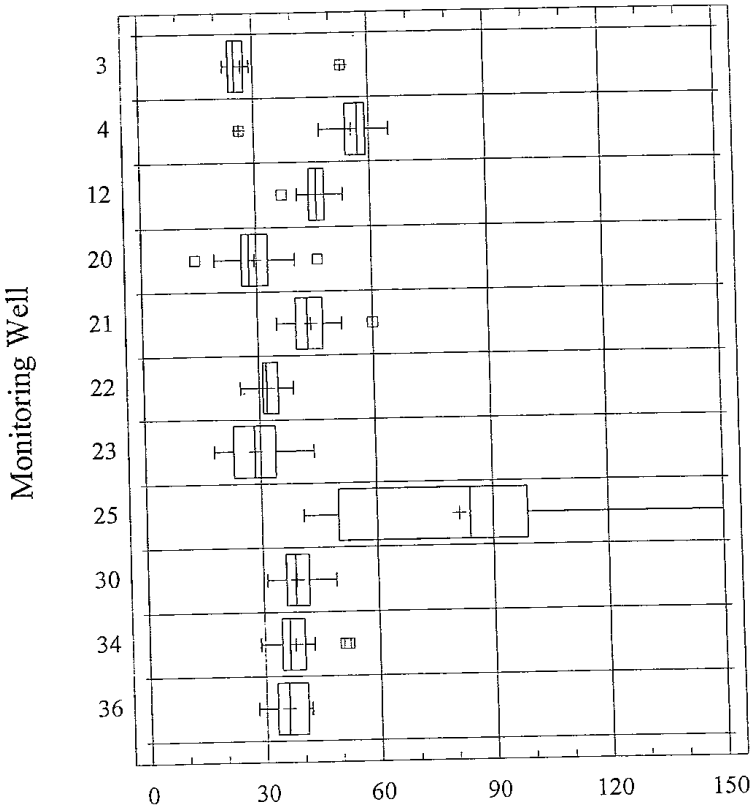


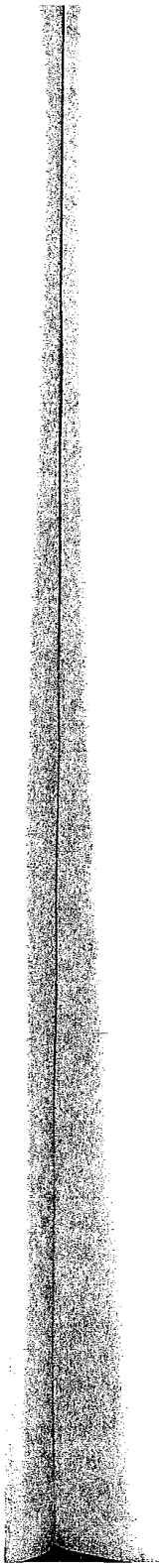
DRAFT


Box-and-Whisker Plot
Monitoring Well
3
4
12
20
21
22
23
25
30
34
36
0
0.2
0.4
0.6
0.8
1
(X 1000)
Chloride (mg/L)

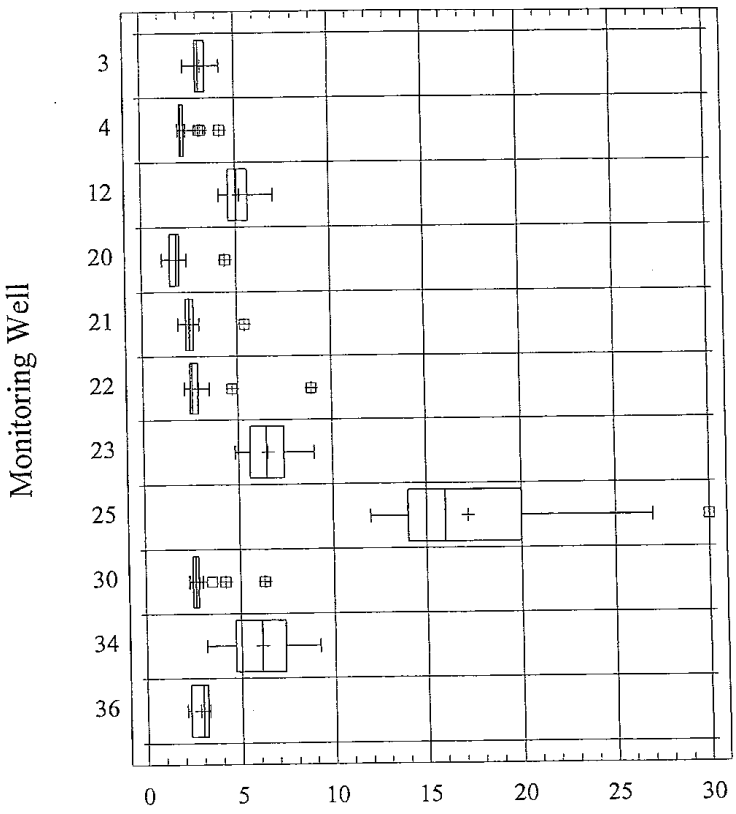
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Box-and-Whisker Plot





Box-and-Whisker Plot



APPENDIX B

Description of the Groundwater Management Zone

Plate 1: Groundwater Management Zone and Monitoring Well Locations

DESCRIPTION OF THE PROPOSED GROUNDWATER MANAGEMENT ZONE
WOOD RIVER POWER STATION
WEST ASH PONDS

The proposed groundwater management zone (GMZ) is identified on the attached Plate 1 with a heavy blue line. The area encompassed by the GMZ is approximately 175.6 acres and is wholly within the property boundaries of Dynegy Midwest Generation, Inc. The perimeter of the GMZ is 12,133 feet (2.3 miles).

The legal description of the GMZ that follows begins at the northeast corner and is identified as the P.O.B. (point of beginning) and proceeds in a clockwise direction around the west ash pond system. Each corner of the GMZ is identified with east and north coordinates (State Planar Coordinate System) in feet. The length of each segment, as well as its bearing, are also indicated on the drawings.

Written Description

Beginning at the P.O.B. at the northeast corner (E 804,417.89; N 509,263.27), the first boundary segment of the GMZ extends south parallel to Chessen Lane a distance of 3,359.39 feet to Point 2 at the southeast corner (E 509,311.08; N 801,058.83). From Point 2 the GMZ extends directly west a distance of 1,230.46 feet to Point 3 (E 508,080.62; N 801,058.83). From this point the GMZ extends northwest 1,801.84 feet to Point 4 at the southwest corner of the GMZ (E 506,559.31; 802,011.37). From Point 4 the GMZ proceeds north along the property boundary through several short segments as follows: north 90.35 feet to Point 5 (E 506,557.96; N 802,101.71); southeast 145.03 feet to Point 6 (E 506,686.04; N 802,033.68); north 150.05 feet to Point 7 (E 506,683.82; N 802,183.71); west 45.01 feet to Point 8 (E 506,638.82; N 802,183.77); north 95.01 feet to Point 9 (E 506,637.41; N 802,278.77); west 82.01 feet to Point 10 (E 506,555.40; N 802,278.87); north 150.00 feet to Point 11 (E 506,553.19; N 802,428.86); east 135.00 feet to Point 12 (E 506,688.19; N 802,428.69); and, north 68.63 feet to Point 13 (E 506,688.28; N 802,497.32). From Point 13 the GMZ proceeds northwest 575.45 feet to Point 14 at the western-most point of the GMZ (E 506,179.95; N 802,767.03). Proceeding from Point 14 the GMZ turns towards the north-northeast and proceeds 625.97 feet to Point 15 (E 506,540.65; N 803,278.62). From Point 15 the GMZ proceeds northwest 1,716.47 feet to Point 16 (E 508,041.12; N 804,112.23); north 580.00 feet to Point 17 (E 508,032.44; N 804,692.16); and, east 519.07 feet to Point 18 (E 508,551.51; N804,692.16). The last segment from Point 18 proceeds east-southeast 762.78 feet back to the P.O.B. at the northeast corner.

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Dynegy Midwest Generation, Inc.
Wood River Power Station, #1 Chessen Lane
Alton, IL 62002-2068
www.dynegy.com

March 27, 2009

Via Overnight Delivery

DYNEGY

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N-5783
Arlington, VA 22202 2733

Re: Wood River Power Station
Response to Request for Information Under CERCLA Section 104(e)

Dear Mr. Kinch:

Dynegy Midwest Generation, Inc. (DMG), the owner and operator of Wood River Power Station, submits this response to the U.S. EPA's March 9, 2009 Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9604(e), as received by Wood River Power Station on March 13, 2009.

As an initial matter, DMG objects to each request to the extent it is vague, overly broad or too indefinite for reasonable interpretation, requests information protected by attorney-client privilege, work product doctrine, or any other privilege or protection, or is beyond the scope of EPA's authority pursuant to 42 U.S.C. 9604(e). Without waiving any of these objections, DMG provides below its response to each request for information concerning Wood River Power Station.

In accordance with EPA's request, the information provided regarding Wood River Power Station concerns each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

Specifically, Wood River Power Station has two surface impoundments systems within the scope of EPA's information collection request: the West Ash Pond System,which consists of two active cells (*i.e.,* Cell 2E and Cell 3), and the East Ash Pond System, which consists of two cells.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate

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who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

Response to Request No. 1:

Cells 2E and 3 of the West Ash Pond System at the Wood River Power Station are rated as Low in the National Inventory of Dams (NID) database. The Illinois Department of Natural Resources (IDNR) classifies dams in accordance with its own criteria. 17 Ill. Admin. Code § 3702.30(a)(1). The IDNR has determined that the West Ash Pond System at Wood River Power Station is a Class III small dam. IDNR Permit No. DS2003215 (Dec. 1, 2003). The IDNR's Class III rating corresponds to the U.S. Army Corps of Engineers low hazard potential category. 17 Ill. Admin. Code § 3702.30(a)(1)(C).

The East Ash Pond System at the Wood River Power Station is not listed in the NID database. The IDNR has determined the East Ash Pond System at Wood River Power Station is a Class I small dam. IDNR Permit No. DS2005052 (June 21, 2005). The IDNR's Class I rating is similar to the U.S. Army Corps of Engineers high hazard potential category. 17 Ill. Admin. Code § 3702.30(a)(1)(A).

2. What year was each management unit commissioned and expanded?

Response to Request No. 2:

Cells 2E and 3 of the West Ash Pond System were commissioned (*i.e.,* began receiving ash) in 1997.

The East Ash Pond System was commissioned (*i.e.,* began receiving ash) in 2006. The East Ash Pond System has not been expanded.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Response to Request No. 3:

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Cells 2E and 3 of the West Ash Pond System are intended to permanently contain materials in categories (1) fly ash, (2) bottom ash, (3) boiler slag, and (5) other. The category (5) other materials consist of discharges to the West Ash Pond System of the following materials as identified in the Wood River Power Station's National Pollutant Discharge Elimination System (NPDES) permit:

Fly ash, bottom ash, and coal pyrites sluice water
Ash hopper overflow
Boiler blowdown
Demineralizer regenerant wastes
Water treatment clarifier sludge
Water treatment filter backwash
Units 1-5 turbine rooms and boiler rooms drains
Coal pile runoff
Coal conveyor drain line
Non-chemical metal cleaning wastes
Area runoff
Dredge spoils
Demineralizer brine

The East Ash Pond System is intended to permanently contain materials in categories (1) fly ash, (2) bottom ash, (3) boiler slag, and (5) other. The category (5) other materials consist of discharges to the East Ash Pond System of the following materials as identified in the Wood River Power Station's NPDES permit:

Fly ash, bottom ash, and coal pyrites sluice water
Ash hopper overflow
Boiler blowdown
Demineralizer regenerant wastes
Water treatment clarifier sludge
Water treatment filter backwash
Units 1-5 turbine rooms and boiler rooms drains
Coal pile runoff
Coal conveyor drain line
Non-chemical metal cleaning wastes
Area runoff
Dredge spoils
Demineralizer brine

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4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

Response to Request No. 4:

Cells 2E and 3 of the West Ash Pond System were designed by and constructed under the supervision of a registered Professional Engineer employed by DMG or the previous owner/operator of Wood River Power Station, Illinois Power Company. In 2009, a Professional Engineer employed by URS Corporation inspected and assessed the safety of the West Ash Pond System. Prior to that, beginning in approximately 1998 and through 2005, the West Ash Pond System was inspected every five years by a registered Professional Engineer employed by DMG or Illinois Power Company.

The East Ash Pond System was designed by and constructed under the supervision of a registered Professional Engineer employed by DMG. In 2009, a Professional Engineer employed by URS Corporation inspected and assessed the safety of the East Ash Pond System. Prior to that, beginning in approximately 2007 and through 2008, the East Ash Pond System was inspected annually by a registered Professional Engineer employed by DMG.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

Response to Request No. 5:

DMG last assessed and evaluated the safety (*i.e.,* structural integrity) of the West Ash Pond System and the East Ash Pond System in March 2009. That assessment/evaluation was conducted by Ken Berry, a registered Professional Engineer employed by URS Corporation. Mr. Berry, a Senior Project Manager in the Geotechnical Engineering Group of URS Corporation, is a geotechnical engineer with experience in landslides, levees, foundations, geotechnical instrumentation, and general construction. His recent experience includes a design project for the New Orleans levees, a load test on an I-wall and levee in New Orleans,

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and investigations for 30 miles of levee analyses in the counties east of St. Louis, Missouri. Mr. Berry received his BSCE from North Carolina State University in 1989 and his MSCE (geotechnical) from Virginia Polytechnic Institute and State University in 1990. He is registered as a Professional Engineer in Missouri and Illinois and has been employed by URS Corporation since 1991. Prior to 2009 (*i.e.,* beginning in approximately 1998 and through 2005), a registered Professional Engineer employed by DMG or Illinois Power Company (the previous owner/operator of Wood River Power Station) with experience in dam safety inspected the safety of the West Ash Pond System every five years. Similarly, (*i.e.,* beginning in approximately 2005 and through 2008), a registered Professional Engineer employed by DMG with experience in dam safety annually inspected the structural integrity of the East Ash Pond System.

DMG has not yet received URS' report of the March 2009 dam inspections at Wood River Power Station. After receipt of URS' report, DMG will assign a Professional Engineer to ensure that all required corrective actions are implemented. At that time, DMG will determine whether company employees or contractors will be used to perform any identified corrective actions. DMG has not yet had the opportunity to develop or implement any corrective actions.

DMG plans to have a qualified Professional Engineer perform safety (*i.e.,* structural integrity) inspections of both the West Ash Pond System and East Ash Pond System in 2010.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

Response to Request No. 6:

To the best of DMG's knowledge, no federal or state agency regulatory official has inspected or evaluated the safety (structural integrity) of the West Ash Pond System. DMG is not aware of a planned state or federal inspection or evaluation of the West Ash Pond System in the future.

The IDNR Office of Water Resources (OWR) last inspected the safety (structural integrity) of the East Ash Pond System prior to filling each cell with water. Specifically, IDNR OWR inspected both cells of the East Ash Pond System in approximately 2006. IDNR did not

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provide and DMG does not have copies of those IDNR inspection reports. DMG is not aware of a planned state or federal inspection or evaluation of the East Ash Pond System in the future.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

Response to Request No. 7:

No federal or state regulatory officials have conducted any assessment, evaluation or inspection of either the West or East Ash Pond Systems at Wood River Power Station within the past year.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s). Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management unit(s). The basis for determining maximum height is explained later in this Enclosure.

Response to Request No. 8:

Cells 2E and 3 of the Ash Pond System have a total surface area of 19 acres. The estimated design storage volume at normal pool elevation is as follows: Cell 2E- 120 acre feet (ac-ft); and Cell 3 - 90 ac-ft. The total estimated design volume of Cells 2E and 3 is 210 ac-ft. The estimated volume of materials currently stored in each cell is as follows: Cell 2E- 119 ac-ft; Cell 3 - 9 ac-ft. Because no volume measurements have been taken for Cells 2E and 3 in the West Ash Pond System, on or around March 23, 2009, a DMG-employed Professional Engineer estimated the material volumes in order to respond to this question.

The maximum dam height of Cells 2E and 3 in the West Ash Pond System is approximately as follows: Cell 2E - 20 feet; and Cell 3 - 20 feet.

The East Ash Pond System has a surface area of 38 acres. The estimated design storage volume of East Ash Pond System is 435 ac-ft. The estimated volume of materials currently stored is 58 ac-ft. Because no volume measurements have been taken for the East Ash Pond,

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on or around March 23, 2009, a DMG-employed Professional Engineer estimated the material volumes in order to respond to this question.

The maximum dam height of the East Ash Pond System is approximately 33 feet.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

Response to Request No. 9:

To the best of DMG's knowledge, there have been no spills or unpermitted releases of coal combustion residues or byproducts to surface water or to the land from either Cells 2E or 3 of the West Ash Pond System or the East Ash Pond System at Wood River Power Station in the last ten years.

All discharges from Cells 2E or 3 of the West Ash Pond System or the East Ash Pond System in the last ten years in excess of Wood River Power Station's NPDES permit limitations have been reported to the Illinois Environmental Protection Agency in accordance with NPDES permit reporting requirements. For purposes of responding to this request, DMG did not consider exceedances of NPDES permit pollutant discharge limits to be "unpermitted releases" within the scope of the EPA's request and, thus, they are not identified in this response. To the extent EPA interprets this request differently, DMG objects to the request because it is vague, overly broad, and too indefinite for reasonable interpretation.

10. Please identify all current legal owner(s) and operator(s) at the facility.

Response to Request No. 10:

Dynegy Midwest Generation, Inc. is the current legal owner and operator of Wood River Power Station.

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In accordance with and for purposes of the following certification, all portions of this response are hereby identified as information for which the certifying authorized representative cannot personally verify their accuracy.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature: Robert H Crowe
Name: Robert H. Crowe
Title: Plant Manager

cc: Rich Eimer, Executive Vice President, Generation Operations
Keith McFarland, Vice President, Midwest Fleet Operations
James Ingram, Vice President & Group General Counsel, Environmental



Photo 1: (EAPSP) At SW Bend Electrical Utilitites, Wood River Power Station, Alton, IL, 05.28.09



Photo 2: (EAPSP) At SW Bend Looking Down NW Embankment. Wood River Power Station, Alton, IL, 05.28.09

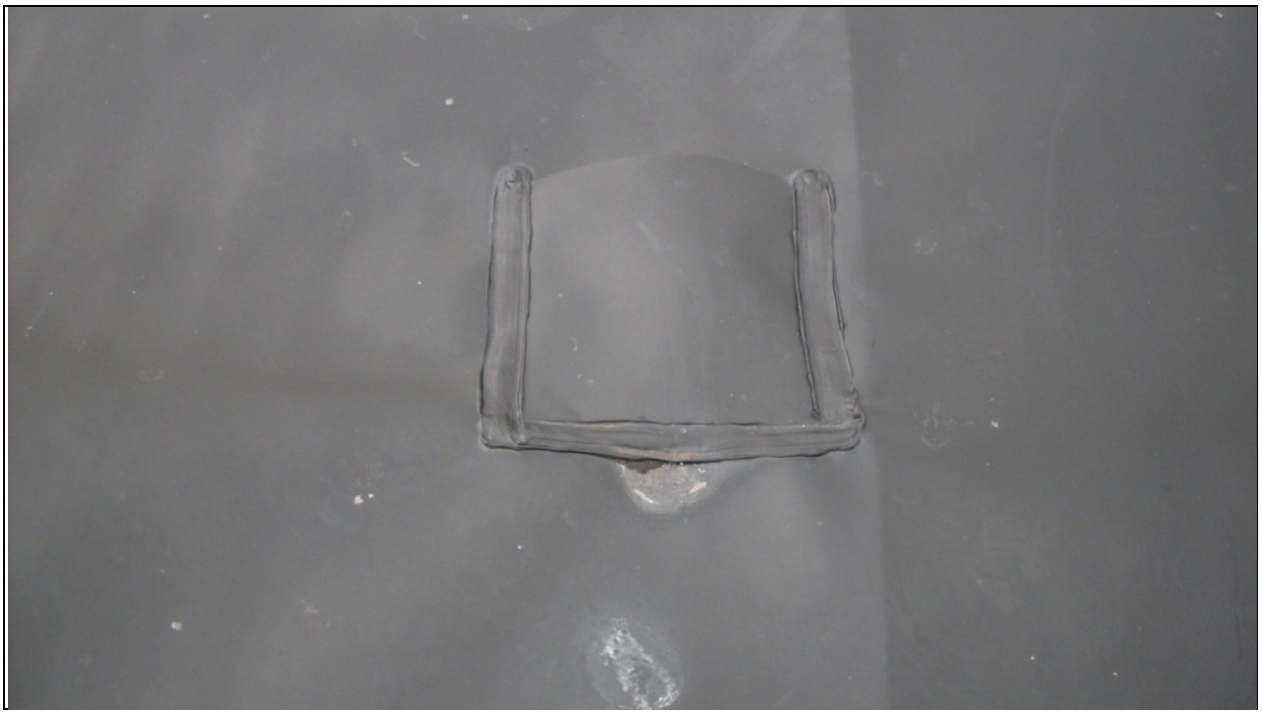


Photo 3: (EAPSP) Air Vent on Liner, Wood River Power Station, Alton, IL, 05.28.09



Photo 4: (EAPSP) Black Polypropylene Liner, Wood River Power Station, Alton, IL, 05.28.09



Photo 5: (EAPSP) Bottom Ash Discharge, Wood River Power Station, Alton, IL, 05.28.09



Photo 6: (EAPSP) Bottom Ash Discharge (facing away from plant), Wood River Power Station, Alton, IL, 05.28.09



Photo 7: (EAPSP) E Berms Facing Plant, Wood River Power Station, Alton, IL, 05.28.09



Photo 8: (EAPSP) E Embankment, Wood River Power Station, Alton, IL, 05.28.09



Photo 9: (EAPSP) Embankment Along N, Wood River Power Station, Alton, IL, 05.28.09



Photo 10: (EAPSP) Embankment Along N EAPSP (1 of 3). Wood River Power Station, Alton, IL, 05.28.09



Photo 11: (EAPSP) Embankment Along N EAPSP (2 of 3), Wood River Power Station, Alton, IL, 05.28.09



Photo 12: (EAPSP) Embankment Along N EAPSP (3 of 3), Wood River Power Station, Alton, IL, 05.28.09



Photo 13: (EAPSP) Facing E, Wood River Power Station, Alton, IL, 05.28.09



Photo 14: (EAPSP) Facing Plant Along NE Embankment, Wood River Power Station, Alton, IL, 05.28.09



Photo 15: (EAPSP) Facing W Along N of EAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 16: (EAPSP) Fly Ash Discharge (1 of 3), Wood River Power Station, Alton, IL, 05.28.09



Photo 17: (EAPSP) Fly Ash Discharge (2 of 3), Wood River Power Station, Alton, IL, 05.28.09



Photo 18: (EAPSP) Fly Ash Discharge (3 of 3), Wood River Power Station, Alton, IL, 05.28.09



Photo 19: (EAPSP) From Mid W Berm Looking Out at Peninsula (1 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 20: (EAPSP) From Mid W Berm Looking Out at Peninsula (2 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 21: (EAPSP) Gage at Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09

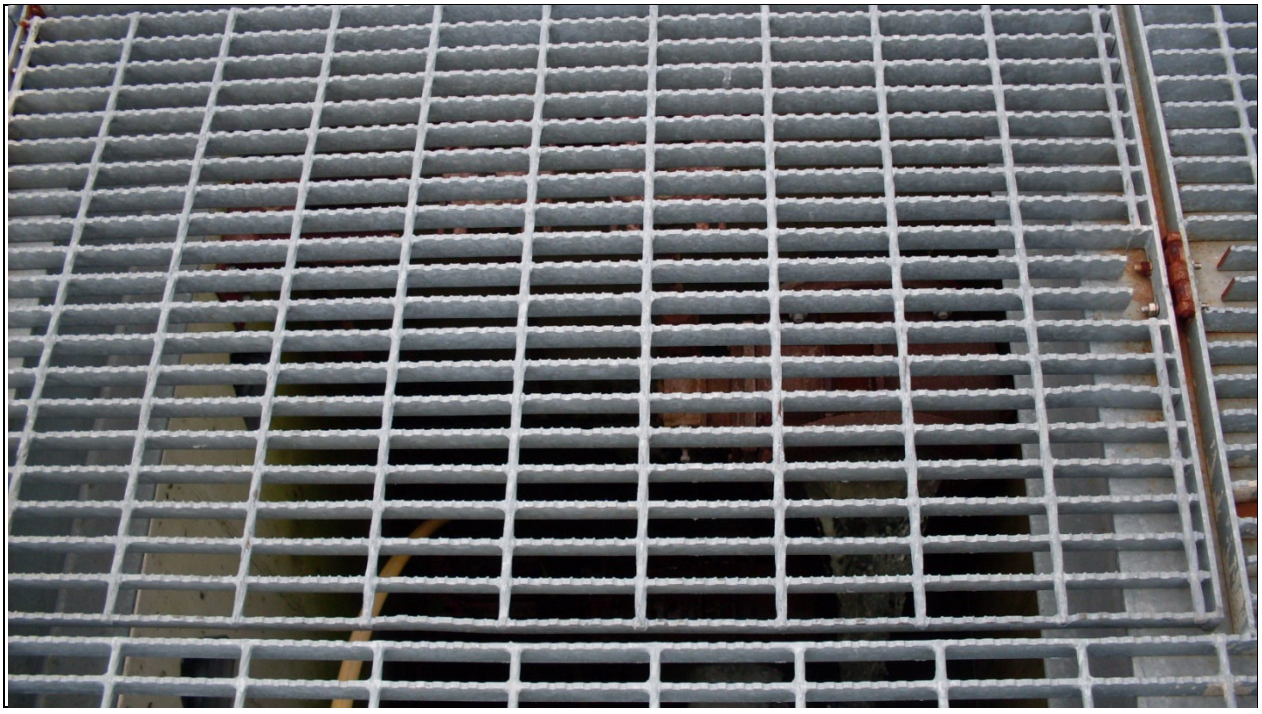


Photo 22: (EAPSP) Grates Over Valves (Discharge Structure), Wood River Power Station, Alton, IL, 05.28.09



Photo 23: (EAPSP) Liner (1 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 24: (EAPSP) Liner (2 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 25: (EAPSP) Liner Along NEAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 26: (EAPSP) Looking at Plant from SW Berm (ash shooting out to left), Wood River Power Station, Alton, IL, 05.28.09



Photo 27: (EAPSP) Looking at Plant from SWW Corner, Wood River Power Station, Alton, IL, 05.28.09



Photo 28: (EAPSP) Looking E Along N EAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 29: (EAPSP) Looking in Pond from Mid W Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 30: (EAPSP) Looking N from Peninsula, Wood River Power Station, Alton, IL, 05.28.09



Photo 31: (EAPSP) Looking N from SW Corner, Wood River Power Station, Alton, IL, 05.28.09



Photo 32: (EAPSP) Looking N with Plant Behind, Wood River Power Station, Alton, IL, 05.28.09



Photo 33: (EAPSP) Looking NW at Standing Water, Wood River Power Station, Alton, IL, 05.28.09



Photo 34: (EAPSP) Looking NW, Wood River Power Station, Alton, IL, 05.28.09



Photo 35: (EAPSP) Looking S from Mid W Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 36: (EAPSP) Looking S from SW Corner, Wood River Power Station, Alton, IL, 05.28.09



Photo 37: (EAPSP) Looking W from Mid W Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 38: (EAPSP) Mid W Berm Looking at Plant, Wood River Power Station, Alton, IL, 05.28.09



Photo 39: (EAPSP) N from EAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 40: (EAPSP) NE Corner Embankment, Wood River Power Station, Alton, IL, 05.28.09



Photo 41: (EAPSP) NE Embankment (facing E), Wood River Power Station, Alton, IL, 05.28.09



Photo 42: (EAPSP) On W Berm Facing Plant (SW), Wood River Power Station, Alton, IL, 05.28.09



Photo 43: (EAPSP) Plant from E Berm of EAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 44: (EAPSP) Ponding at W Toe Drain Along Mid W Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 45: (EAPSP) Ponding at the Tow of Embankment at SW Bend, Wood River Power Station, Alton, IL, 05.28.09



Photo 46: (EAPSP) Toe Drain at SW Corner Base of Embankment (1 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 47: (EAPSP) Toe Drain at SW Corner Base of Embankment (2 of 2), Wood River Power Station, Alton, IL, 05.28.09



Photo 48: (EAPSP) SE Embankment (facing away from plant), Wood River Power Station, Alton, IL, 05.28.09



Photo 49: (EAPSP) SE Embankment (facing plant), Wood River Power Station, Alton, IL, 05.28.09



Photo 50: (EAPSP) SW Embankment, Wood River Power Station, Alton, IL, 05.28.09



Photo 51: (EAPSP) Toe Drain Area Along NE Embankment (behind RR tracks), Wood River Power Station, Alton, IL, 05.28.09



Photo 52: (EAPSP) Upstream Face of SE corner, Wood River Power Station, Alton, IL, 05.28.09

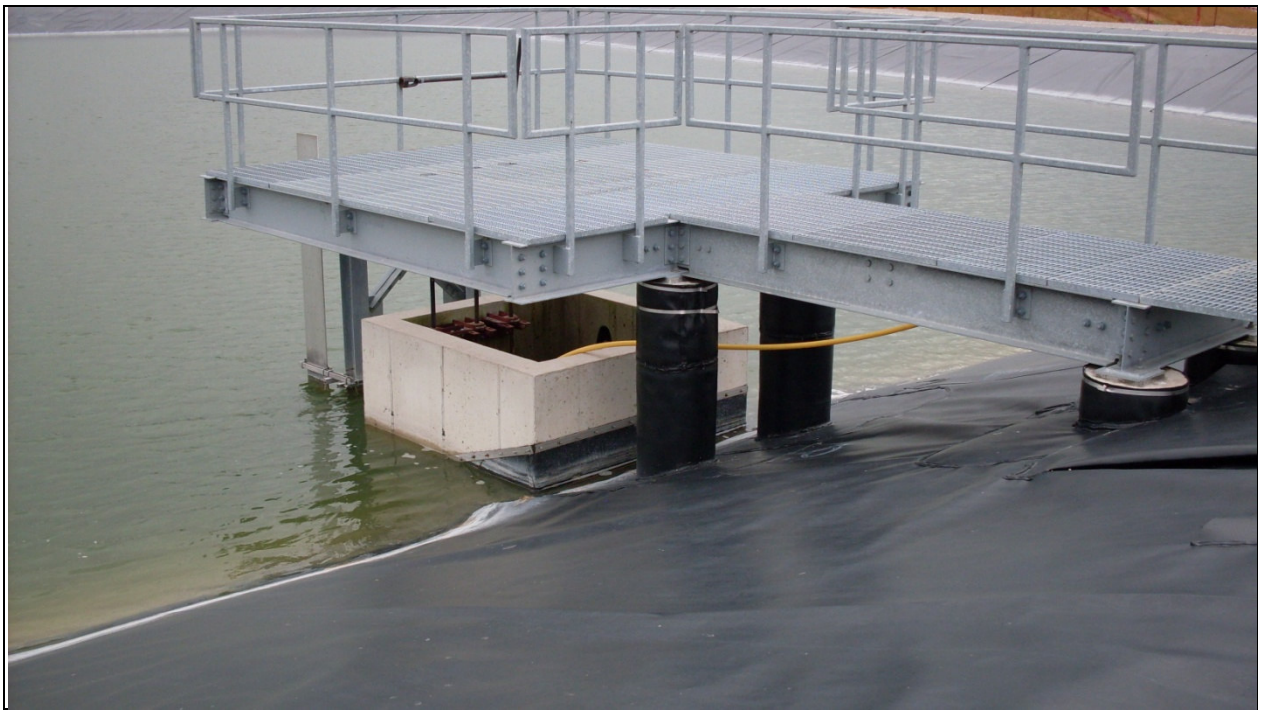


Photo 53: (EAPSP) Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 54: (EAPSP) Embankment between Primary and Secondary Cells, Wood River Power Station, Alton, IL, 05.28.09



Photo 55: (EAPSS) 1 of 2, Wood River Power Station, Alton, IL, 05.28.09



Photo 56: (EAPSS) 2 of 2 , Wood River Power Station, Alton, IL, 05.28.09



Photo 57: (EAPSS) Ponding Water Apparently from Recent Rains, Wood River Power Station, Alton, IL, 05.28.09



Photo 58: (EAPSS) Confluence of Ponds at 4 V-Notch Weirs in Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 59: (EAPSS) Discolored Runoff from Roadway or Crest of Embankment Along N of E Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 60: (EAPSS) Flow Meter on Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 61: (EAPSS) From SW Corner, Wood River Power Station, Alton, IL, 05.28.09



Photo 62: (EAPSS) Gage at Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 63: (EAPSS) Inflow Pipe from Primary Cell, Wood River Power Station, Alton, IL, 05.28.09



Photo 64: (EAPSS) Looking N from E Berm, Wood River Power Station, Alton, IL, 05.28.09



Photo 65: (EAPSS) Looking Up at N Embankment of EAPSP, Wood River Power Station, Alton, IL, 05.28.09



Photo 66: (EAPSS) Taken from NW Corner (inflow pipe from Primary cell), Wood River Power Station, Alton, IL, 05.28.09



Photo 67: (EAPSS) V-Notch Weir in Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 68: (EAPSS) Discharge Structure, Wood River Power Station, Alton, IL, 05.28.09



Photo 69: (WAPS) Cell 1, Coal Pile and SE Embankment of Cell 1, Wood River Power Station, Alton, IL, 05.29.09



Photo 70: (WAPS) Cell 1, Looking Up N Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 71: (WAPS) Cell 1, NE Embankment (Cell 3 below it), Wood River Power Station, Alton, IL, 05.29.09



Photo 72: (WAPS) Cell 1, South Side, Coal Behind, Wood River Power Station, Alton, IL, 05.29.09



Photo 73: (WAPS) Cell 1, Storage Area (filled with surface runoff), Wood River Power Station, Alton, IL, 05.29.09



Photo 74: (WAPS) Cell 1, SW Corner (embankment), Wood River Power Station, Alton, IL, 05.29.09

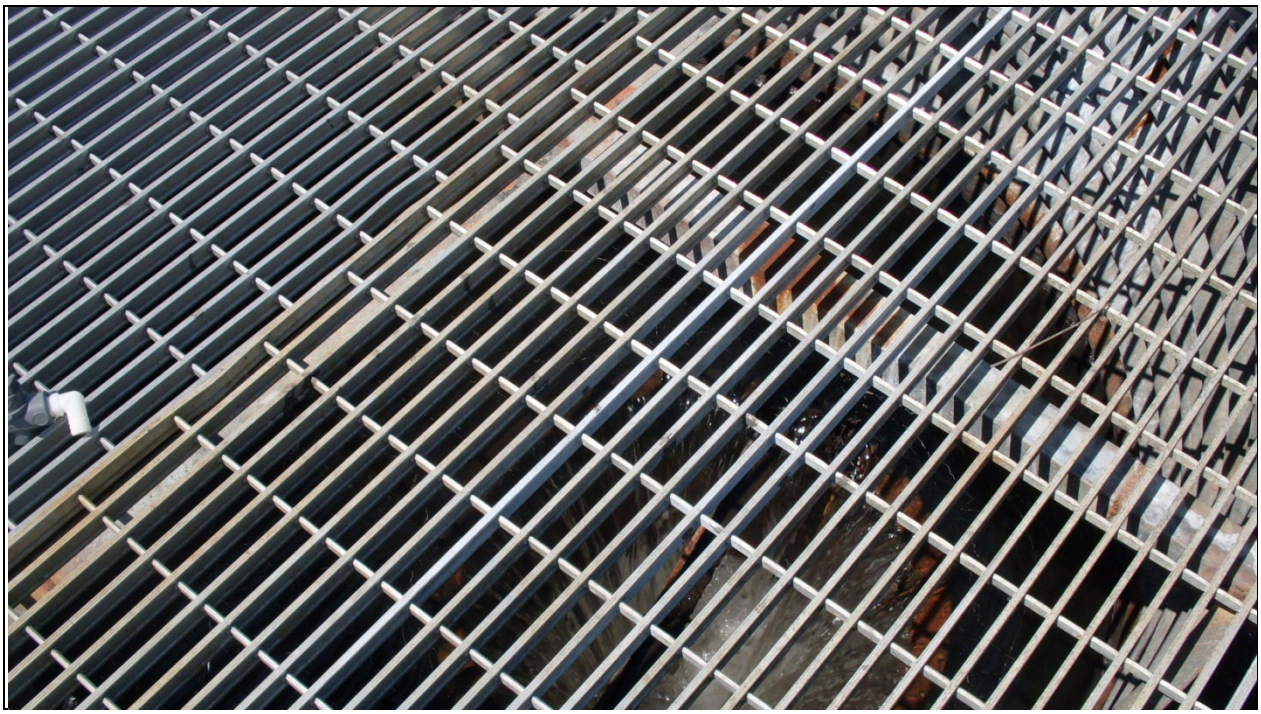


Photo 75: (Cell 2E) 4 V-Notch Weir Discharge Structure into Cell 3, Wood River Power Station, Alton, IL, 05.29.09



Photo 76: (WAPS) Cell 2E, Staff Gage, Wood River Power Station, Alton, IL, 05.29.09



Photo 77: (WAPS) Cell 2E, Liner, Wood River Power Station, Alton, IL, 05.29.09



Photo 78: (WAPS) Cell 2E, N Embankment (1 of 2), Wood River Power Station, Alton, IL, 05.29.09



Photo 79: (WAPS) Cell 2E, N Embankment (2 of 2) ~25-30', Wood River Power Station, Alton, IL, 05.29.09



Photo 80: (WAPS) Cell 2E, W Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 81: (WAPS) Cell 2W, 1 of 2, Wood River Power Station, Alton, IL, 05.29.09



Photo 82: (WAPS) Cell 2W, 2 of 2, Wood River Power Station, Alton, IL, 05.29.09



Photo 83: (WAPS) Cell 2W, Embankment N of Cell 2W, Wood River Power Station, Alton, IL, 05.29.09



Photo 84: (WAPS) Cell 2W Looking from Between Cells 2E and 1, Wood River Power Station, Alton, IL, 05.29.09



Photo 85: (WAPS) Cell 2W, NE Corner; N Embankment of Cell 2E, Wood River Power Station, Alton, IL, 05.29.09



Photo 86: (WAPS) Cell 2W, SW Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 87: (WAPS) Cell 3, E Berm, Wood River Power Station, Alton, IL, 05.29.09



Photo 88: (WAPS) Cell 3, Flow Meter, Wood River Power Station, Alton, IL, 05.29.09



Photo 89: (WAPS) Cell 3, N Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 90: (WAPS) Cell 3, Interior Berm Between Cell 3 and Cell 2E, Wood River Power Station, Alton, IL, 05.29.09



Photo 91: (WAPS) Cell 3, N Berm, Wood River Power Station, Alton, IL, 05.29.09



Photo 92: (WAPS) Cell 3, N Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 93: (WAPS) Cell 3, NW Embankment, Wood River Power Station, Alton, IL, 05.29.09



Photo 94: (WAPS) Cell 3, Outfall Structure, Wood River Power Station, Alton, IL, 05.29.09



Photo 95: (WAPS) Cell 3, W Side of Cell 3, Wood River Power Station, Alton, IL, 05.29.09



Photo 96: (WAPS) Cell 2E, Coal Pile Runoff Outfall Wood River Power Station, Alton, IL, 05.29.09



Photo 97: (WAPS) Joint Embankment of Cell 2E and Cell 1, Wood River Power Station, Alton, IL, 05.29.09



Photo 98: (WAPS) Cell 1 Embankment Near Coal Pile, Wood River Power Station, Alton, IL, 05.29.09

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Wood River Power Station Date: 5/28/09

Unit Name: East Ash Pond System (Primary Operator's Name: Pynesy

Unit I.D.: Hazard Potential Classification: High Significant Low

Inspector's Name: Cleighton Smith / Lauren Chotzke

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	varies		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	varies		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	being provided		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	see note 1
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
1	standing water at toe of embankment in some areas was deemed to be from recent rain.

EPA FORM -XXXX

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # N/A INSPECTOR Cleighton Smith, Lauren Ohotzke

Date _____

Impoundment Name Wood River East Ash Pond System

Impoundment Company Dynegy

EPA Region V

State Agency (Field Office) Addresss Illinois EPA
1021 N. Grand Ave. E. P.O. Box 19276
Springfield, IL

Name of Impoundment E. Ash Pond System

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number) 62794

New _____ Update _____

	Yes	No
Is impoundment currently under construction?	_____	✓
Is water or ccw currently being pumped into the impoundment?	✓	_____

IMPOUNDMENT FUNCTION: Storage of CCW

Nearest Downstream Town : Name _____

Distance from the impoundment _____

Impoundment Location:
Longitude -90 Degrees 08 Minutes 06.34 Seconds
Latitude 38 Degrees 51 Minutes 55.15 Seconds
State IL. County Madison

Does a state agency regulate this impoundment? YES X NO _____

If So Which State Agency? Illinois Department of Natural Resources Office of Dam Safety

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_X_ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

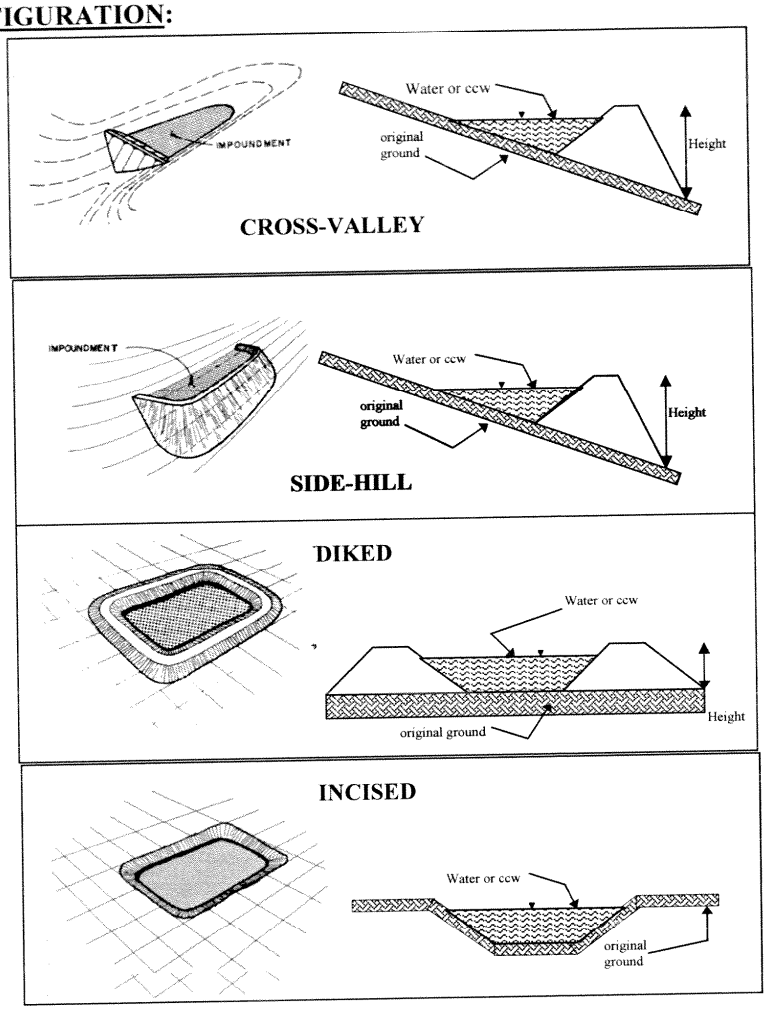
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Illinois DNR has assigned a high hazard classification system due to potential loss of life of Dynegy employees

EPA Form XXXX-XXX, Jan 09

2

CONFIGURATION:



____ Cross-Valley
____ Side-Hill
X Diked
____ Incised (form completion optional)
____ Combination Incised/Diked

Embankment Height 33 feet
Pool Area 38 acres
Current Freeboard being provided feet

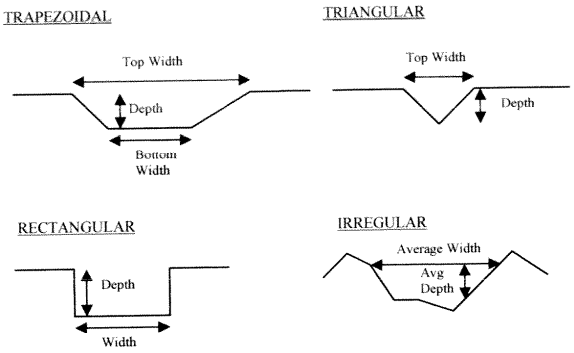
Embankment Material Sand/ash
Liner clay + geomembrane
Liner Permeability being provided

EPA Form XXXX-XXX, Jan 09

3

TYPE OF OUTLET (Mark all that apply)

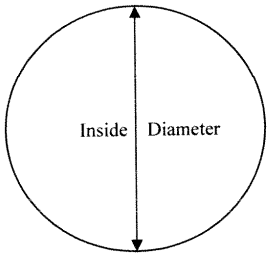
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular



_____ depth
_____ bottom (or average) width
_____ top width
_____

_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____

_____

Is water flowing through the outlet? YES _____ NO _____

_____ **No Outlet**

Square concrete drop structure with "V" notches on all 4 sides, flows into a culvert which drains to Wood River Creek.

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By DONALD GRAHLHERR, P.E.

_____

EPA Form XXXX-XXX, Jan 09

4

Has there ever been a failure at this site? YES _____ NO ✓

If So When? N/A

If So Please Describe : _____

Has there ever been significant seepages at this site? YES _____ NO ✓

If So When? N/A

IF So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO ✓

If so, which method (e.g., piezometers, gw pumping,...)? N/A

If so Please Describe : _____

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Wood River Power Station Date: 5/29/09

Unit Name: West Ash Pond System (Cell) Operator's Name: Dynegy

Unit I.D.: Hazard Potential Classification: High Significant Low

Inspector's Name: Cleighton Smith / Lauren Ohotzke

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	Varies		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	Varies		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	being provided		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

EPA FORM -XXXX

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # _____ INSPECTOR Cleighton Smith Laurenohotzke

Date _____

Impoundment Name West Ash Pond System

Impoundment Company Dynegy

EPA Region V

State Agency (Field Office) Addresss IL EPA, 1021 N. Grand Ave E, PO Box 19276 Springfield, IL 62794

Name of Impoundment West Ash Pond System

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

	Yes	No
Is impoundment currently under construction?	_____	X
Is water or ccw currently being pumped into the impoundment?	_____	X

IMPOUNDMENT FUNCTION: COAL PILE RUNOFF

Nearest Downstream Town : Name N/A

Distance from the impoundment N/A

Impoundment Location: Longitude _____ Degrees _____ Minutes _____ Seconds

Latitude _____ Degrees _____ Minutes _____ Seconds

State IL County Madison

Does a state agency regulate this impoundment? YES X NO _____

If So Which State Agency? IL DNR- OFFICE OF DAM SAFETY

EPA Form XXXX-XXX, Jan 09

1

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

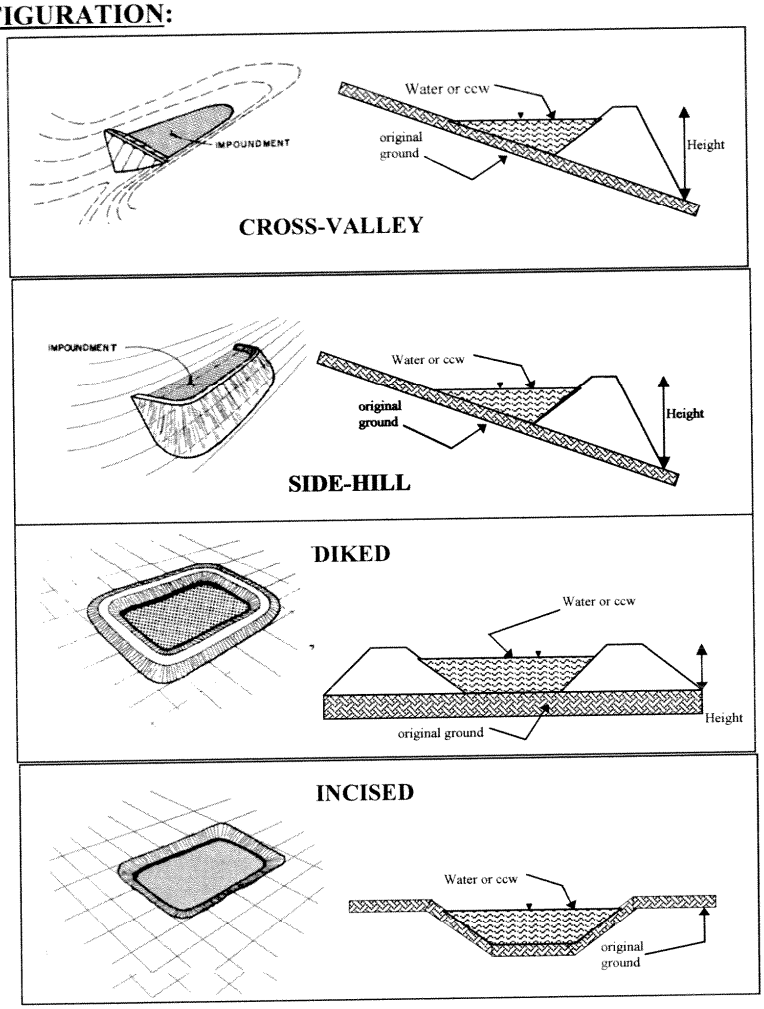
__X__ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

IL DNR HAZARD RATING IS HIGH DUE TO POTENTIAL FOR LOSS OF LIFE OF DYNEGY EMPLOYEES.

NOTE: DOWNSTREAM RR EMBANKMENTS PREVENT FAILURE FROM AFFECTING POPULATED AREAS.

CONFIGURATION:



_____ Cross-Valley
_____ Side-Hill
__X__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height ~ 20 feet
Pool Area 19 (cells 2E +3) acres
Current Freeboard being provided feet

Embankment Material sand/ash, clay
Liner clay
Liner Permeability being provided

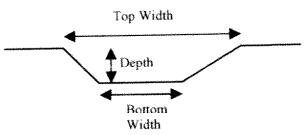
EPA Form XXXX-XXX, Jan 09

3

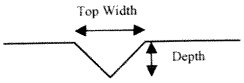
TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

TRAPEZOIDAL

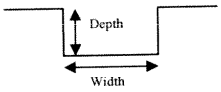


TRIANGULAR

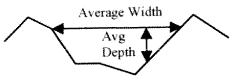


_____ depth
_____ bottom (or average) width
_____ top width
_____

RECTANGULAR

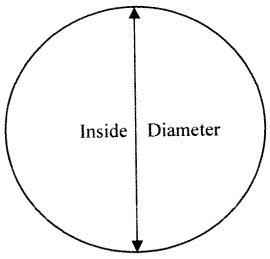


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____

_____

Is water flowing through the outlet? YES ✓ NO _____

_____ **No Outlet**

_____

_____ **Other Type of Outlet** (specify) square concrete drop structure with "V" notches on all 4 sides; flows into a culvert which discharges to Wood River Creek

The Impoundment was Designed By JOSEPH KLINGER, P.E.

EPA Form XXXX-XXX, Jan 09

4

Has there ever been a failure at this site? YES _____ NO ✓

If So When? N/A

If So Please Describe : _____

Has there ever been significant seepages at this site? YES _____ NO ✓

If So When? N/A

IF So Please Describe: _____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO ✓

If so, which method (e.g., piezometers, gw pumping,...)? N/A

If so Please Describe : _____

DRAFT

Wood River Power Station **May 28, 2009**

List of Attendees **Day 1**

Name	Company	Phone	E-mail
Rick Diericx	DMG-O'Fallon	618-296-5912	Rick_Diericx@Dynegy.com
Tom Davis	DMG-O'Fallon	618-206-5931	tom.davis@dynegy.com
Bob Crowe	DMG-Wood River	618-433-0111	bob.crowe@dynegy.com
Don Grahlherr	URS	314-429-0100	don_grahlerr@URScorp.com
Joe Kimlinger	Dynegy	618-410-6534	doe.kimlinger@dynegy.com
Don Crove	Dynegy	618-433-1010	don.crove@dynegy.com
Susan McVety	DMG-O'Fallen	618-206-5930	susan.mcvety@dynegy.com
Kenneth E. Smith	IEPA	217-524-3280	kenn.smithe@illinois.gov
Ted Dragovich	IEPA/BOL	217-524-3306	ted.dragovich@illinois.gove
Chris Liebmann	IEPA/BOL	217-524-32947	chris.liebmann@illinois.gov
Cleighton Smith	Dewberry	856-802-08743	csmith@dewberry.com
Lauren Ohotzke	Dewberry	856-802-08743	lohotzke@dewberry.com

DRAFT

Wood River Power Station **May 29, 2009**

List of Attendees **Day 2**

Name	Company	Phone	E-mail
Rick Diericx	DMG-O'Fallon	618-296-5912	Rick_Diericx@Dynegy.com
Tom Davis	DMG-O'Fallon	618-206-5931	tom.davis@dynegy.com
Bob Crowe	DMG-Wood River	618-433-0111	bob.crowe@dynegy.com
Don Crove	Dynegy	618-433-1010	don.crove@dynegy.com
Susan McVety	DMG-O'Fallen	618-206-5930	susan.mcvety@dynegy.com
Cleighton Smith	Dewberry	856-802-08743	csmith@dewberry.com
Lauren Ohotzke	Dewberry	856-802-08743	lohotzke@dewberry.com

Wood River Power Station Meeting Notes May 28, 2009

- We will send Dynegy information we send EPA
- Dynegy has no problem with us sharing with IEPA and IDNR
- Report itself goes to USEPA ~ 1 month

Attendance/Position (Day 1: 5.28.09)

(see Attendee List for more info)

Attendees	Company	Position
Susan	Dynegy	Envir
Don	Dynegy	Envir
Joe	Dynegy	Constr
Don	URS	Geotech
Bob	Dynegy	Plant Mngr
Tom	Dynegy	Envir
Rick	Dynegy	Envir
Chris	IEPA	Envir
Ted	IEPA	Envir
Ken	IEPA	Envir
Cleighton	Dewberry	Dam Safety
Lauren	Dewberry	Dam Safety

Purpose of Visit

- Observing facility because of incident in Kingston, TN where impoundment "failed" letting fly ash into community. Lots of environmental damage. Environmental groups want to do something about coal combustion (CC) sites.
- Professional observation made by Cleighton Smith
  - PE, Illinois 1982
  - Spoke with Paul Mauer, IDNR, about above condition
- Cleighton and Lauren at site by request of USEPA
  - Lockheed Martin contract
  - Superfund $ to get investigations done timely
  - Dewberry is subcontractor of L. Martin
- To gather information visually. Take photos, etc.
- Gather information on impoundments that exist.
- CCW impoundments of interest

    - Coal runoff outside scope of project
    - Will not focus upon incisions (zero height impoundments)
- Find out which impoundments are used for what

To be Received from Dynegy

- Emergency Action Plan
- O&M Plan

Wood River Power Station

- "Almost all" cells here have already been classified
- Coal Combustion Waste (CCW) impoundments
- Most ash sold (not all)
- "waste" goes into Wood River Creek
- Meet SO_2 limits with low sulfur coal
- Closure work plan for West Pond System (WPS)
    - Submitted ground water monitoring data to IEPA who then evaluates the data
    - Awaiting closure but by submitting closure work plan, no more CCW to be submitted into WPS.
    - WPS can remain uncapped so ash can be mined out to sell.

Day 1 (5/28/09)

- Ash from Powder River Basin (PRB) coal area (area in Wyoming)
- East Ash Pond (EAP)
    - East Ash Pond Primary cell (**EAPP**)
        - Limiting factor for heigh were the utility wires along Chessen Rd.
        - SE corner of EAP are pipes shooting bottom-ash sluicing water (which carries the ash)
        - Berms ~15' wide here
        - Polypropylene Liner
            - Black because it contains carbon
            - Black so it does not get eaten up by the sun
            - Air vents to prevent "doming" to occur
        - Fly-ash
            - Class-C (contains Calcium→ very valuable to contractors)
        - Recycling System
            - Water drawn out of EAPP to shoot fly ash back into pond at beginning of cycle in South corner
    - East Ash Pond Secondary smaller cell (**EAPS**)
        - Essentially to improve water quality prior to discharge
    - All ash exits into Wood River Creek after passing through the secondary cell
    - RR tracks in front of levee along Wood River Creek

Day 2 (5/29/09)

- West Ash Pond System (WAPS)
    - 2 active cells
        - Cell 2E
            - Essentially filled
            - Runoff
            - Putting in coal ash
            - Fly ash=orange in color
            - Bottom ash=dark in color
            - N embankment ~25-30'
        - Cell 3
            - Some CO_2 here (very little)
    - 2 inactive cells; not yet officially closed (CCW still in there, although no longer putting any in)
        - Cell 1
            - Out of service
            - Inactive Since mid 1990s

- Storage area contents
    - Combination of fly-ash and bottom ash
    - Surface runoff
    - Lots of vegetation
    - Old fly-ash
        - More on N side
        - Mine out to sell
    - Bottom-ash
        - More on S side
    - Low (relatively) sulfur Illinois coal
    - PRB coal (true for all Midwest region of Dynegy)
- Pile of bottom and fly ash combined along NE berm

- Cell 2 W
    - Inactive
    - Fairly stable
    - Full of precipitation
    - Essentially a wetland
        - Lots of vegetation
        - Lots of wildlife
    - Next to impossible to get photos of all embankments due to vegetation and presence of wildlife