TIP PROJECT: R-2719A

CONTRACT: 6300016248

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

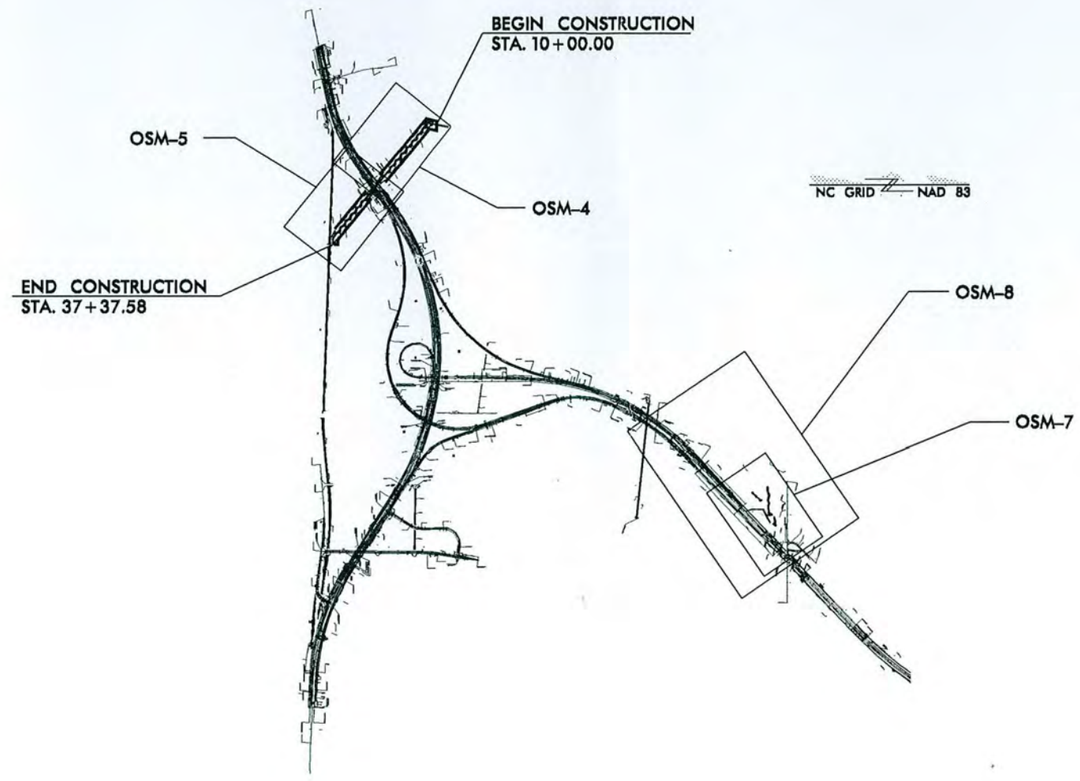
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2719A	OSM-1	15

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION

LENOIR COUNTY

LOCATION: UT TO FALLING CREEK AND WETLAND AREA SOUTH OF BANKS SCHOOL RD.

TYPE OF WORK: ON-SITE MITIGATION



1006 Plans

1, 8, 7A
24, 25, 25A

GRAPHIC SCALES

50 0 100
PLANS

2.5 0 5
PROFILE (HORIZONTAL)

0.5 0 1
PROFILE (VERTICAL)

PROJECT LENGTH

Prepared in the Office of:
Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. THEEKE

PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-2

PROJECT ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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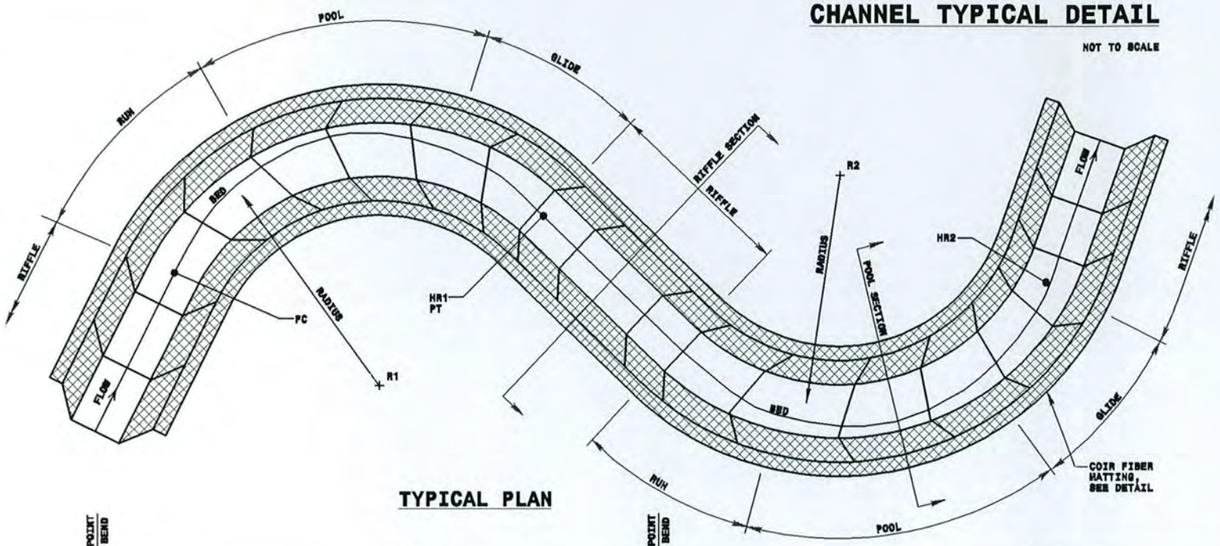
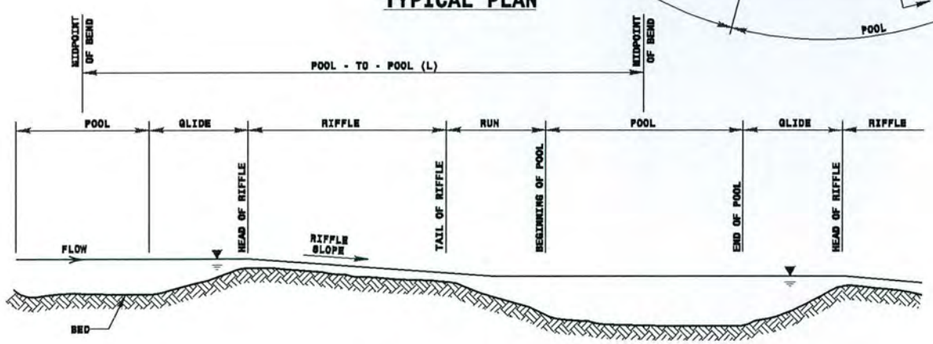
CHANNEL TYPICAL DETAIL

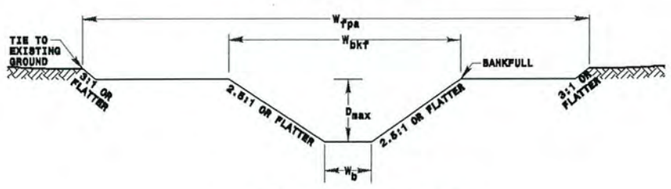
NOT TO SCALE



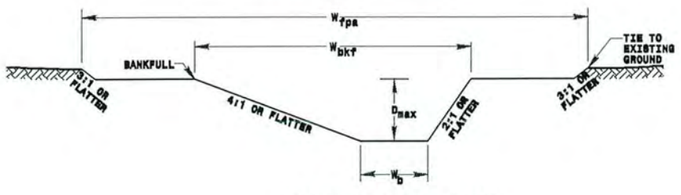
TYPICAL PLAN



TYPICAL PROFILE



TYPICAL RIFFLE WITH BANKFULL BENCH



TYPICAL POOL WITH BANKFULL BENCH

W_{bkf} = BANKFULL WIDTH
D_{max} = MAXIMUM DEPTH
W_b = BOTTOM WIDTH
W_{fpa} = FLOOD PRONE AREA WIDTH

NOTES:
1. THE COORDINATES FOR EACH CENTER OF RADIUS (EX. "R1","R2") AND EACH HEAD OF RIFFLE (EX. "HR1", "HR2") ARE INDICATED ON THE PLAN SHEETS.

CROSS-SECTION DIMENSIONS

	RIFFLE				POOL				
REACH	W_{bkf}	D_{max}	W_b	W_{fpa}	W_{bkf}	D_{max}	W_b	W_{fpa}	Width/Depth Ratio
Sta.10+00 - Sta.22+31.85	9.4	1.3	3.0	80	13.0	2.0	2.0	80	11
Sta.25+82 - Sta.37+37.58	9.4	1.3	3.0	80	13.0	2.0	2.0	80	11

GEOMORPHOLOGICAL TABLE

Variables	Site 1 Proposed Condition	Site 1 Existing Condition	Beaverdam Swamp Reference Condition
stream type	E5	G5	E5/C5
drainage area (sq mi)	0.5	0.5	3.00
bankfull width (ft)	9.4	9.3 - 12.7	18.6
bankfull mean depth (ft)	0.9	0.6 - 0.8	1.4
width/depth ratio	11	11 - 20	14
bankfull cross-sectional area (sq ft)	8.0	7.9 - 8.1	25.3
bankfull mean velocity (ft/sec)	0.6	0.6	0.735
bankfull discharge (cu ft/sec)	5.0	5.0	18.6
bankfull max depth (ft)	1.3	1.5	2.3
width of floodprone area (ft)	80	15	>100
entrenchment ratio	8.5	1.3	>10
meander length (ft)	92 - 125	NA	92 - 125
radius of curvature (ft)	22 - 30	NA	30 - 40
ratio of radius of curvature to bankfull width	2.3 - 3.2	NA	1.8 - 2.4
belt width (ft)	50	NA	49 - 105
meander width ratio	5.3	NA	2.9 - 6.3
sinuosity (stream length/valley length)	1.2	1.1	1.66
valley slope	0.0006	0.0006	0.0007
average slope	0.0005	0.0005	0.0004
pool slope	0.00001	NA	0.00001
ratio of pool slope to average slope	0.02	NA	0.025
maximum pool depth (ft)	2.0	NA	3.3
ratio of pool depth to average bankfull depth	2.2	NA	2.4
pool width (ft)	13.0	NA	15.2
ratio of pool width to bankfull width	1.4	NA	0.8
pool to pool spacing (ft)	39 - 86	NA	100
ratio of pool to pool spacing to bankfull width	4.1 - 9.1	NA	5.4
ratio of lowest bank height to bankfull height	1.0	NA	1.0

REVISIONS

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
R-2719A	2-C

PROJECT ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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8000 Regency Parkway
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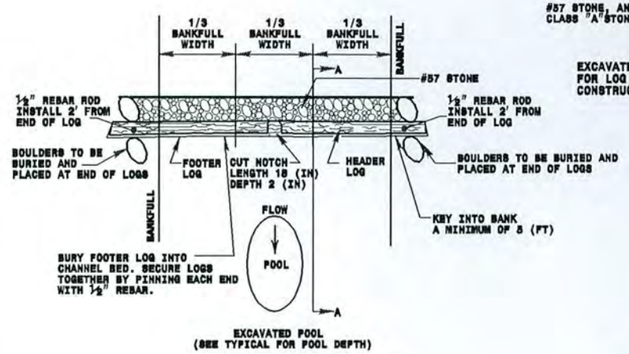
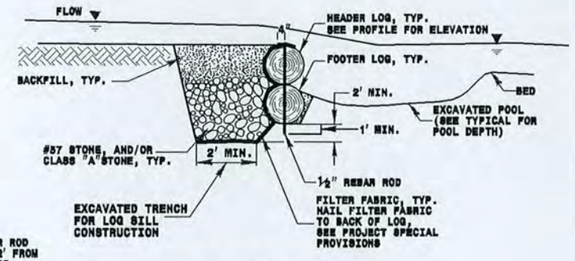
05M-2A



PLAN VIEW



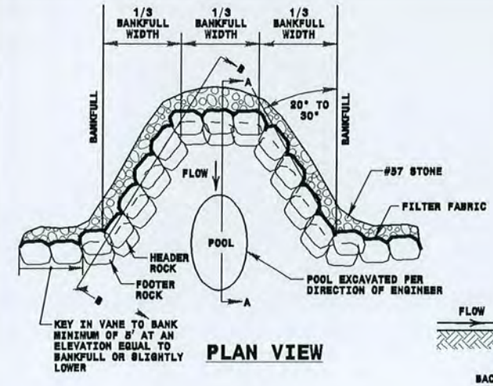
SECTION A-A

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
10+06.75	2	3	2
17+22.19	2	3	2
20+91.49	2	3	2
26+94.98	2	3	2
31+76.71	2	3	2
34+00.16	2	3	2

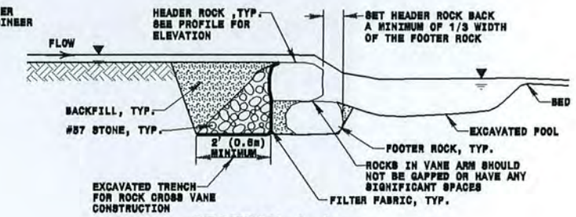
NOTES:
1. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER LOG.
2. CLASS "A" STONE, AND/OR #57 STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
3. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
4. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

LOG SILL DETAIL

NOT TO SCALE



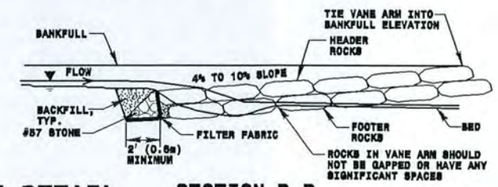
PLAN VIEW



SECTION A-A

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
36+76.88	2'	3'	2'

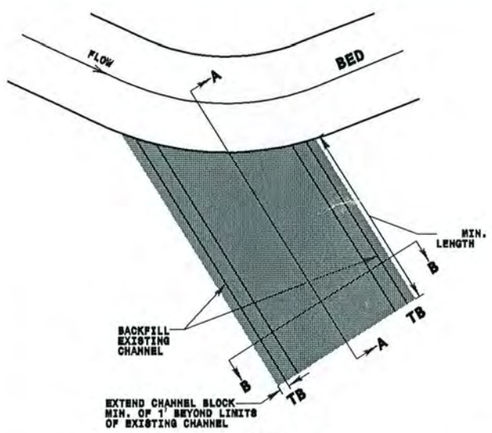
NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.



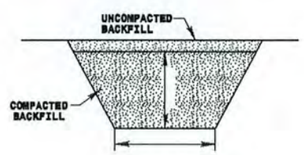
SECTION B-B

ROCK CROSS VANE DETAIL

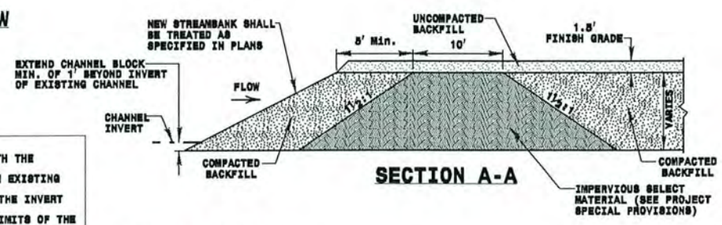
NOT TO SCALE



PLAN VIEW



SECTION B-B

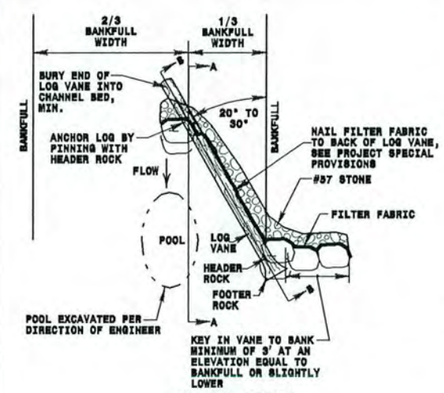


SECTION A-A

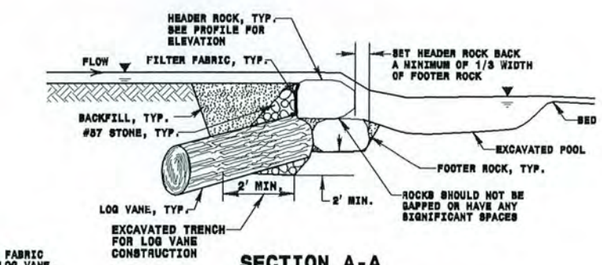
NOTES:
1. CHANNEL BLOCK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2. BLOCK SHOULD BE INSTALLED AT THE INTERFACE BETWEEN EXISTING CHANNEL AND PROPOSED CHANNEL.
3. BOTTOM OF BLOCK SHOULD BE A MINIMUM OF 0.5' BELOW THE INVERT OF THE EXISTING CHANNEL.
4. BLOCK SHOULD EXTEND A MINIMUM OF 1.0' BEYOND THE LIMITS OF THE EXISTING STREAM CHANNEL.
5. INSTALL EROSION CONTROL MATTING AND SEED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS IMMEDIATELY AFTER GRADING.
6. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.

STREAM PLUG

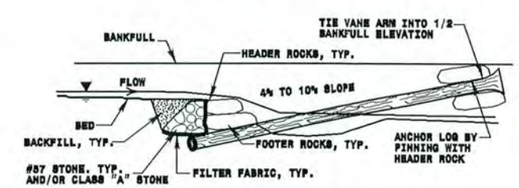
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
10+62.88	2	3	2
12+16.94	2	3	2
22+18.86	2	3	2
27+43.22	2	3	2
35+41.78	2	3	2

LOG VANE DETAIL

NOT TO SCALE

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE AND/OR #57 STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.

REVISIONS

28-MAY-2008 15:36
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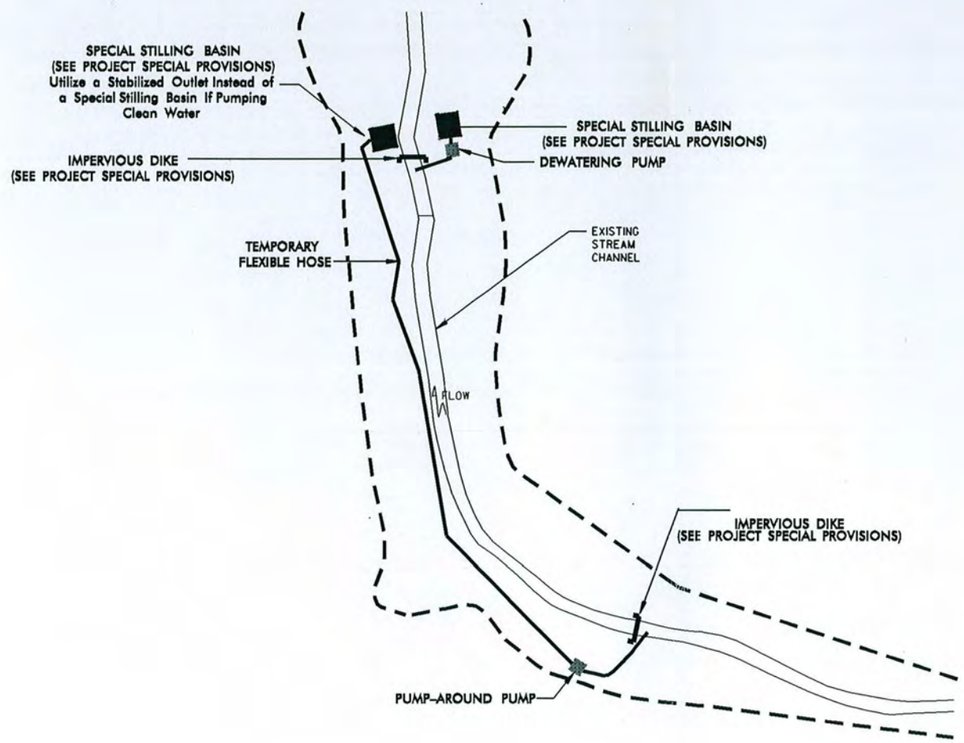
PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-3

PROJECT ENGINEER

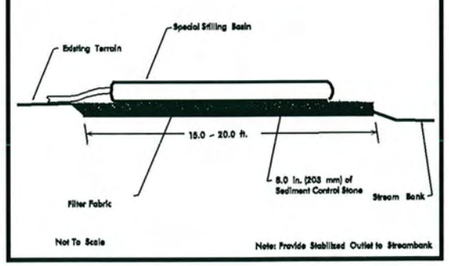
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 600
Cary, NORTH CAROLINA 27511
Phone 919.463.5488
Fax 919.463.5490

EXAMPLE OF PUMP-AROUND OPERATION



SPECIAL STILLING BASIN WITH ROCK PAD



NOTES:
1) All excavation shall be performed in only dry or isolated sections of channel.
2) Impervious dikes are to be used to isolate work from stream flow when necessary.
3) All graded areas shall be stabilized within 24 hours.
4) Maintenance of stream flow operations shall be incidental to the work. This includes polyethylene sheeting, diversion pipes, pumps and hoses.
5) Pumps and hoses shall be of sufficicient size to dewater the work area.

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

1. INSTALL SPECIAL STILLING BASIN(S)..
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED IN ONE DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.

REVISIONS

2/26/03

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PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-4

PROJECT ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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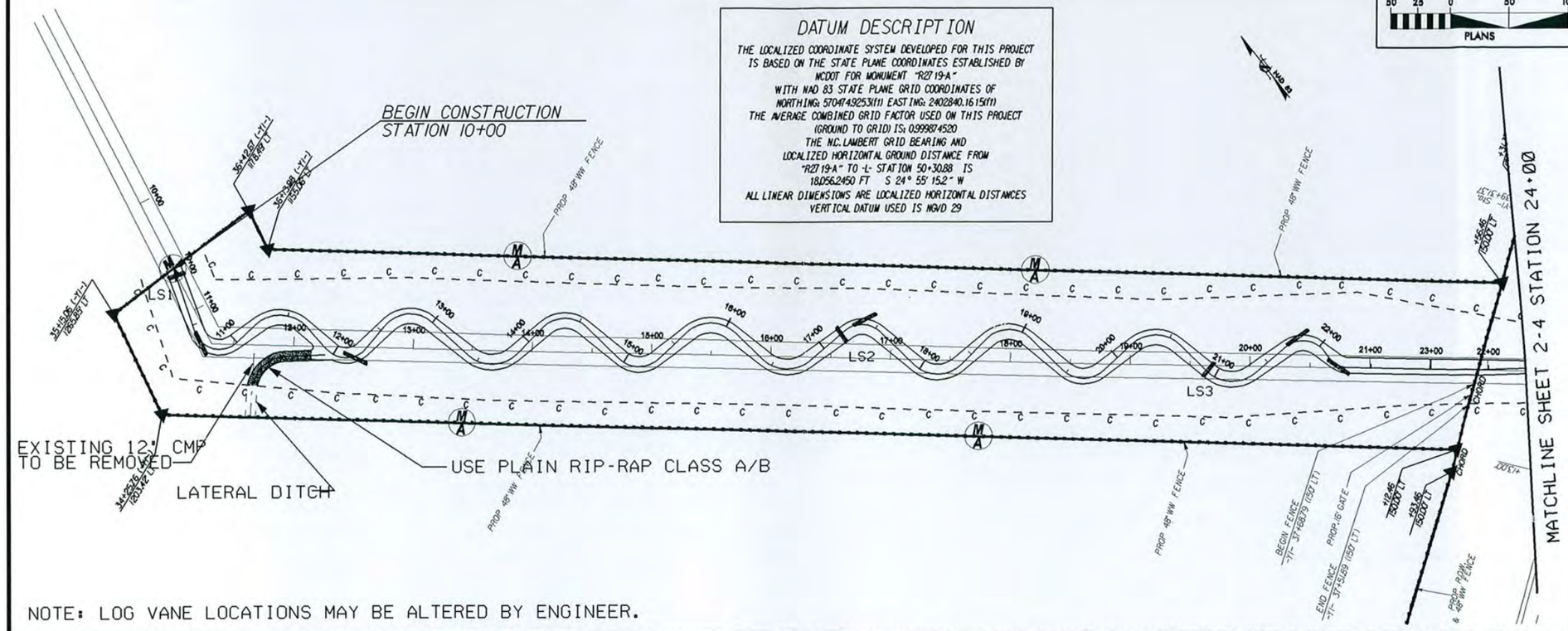
Fax: 919.483.5490

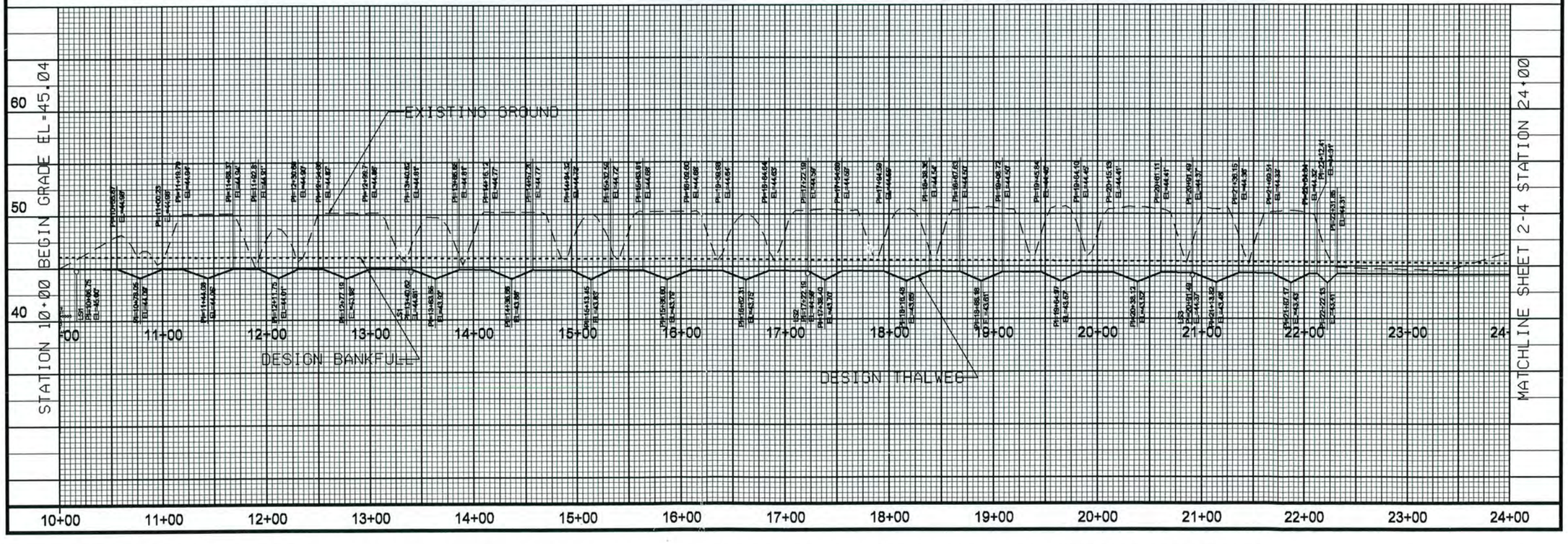
GRAPHIC SCALE
50 25 0 50 100
PLANS

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "R2719-A"
WITH NAD 83 STATE PLANE GRID COORDINATES OF NORTHING: 570474.9253(ft) EASTING: 2402840.1615(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999874520
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "R2719-A" TO -L- STATION 50+30.88 IS 18,056.2450 FT S 24° 55' 15.2" W
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NGVD 29



NOTE: LOG VANE LOCATIONS MAY BE ALTERED BY ENGINEER.



8/17/99

PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-5

GRAPHIC SCALE
50 25 0 50 100
PLANS

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

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Baker Engineering NY, Inc.
8000 Regency Parkway
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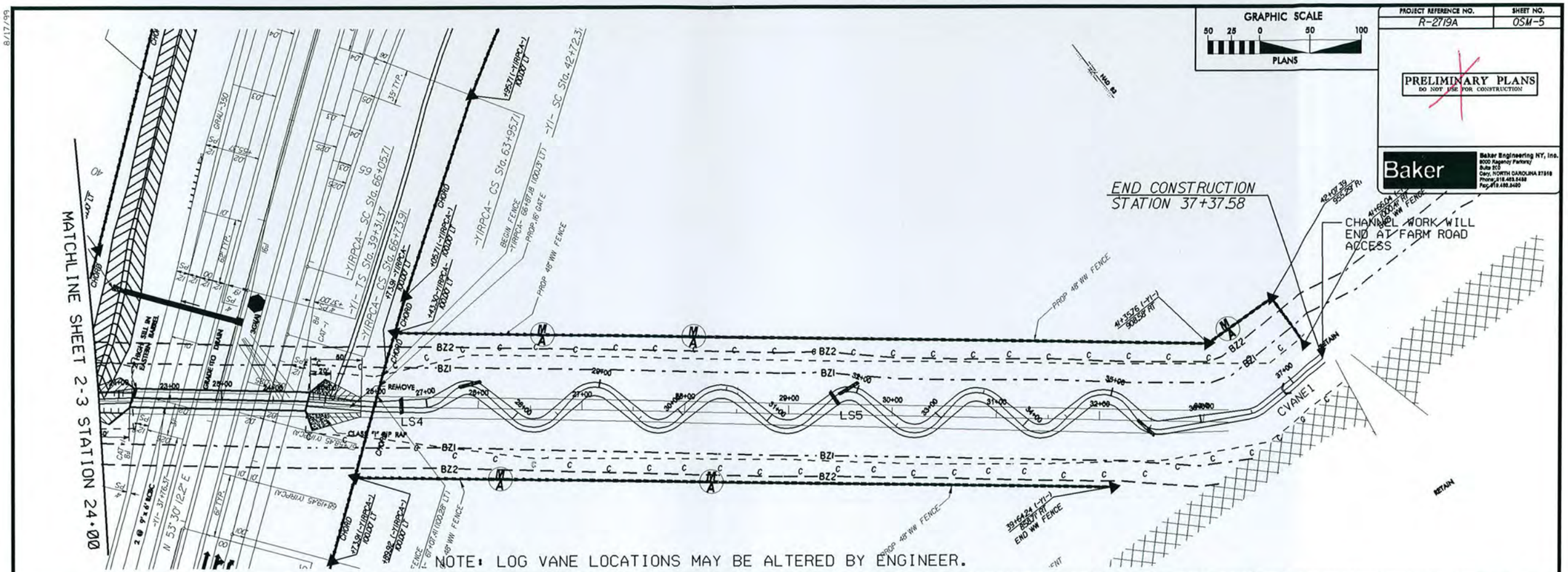
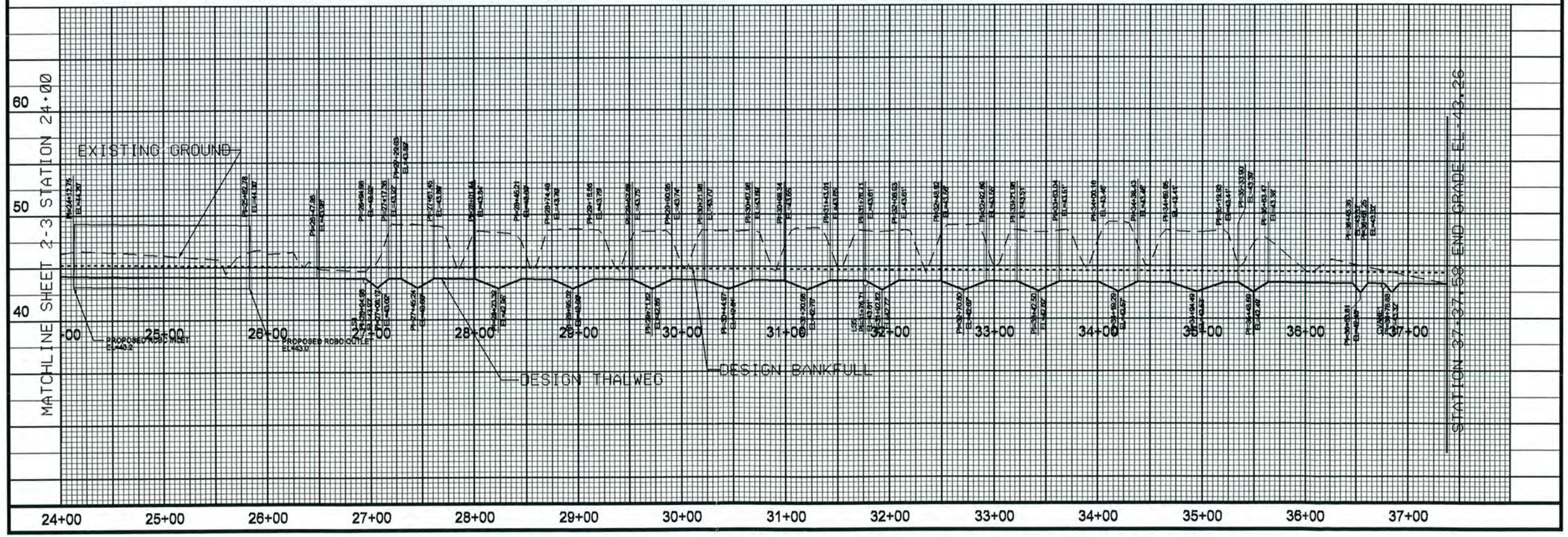
Fax: 919.469.8480



NOTE: LOG VANE LOCATIONS MAY BE ALTERED BY ENGINEER.



CURVE DATA

CV1

P.I. Station	10+90.76 N	554,098.4727 E	2,391,376.5143
Delta	= 115° 31' 46.45" (LT)		
Degree	= 260° 26' 07.30"		
Tangent	= 34.8878		
Length	= 44.3602		
Radius	= 22.0000		
External	= 19.2451		
Long Chord	= 37.2181		
Mid. Ord.	= 10.2653		
P.C. Station	10+55.87 N	554,131.3507 E	2,391,388.1846
P.T. Station	11+00.23 N	554,102.1114 E	2,391,411.2118
C.C.	N	554,123.9914 E	2,391,408.9173

CV2

P.I. Station	11+51.28 N	554,107.4360 E	2,391,461.9853
Delta	= 92° 46' 53.46" (RT)		
Degree	= 190° 59' 09.35"		
Tangent	= 31.4929		
Length	= 48.5803		
Radius	= 30.0000		
External	= 13.4949		
Long Chord	= 43.4436		
Mid. Ord.	= 9.3079		
P.C. Station	11+19.79 N	554,104.1514 E	2,391,430.5641
P.T. Station	11+68.37 N	554,078.9924 E	2,391,463.7461
C.C.	N	554,074.3150 E	2,391,433.7930

CV3

P.I. Station	12+18.39 N	554,026.0457 E	2,391,466.5431
Delta	= 98° 36' 58.56" (LT)		
Degree	= 260° 26' 07.30"		
Tangent	= 25.5647		
Length	= 37.8659		
Radius	= 22.0000		
External	= 11.7428		
Long Chord	= 33.3620		
Mid. Ord.	= 7.6562		
P.C. Station	11+92.81 N	554,051.5904 E	2,391,465.1126
P.T. Station	12+30.68 N	554,031.2871 E	2,391,491.5852
C.C.	N	554,052.8205 E	2,391,487.0782

CV4

P.I. Station	12+83.75 N	554,042.1601 E	2,391,543.5339
Delta	= 92° 11' 36.00" (RT)		
Degree	= 204° 37' 40.02"		
Tangent	= 29.0929		
Length	= 45.0542		
Radius	= 28.0000		
External	= 12.3782		
Long Chord	= 40.3486		
Mid. Ord.	= 8.5536		
P.C. Station	12+54.66 N	554,036.2000 E	2,391,515.0581
P.T. Station	12+99.71 N	554,013.4770 E	2,391,548.3996

CV5

P.I. Station	13+69.57 N	553,944.6052 E	2,391,560.0834
Delta	= 87° 57' 59.35" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 28.9537		
Length	= 46.0591		
Radius	= 30.0000		
External	= 11.6931		
Long Chord	= 41.6669		
Mid. Ord.	= 8.4137		
P.C. Station	13+40.61 N	553,973.1510 E	2,391,555.2406
P.T. Station	13+86.67 N	553,948.4316 E	2,391,588.7832

CV6

P.I. Station	14+42.36 N	553,955.7915 E	2,391,643.9505
Delta	= 90° 31' 55.35" (RT)		
Degree	= 220° 22' 06.18"		
Tangent	= 26.2426		
Length	= 41.0821		
Radius	= 26.0000		
External	= 10.9415		
Long Chord	= 36.9399		
Mid. Ord.	= 7.7008		
P.C. Station	14+16.12 N	553,952.3231 E	2,391,617.9652
P.T. Station	14+57.20 N	553,929.7480 E	2,391,647.2071

CV7

P.I. Station	15+18.33 N	553,869.0766 E	2,391,654.7239
Delta	= 87° 42' 03.74" (LT)		
Degree	= 229° 10' 59.22"		
Tangent	= 24.0165		
Length	= 38.2668		
Radius	= 25.0000		
External	= 9.6669		
Long Chord	= 34.6390		
Mid. Ord.	= 6.9713		
P.C. Station	14+94.32 N	553,892.9111 E	2,391,651.7710
P.T. Station	15+32.58 N	553,871.0713 E	2,391,678.5575

CV8

P.I. Station	15+92.49 N	553,876.0462 E	2,391,738.3572
Delta	= 87° 49' 21.57" (RT)		
Degree	= 190° 59' 09.35"		
Tangent	= 28.8811		
Length	= 45.9838		
Radius	= 30.0000		
External	= 11.6427		
Long Chord	= 41.6127		
Mid. Ord.	= 8.3876		
P.C. Station	15+63.61 N	553,873.6478 E	2,391,709.5759
P.T. Station	16+09.59 N	553,847.3766 E	2,391,741.5474

CV9

P.I. Station	16+67.61 N	553,789.7897 E	2,391,748.5580
Delta	= 85° 17' 29.65" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 27.6307		
Length	= 44.6586		
Radius	= 30.0000		
External	= 10.7856		
Long Chord	= 40.6478		
Mid. Ord.	= 7.9333		
P.C. Station	16+39.97 N	553,817.2179 E	2,391,745.5189
P.T. Station	16+84.63 N	553,790.5661 E	2,391,776.4677

CV10

P.I. Station	17+42.14 N	553,793.1064 E	2,391,833.9324
Delta	= 84° 25' 42.44" (RT)		
Degree	= 260° 26' 07.30"		
Tangent	= 19.9563		
Length	= 32.4182		
Radius	= 22.0000		
External	= 7.7041		
Long Chord	= 29.5638		
Mid. Ord.	= 5.7060		
P.C. Station	17+22.18 N	553,792.3289 E	2,391,813.9892
P.T. Station	17+54.60 N	553,773.3329 E	2,391,836.5425

CV11

P.I. Station	18+22.37 N	553,706.1673 E	2,391,845.8452
Delta	= 89° 33' 19.17" (LT)		
Degree	= 204° 37' 40.02"		
Tangent	= 27.7835		
Length	= 43.7650		
Radius	= 28.0000		
External	= 11.4452		
Long Chord	= 39.4440		
Mid. Ord.	= 8.1243		
P.C. Station	17+94.59 N	553,733.7135 E	2,391,842.0726
P.T. Station	18+38.36 N	553,709.7462 E	2,391,873.3996

CV12

P.I. Station	18+93.87 N	553,716.8577 E	2,391,928.4605
Delta	= 90° 31' 55.35" (RT)		
Degree	= 220° 22' 06.18"		
Tangent	= 26.2426		
Length	= 41.0821		
Radius	= 26.0000		
External	= 10.9415		
Long Chord	= 36.9399		
Mid. Ord.	= 7.7008		
P.C. Station	18+67.63 N	553,713.4962 E	2,391,902.4342
P.T. Station	19+08.71 N	553,690.8012 E	2,391,931.5802

CV13

P.I. Station	19+69.85 N	553,630.0996 E	2,391,938.8479
Delta	= 87° 42' 03.74" (LT)		
Degree	= 229° 10' 59.22"		
Tangent	= 24.0165		
Length	= 38.2668		
Radius	= 25.0000		
External	= 9.6669		
Long Chord	= 34.6390		
Mid. Ord.	= 6.9713		
P.C. Station	19+45.83 N	553,653.9458 E	2,391,935.9928
P.T. Station	19+84.10 N	553,631.9958 E	2,391,962.7894

CV14

P.I. Station	20+44.01 N	553,636.7257 E	2,392,022.5091
Delta	= 87° 49' 21.57" (RT)		
Degree	= 190° 59' 09.35"		
Tangent	= 28.8811		
Length	= 45.9838		
Radius	= 30.0000		
External	= 11.6427		
Long Chord	= 41.6127		
Mid. Ord.	= 8.3876		
P.C. Station	20+15.12 N	553,634.4454 E	2,391,993.7181
P.T. Station	20+61.11 N	553,606.0422 E	2,392,025.8815

CV15

P.I. Station	21+19.12 N	553,550.4266 E	2,392,032.6556
Delta	= 85° 17' 29.65" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 27.6307		
Length	= 44.6586		
Radius	= 30.0000		
External	= 10.7856		
Long Chord	= 40.6478		
Mid. Ord.	= 7.9333		
P.C. Station	20+91.49 N	553,577.8664 E	2,392,029.4292
P.T. Station	21+36.15 N	553,551.3898 E	2,392,060.2695

CV16

P.I. Station	21+92.29 N	553,553.3464 E	2,392,116.3757
Delta	= 91° 59' 50.40" (RT)		
Degree	= 260° 26' 07.30"		
Tangent	= 22.7806		
Length	= 35.3244		
Radius	= 22.0000		
External	= 9.6695		
Long Chord	= 31.6502		
Mid. Ord.	= 6.7171		
P.C. Station	21+69.51 N	553,552.5525 E	2,392,093.6069
P.T. Station	22+04.83 N	553,530.5658 E	2,392,116.3757

CV17

P.I. Station	22+22.82 N	553,512.5631 E	2,392,116.3757
Delta	= 50° 36' 37.38" (LT)		
Degree	= 260° 26' 07.30"		
Tangent	= 10.4018		
Length	= 19.4330		
Radius	= 22.0000		
External	= 2.3351		
Long Chord	= 18.8074		
Mid. Ord.	= 2.1110		
P.C. Station	22+12.41 N	553,522.9648 E	2,392,116.3757
P.T. Station	22+31.85 N	553,506.9822 E	2,392,124.4147

CV18

P.I. Station	27+06.72 N	553,203.2661 E	2,392,489.9923
Delta	= 42° 44' 39.34" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 11.7400		
Length	= 22.3808		
Radius	= 30.0000		
External	= 2.2153		
Long Chord	= 21.8654		
Mid. Ord.	= 2.0630		
P.C. Station	26+94.98 N	553,210.7173 E	2,392,480.9198
P.T. Station	27+17.36 N	553,203.9518 E	2,392,501.7123

CV19

P.I. Station	27+48.99 N	553,205.7990 E	2,392,533.2889
Delta	= 84° 25' 42.44" (RT)		
Degree	= 260° 26' 07.30"		
Tangent	= 19.9563		
Length	= 32.4182		
Radius	= 22.0000		
External	= 7.7041		
Long Chord	= 29.5638		
Mid. Ord.	= 5.7060		
P.C. Station	27+29.03 N	553,204.6334 E	2,392,513.3647
P.T. Station	27+61.45 N	553,186.0621 E	2,392,536.3835

CV20

P.I. Station	28+29.23 N	553,119.1283 E	2,392,546.8916
Delta	= 89° 33' 19.17" (LT)		
Degree	= 204° 37' 40.02"		
Tangent	= 27.7835		
Length	= 43.7650		
Radius	= 28.0000		
External	= 11.4452		
Long Chord	= 39.4440		
Mid. Ord.	= 8.1243		
P.C. Station	28+01.44 N	553,146.5759 E	2,392,542.5838
P.T. Station	28+45.21 N	553,123.2230 E	2,392,574.3717

CV21

P.I. Station	29+00.73 N	553,131.4050 E	2,392,629.2835
Delta	= 90° 31' 55.35" (RT)		
Degree	= 220° 22' 06.18"		
Tangent	= 26.2426		
Length	= 41.0821		
Radius	= 26.0000		
External	= 10.9415		
Long Chord	= 36.9399		
Mid. Ord.	= 7.7008		
P.C. Station	28+74.48 N	553,127.5375 E	2,392,603.3275
P.T. Station	29+15.56 N	553,106.4142 E	2,392,632.9099

CV22

P.I. Station	29+76.70 N	553,044.8657 E	2,392,641.3579
Delta	= 87° 42' 03.74" (LT)		
Degree	= 229° 10' 59.22"		
Tangent	= 24.0165		
Length	= 38.2668		
Radius	= 25.0000		
External	= 9.6669		
Long Chord	= 34.6390		
Mid. Ord.	= 6.9713		
P.C. Station	29+52.68 N	553,068.6517 E	2,392,638.0392
P.T. Station	29+90.95 N	553,047.2276 E	2,392,665.2580

CV23

P.I. Station	30+50.86 N	553,053.1191 E	2,392,724.8742
Delta	= 87° 49' 21.57" (RT)		
Degree	= 190° 59' 09.35"		
Tangent	= 28.8811		
Length	= 45.9838		
Radius	= 30.0000		
External	= 11.6427		
Long Chord	= 41.6127		
Mid. Ord.	= 8.3876		
P.C. Station	30+21.98 N	553,050.2768 E	2,392,696.1332
P.T. Station	30+67.96 N	553,024.5067 E	2,392,728.5045

CV24

P.I. Station	31+25.98 N	552,967.0222 E	2,392,736.7006
Delta	= 85° 18' 59.44" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 27.6428		
Length	= 44.6716		
Radius	= 30.0000		
External	= 10.7937		
Long Chord	= 40.6574		
Mid. Ord.	= 7.9377		
P.C. Station	30+98.34 N	552,994.4078 E	2,392,732.9389
P.T. Station	31+43.01 N	552,968.5353 E	2,392,764.3019

CV25

P.I. Station	31+96.49 N	552,971.4624 E	2,392,817.6985
Delta	= 83° 54' 24.65" (RT)		
Degree	= 260° 26' 07.30"		
Tangent	= 19.7765		
Length	= 32.2179		
Radius	= 22.0000		
External	= 7.5823		
Long Chord	= 29.4152		
Mid. Ord.	= 5.6389		
P.C. Station	31+76.71 N	552,970.3799 E	2,392,797.9516
P.T. Station	32+08.93 N	552,951.9420 E	2,392,820.5709

CV26

P.I. Station	32+76.70 N	552,885.0464 E	2,392,831.7427
Delta	= 89° 33' 19.17" (LT)		
Degree	= 204° 37' 40.02"		
Tangent	= 27.7835		
Length	= 43.7650		
Radius	= 28.0000		
External	= 11.4452		
Long Chord	= 39.4440		
Mid. Ord.	= 8.1243		
P.C. Station	32+48.92 N	552,912.4701 E	2,392,827.2858
P.T. Station	32+92.69 N	552,889.2903 E	2,392,859.2002

CV27

P.I. Station	33+48.20 N	552,897.7706 E	2,392,914.0667
Delta	= 90° 31' 55.35" (RT)		
Degree	= 220° 22' 06.18"		
Tangent	= 26.2426		
Length	= 41.0821		
Radius	= 26.0000		
External	= 10.9415		
Long Chord	= 36.9399		
Mid. Ord.	= 7.7008		
P.C. Station	33+21.96 N	552,893.7621 E	2,392,888.1321
P.T. Station	33+63.04 N	552,871.7999 E	2,392,917.5343

CV28

P.I. Station	34+24.18 N	552,811.2981 E	2,392,926.6111
Delta	= 87° 42' 03.74" (LT)		
Degree	= 229° 10' 59.22"		
Tangent	= 24.0165		
Length	= 38.2668		
Radius	= 25.0000		
External	= 9.6669		
Long Chord	= 34.6390		
Mid. Ord.	= 6.9713		
P.C. Station	34+00.16 N	552,835.0656 E	2,392,923.1632
P.T. Station	34+38.43 N	552,813.7896 E	2,392,950.4980

CV29

P.I. Station	35+03.06 N	552,820.4953 E	2,393,014.7792
Delta	= 97° 09' 39.97" (RT)		
Degree	= 190° 59' 09.35"		
Tangent	= 34.0050		
Length	= 50.8734		
Radius	= 30.0000		
External	= 15.3469		
Long Chord	= 44.9932		
Mid. Ord.	= 10.1530		
P.C. Station	34+69.05 N	552,816.9672 E	2,392,980.9576
P.T. Station	35+19.93 N	552,786.4976 E	2,393,014.0635

CV30

P.I. Station	35+50.37 N	552,755.0626 E	2,393,013.4229
Delta	= 62° 45' 16.57" (LT)		
Degree	= 212° 12' 23.73"		
Tangent	= 16.4562		
Length	= 29.5724		
Radius	= 27.0000		
External	= 4.6249		
Long Chord	= 28.1163		
Mid. Ord.	= 3.9486		
P.C. Station	35+33.90 N	552,772.5252 E	2,393,013.7694
P.T. Station	35+63.48 N	552,748.2150 E	2,393,027.9003

CV31

P.I. Station	36+53.97 N	552,705.1062 E	2,393,107.4637
Delta	= 28° 26' 07.55" (LT)		
Degree	= 190° 59' 09.35"		
Tangent	= 7.6010		
Length	= 14.8886		
Radius	= 30.0000		
External	= 0.9460		
Long Chord	= 14.7364		
Mid. Ord.	= 0.9189		
P.C. Station	36+46.37 N	552,708.7274 E	2,393,100.7807
P.T. Station	36+61.26 N	552,705.1041 E	2,393,115.0647

PROJECT ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, NORTH CAROLINA 27511
Phone: 919.463.5488
Fax: 919.463.5490

REVISIONS

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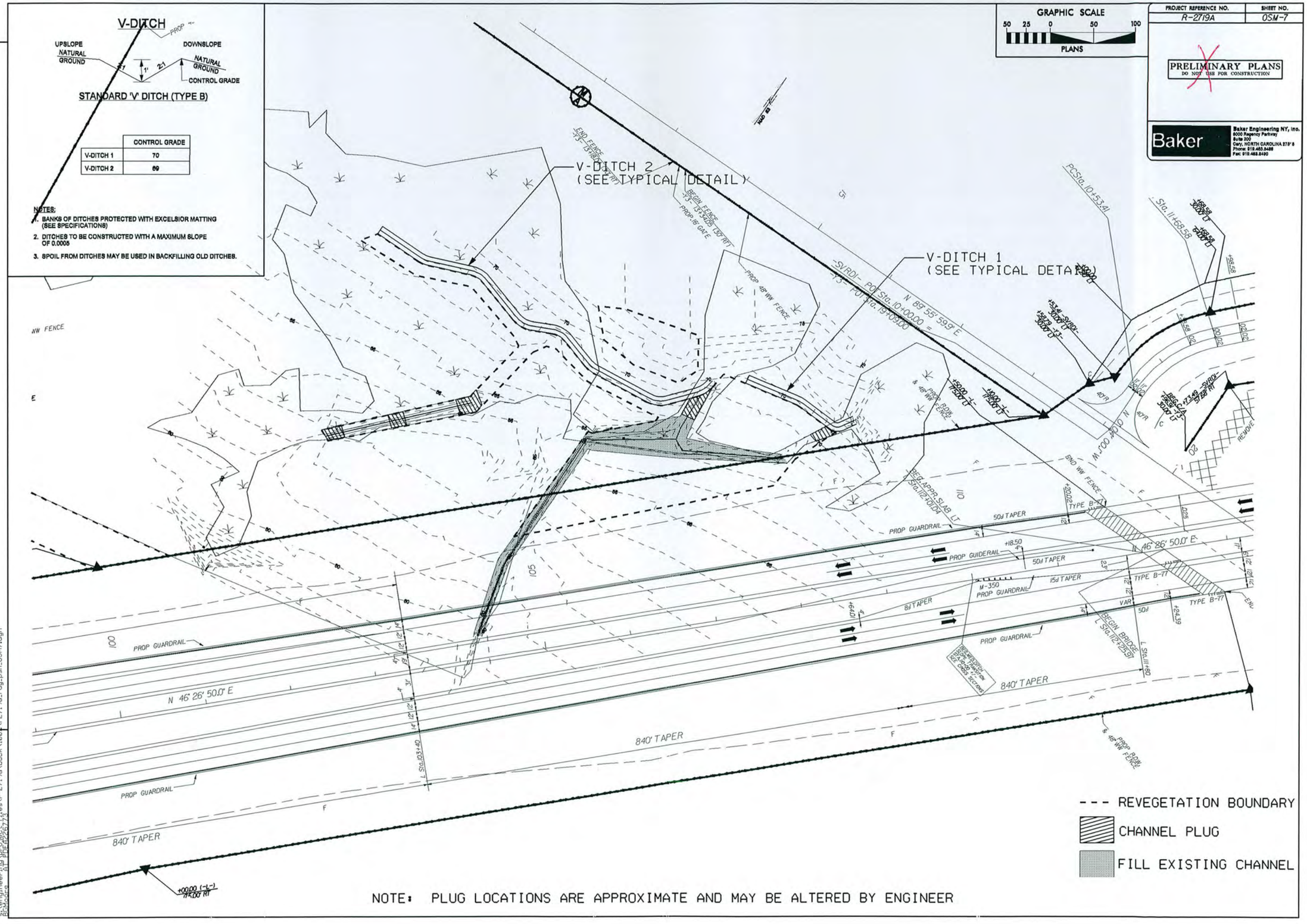

NOTE: PLUG LOCATIONS ARE APPROXIMATE AND MAY BE ALTERED BY ENGINEER

REVISIONS

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BGMoore AT PDF4226773

PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-8

GRAPHIC SCALE
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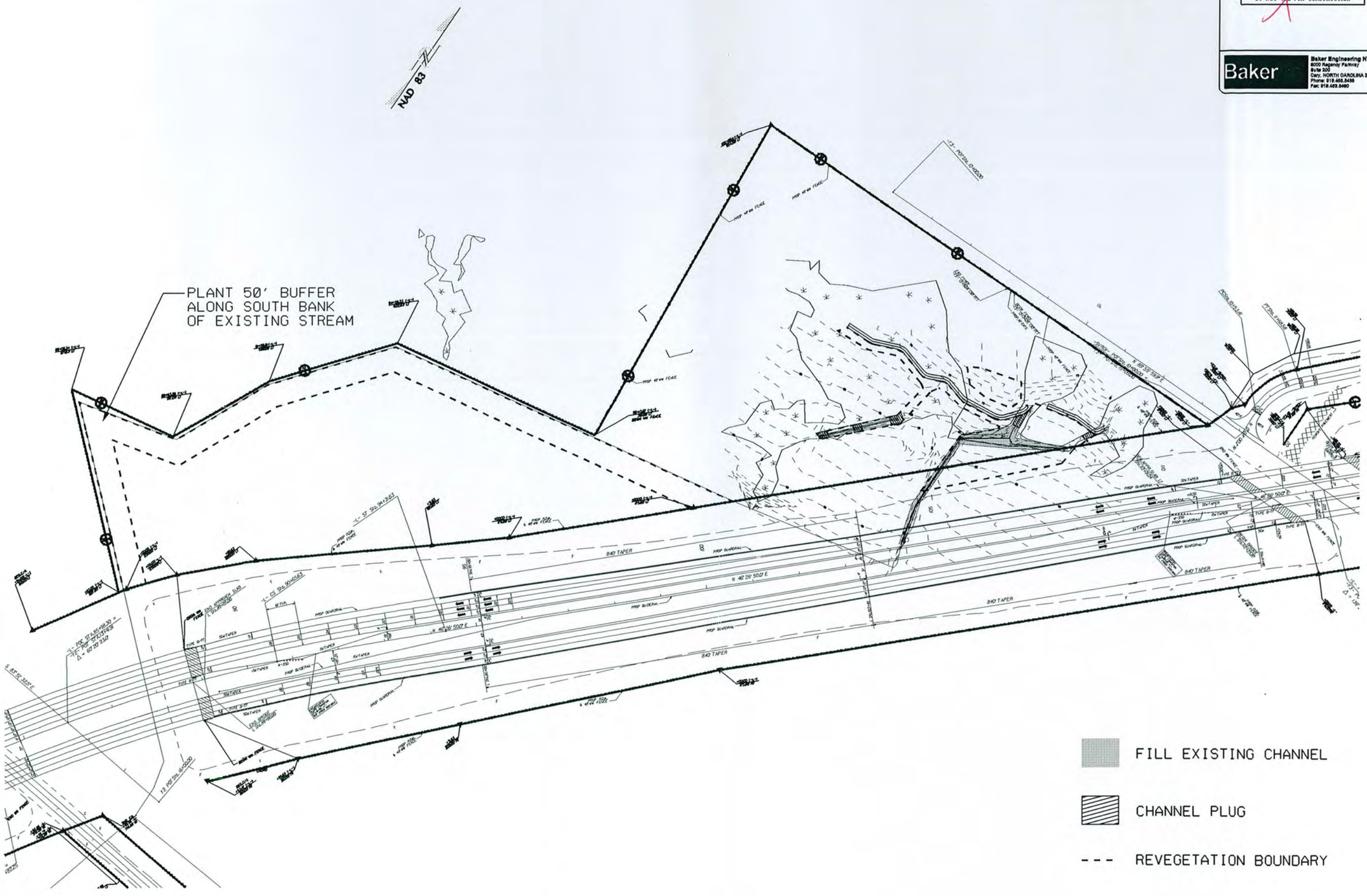
PLANS

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 300
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490

REVISIONS



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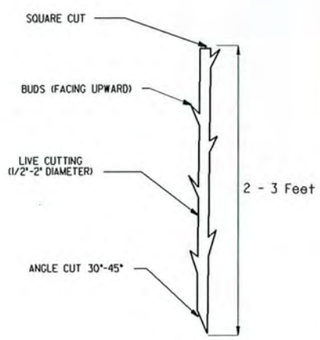
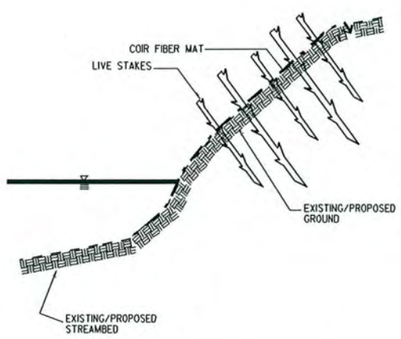
PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PLANTING DETAILS

LIVE STAKES PLANTING DETAIL

LIVE STAKE

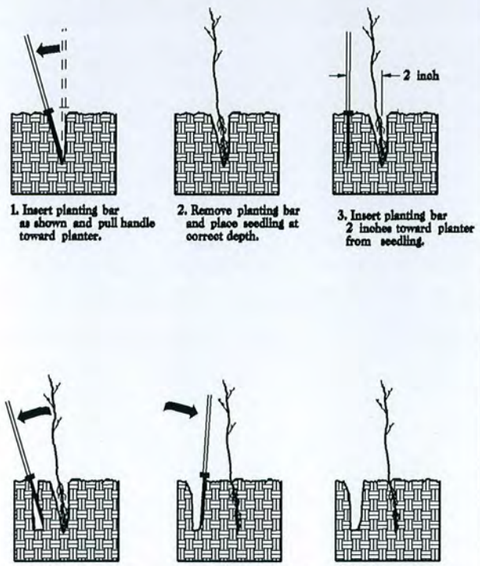




BANK STABILIZATION WITH LIVE STAKES

NOTE:
LIVE STAKES SHALL BE SPACED APPROXIMATELY 4 FEET ON CENTER
LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY ¾ OF LIVE STAKE IS WITHIN GROUND

BAREROOT PLANTING DETAIL DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 2 inches toward planter from seedling.
4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

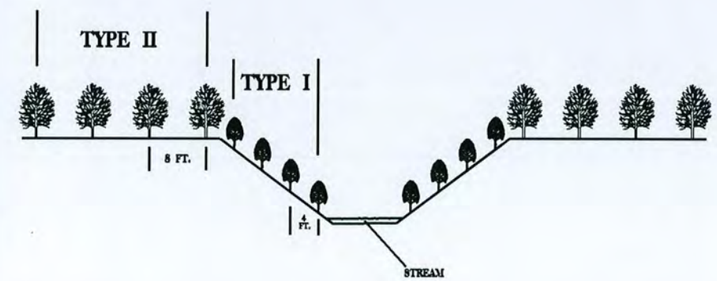
PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 12 inches long, 4 inches wide and 1 inch thick at center.

ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches below the root collar.

- ☐ TYPE 1 STREAMBANK REFORESTATION SHALL BE PLANTED 3 FT. TO 5 FT. ON CENTER, RANDOM SPACING, AVERAGING 4 FT. ON CENTER, APPROXIMATELY 2724 PLANTS PER ACRE.
- ☐ TYPE 2 STREAMBANK REFORESTATION SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.
- ☐ NOTE: TYPE 1 AND TYPE 2 STREAMBANK REFORESTATION SHALL BE PAID FOR AS "STREAMBANK REFORESTATION"

STREAMBANK REFORESTATION TYPICAL



STREAMBANK REFORESTATION

MIXTURE, TYPE, SIZE, AND FURNISH SHALL CONFORM TO THE FOLLOWING:

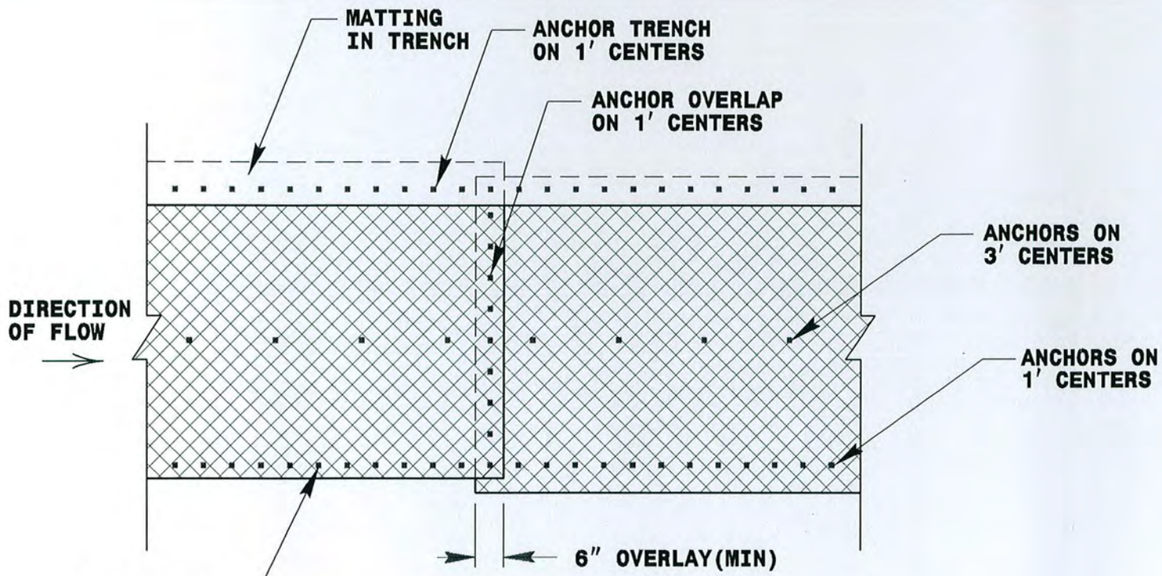
TYPE 1		
50% CORNUS AMOMUM	SILKY DOGWOOD	2 ft - 3 ft LIVE STAKES
50% SAMBUCUS CANADENSIS	ELDERBERRY	2 ft - 3 ft LIVE STAKES
TYPE 2		
30% BETULA NIGRA	RIVER BIRCH	12 in - 18 in BR
30% FRAXINUS PENNSYLVANICA	GREEN ASH	12 in - 18 in BR
20% QUERCUS LYRATA	OVERCUP OAK	12 in - 18 in BR
20% QUERCUS MICHAUXII	SWAMP CHESTNUT OAK	12 in - 18 in BR

☐ SEE PLAN SHEETS FOR AREAS TO BE PLANTED

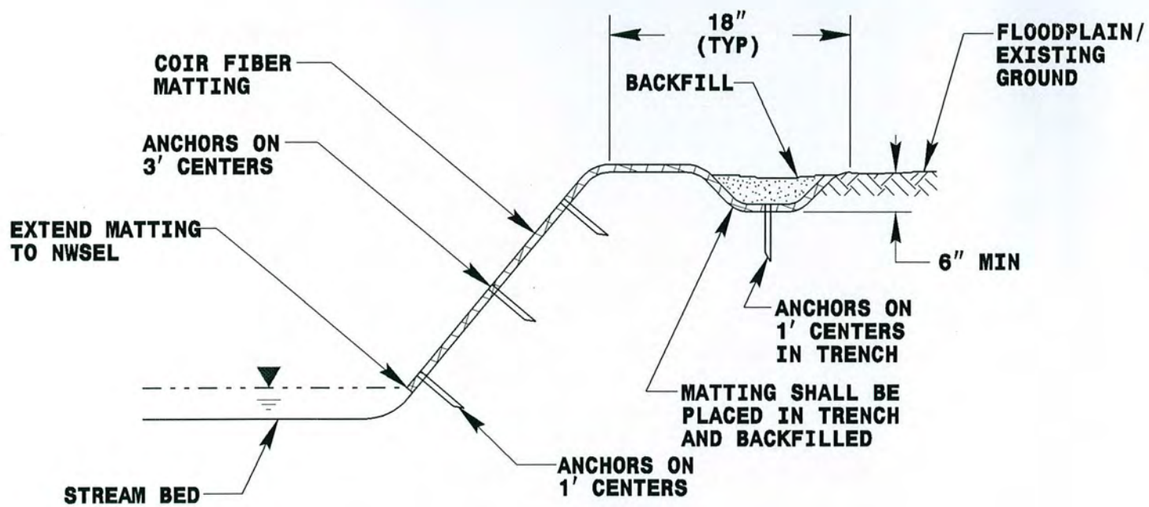
STREAMBANK REFORESTATION DETAIL SHEET 1 OF 2

N.C.D.O.T. - ROADSIDE ENVIRONMENTAL UNIT

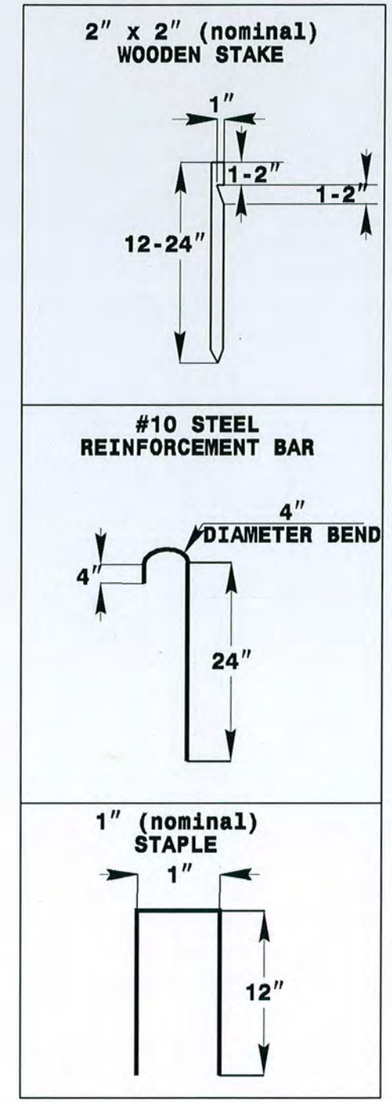
PROJECT REFERENCE NO.	SHEET NO.
R-2719A	OSM-10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



PLAN VIEW



TYPICAL CROSS SECTION



ANCHOR OPTIONS

COIR FIBER MATTING DETAIL

NOT TO SCALE

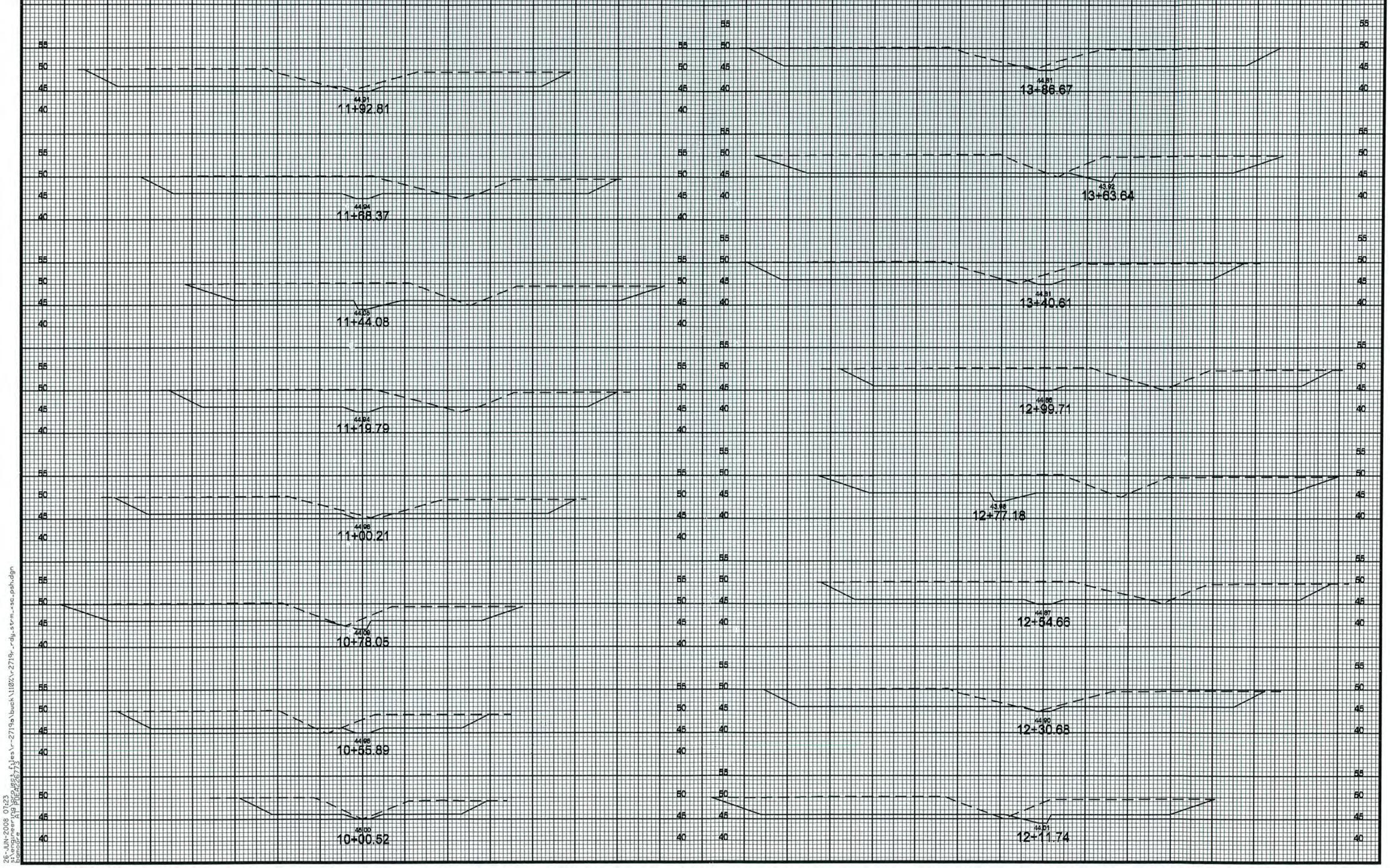
STREAMBANK REFORESTATION

DETAIL SHEET 2 OF 2

N.C.D.O.T. - ROADSIDE ENVIRONMENTAL UNIT

8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-2719A	OSM-11



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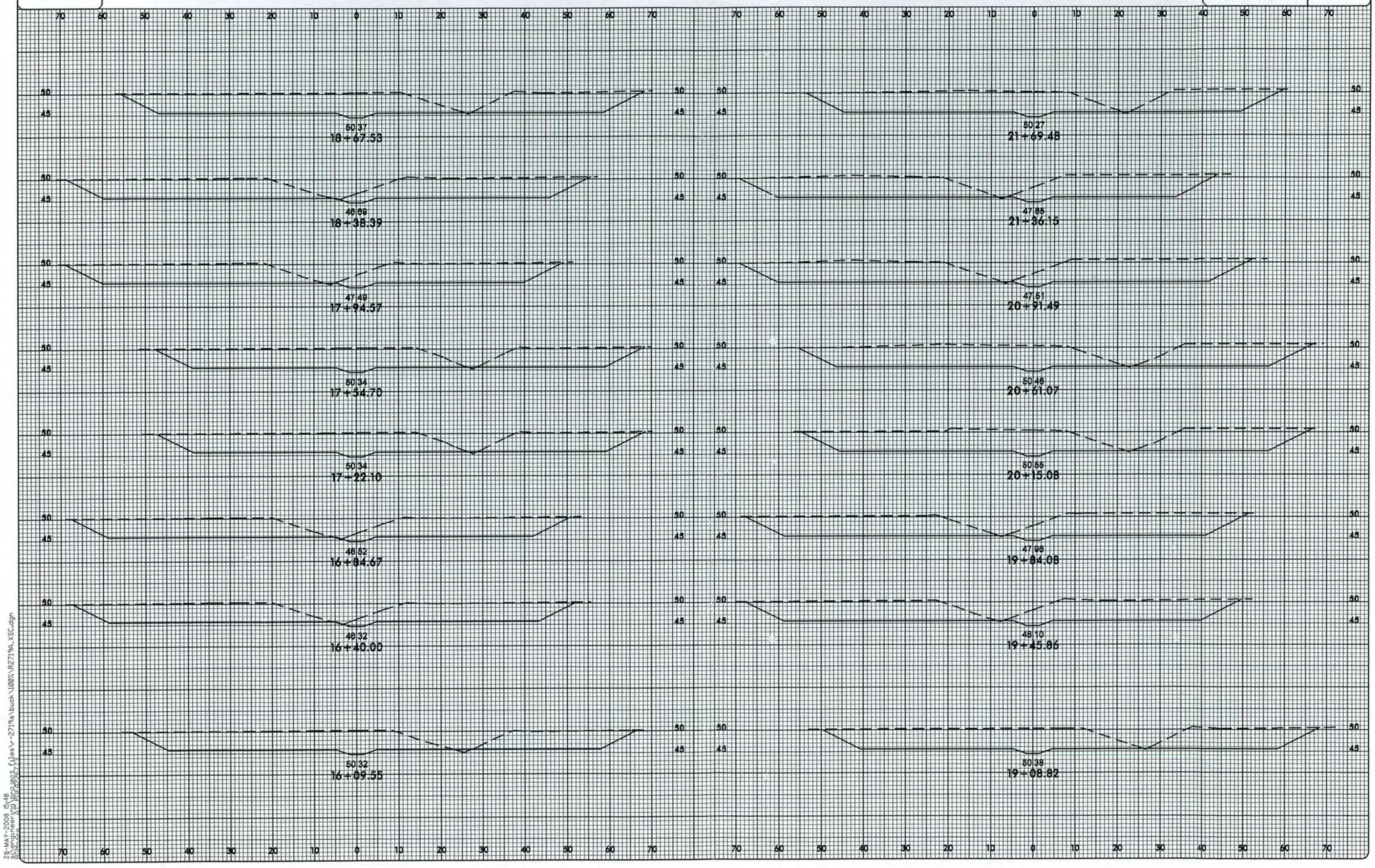
R-2719A	OSM-12



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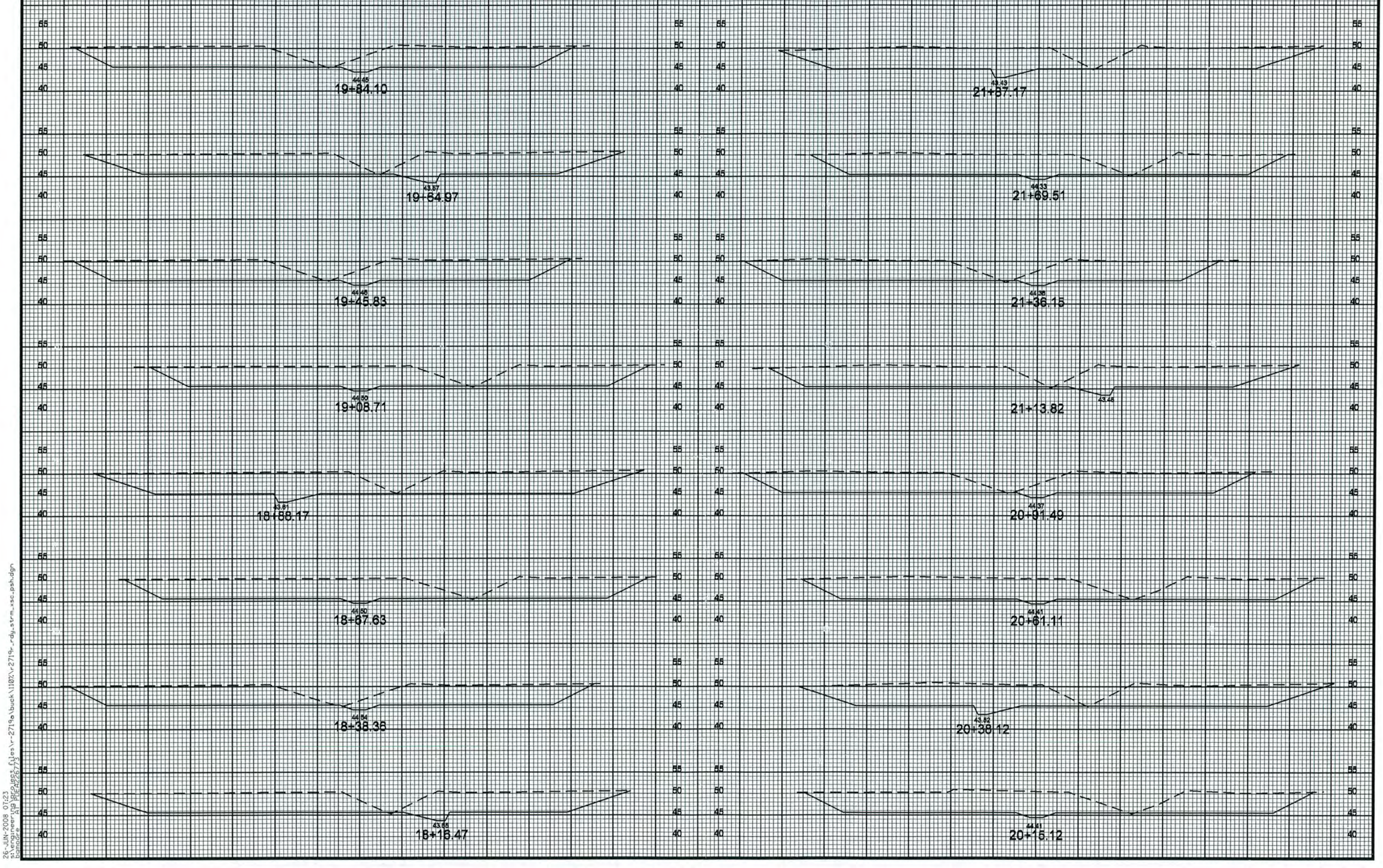

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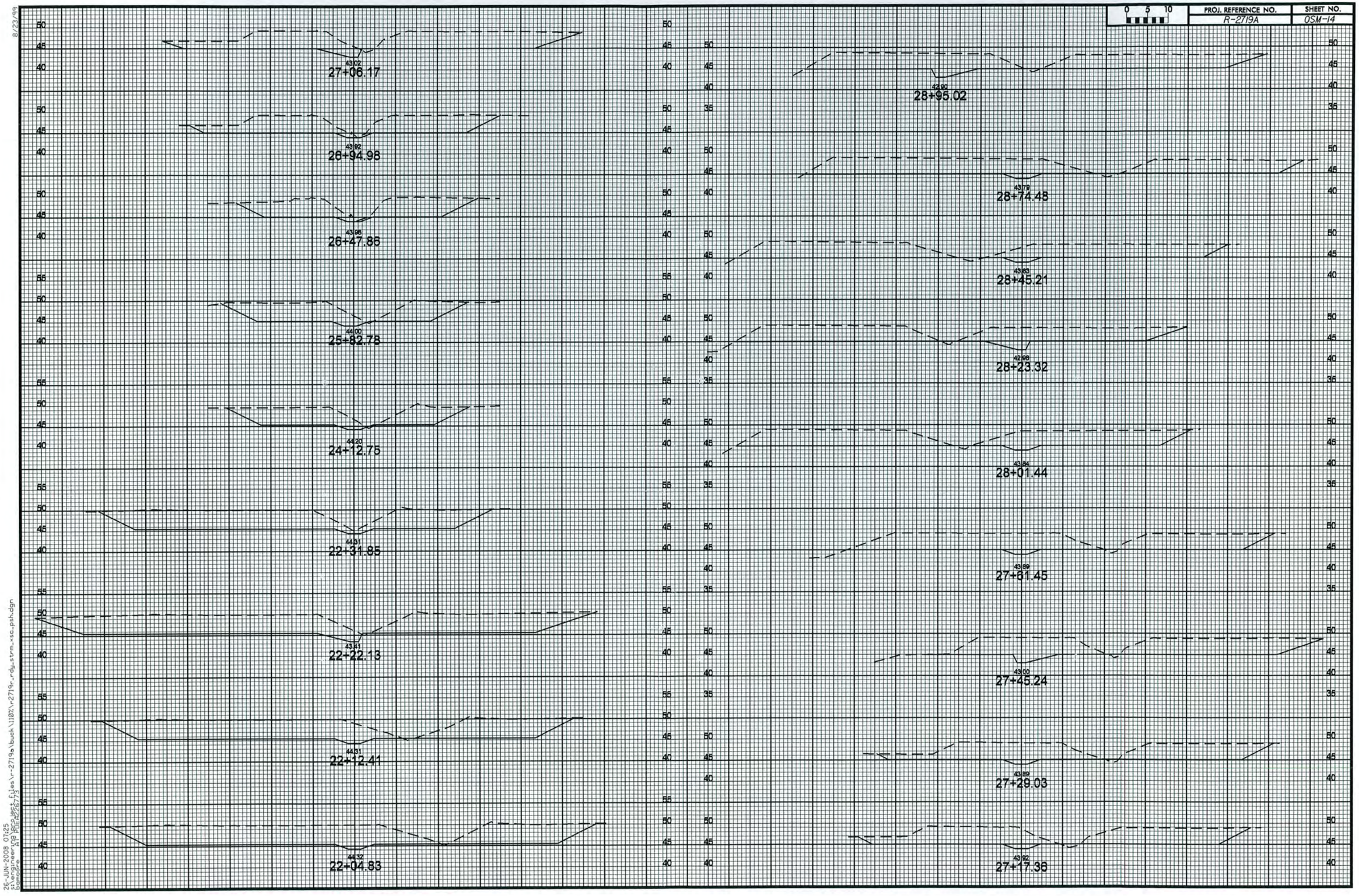

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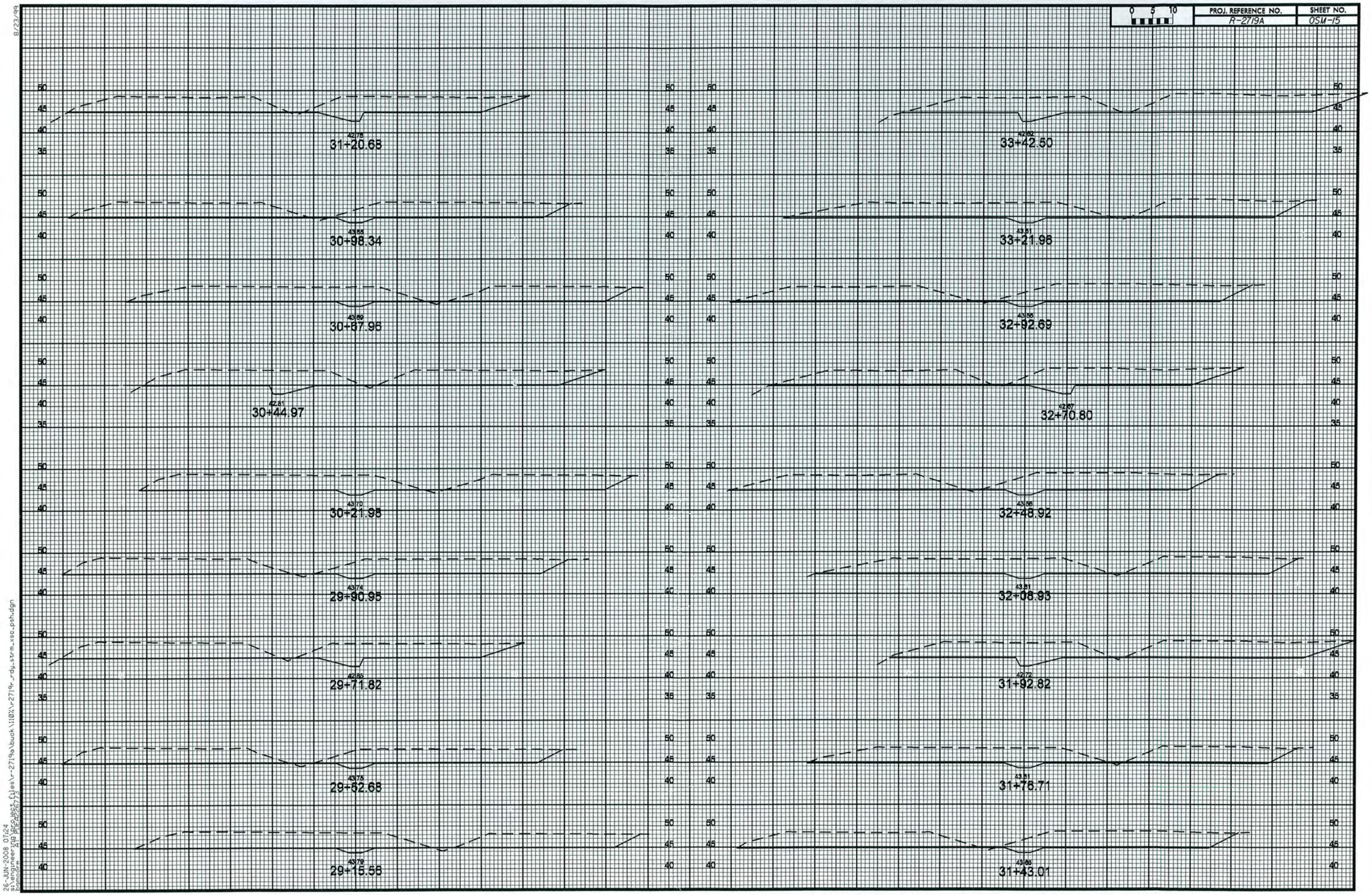

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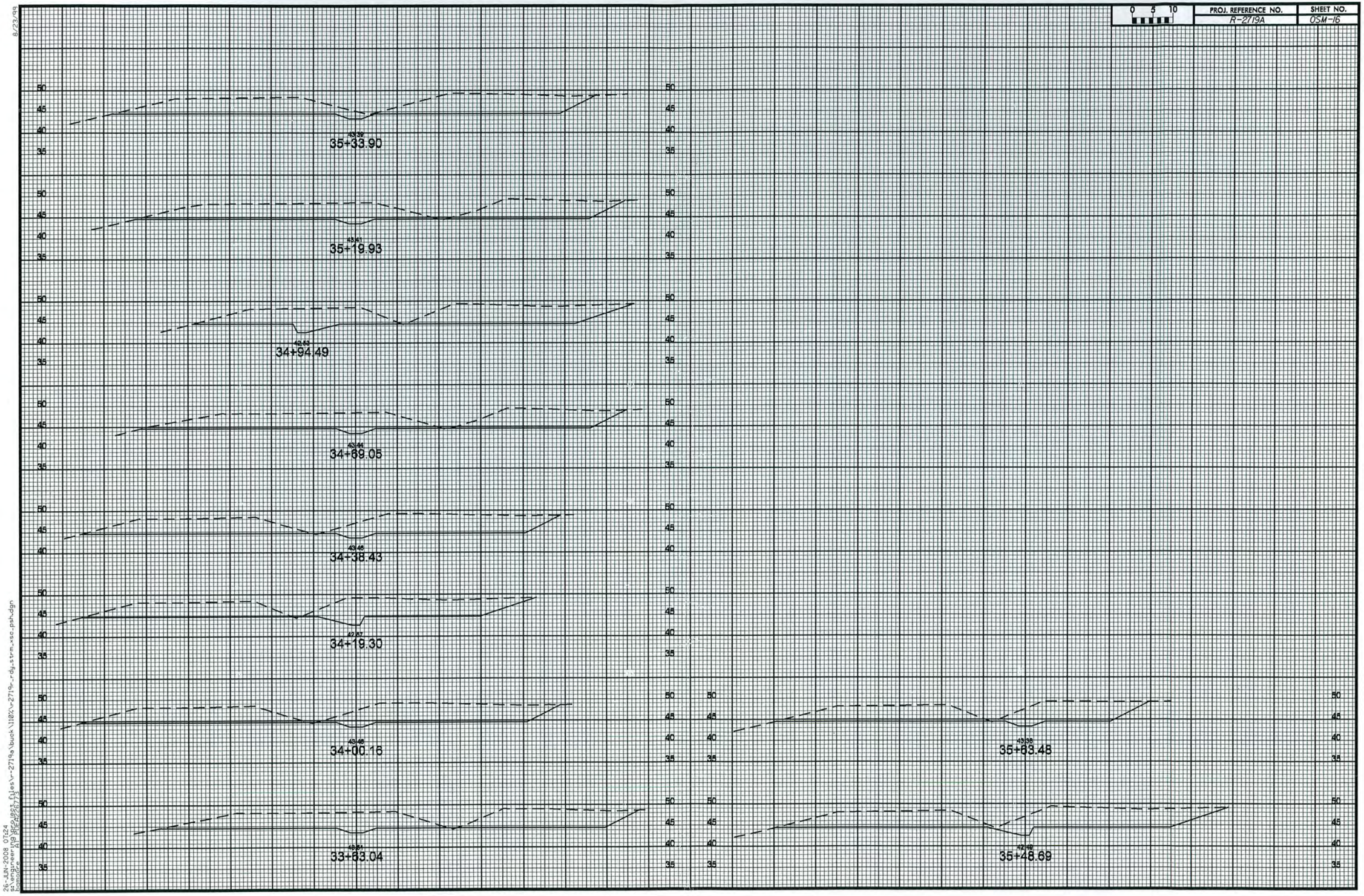
R-2719A	OSM-16



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