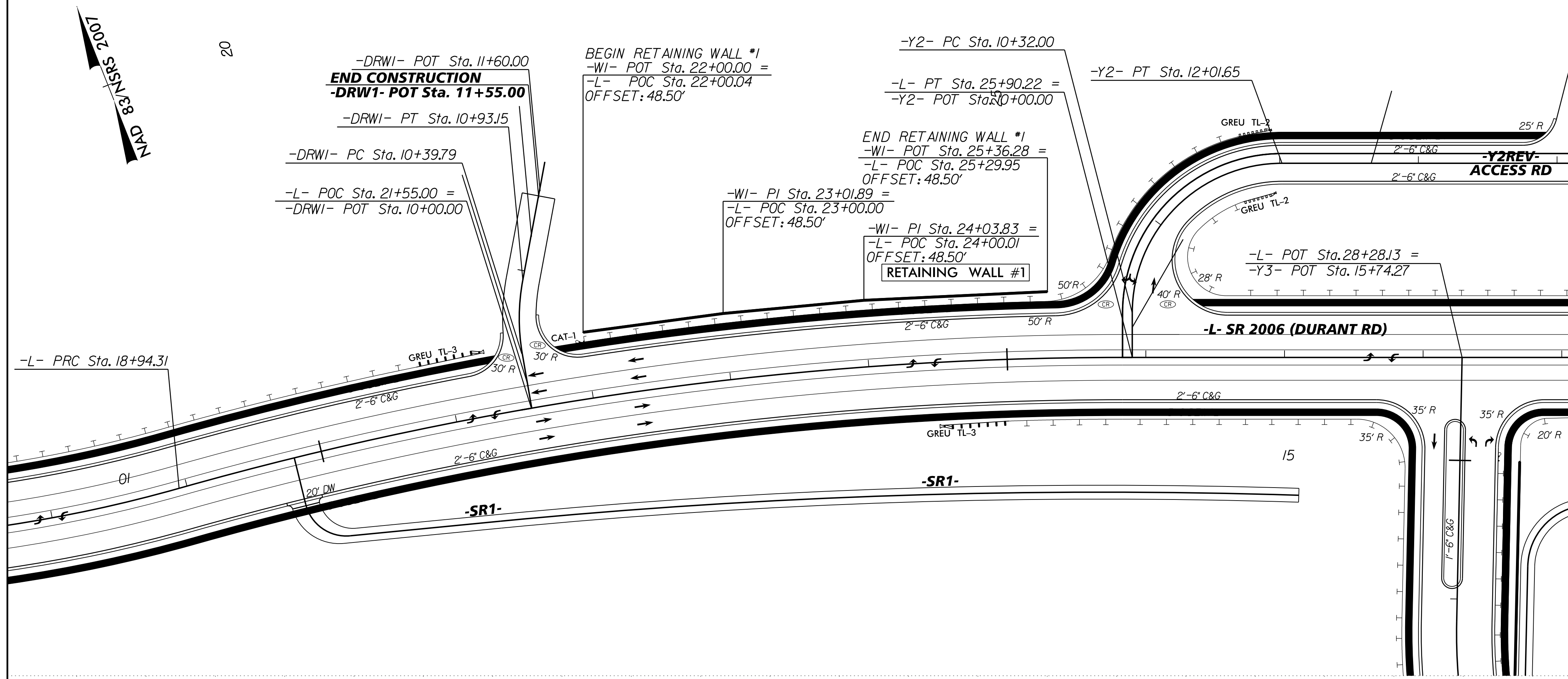


RETAINING WALL #1 ENVELOPE

25

Kimley Horn
 421 FAYETTEVILLE STREET, SUITE 600
 RALEIGH, N.C. 27601

PROJECT REFERENCE NO. P-5720	SHEET NO. W-1
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	GEOTECHNICAL ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

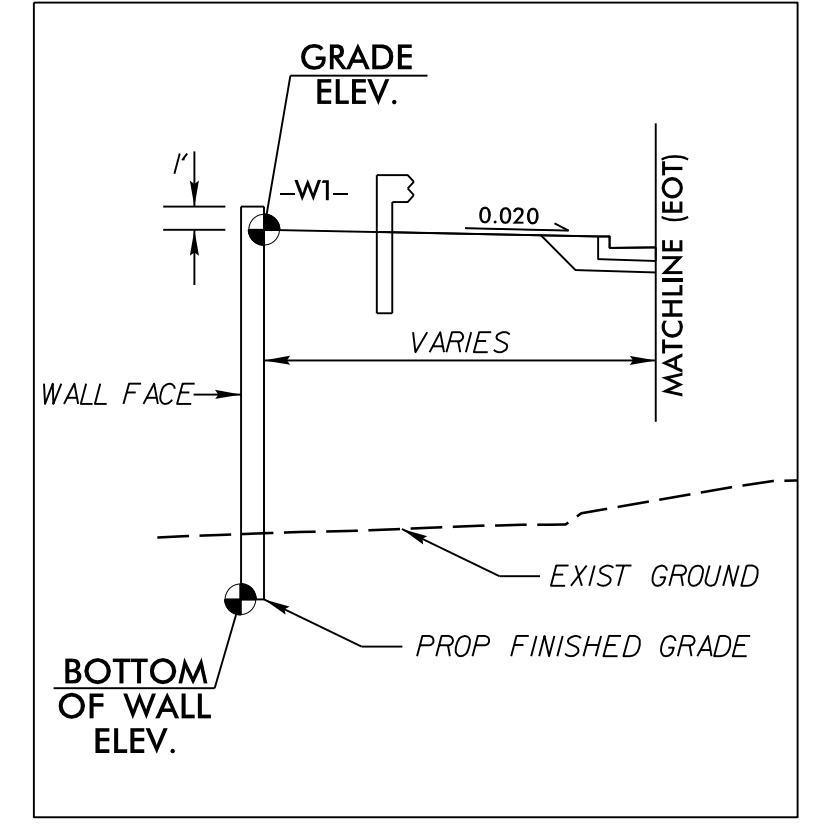


-L-
 PI Sta 22+40.96
 $\Delta = 15' 47' 19.4" (RT)$
 $D = 2' 17' 30.6"$
 $L = 688.9'$
 $T = 346.65'$
 $R = 2,500.00'$
 $SE = 0.03$

-Y3-
 PI Sta 12+21.27
 $\Delta = 16' 38' 57.7" (LT)$
 $D = 14' 19' 26.2"$
 $L = 116.23'$
 $T = 58.53'$
 $R = 400.00'$
 $SE = RC$

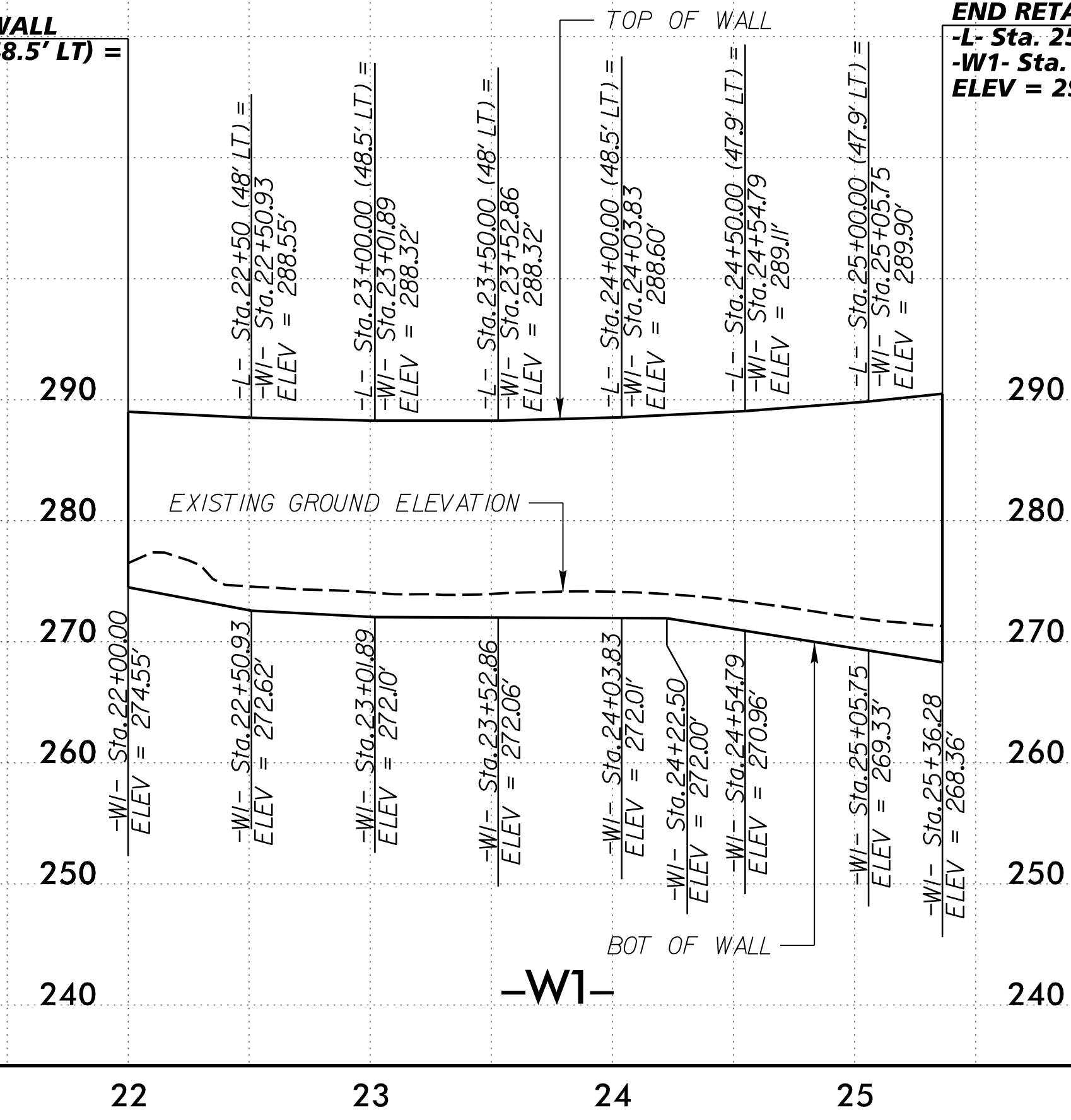
PI Sta 13+31.52
 $\Delta = 14' 58' 04.0" (RT)$
 $D = 14' 19' 26.2"$
 $L = 104.49'$
 $T = 52.55'$
 $R = 400.00'$
 $SE = RC$

-Y2-
 PI Sta 11+40.00
 $\Delta = 90' 00' 00.0" (RT)$
 $D = 53' 03' 06.0"$
 $L = 169.65'$
 $T = 108.00'$
 $R = 108.00'$
 $SE = 0.03$



BEGIN RETAINING WALL
 -L- Sta. 22+00.04 (48.5' LT) =
 -W1- Sta. 22+00.00
 ELEV = 289.05'

END RETAINING WALL
 -L- Sta. 25+29.95 (48.5' LT) =
 -W1- Sta. 25+36.28
 ELEV = 290.55'

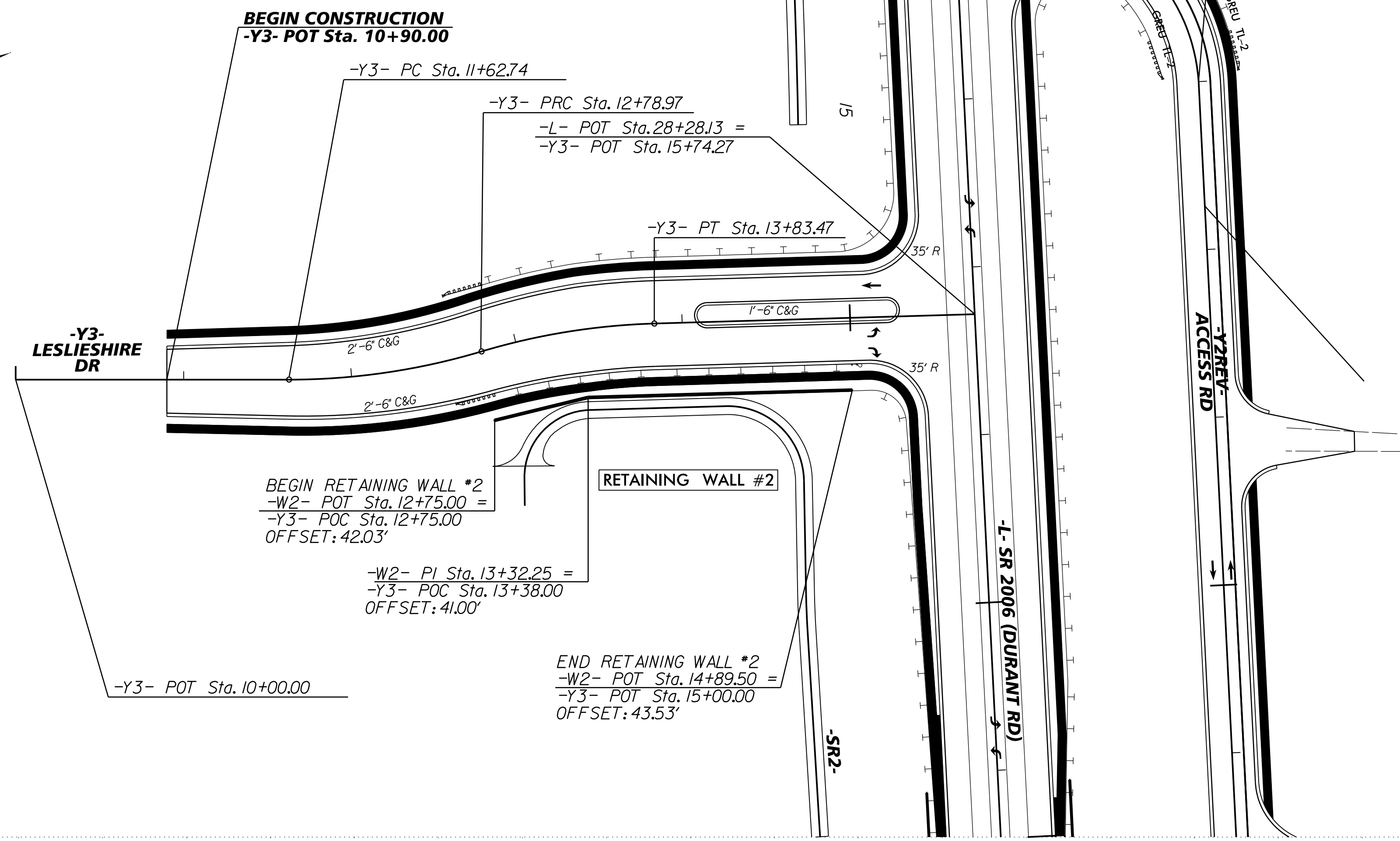
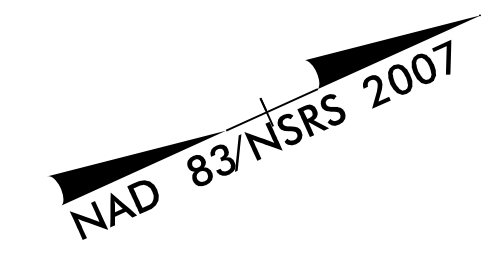


ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO. 1	7120 SF

REVISIONS

\$DATE\$

RETAINING WALL #2 ENVELOPE



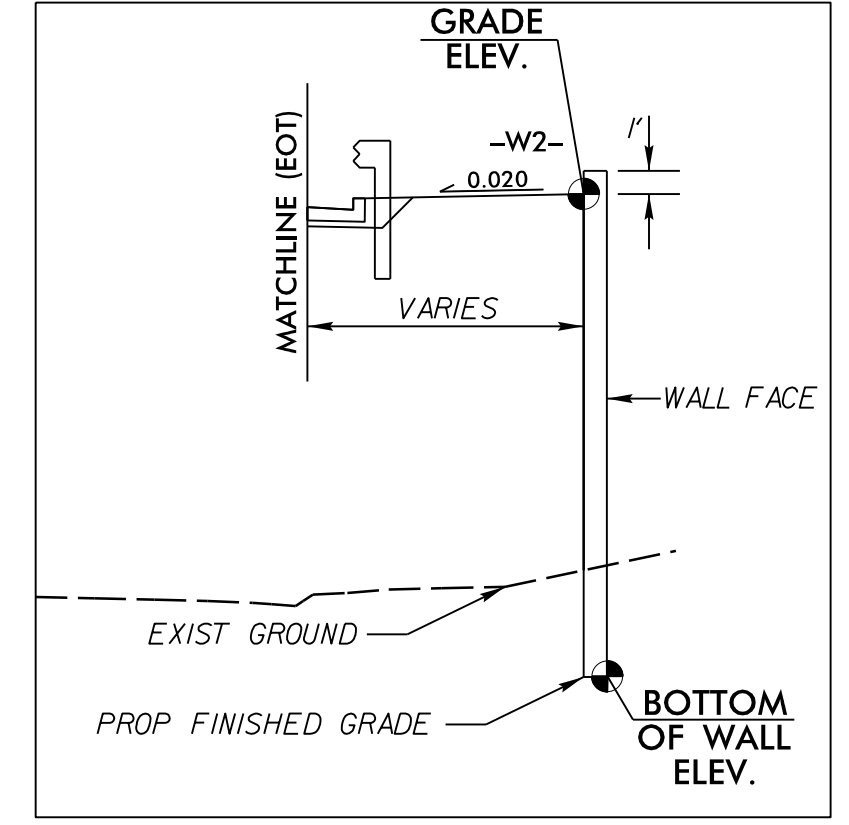
Kimley Horn
 421 FAYETTEVILLE STREET, SUITE 600
 RALEIGH, N.C. 27601

PROJECT REFERENCE NO. P-5720	SHEET NO. W-2
RW SHEET NO.	GEOTECHNICAL ENGINEER
ROADWAY DESIGN ENGINEER	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

-L-
 PI Sta 22+40.96
 Δ = 15° 47' 19.4" (RT)
 D = 2' 17" 30.6"
 L = 688.9'
 T = 346.65'
 R = 2,500.00'
 SE = 0.03

-Y3-
 PI Sta 12+21.27 Δ = 16° 38' 57.7" (LT)
 PI Sta 13+31.52 Δ = 14° 58' 04.0" (RT)
 D = 14° 19' 26.2" D = 14° 19' 26.2"
 L = 116.23' L = 104.49'
 T = 58.53' T = 52.55'
 R = 400.00' R = 400.00'
 SE = RC SE = RC

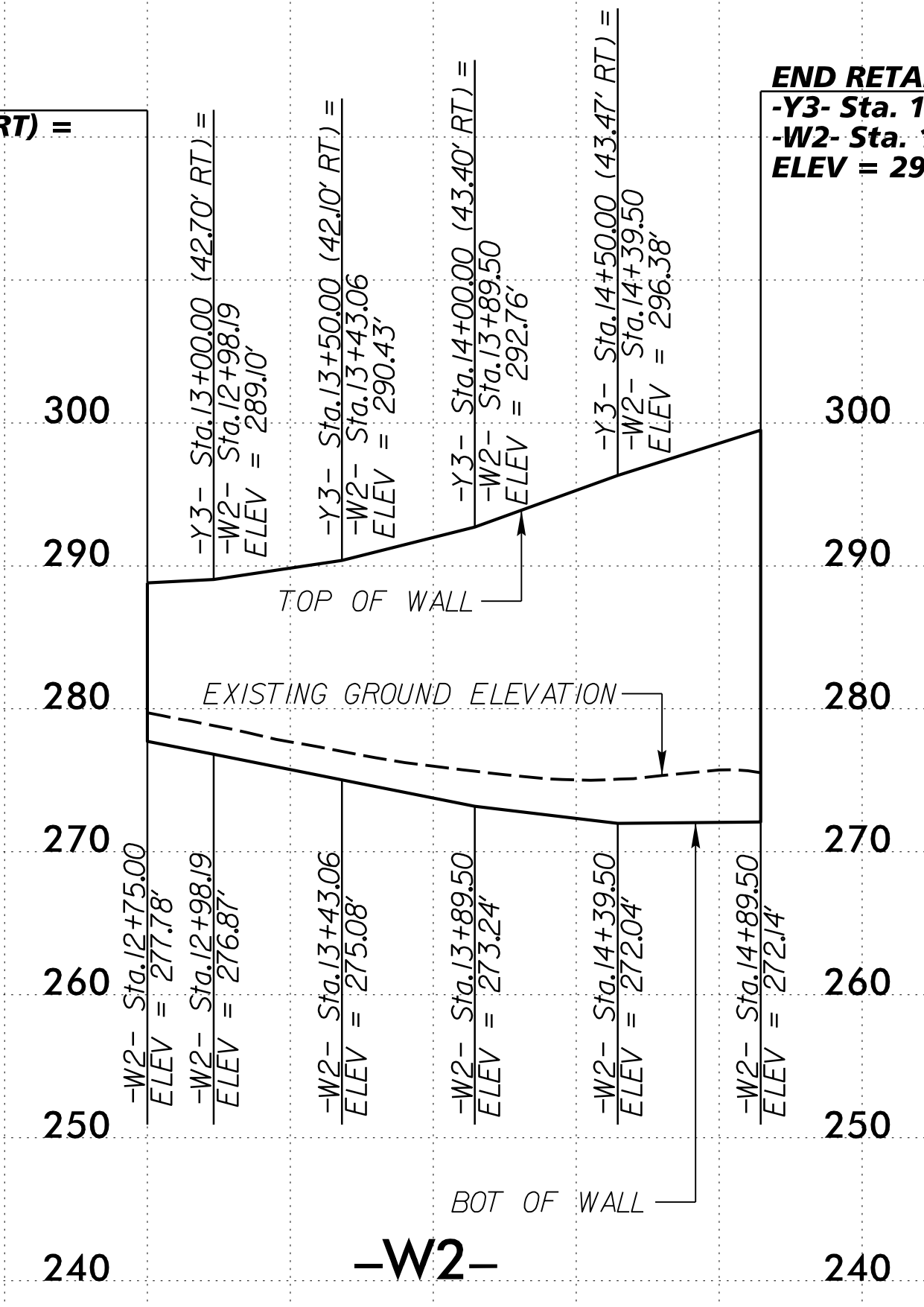
-Y2-
 PI Sta 11+40.00
 Δ = 90° 00' 00.0" (RT)
 D = 53° 03' 06.0"
 L = 169.65'
 T = 108.00'
 R = 108.00'
 SE = 0.03



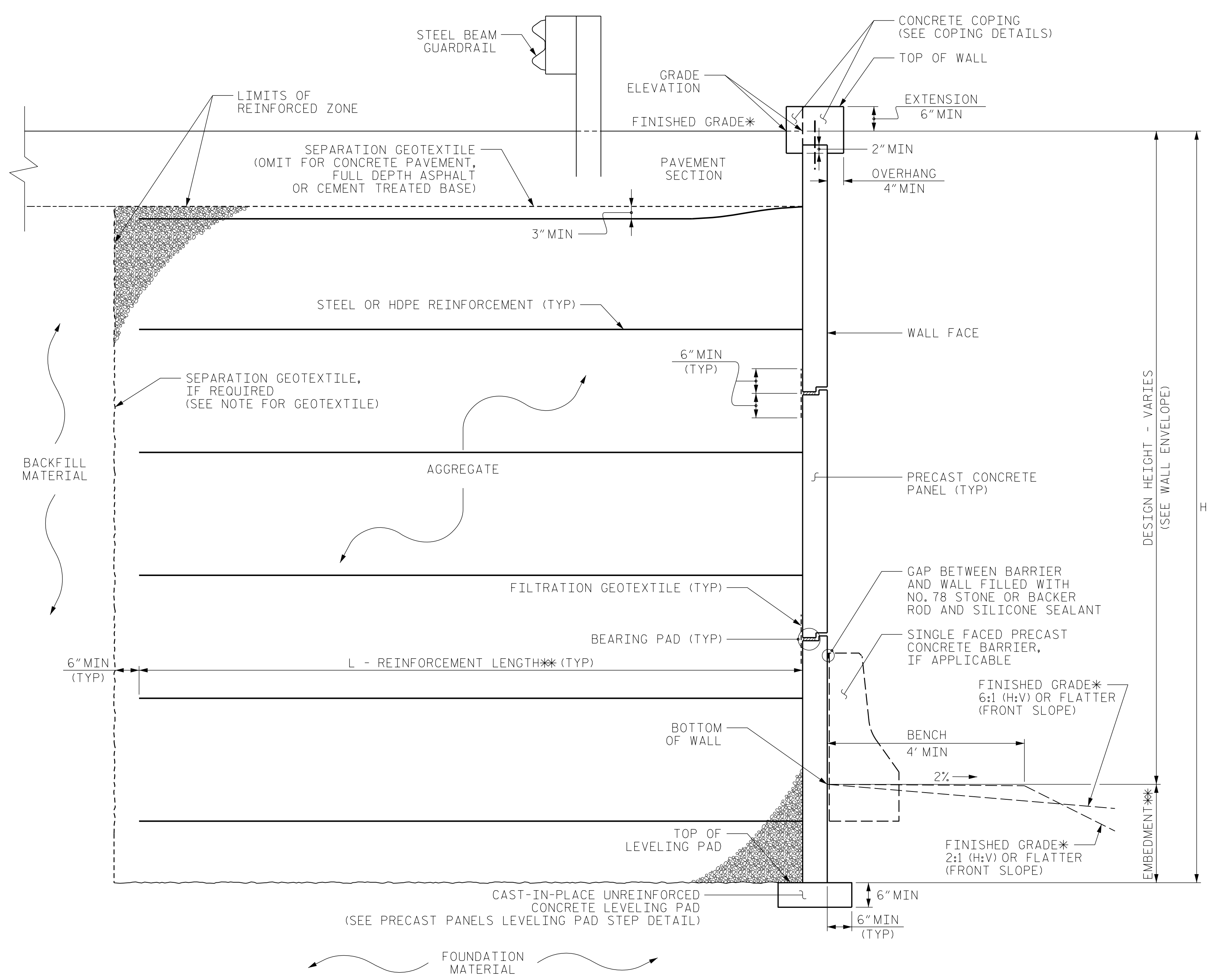
REVISIONS

BEGIN RETAINING WALL
 -Y3- Sta. 12+75.00 (42' RT) =
 -W2- Sta. 12+75.00
 ELEV = 288.86'

END RETAINING WALL
 -Y3- Sta. 15+00.00 (43.54' RT) =
 -W2- Sta. 14+89.50
 ELEV = 299.55'

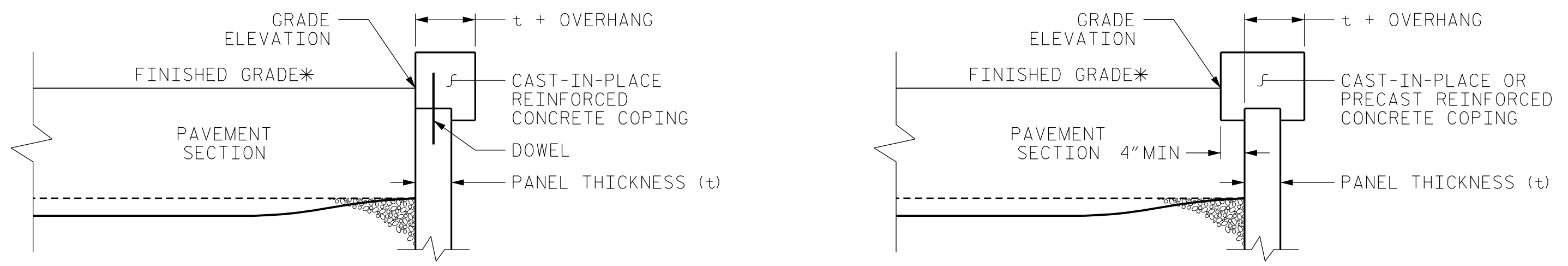


ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO. 1	4520 SF



MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

**SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS. *SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS. *SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

GEOTECHNICAL ENGINEER DecSigned by: <u>Jeremy R Hamm</u> 9/13/2021 SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

PROJECT NO.: P-5720
 WAKE COUNTY
 STATION: -W1- & -W2-
 SHEET 3 OF 8

**RETAINING WALLS NO. 1 AND NO. 2
-W1- & -W2-
WITH PANELS AND GUARDRAIL
TYPICAL & COPING DETAILS**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-3
2			4			

PREPARED BY: S. C. CROCKETT	DATE: 11/28/18
REVIEWED BY: J. R. HAMM	DATE: 11/30/18

**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS -W1- & -W2-.

A SEPARATION GEOTEXTILE IS NOT REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS -W1- & -W2-

A DRAIN IS NOT REQUIRED FOR RETAINING WALLS -W1- & -W2-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS -W1- & -W2-, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALL -W1- FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 5700 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8H
- 5) MINIMUM EMBEDMENT DEPTH = 4 FT
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	115	28	0

DESIGN RETAINING WALL -W2- FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 7100 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7H
- 5) MINIMUM EMBEDMENT DEPTH = 2 FT
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:


MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	125	34	0

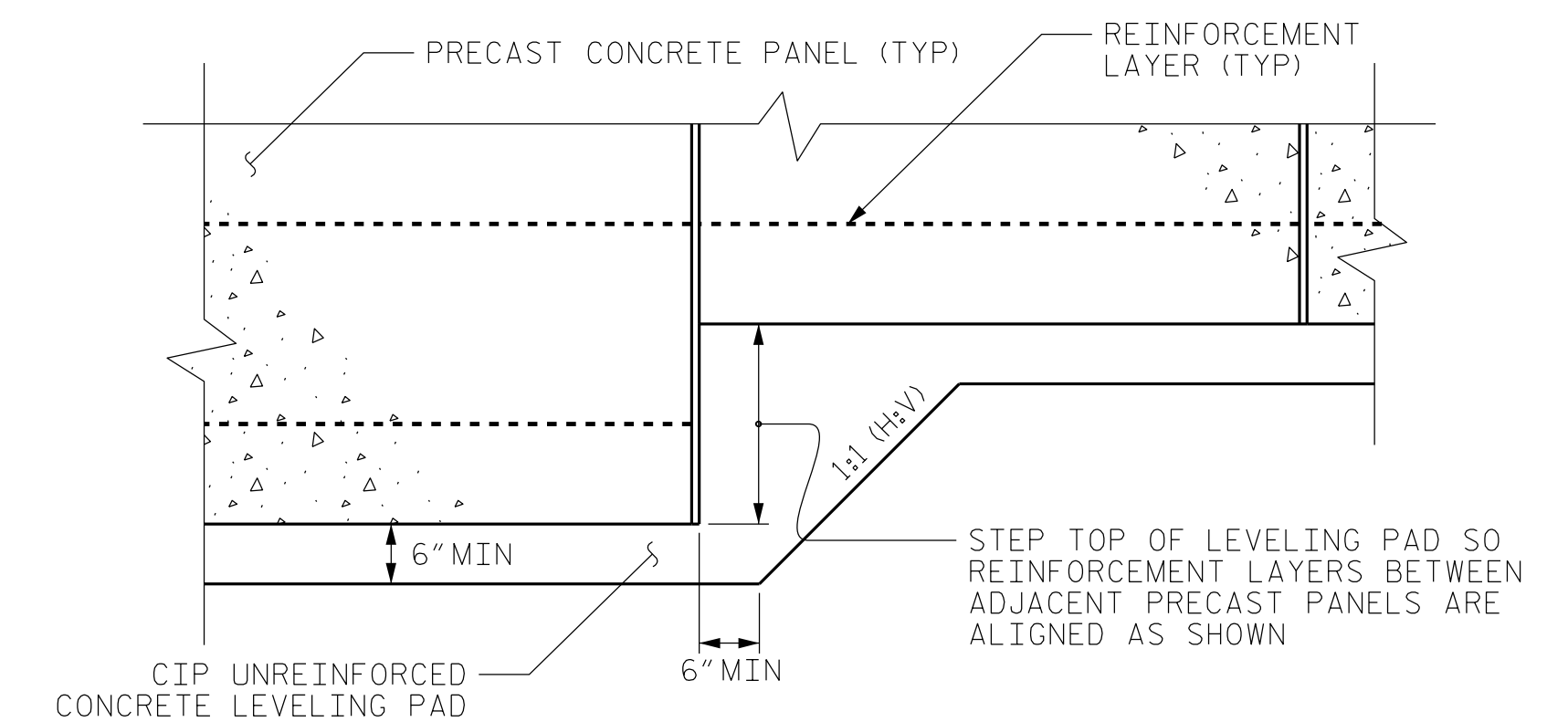
DESIGN RETAINING WALLS -W1- & -W2- FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS -W1- & -W2-.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALLS -W1- & -W2- UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED. IF UNSTABLE MATERIAL EXISTS AT THE REQUIRED EMBEDMENT DEPTH, REMOVE AND REPLACE WITH ADDITIONAL COARSE AGGREGATE AS DIRECTED BY THE ENGINEER.


AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALLS -W1- & -W2-. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.

GEOTECHNICAL ENGINEER  DocuSigned by: Jeremy R Hamm 9/13/2021 SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



PRECAST PANELS
LEVELING PAD STEP DETAIL

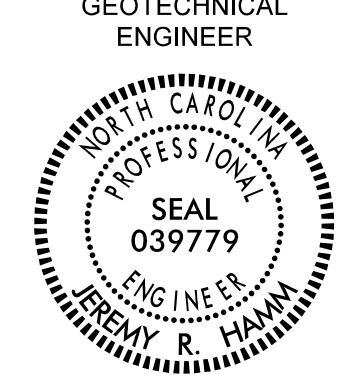
PROJECT NO.: P-5720
 WAKE COUNTY
 STATION: -W1- & -W2-
 SHEET 4 OF 8

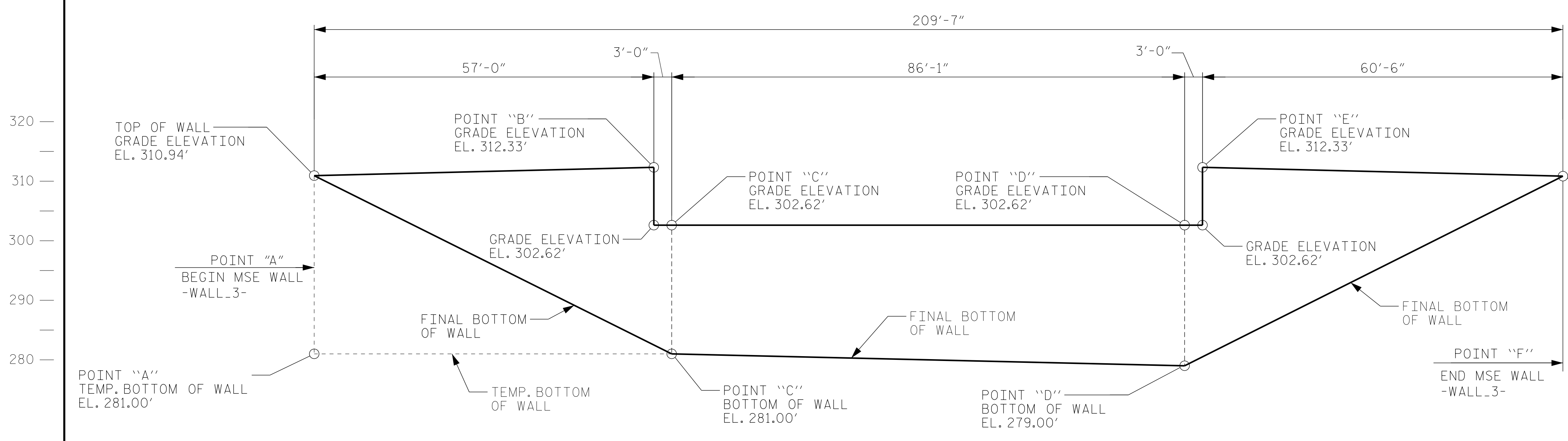
	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT
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**RETAINING WALLS NO. 1 AND NO. 2
-W1- & -W2-
NOTES AND PRECAST PANELS
LEVELING PAD STEP DETAIL**

REVISIONS						SHEET NO. W-4
NO.	BY	DATE	NO.	BY	DATE	
1			3			
2			4			

PREPARED BY: S. C. CROCKETT	DATE: 11/28/18
REVIEWED BY: J. R. HAMM	DATE: 11/30/18

GEOTECHNICAL ENGINEER  DocuSigned by: Jeremy R Hamm 9/13/2021	ENGINEER SIGNATURE _____ DATE _____
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



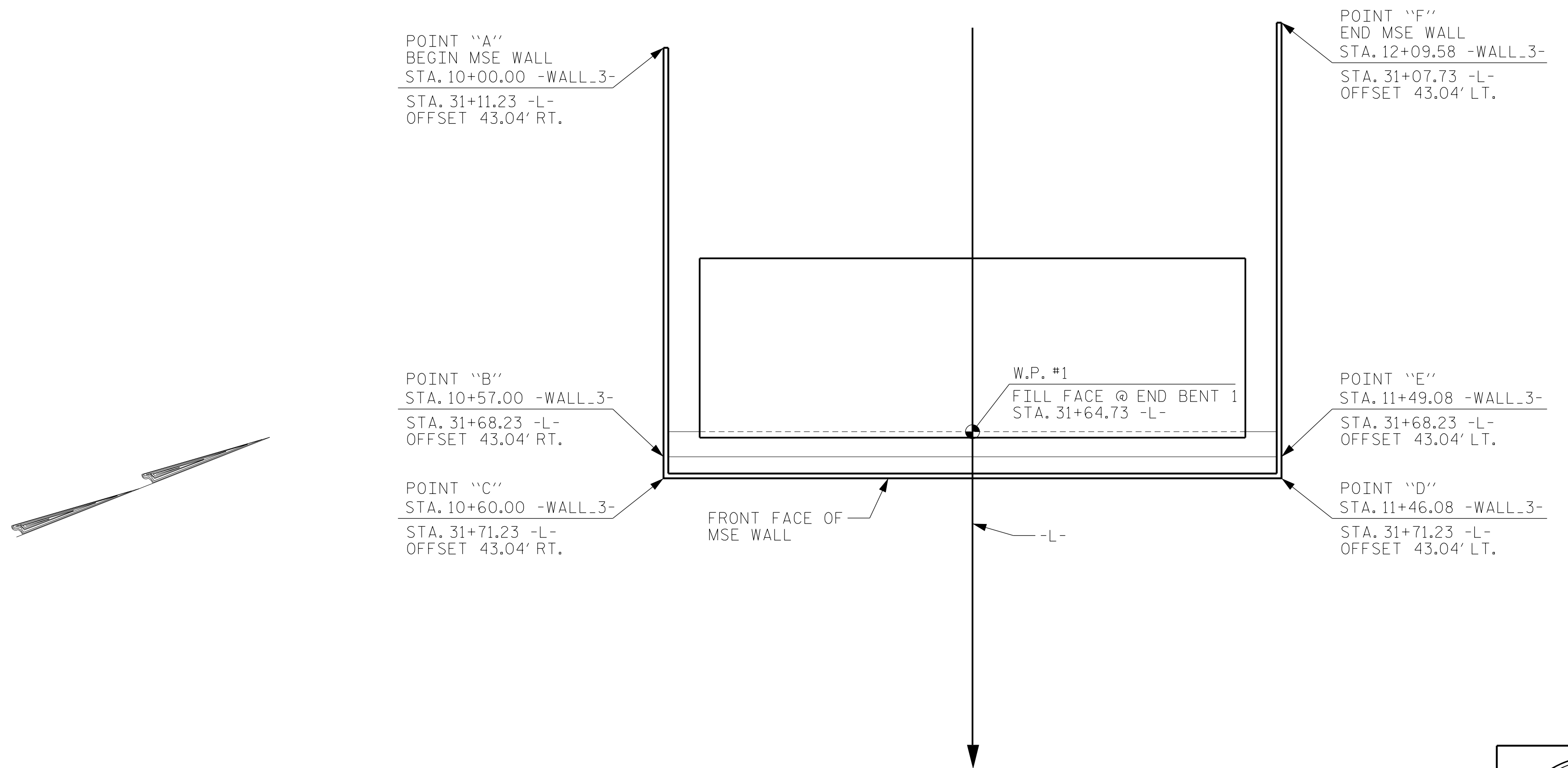
ELEVATION OF MSE RETAINING WALL NO. 3 AT END BENT 1
 LOOKING DOWNSTATION
 (ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL)

NOTES

TEMPORARY SHORING WALL (BY OTHERS) CONNECTS TO END OF MSE WALL ON SOUTH SIDE OF BRIDGE AND IS NOT SHOWN.

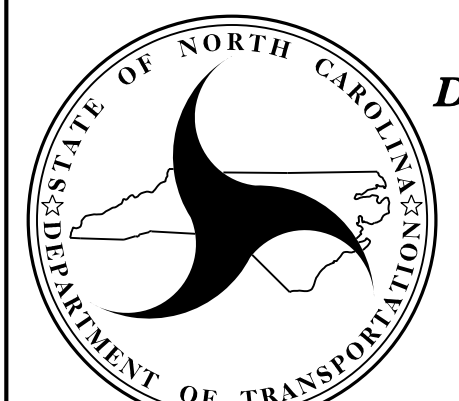
IN THE FINAL CONDITION, A PORTION OF THE MSE WALL ON THE SOUTH SIDE WILL BE BURIED AS INDICATED IN THE ELEVATION VIEW ON THIS SHEET.

ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO. 3	5590 SF



PLAN OF MSE WALL AT END BENT 1
 (BRIDGE SUPERSTRUCTURE NOT SHOWN FOR CLARITY)

PROJECT NO.: P-5720
 WAKE COUNTY
 STATION: -WALL_3-
 SHEET 5 OF 8

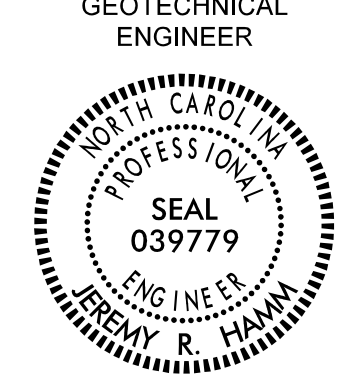

**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**
**GEOTECHNICAL
ENGINEERING UNIT**

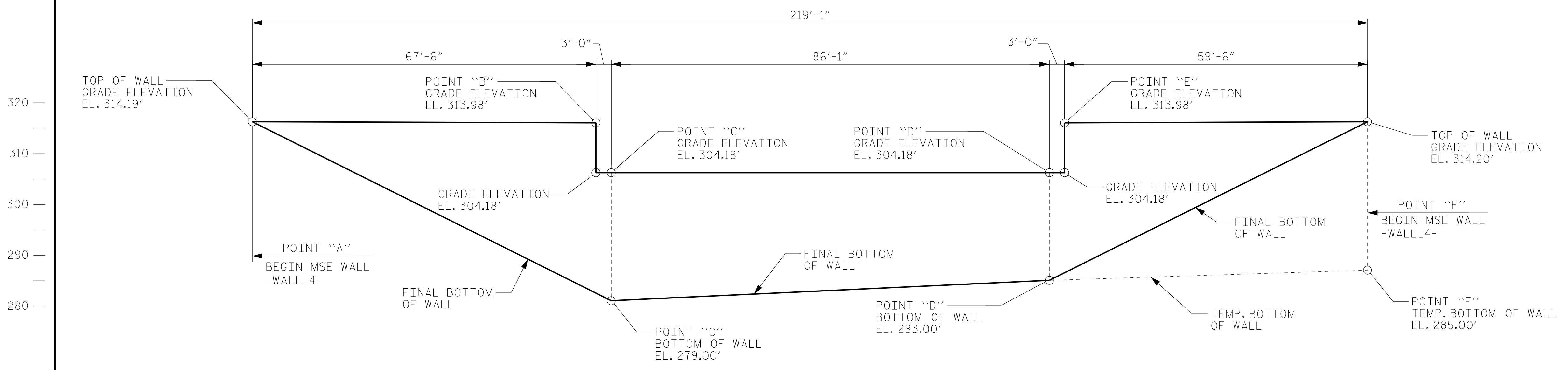
RETAINING WALL #3 -WALL 3- WALL PLAN AND ENVELOPE					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	HUNSBERGER, W. S.	08/12/20	3	-	-
2	-	-	4	-	-

S. C. CROCKETT	DATE: 1/21/19
J. R. HAMM	DATE: 1/21/19

\$DATE\$

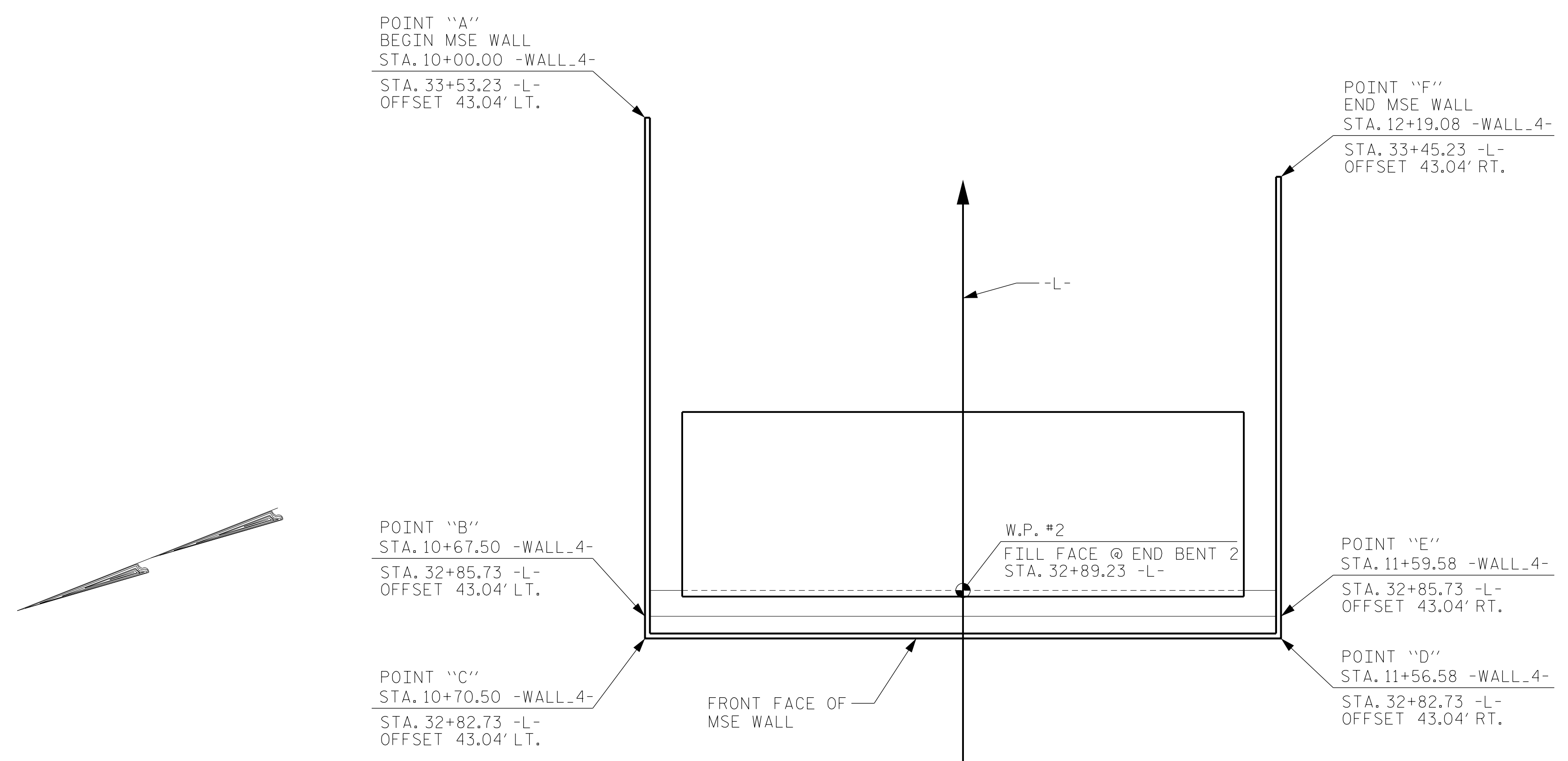
SHEET NO.
W-5

GEOTECHNICAL ENGINEER  Documented by: Signature: <u>Jeremy R. Hamm</u> DATE: 9/13/2021 SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



ELEVATION OF MSE RETAINING WALL NO. 4 AT END BENT 2
 LOOKING UPSTATION
 (ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL)

ESTIMATED MSE WALL QUANTITIES (SQUARE FEET)	
MSE RETAINING WALL NO. 4	5820 SF

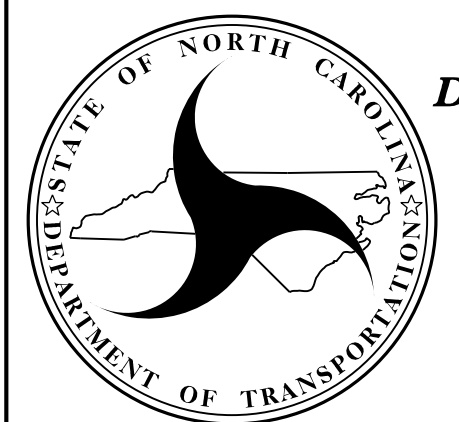


PLAN OF MSE WALL AT END BENT 2
 (BRIDGE SUPERSTRUCTURE NOT SHOWN FOR CLARITY)

NOTES

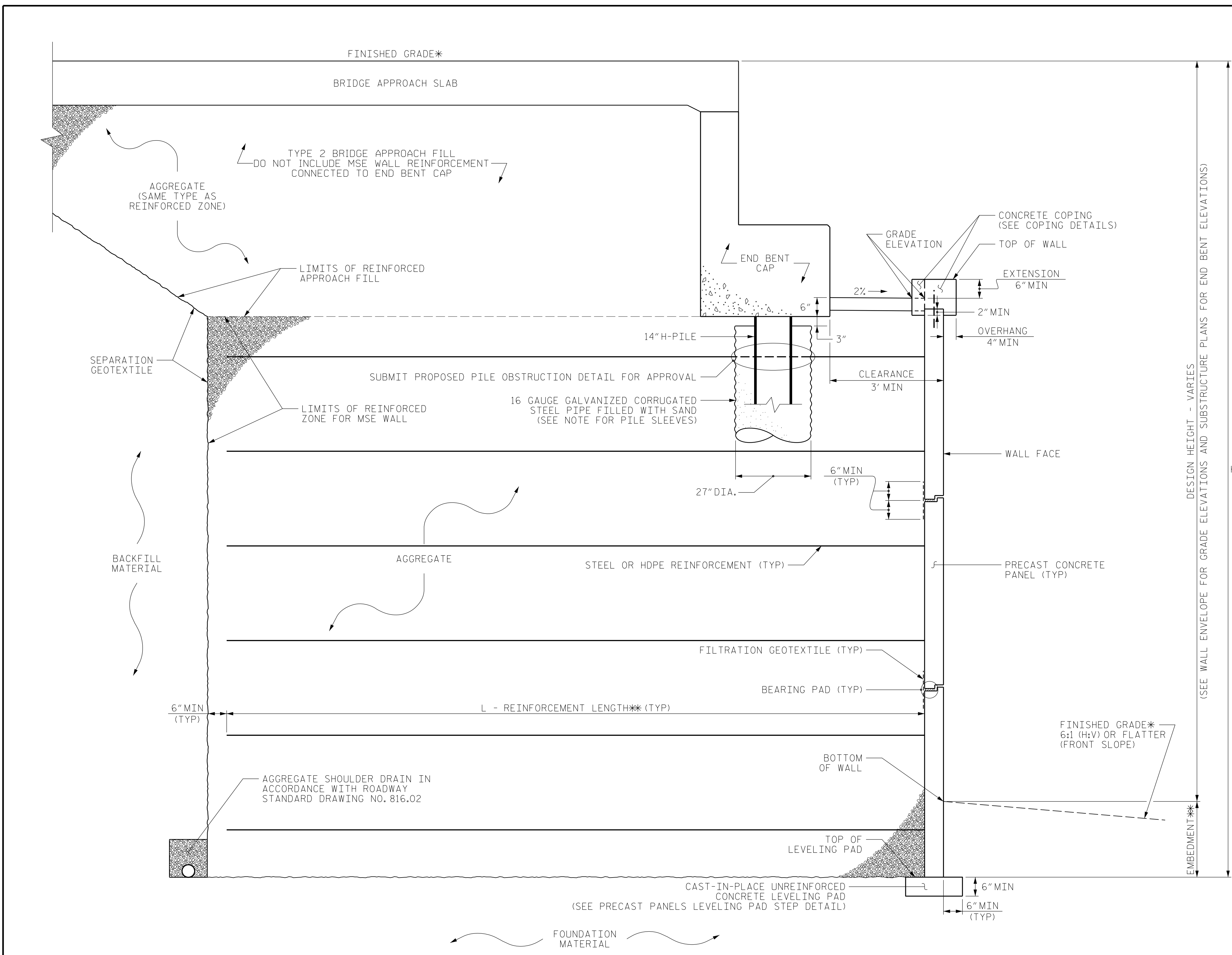
TEMPORARY SHORING WALL (BY OTHERS) CONNECTS TO END OF MSE WALL ON SOUTH SIDE OF BRIDGE AND IS NOT SHOWN.
 IN THE FINAL CONDITION, A PORTION OF THE MSE WALL ON THE SOUTH SIDE WILL BE BURIED AS INDICATED IN THE ELEVATION VIEW ON THIS SHEET.

PROJECT NO.: P-5720
 WAKE COUNTY
 STATION: -WALL_4-
 SHEET 6 OF 8


**NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS**
**GEOTECHNICAL
 ENGINEERING UNIT**

REVISIONS						SHEET NO. W-6
NO.	BY	DATE	NO.	BY	DATE	
1	HUNSBERGER, W. S.	08/12/20	3	-	-	
2	-	-	4	-	-	

S. C. CROCKETT	DATE: 11/28/18
J. R. HAMM	DATE: 11/30/18



MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION

GEOTECHNICAL ENGINEER

ENGINEER

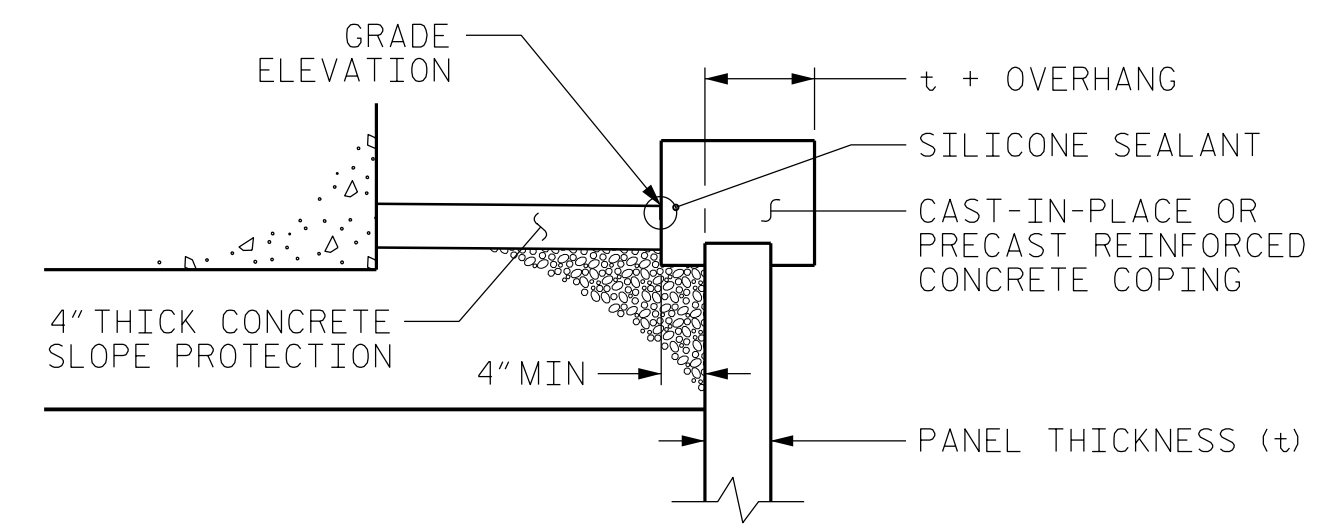
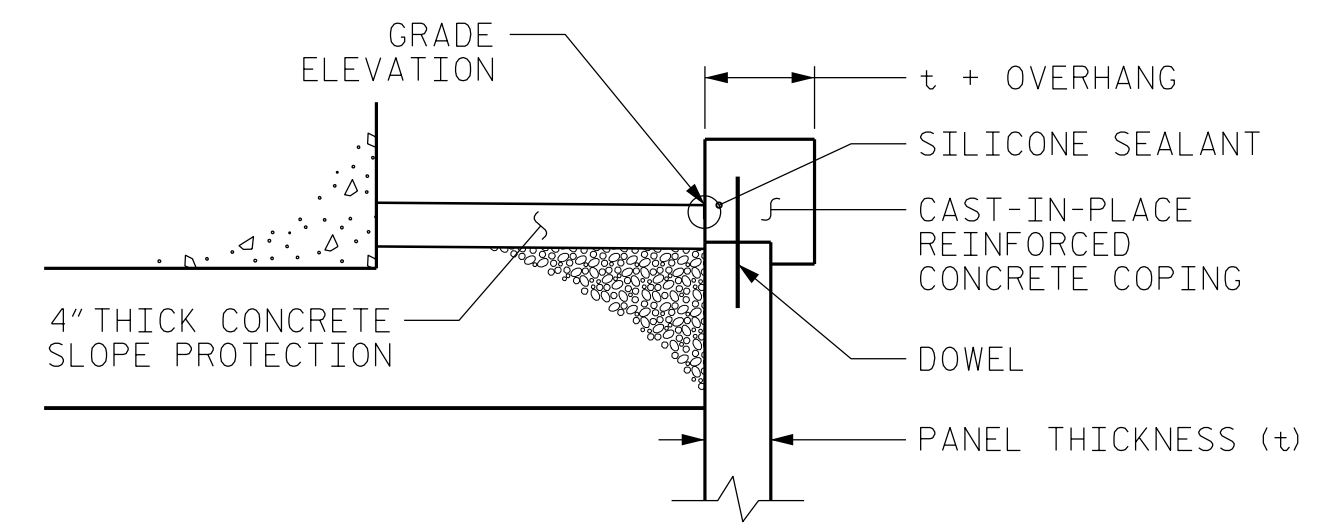
SEAL
039779
ENGINEER
JEREMY R. HAMM

DocuSigned by:
Jeremy Hamm
45220208B5C44A

1/8/2024

SIGNATURE DATE SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

PROJECT NO.: P-5720

WAKE COUNTY

STATION: -WALL 3- & -WALL 4-

SHEET 7 OF 8

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

RETAINING WALLS NO. 3 AND NO. 4 -WALL 3- & -WALL 4- MSE ABUTMENT WALL WITH PANELS, END BENTS ON H-PILES AND PILE SLEEVES TYPICAL & COPING DETAILS

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-7
2			4			

PREPARED BY: S. C. CROCKETT	DATE: 11/28/18
REVIEWED BY: J. R. HAMM	DATE: 11/30/18

NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS -WALL 3- & -WALL 4-
 A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS -WALL 3- & -WALL 4-
 A DRAIN IS REQUIRED FOR RETAINING WALLS -WALL 3- & -WALL 4-

PILE SLEEVES ARE REQUIRED AROUND PILES FOR ALL END BENTS. END BENTS ARE LOCATED AT THE FOLLOWING STATIONS:
 -WALL 3- END BENT NO.1 STATION 31+64.73 -L-
 -WALL 4- END BENT NO.2 STATION 32+89.23 -L-

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS -WALL 3- & -WALL 4-, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALLS -WALL 3- & -WALL 4- FOR THE FOLLOWING:
 1) H = DESIGN HEIGHT + EMBEDMENT
 2) DESIGN LIFE = 100 YEARS
 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 7000 PSF
 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.75H
 5) MINIMUM EMBEDMENT DEPTH = 3.5 FT
 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (ϕ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	110	28	0

DESIGN RETAINING WALLS -WALL 3- & -WALL 4- FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN RETAINING WALLS -WALL 3- & -WALL 4- FOR A PIPE EXTENDING THROUGH THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING MSE WALL DESIGN OR CONSTRUCTION.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS -WALL 3- & -WALL 4-
 FOUNDATIONS FOR END BENTS WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS -WALL 3- & -WALL 4-. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS. END BENT LOCATIONS ARE SUMMARIZED IN ABOVE NOTE FOR PILE SLEEVES.

DESIGN RETAINING WALLS -WALL3- AND -WALL4- FOR A LATERAL LOAD FROM FOUNDATIONS LOCATED BEHIND THE MSE WALL APPLIED AS A FACTORED UNIFORM PRESSURE OF 600 PSF TO THE BACK OF PANELS WITHIN THE UPPER 10 FEET OF THE WALL.


INSTALL PILE SLEEVES FOR END BENT NO.1 LOCATED AT STATION 31+64.73 -L- WHILE CONSTRUCTING RETAINING WALL -WALL 3-. OBSERVE A 1 MONTH WAITING PERIOD AFTER CONSTRUCTING THE MSE ABUTMENT WALL TO WITHIN 1 FT OF THE BOTTOM OF CAP ELEVATION. THEN, INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

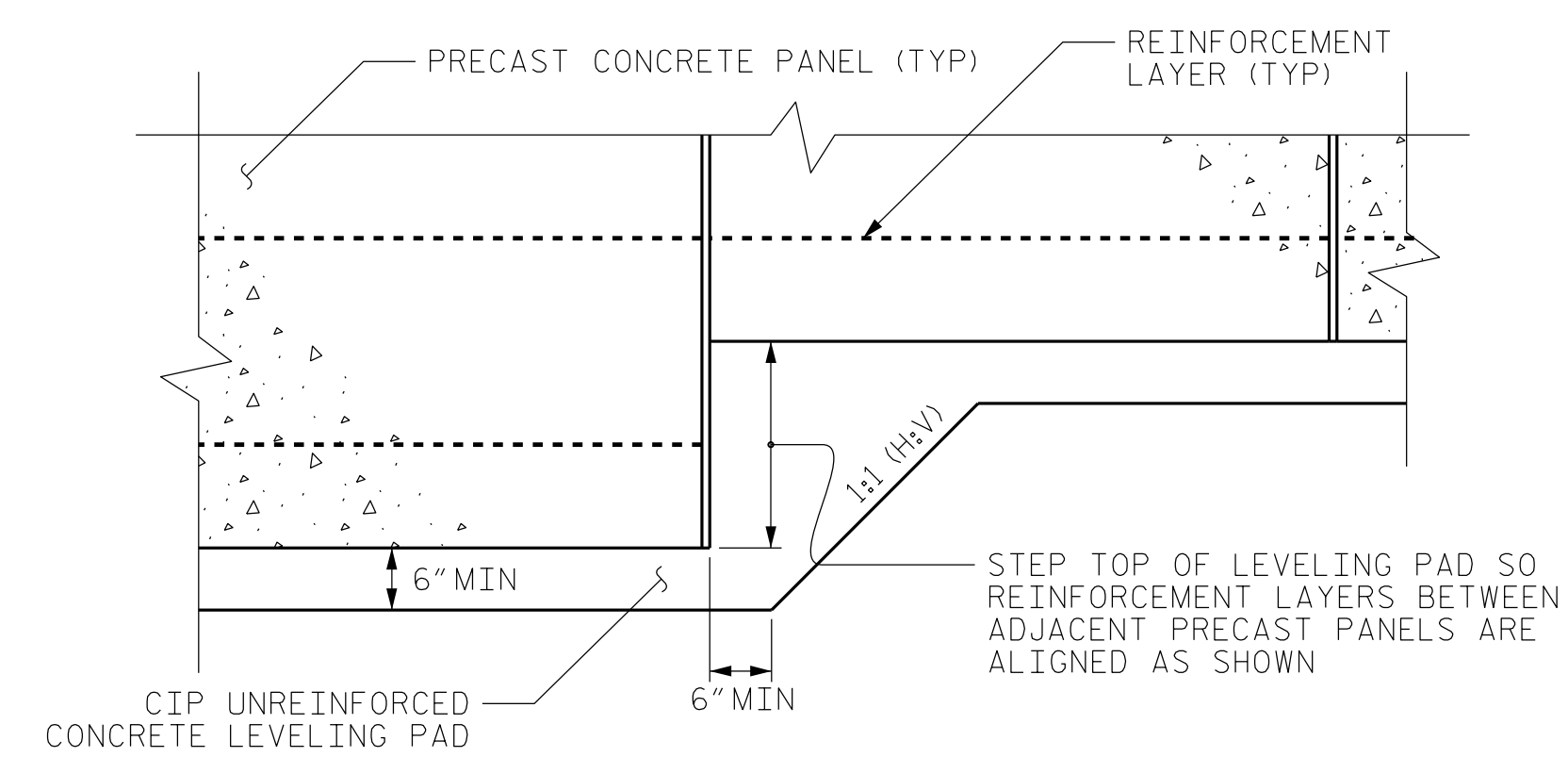
INSTALL PILE SLEEVES FOR END BENT NO.2 LOCATED AT STATION 32+89.23 -L- WHILE CONSTRUCTING RETAINING WALL -WALL 4-. OBSERVE A 1 MONTH WAITING PERIOD AFTER CONSTRUCTING THE MSE ABUTMENT WALL TO WITHIN 1 FT OF THE BOTTOM OF CAP ELEVATION. THEN, INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALLS -WALL 3- & -WALL 4- UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED. IF UNSTABLE MATERIAL EXISTS AT THE REQUIRED EMBEDMENT DEPTH, REMOVE AND REPLACE WITH ADDITIONAL COARSE AGGREGATE AS DIRECTED BY THE ENGINEER.

TEMPORARY SHORING IS REQUIRED FOR RETAINING WALLS -WALL 3- & -WALL 4- IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS.


AT THE CONTRACTOR'S OPTION, "TEMPORARY SHORING FOR WALL CONSTRUCTION" MAY BE USED TO CONSTRUCT RETAINING WALLS -WALL 3- & -WALL 4-. SEE MSE RETAINING WALLS PROVISION FOR TEMPORARY SHORING FOR WALL CONSTRUCTION.

GEOTECHNICAL ENGINEER  Documented by: Signature: <u>Jeremy Hamm</u> DATE: <u>1/8/2024</u> <small>48220204882484</small> SIGNATURE DATE SIGNATURE DATE	ENGINEER SIGNATURE DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	



PRECAST PANELS
LEVELING PAD STEP DETAIL

PROJECT NO.: P-5720
WAKE COUNTY
 STATION: -WALL 3- & -WALL 4-
 SHEET 8 OF 8

	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT
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RETAINING WALLS NO. 3 AND NO. 4 -WALL 3- & -WALL 4- WITH PANELS AND GUARDRAIL TYPICAL & COPING DETAILS					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

PREPARED BY: S. C. CROCKETT	DATE: 11/28/18
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