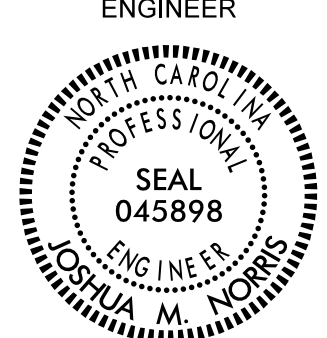


GEOTECHNICAL ENGINEER

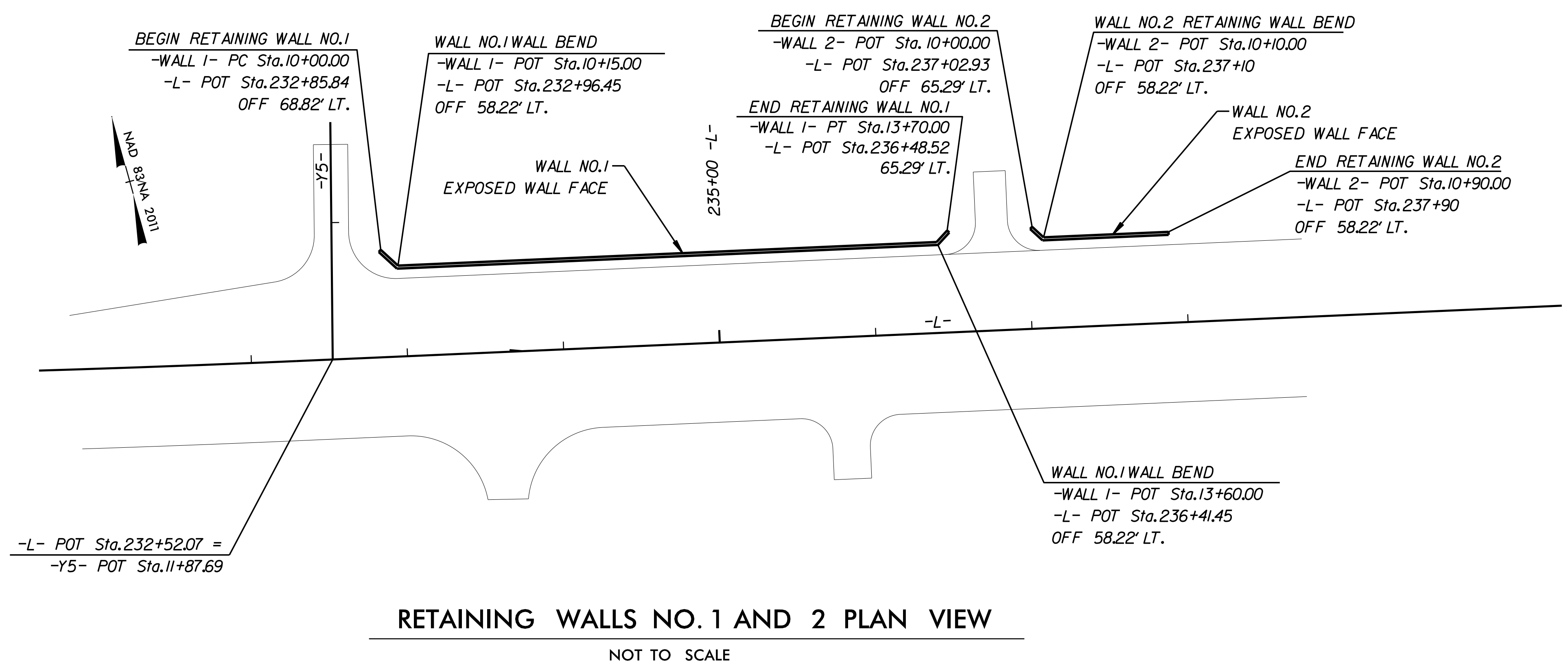
ENGINEER



DocuSigned by:  
Joshua Norris 2/28/2019

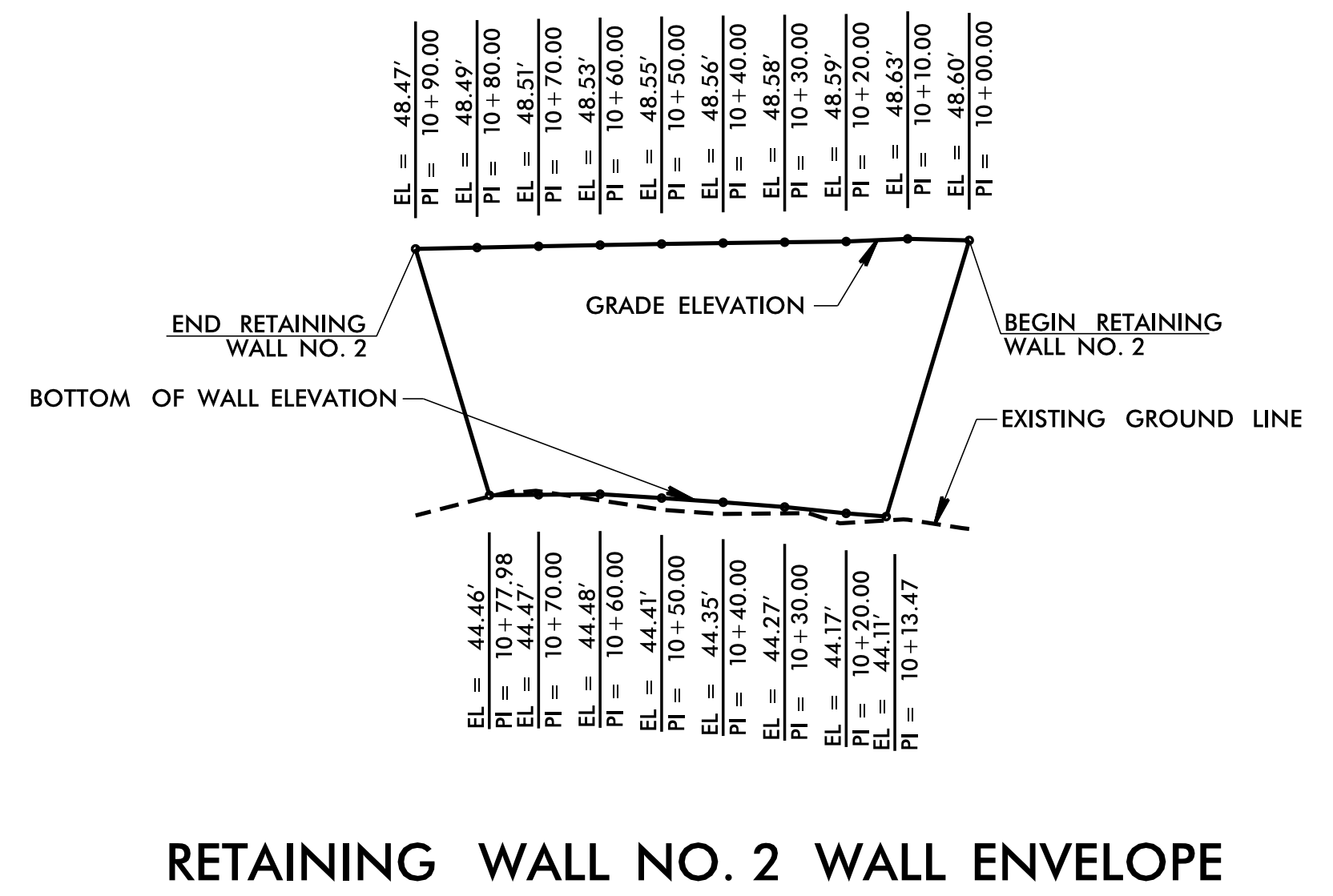
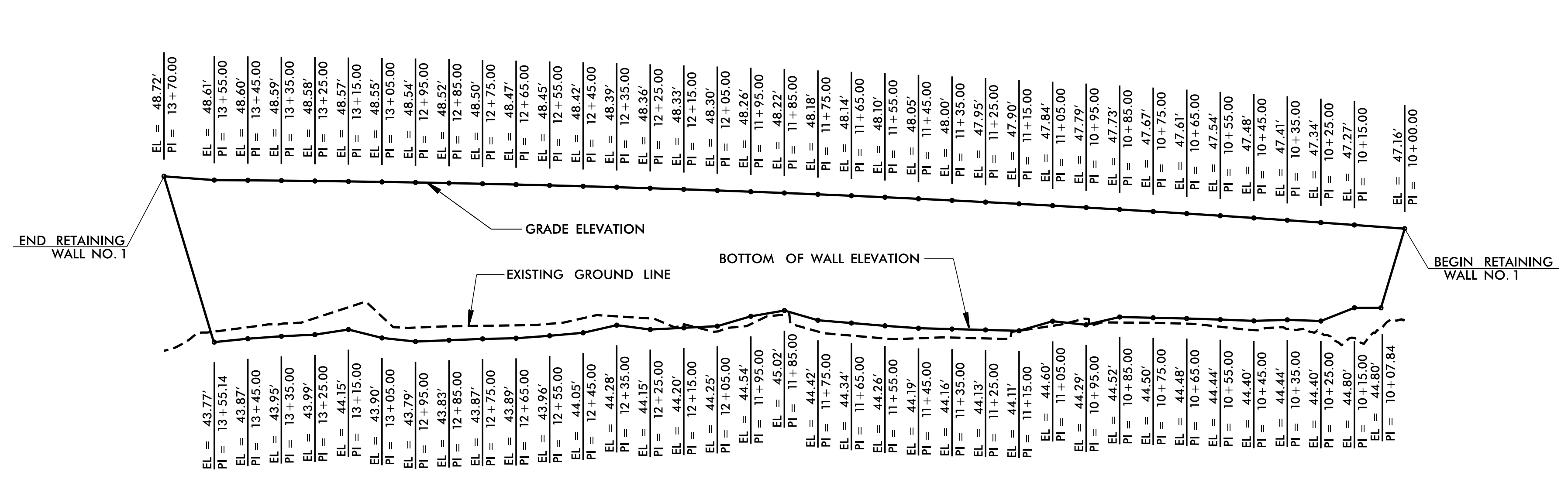
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**ESTIMATED MSE WALL QUANTITIES**  
(SQUARE FEET)

MSE RETAINING WALL NO. 1	1,950 SF
MSE RETAINING WALL NO. 2	460 SF

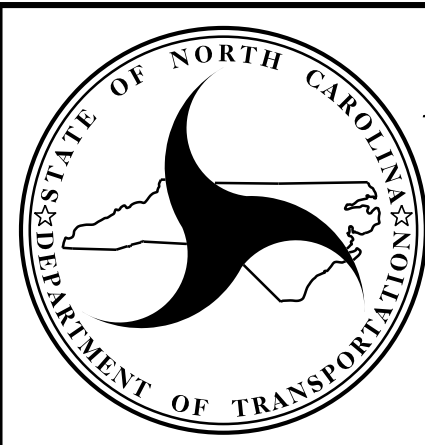


PREPARED BY: J. NORRIS DATE: 02/14/19  
 REVIEWED BY: S. ONEIL DATE: 02/14/19

Prepared in the Office of:



**CATLIN**  
Engineers and Scientists  
Wilmington, North Carolina



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

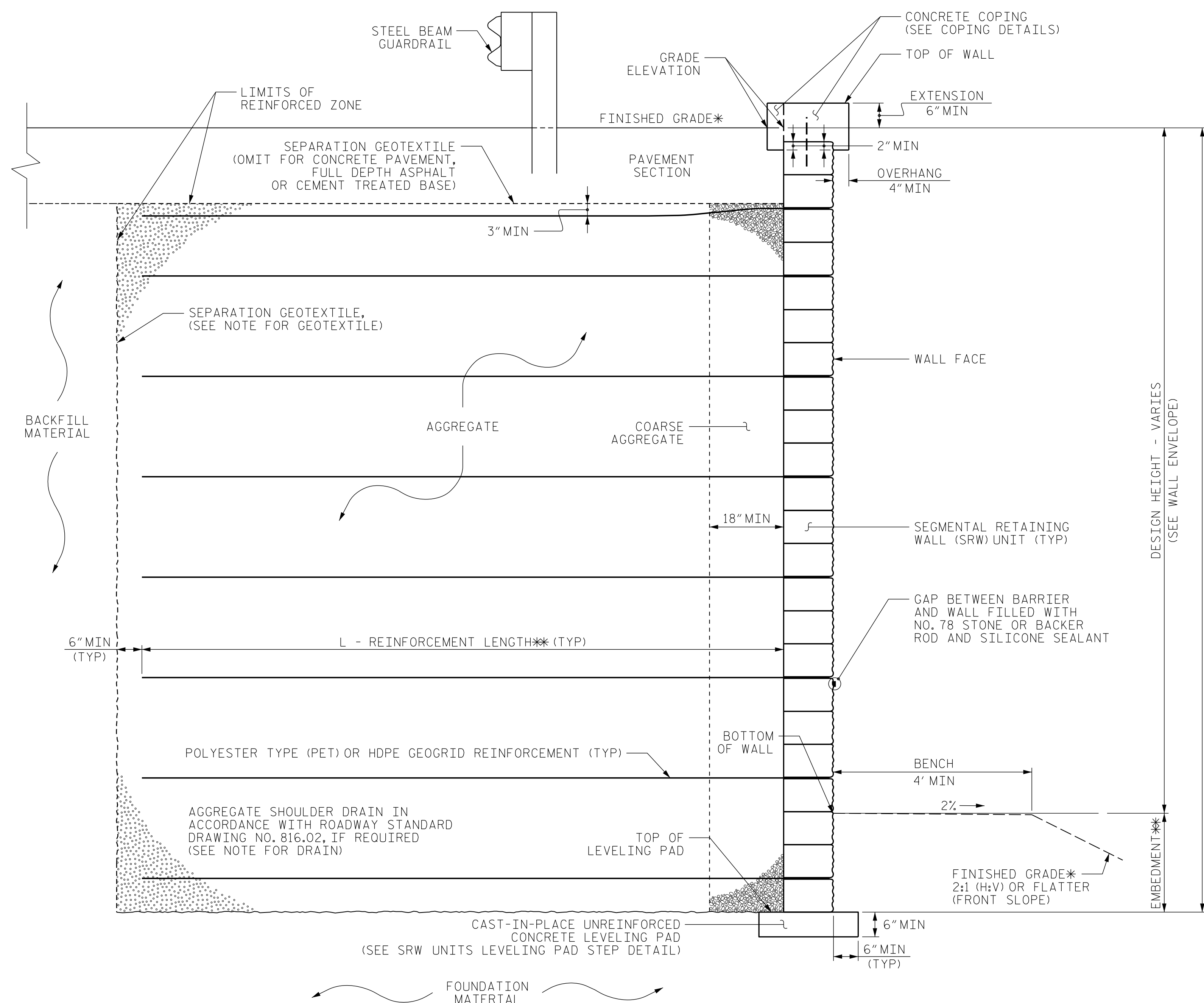
**GEOTECHNICAL**  
ENGINEERING UNIT

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 232+85 -L- & 237+00 -L-  
 SHEET 1 OF 2

**RETAINING WALLS NO. 1 AND 2 PLAN AND WALL ENVELOPE**

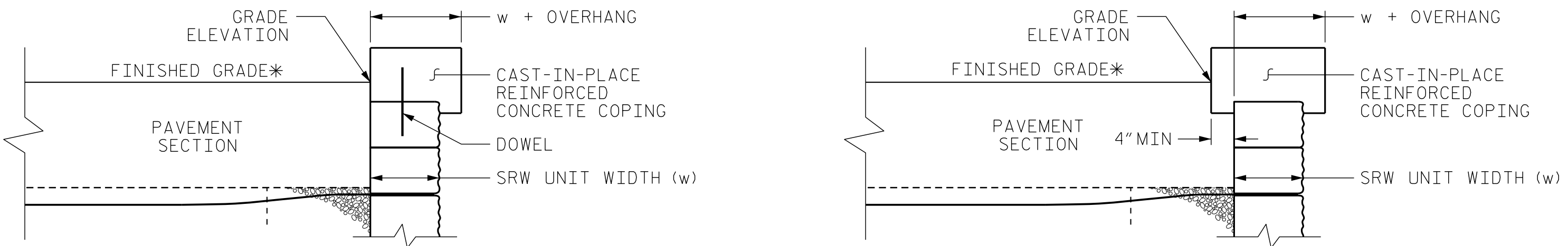
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NO.	BY	DATE	NO.	BY	DATE
1	-	-	3	-	-
2	-	-	4	-	-

SHEET NO. W-1



**MSE WALL WITH SRW UNITS - 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 SRW UNITS WITH DOWELS OR EXTEND COPING DOWN BACK OF SRW UNITS. \*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

**NOTES:**

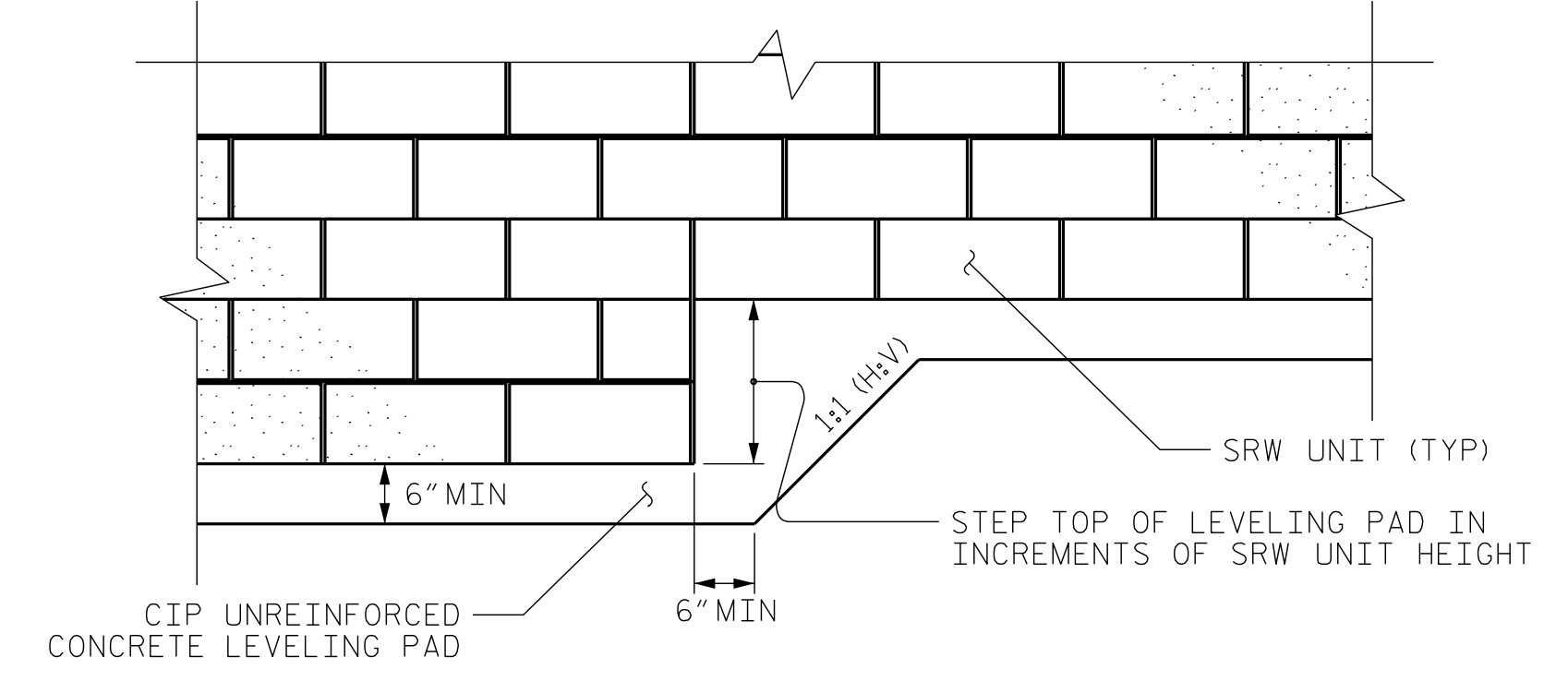
- FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- USE AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL UNITS (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALLS NO.1 AND 2.
- AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS NO.1 AND 2.
- CIP REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALLS NO.1 AND 2.
- A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS NO.1 AND 2.
- A DRAIN IS NOT REQUIRED FOR RETAINING WALLS NO.1 AND 2.
- DESIGN RETAINING WALLS NO.1 AND 2 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 NO.1 AND 2.
- DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALLS NO.1 AND 2 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.
- BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS NO.1 AND 2, 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 NO.1 AND 2 FOR THE FOLLOWING:
  - 1) H = DESIGN HEIGHT + EMBEDMENT
  - 2) DESIGN LIFE = 100 YEARS
  - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 1,550 PSF
  - 4) MINIMUM REINFORCEMENT LENGTH (L) = 6 FT
  - 5) 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	120	29	0



**SRW UNITS LEVELING PAD STEP DETAIL**

GEOTECHNICAL ENGINEER

ENGINEER

20190725CD1E4ED  
 DocuSigned by:  
 Josie Norris  
 2/28/2019

DATE: 2/28/2019

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PREPARED BY: J. NORRIS	DATE: 02/14/19
REVIEWED BY: S. ONEIL	DATE: 02/14/19

Prepared in the Office of:

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 Wilmington, North Carolina

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

**GEOTECHNICAL ENGINEERING UNIT**

PROJECT NO.: R-5021

BRUNSWICK COUNTY

STATION: 232+85 -L- & 237+00 -L-

SHEET 2 OF 2

**RETAINING WALLS NO. 1 AND 2 TYPICAL SECTION AND DETAILS**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
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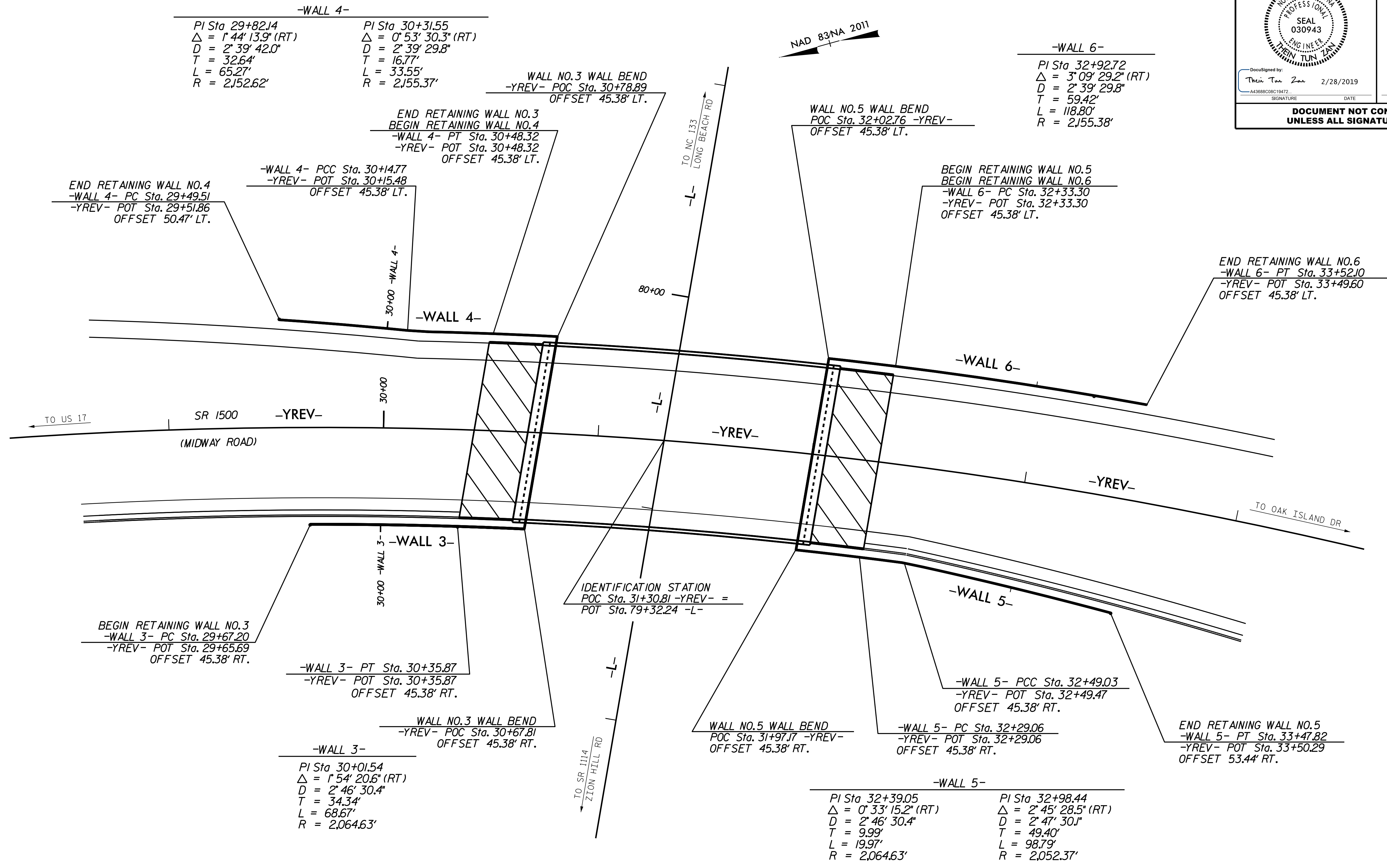
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:  
Thein Tun Zan 2/28/2019

SIGNATURE DATE SIGNATURE DATE

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RETAINING WALL NO. 3, 4, 5 & 6 PLAN VIEW  
 NOT TO SCALE

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 31+30.81 -YREV- (79+32.24 -L-)  
 SHEET 1 OF 5

PREPARED BY: THEIN TUN ZAN DATE: 01-2019  
 REVIEWED BY: JAMES BATTS DATE: 01-2019

NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

**GEOTECHNICAL  
 ENGINEERING UNIT**

MSE RETAINING WALL  
 WALL NO. 3, 4, 5 & 6  
 PLAN VIEW

REVISIONS					
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2	-	-	4	-	-

SHEET NO. W-3

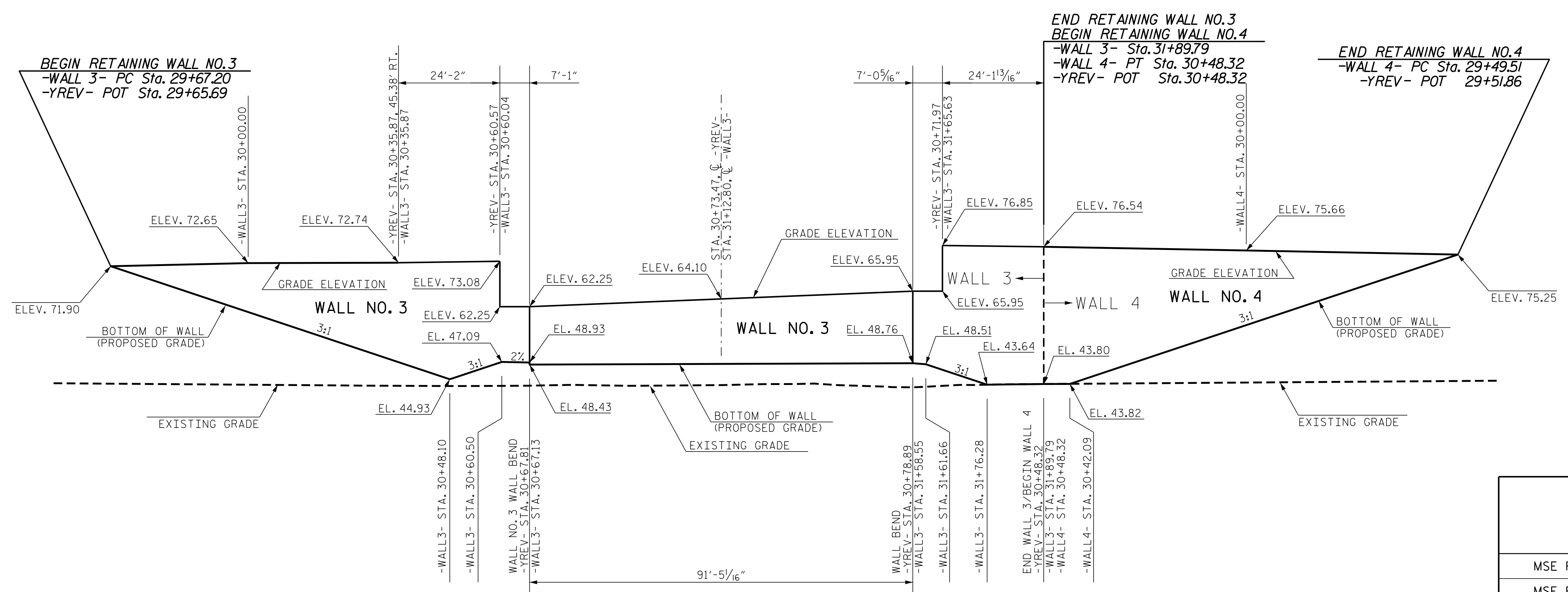
GEOTECHNICAL ENGINEER

ENGINEER

DocuSigned by:  
Thein Tun Zan 2/28/2019

DATE: 2/28/2019

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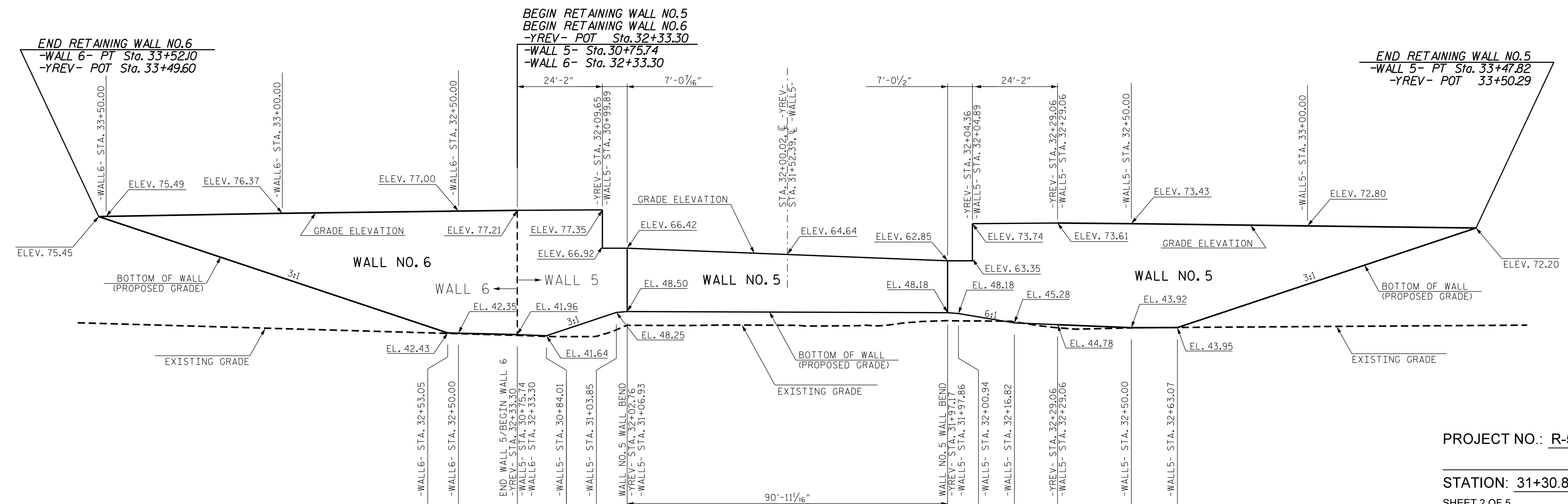


**RETAINING WALL NO. 3 & 4 WALL ENVELOPES**

EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

**ESTIMATED MSE WALL QUANTITIES**  
(SQUARE FEET)

MSE RETAINING WALL NO. 3	4,540 SF
MSE RETAINING WALL NO. 4	2,015 SF
MSE RETAINING WALL NO. 5	6,270 SF
MSE RETAINING WALL NO. 6	2,765 SF



**RETAINING WALL NO. 5 & 6 WALL ENVELOPES**

EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 31+30.81 -YREV- (79+32.24 -L-)  
SHEET 2 OF 5

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

**GEOTECHNICAL  
ENGINEERING UNIT**

**MSE RETAINING WALL  
WALL NO. 3, 4, 5 & 6  
WALL ENVELOPES**

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1			3		
2			4		

SHEET NO. W-4

PREPARED BY: THEIN TUN ZAN DATE: 01-2019  
REVIEWED BY: JAMES BATTS DATE: 01-2019



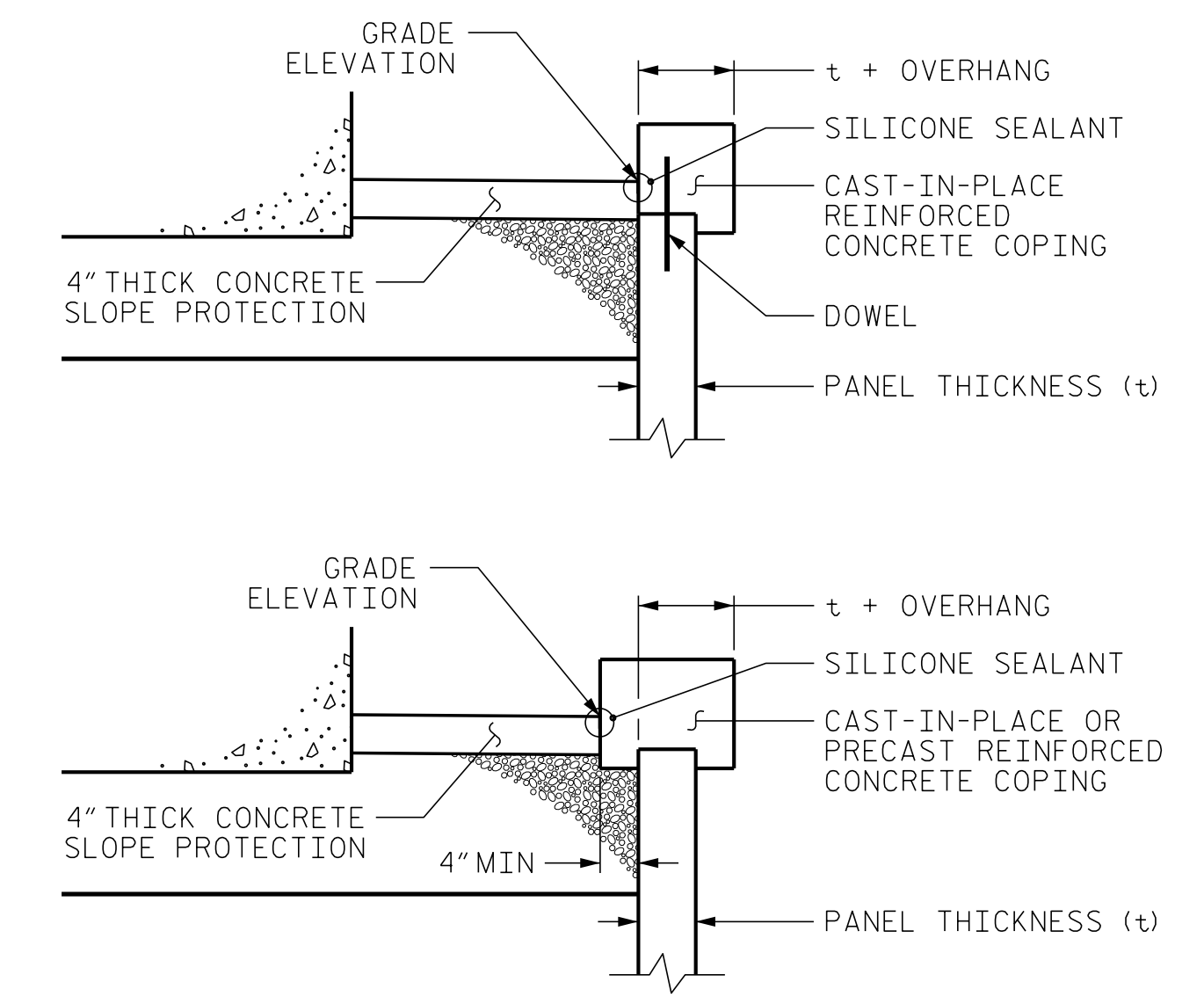
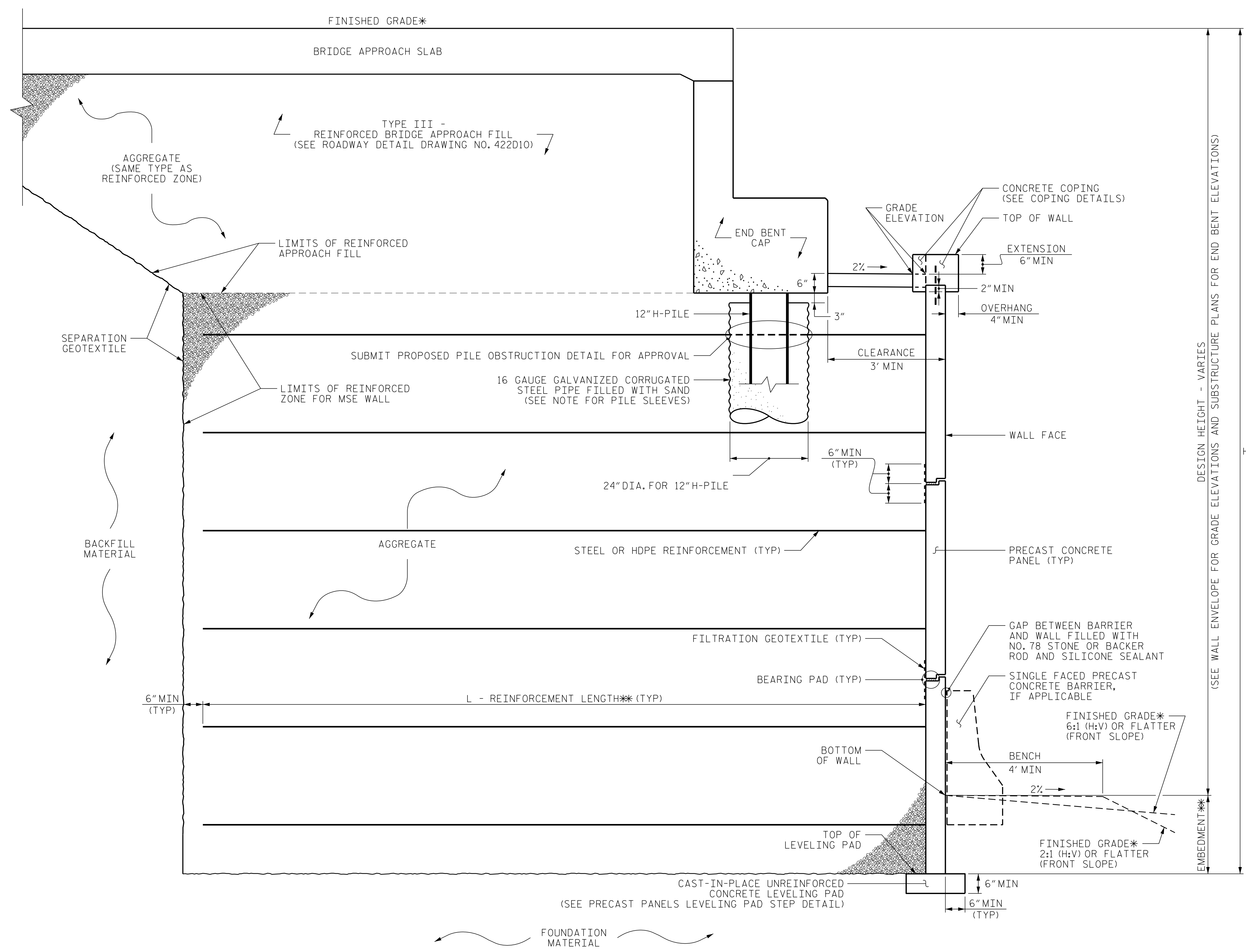
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 030943

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**COPING DETAILS**

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

**MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION**

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

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 31+30.81 -YREV- (79+32.24 -L-)  
 SHEET 3 OF 5

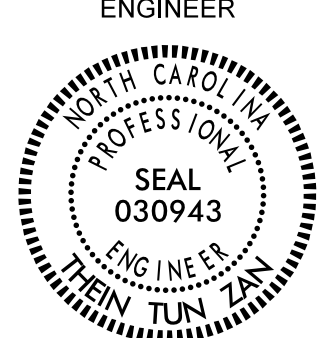
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
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2	-	-	4	-	-	

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019

GEOTECHNICAL ENGINEER

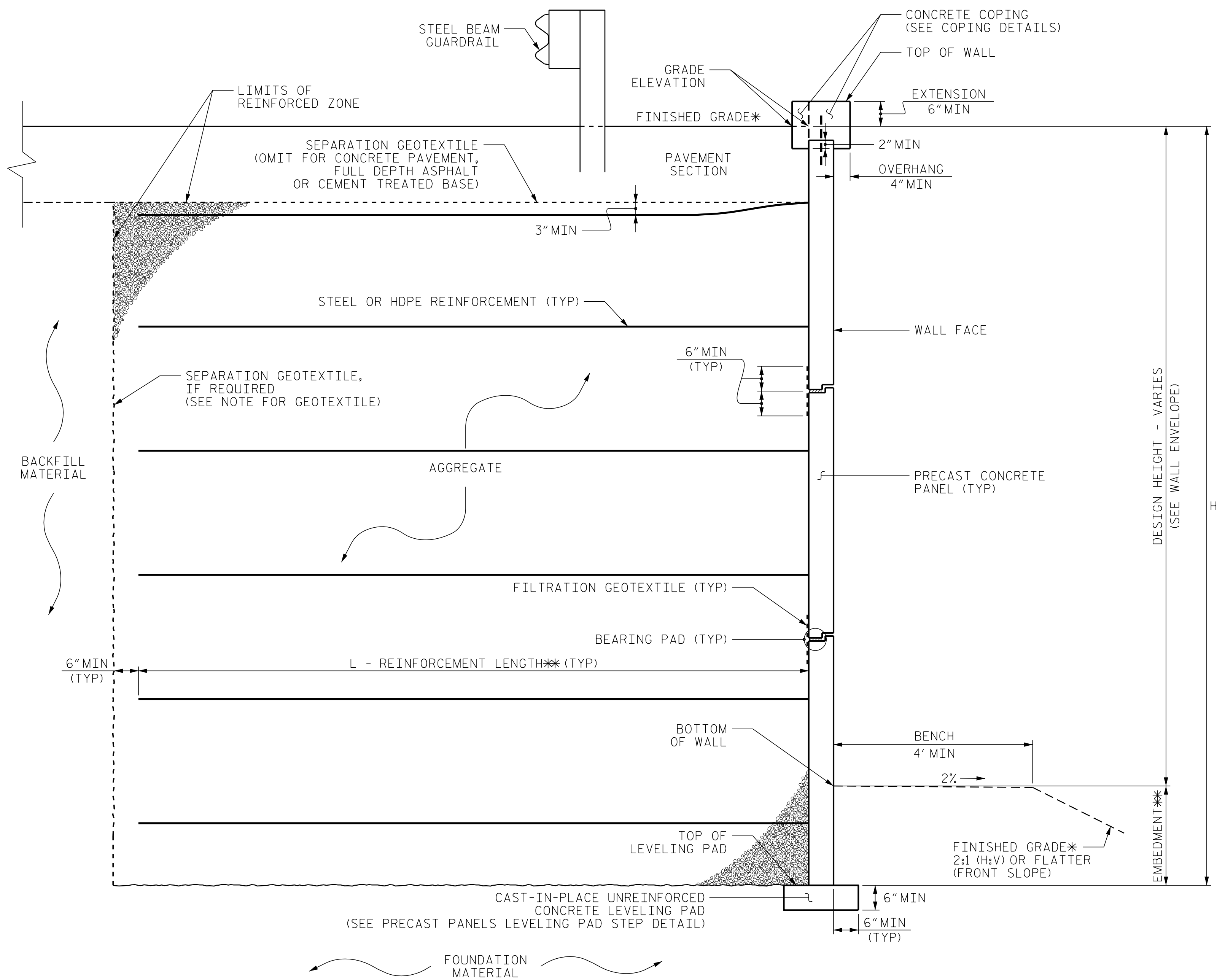


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**Thein Tun Zan** 2/28/2019

ENGINEER

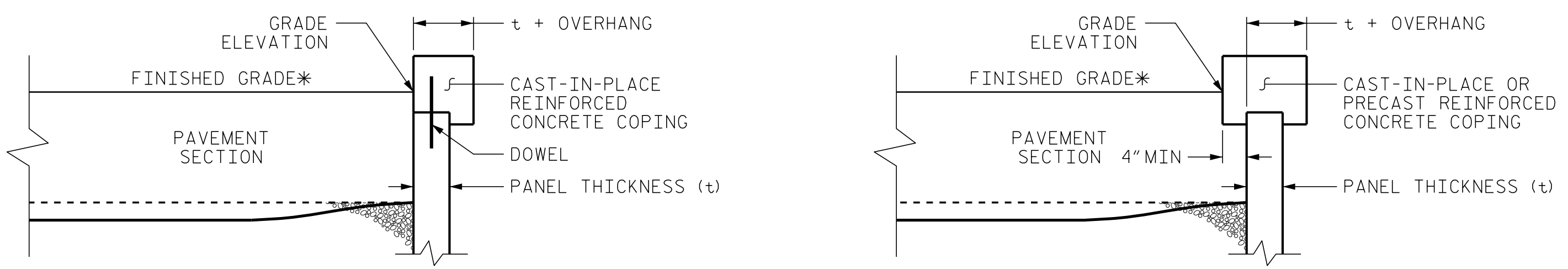
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**MSE WALL WITH PRECAST PANELS - TYPICAL SECTION**

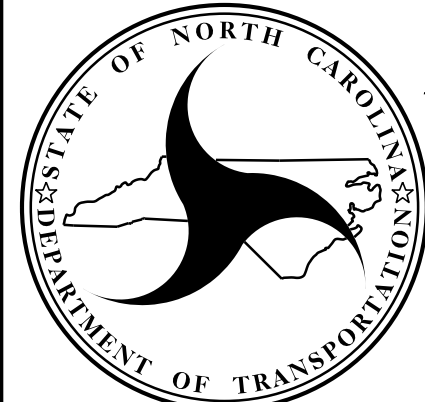
\*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.  
\*\*SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE, MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



**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.

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 31+30.81 -YREV- (79+32.24 -L-)  
SHEET 4 OF 5




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

**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS						SHEET NO. W-6
NO.	BY	DATE	NO.	BY	DATE	
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2	-	-	4	-	-	

PREPARED BY: THEIN TUN ZAN      DATE: 01-2019  
REVIEWED BY: JAMES BATTS      DATE: 01-2019



GEOTECHNICAL ENGINEER  SEAL 030943 ENGINEER THEIN TUN ZAN	ENGINEER
DocuSigned by: <i>Thein Tun Zan</i> 2/28/2019 <small>A4388808C19472</small>	
<small>SIGNATURE</small>	<small>DATE</small>
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

**NOTES:**

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

FOR TYPE III REINFORCED BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY DETAIL DRAWING NO. 422D10.

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 WALL NO. 3, 4, 5 & 6.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 3, 4, 5 & 6.

A DRAIN IS NOT REQUIRED FOR RETAINING WALL NO. 3, 4, 5 & 6.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO.1 LOCATED AT STATION 30+66.39 -YREV-, AND FOR END BENT NO.2 LOCATED AT STATION 32+07.06 -YREV-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 3, 4, 5 & 6, 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 NO. 3, 4, 5 & 6 FOR THE FOLLOWING:  
 1) H = DESIGN HEIGHT + EMBEDMENT  
 2) DESIGN LIFE = 100 YEARS  
 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 7,150 SF  
 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.9 H  
 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) 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 ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	120	28	0

DESIGN RETAINING WALL NO. 3, 4, 5 & 6 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

FOUNDATIONS FOR SIGNS, LIGHTING OR SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 3, 4, 5 & 6 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

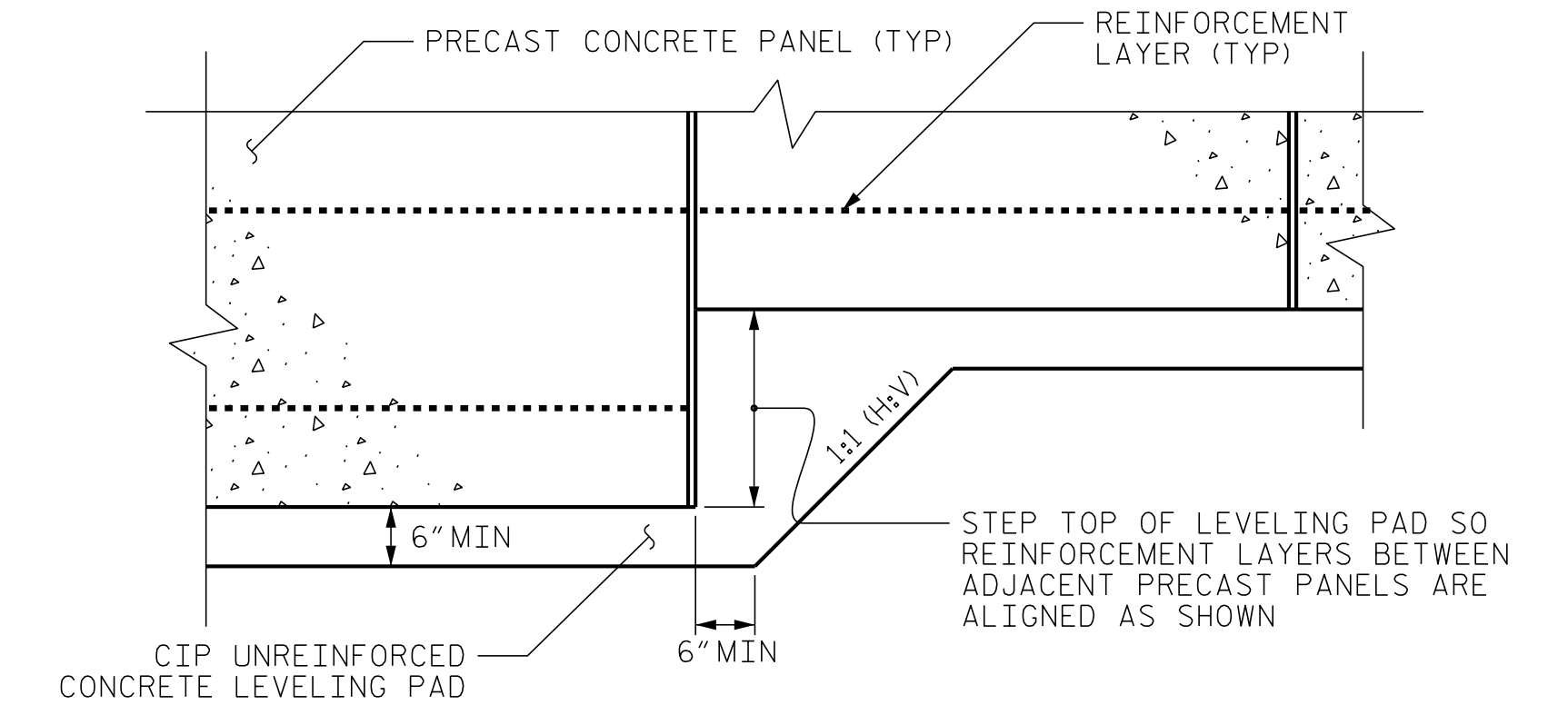
EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 3, 4, 5 & 6.

FOUNDATIONS FOR END BENT NO.1 LOCATED AT STATION 30+66.39 -YREV- AND END BENT NO.2 LOCATED AT STATION 32+07.06 -YREV- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 3, 4, 5 & 6. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

DESIGN RETAINING WALL NO. 3, 4, 5 & 6 FOR A LATERAL LOAD FROM FOUNDATIONS LOCATED BEHIND THE MSE WALL APPLIED AS A FACTORED UNIFORM PRESSURE OF 500 PSF TO THE BACK OF PANELS AT THE TOP 10 FT OF THE ABUTMENT WALLS .


INSTALL PILE SLEEVES FOR END BENT NO.1 LOCATED AT STATION 30+66.39 -YREV- AND END BENT NO.2 LOCATED AT STATION 32+07.06 -YREV- WHILE CONSTRUCTING RETAINING WALL NO. 3, 4, 5 & 6. 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 WALL NO. 3, 4, 5 & 6 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.



**PRECAST PANELS  
LEVELING PAD STEP DETAIL**

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 31+30.81 -YREV- (79+32.24 -L-)  
 SHEET 5 OF 5



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

**GEOTECHNICAL  
ENGINEERING UNIT**

**MSE RETAINING WALL  
WALL NO. 3, 4, 5 & 6  
NOTES & DETAILS**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-7
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PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019

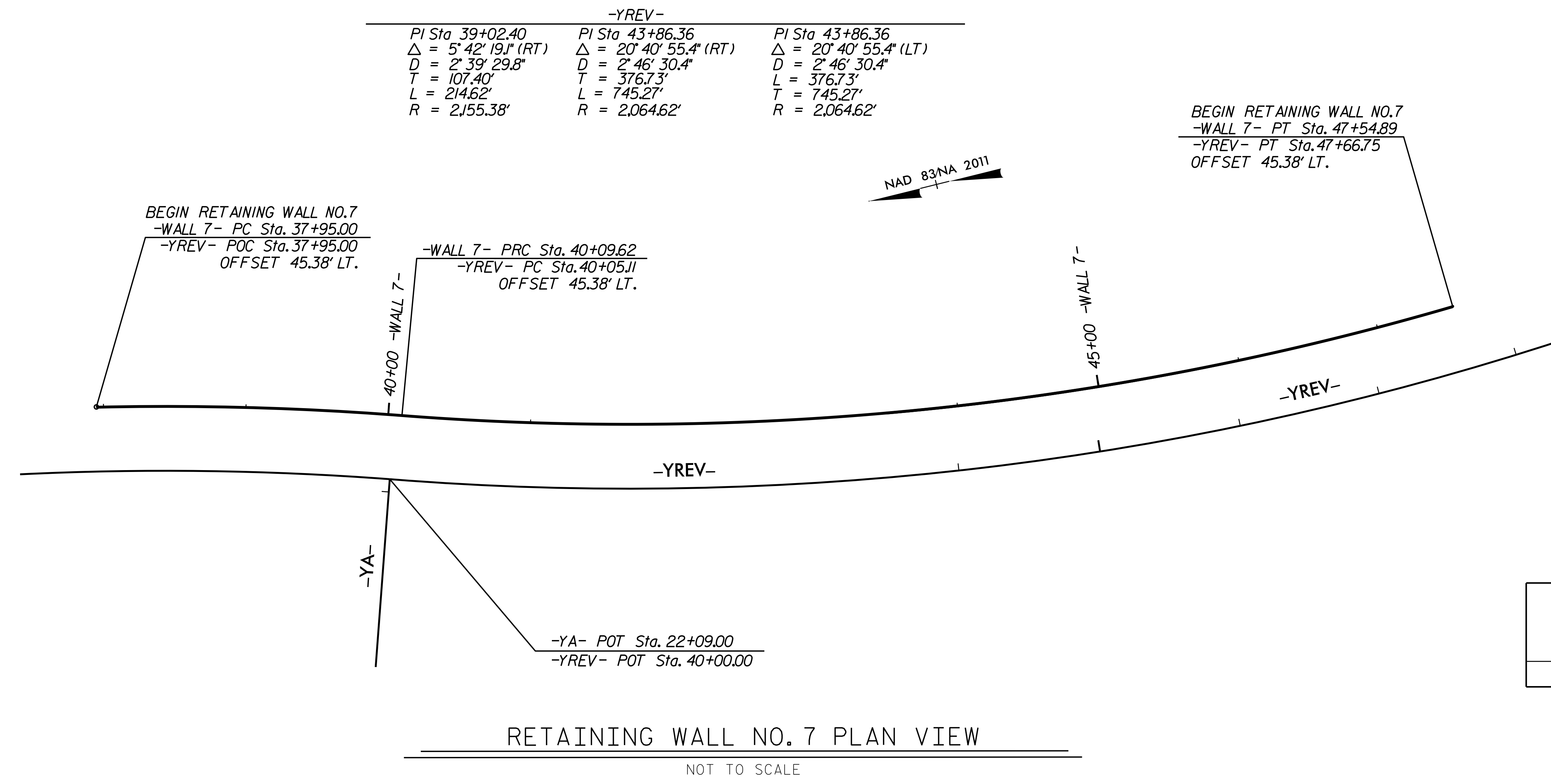
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Thein Tun Zan 2/28/2019

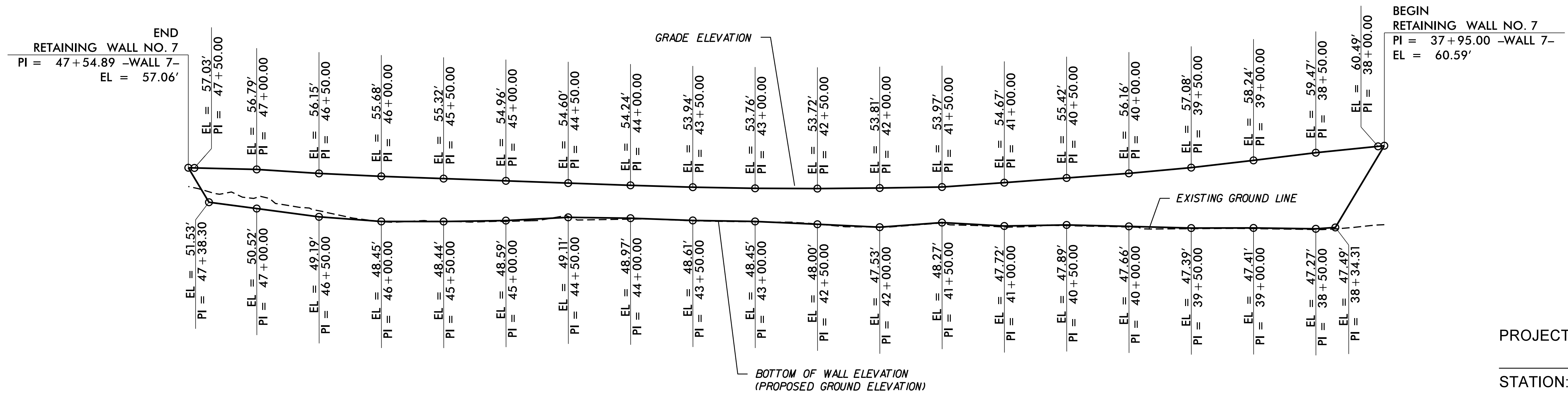
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ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 7	8,265 SF

**RETAINING WALL NO. 7 PLAN VIEW**  
NOT TO SCALE



**RETAINING WALL NO. 7 WALL ENVELOPE**  
EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 38+00 -YREV-  
SHEET 1 OF 4

PREPARED BY: THEIN TUN ZAN DATE: 01-2019  
REVIEWED BY: JAMES BATTS DATE: 01-2019

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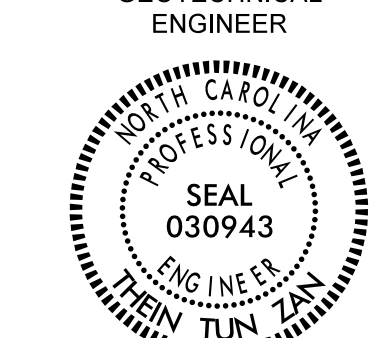
**MSE RETAINING WALL NO. 7  
PLAN VIEW &  
WALL ENVELOPE**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
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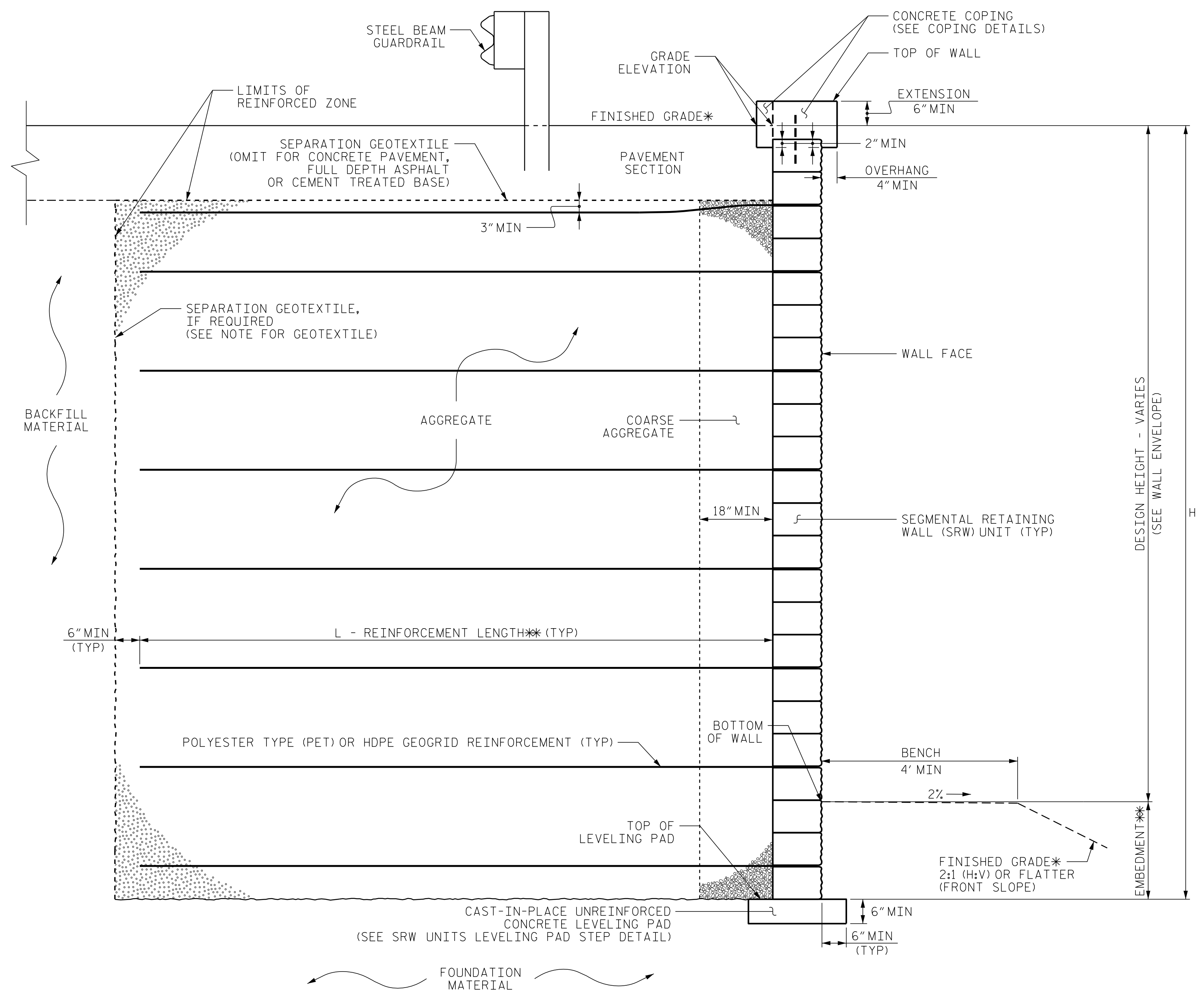
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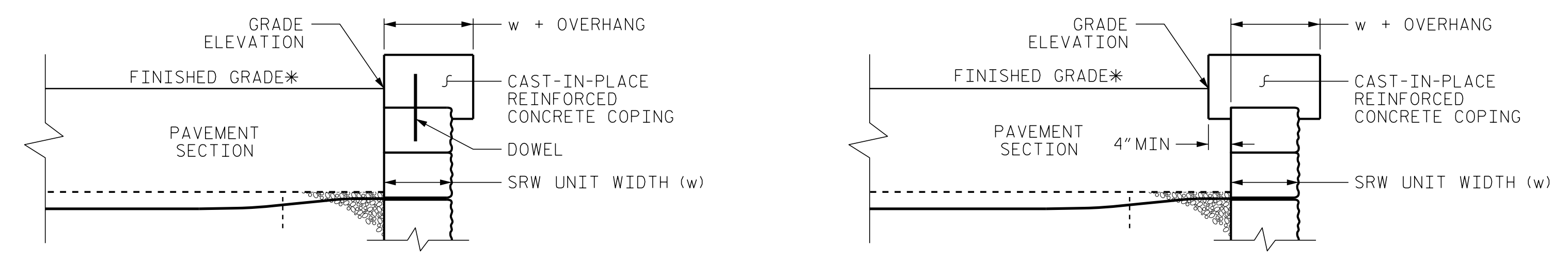
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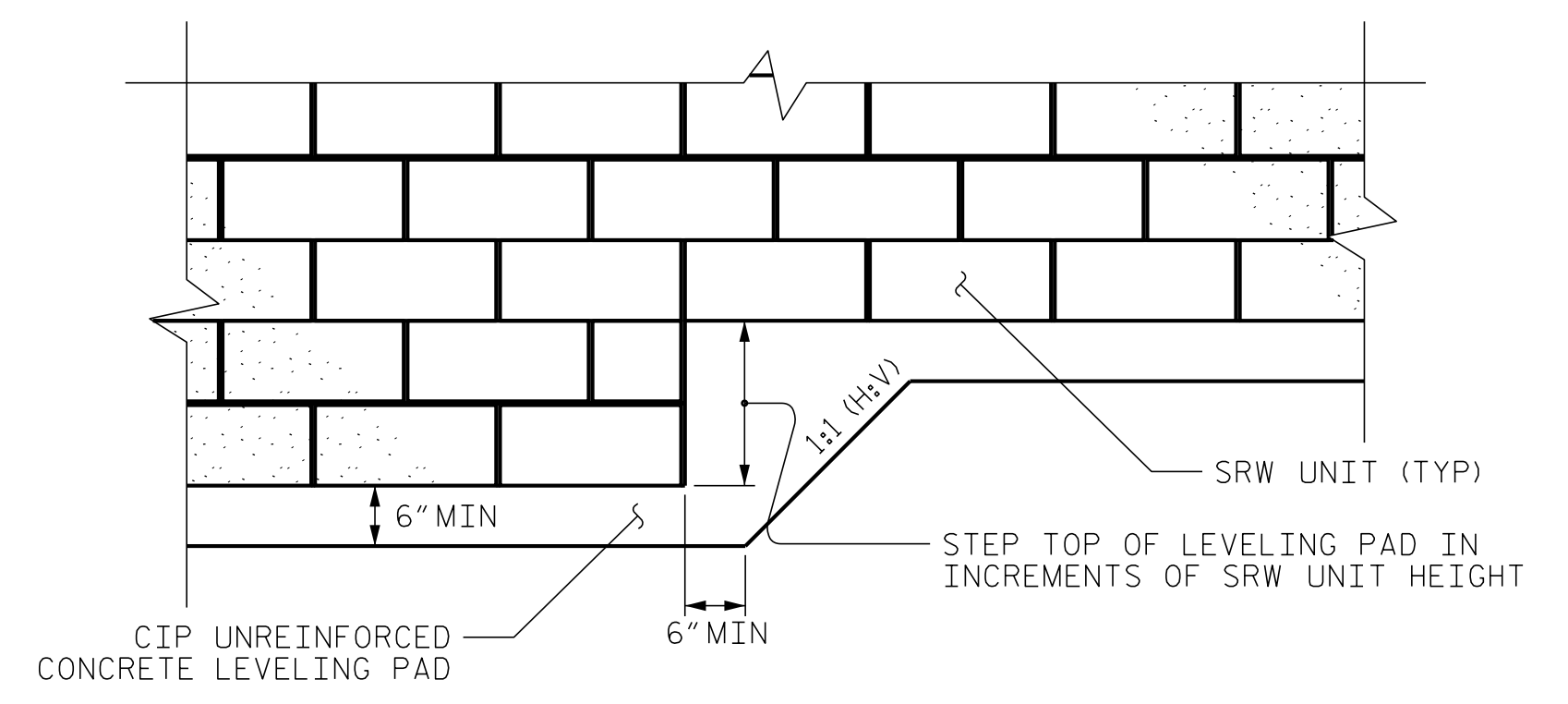
**MSE WALL WITH SRW UNITS - TYPICAL SECTION**

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




**COPING DETAILS**

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



**SRW UNITS LEVELING PAD STEP DETAIL**

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 38+00 -YREV-  
SHEET 2 OF 4



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

**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS						SHEET NO. W-9
NO.	BY	DATE	NO.	BY	DATE	
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PREPARED BY: THEIN TUN ZAN      DATE: 01-2019  
REVIEWED BY: JAMES BATTS      DATE: 01-2019

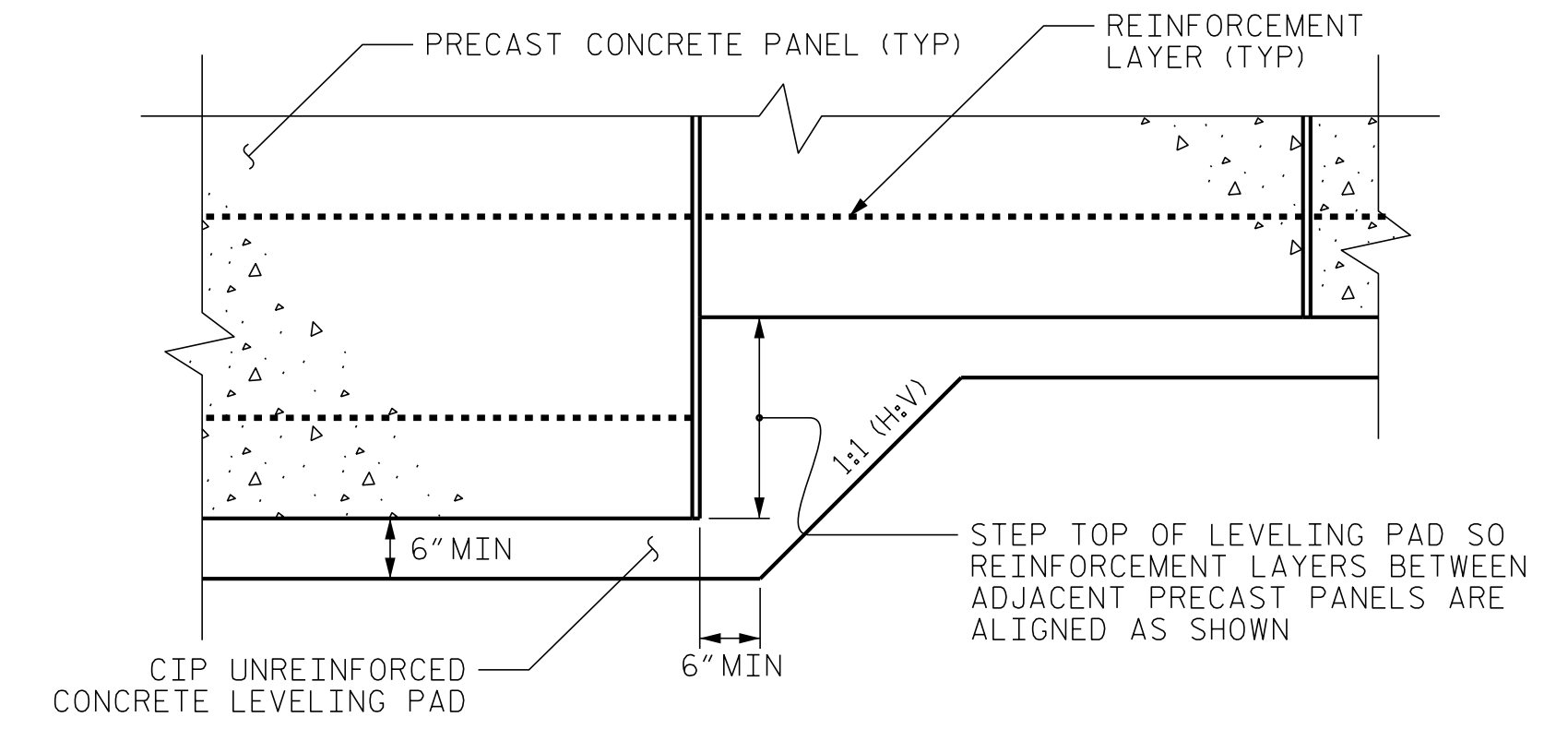
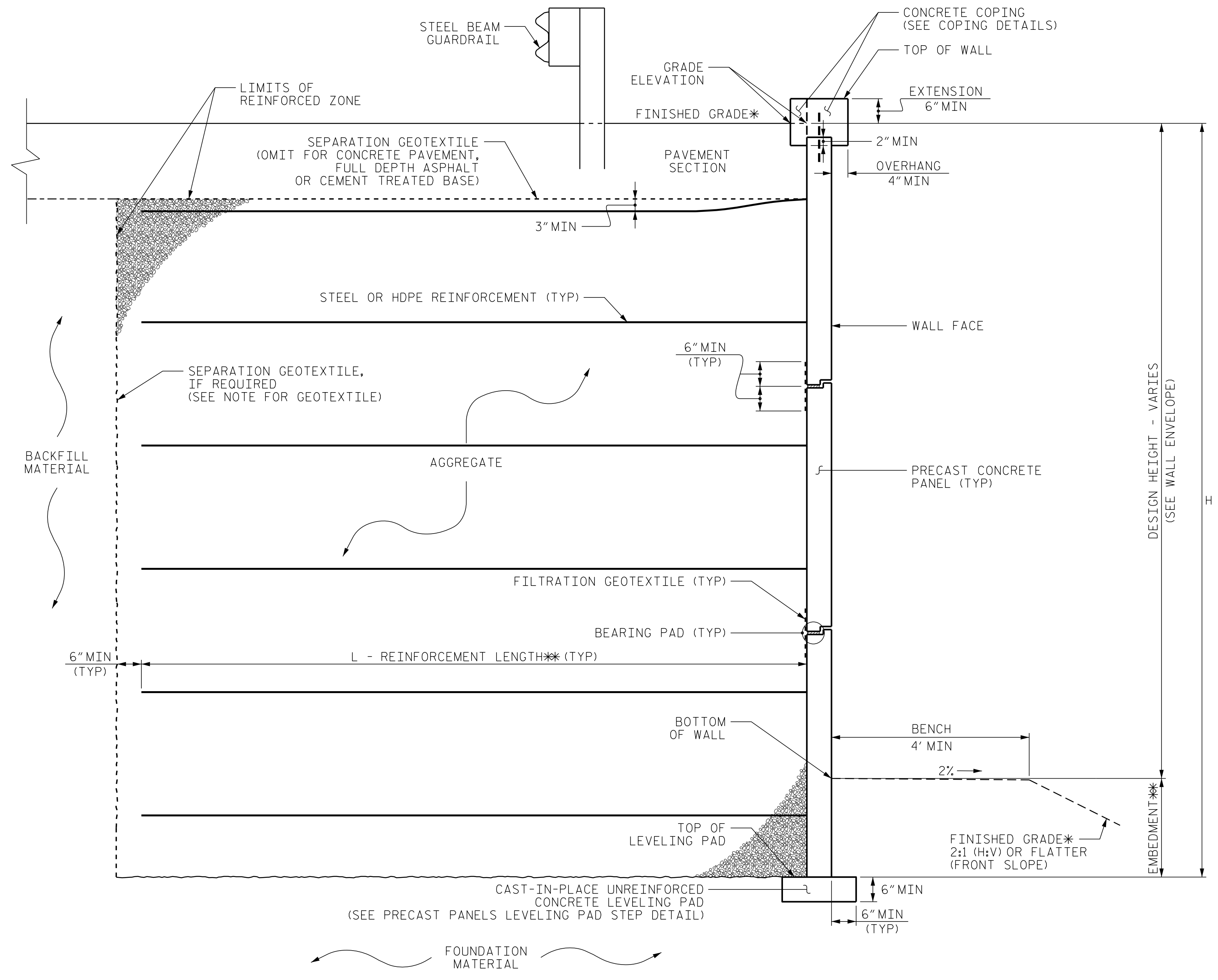
GEOTECHNICAL ENGINEER

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Thein Tun Zan 2/28/2019

ENGINEER

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

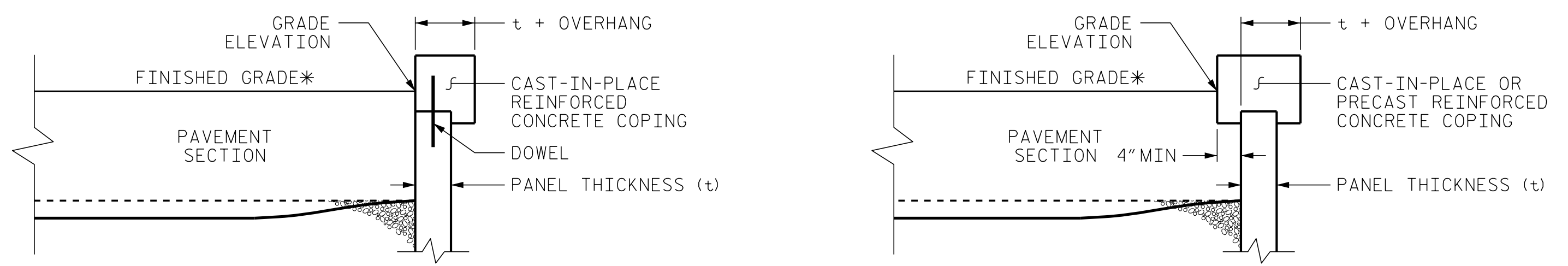
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**PRECAST PANELS  
LEVELING PAD STEP DETAIL**

**MSE WALL WITH PRECAST PANELS - TYPICAL SECTION**

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



**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.

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 38+00 -YREV-  
SHEET 3 OF 4


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

**GEOTECHNICAL  
ENGINEERING UNIT**

REVISIONS						SHEET NO. W-10
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	
2	-	-	4	-	-	

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019



GEOTECHNICAL ENGINEER  DocuSigned by: <i>Thein Tun Zan</i> 2/28/2019 <small>A43688C0C1947Z</small>	ENGINEER
SIGNATURE	DATE
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	

**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 AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. 7.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 7.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 7.

A DRAIN IS NOT REQUIRED FOR RETAINING WALL NO. 7.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 7, 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 NO. 7 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 3,600 PSF
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8 H
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) 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:

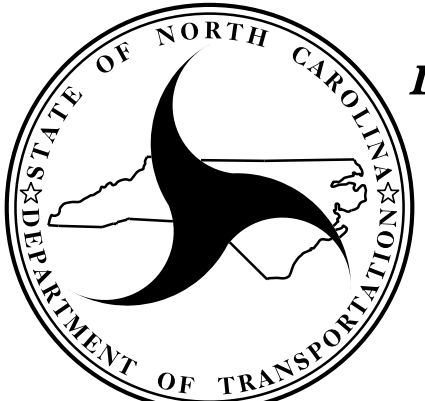
MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 7 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 WALL NO. 7.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 7 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 38+00 -YREV-  
 SHEET 4 OF 4



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

**GEOTECHNICAL  
ENGINEERING UNIT**

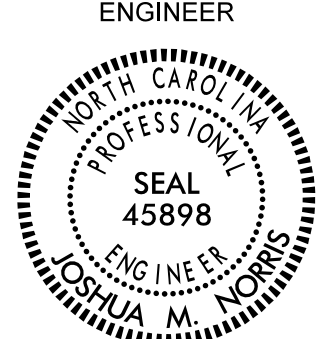
**MSE RETAINING WALL NO. 7  
NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-11
2	-	-	4	-	-	

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019

GEOTECHNICAL ENGINEER

ENGINEER

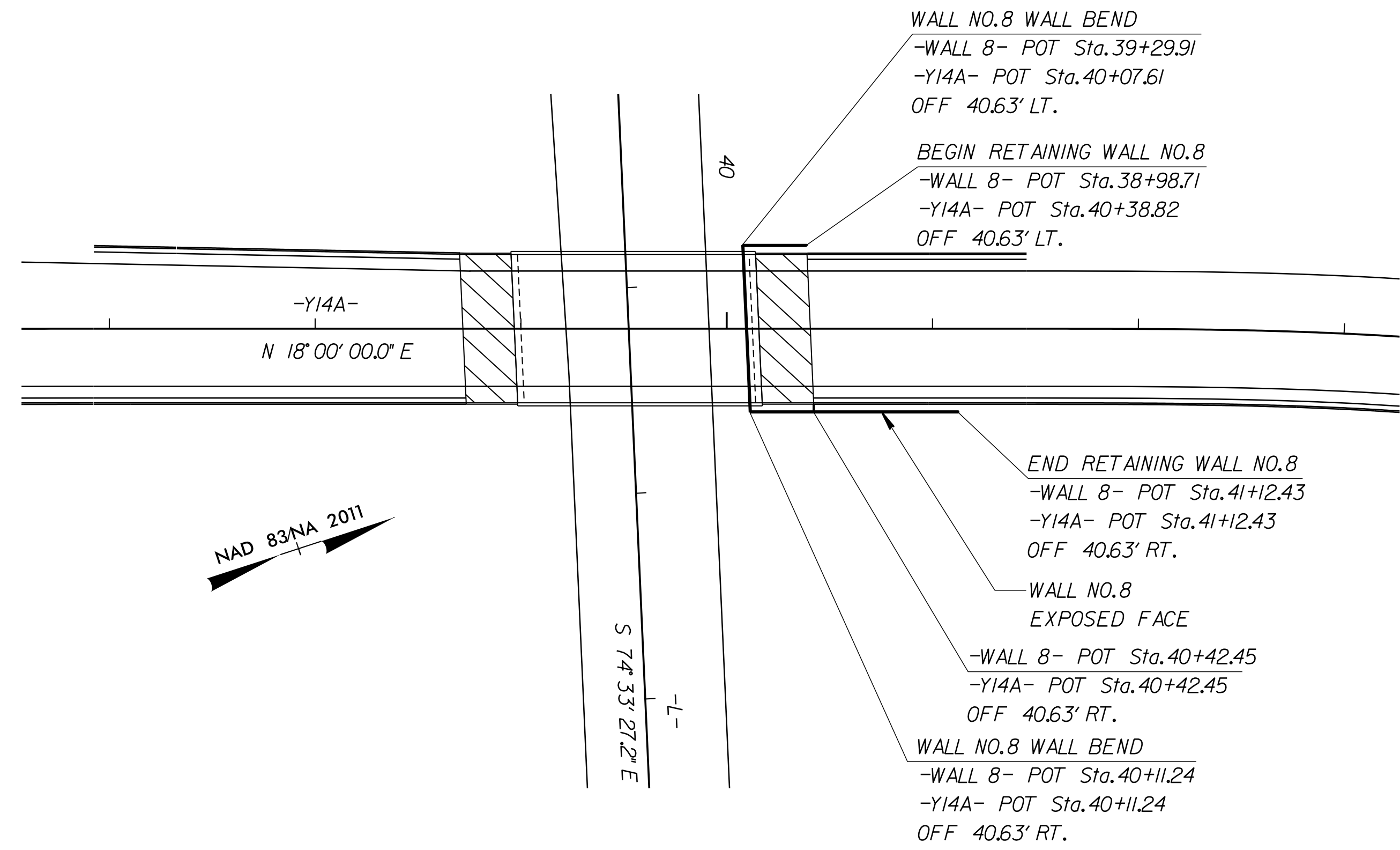


DocuSigned by:  
Joshua M. Norris  
2/28/2019

DATE: 2/28/2019

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

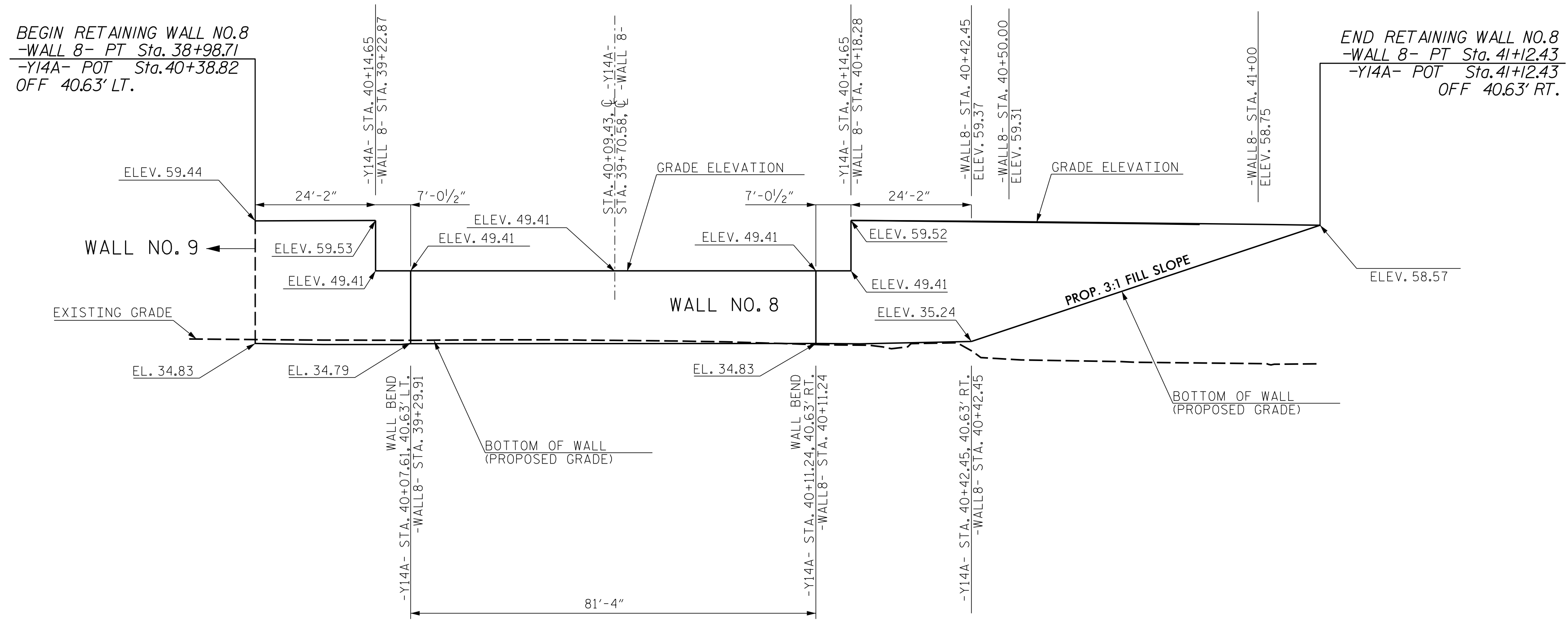
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UNLESS ALL SIGNATURES COMPLETED**



ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 8	4,135

RETAINING WALL NO. 8 WALL PLAN VIEW

NOT TO SCALE



RETAINING WALL NO. 8 WALL ENVELOPE

EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

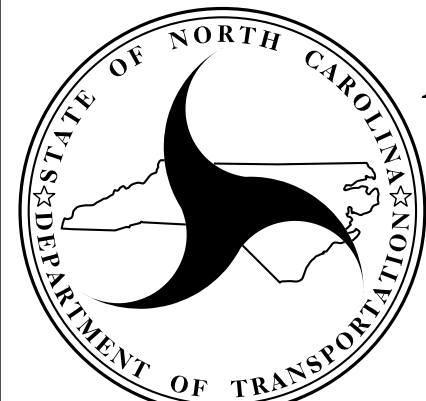
PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 40+39 -Y14A-  
SHEET 1 OF 6

PREPARED BY: J. NORRIS DATE: 02/25/19  
REVIEWED BY: B. LACKEY DATE: 02/25/19

Prepared in the Office of:



**CATLIN**  
Engineers and Scientists  
Wilmington, North Carolina



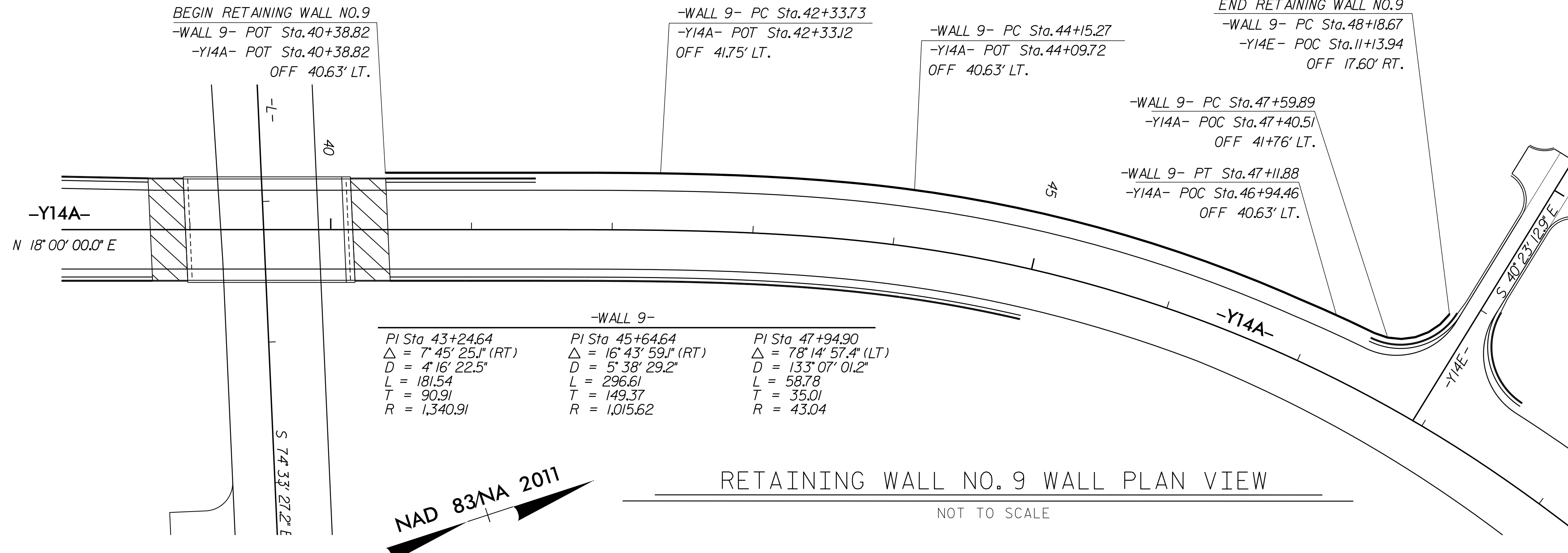
NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

**GEOTECHNICAL  
ENGINEERING UNIT**

MSE RETAINING WALL NO. 8  
PLAN AND WALL ENVELOPE

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-12
2	-	-	4	-	-	





GEOTECHNICAL ENGINEER

ENGINEER

PROFESSIONAL SEAL 45898

JOSUA M. NORRIS

DocuSigned by: Josie Norris 5/23/2019

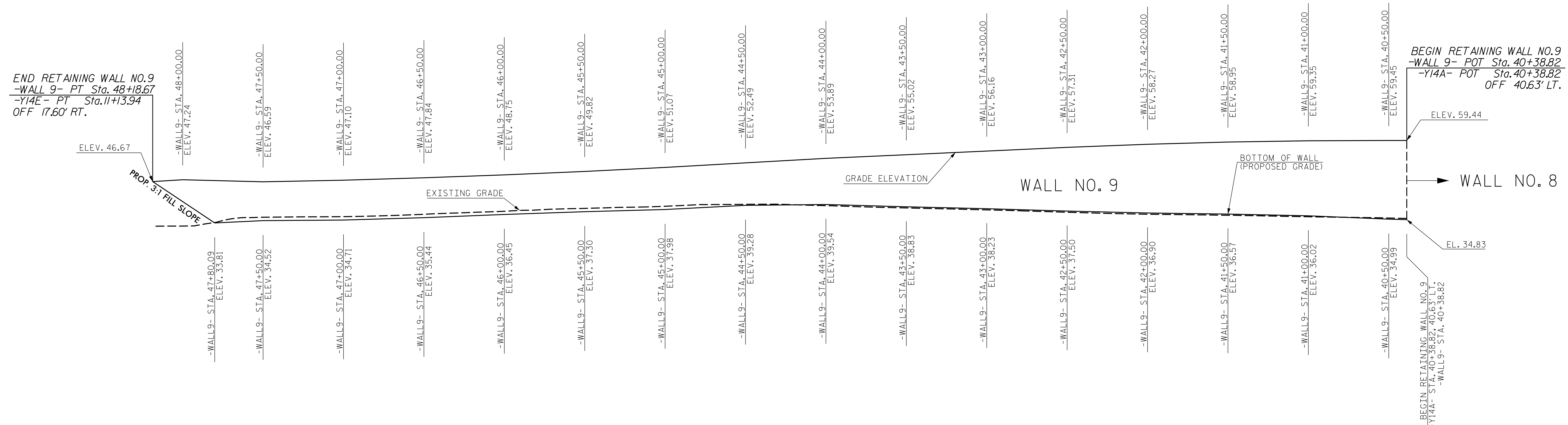
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ESTIMATED MSE WALL QUANTITY (SQUARE FEET)

MSE RETAINING WALL NO. 9	16,210
--------------------------	--------

RETAINING WALL NO. 9 WALL PLAN VIEW  
NOT TO SCALE



RETAINING WALL NO. 9 WALL ENVELOPE  
EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 40+40 -Y14A-  
SHEET 2 OF 6

PREPARED BY: J. NORRIS	DATE: 05/23/19
REVIEWED BY: S. O'NEIL	DATE: 05/23/19

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Engineers and Scientists  
Wilmington, North Carolina

NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

**GEOTECHNICAL ENGINEERING UNIT**

MSE RETAINING WALL NO. 9  
PLAN AND WALL ENVELOPE

REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	JMN	05/23/19	3	-	-
2	-	-	4	-	-

SHEET NO. W-13

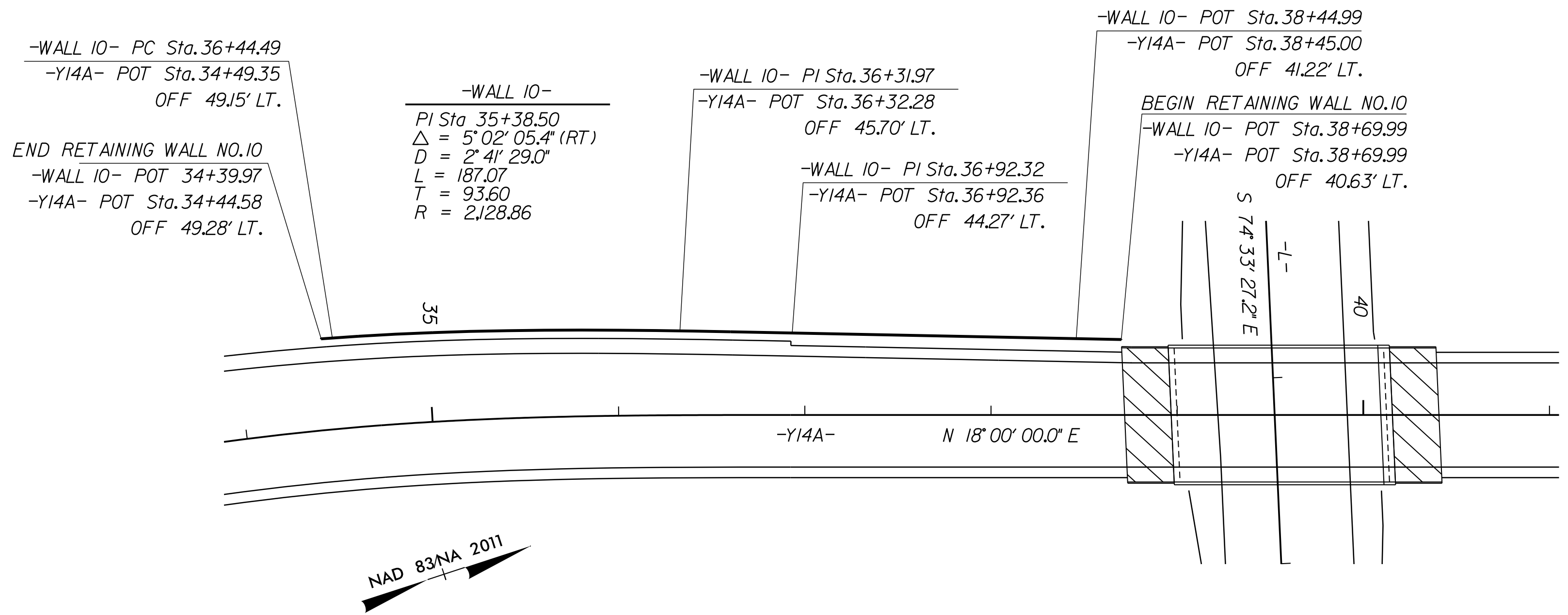
GEOTECHNICAL ENGINEER

ENGINEER

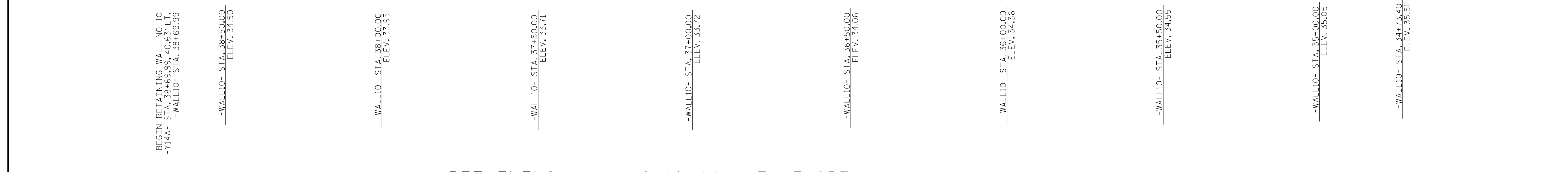
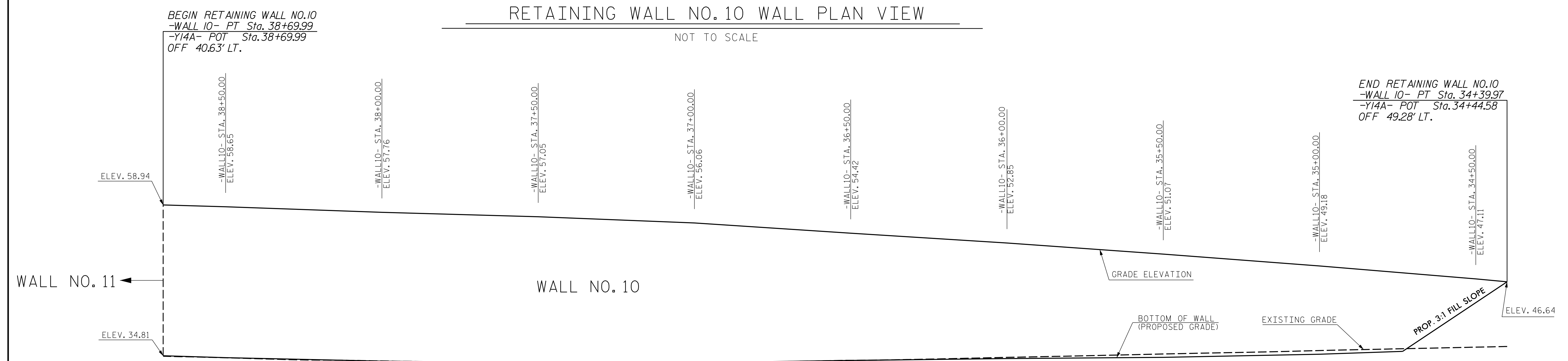
DocuSigned by:  
Joshua Norris  
2/28/2019

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ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO. 10	9,625 SF



PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 38+70 -Y14A-  
SHEET 3 OF 6

PREPARED BY: J. NORRIS DATE: 02/25/19  
REVIEWED BY: B. LACKEY DATE: 02/25/19

Prepared in the Office of:

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Engineers and Scientists  
Wilmington, North Carolina

NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

**GEOTECHNICAL  
ENGINEERING UNIT**

MSE RETAINING WALL NO. 10  
PLAN AND WALL ENVELOPE

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

SHEET NO. W-14



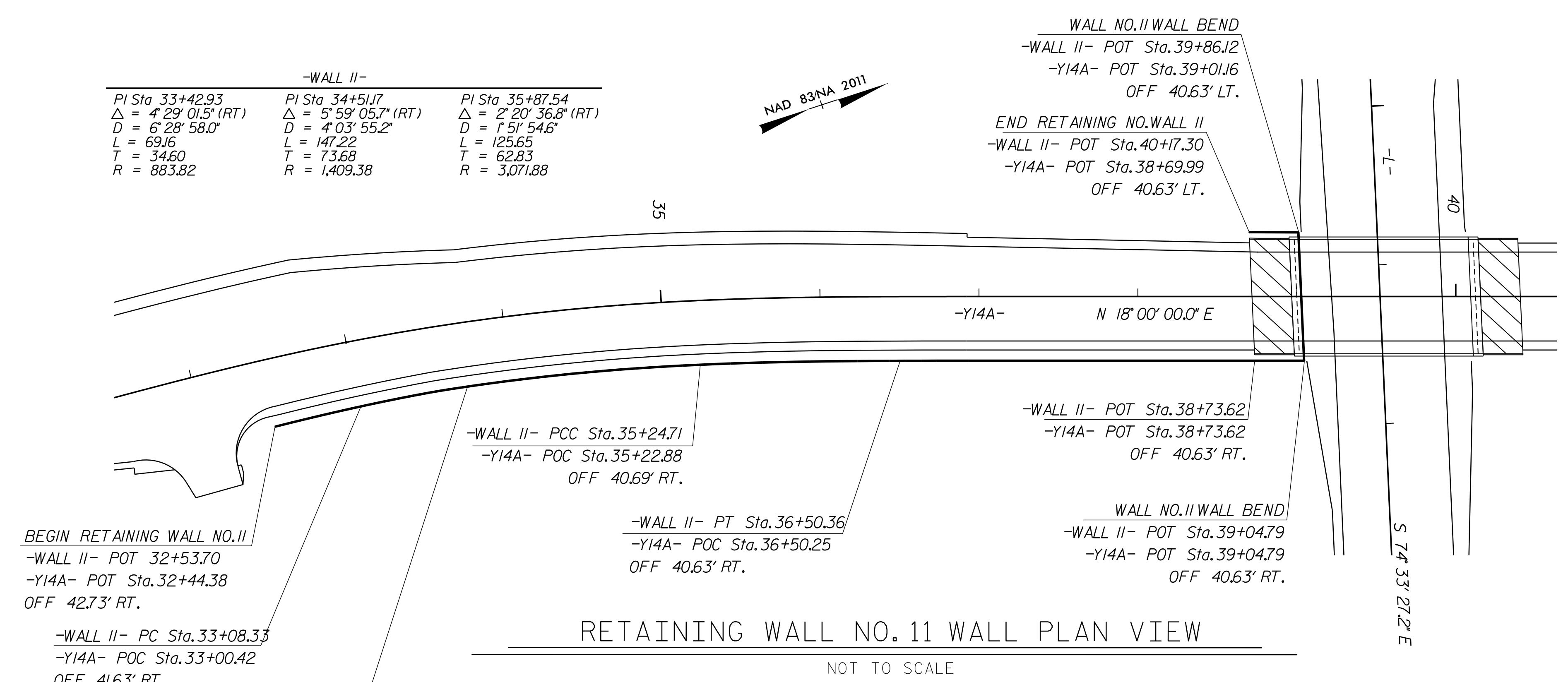
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 45898

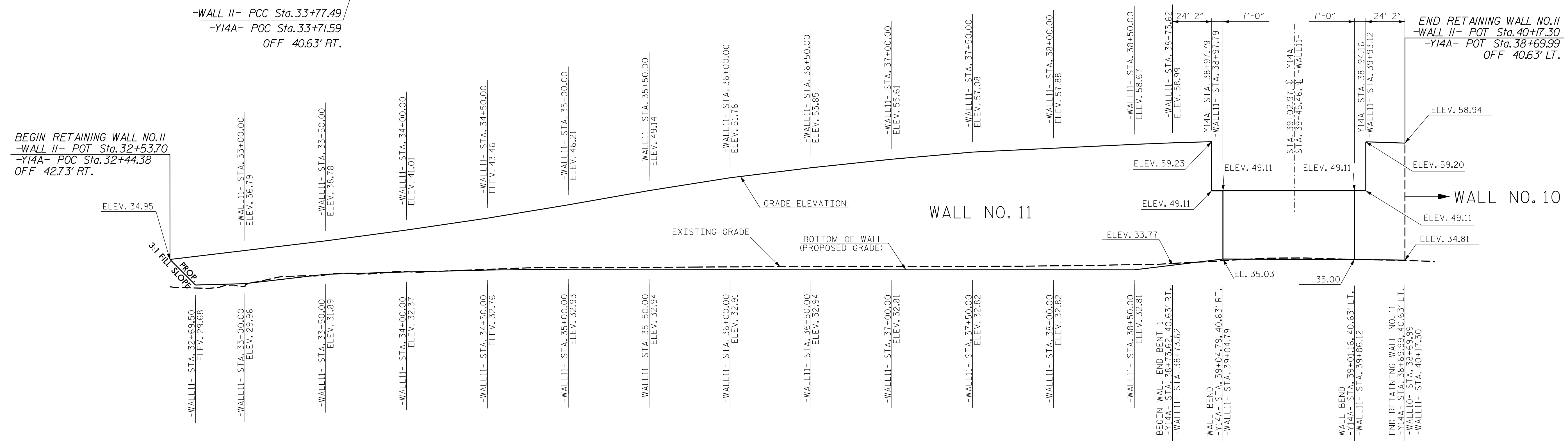
DocuSigned by: Josie Norris 2/28/2019

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ESTIMATED MSE WALL QUANTITY (SQUARE FEET)

MSE RETAINING WALL NO. 11	14,880 SF
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PREPARED BY: J. NORRIS	DATE: 02/25/19
REVIEWED BY: J. NORRIS	DATE: 02/25/19

Prepared in the Office of:

**CATLIN**  
Engineers and Scientists  
Wilmington, North Carolina

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

PROJECT NO.: R-5021

BRUNSWICK COUNTY

STATION: 39+52.37 -Y14A-

SHEET 4 OF 6

MSE RETAINING WALL NO. 11 PLAN AND ENVELOPE

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

SHEET NO. W-15

GEOTECHNICAL ENGINEER

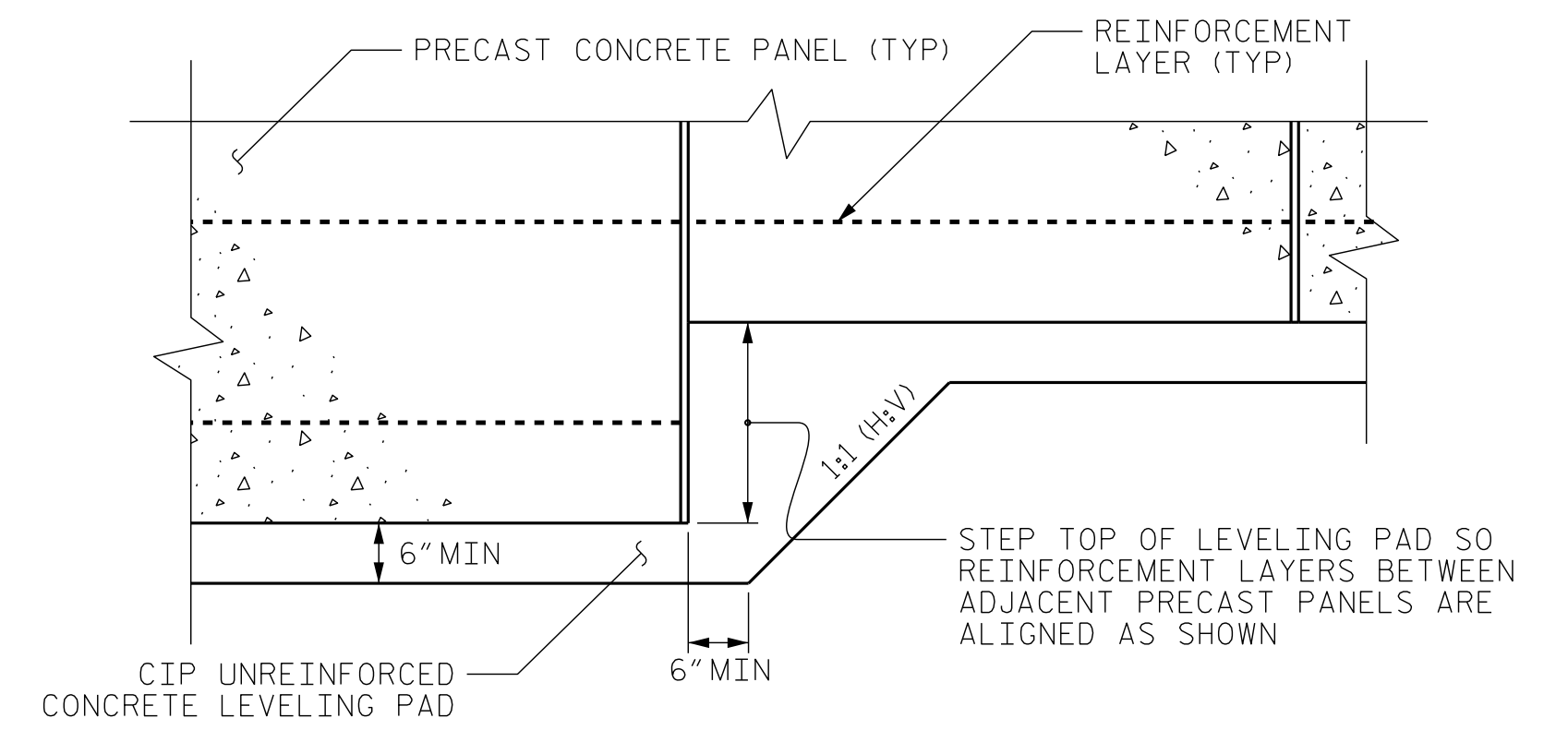
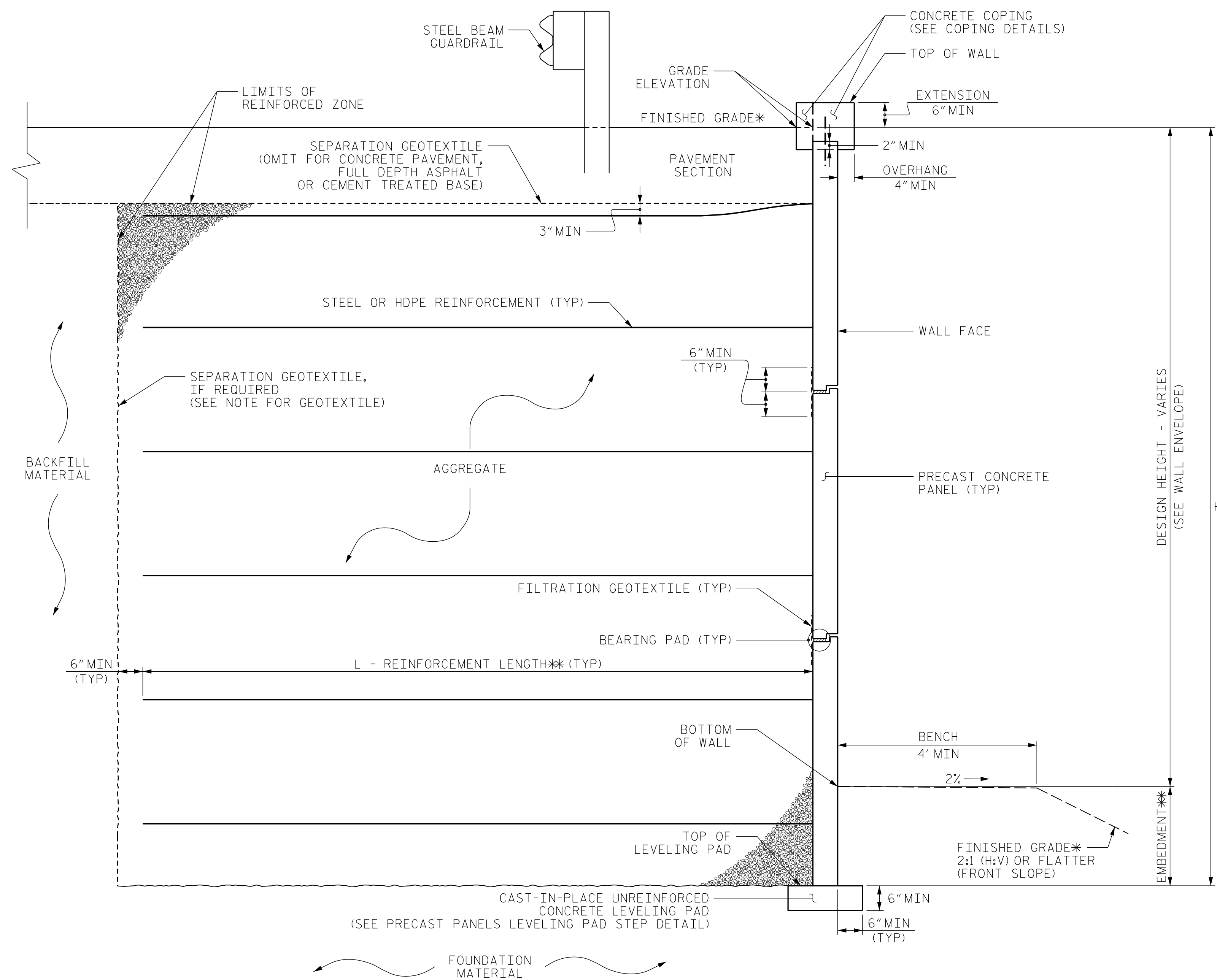
ENGINEER

SEAL 45898

DocuSigned by: Josie Norris 2/28/2019

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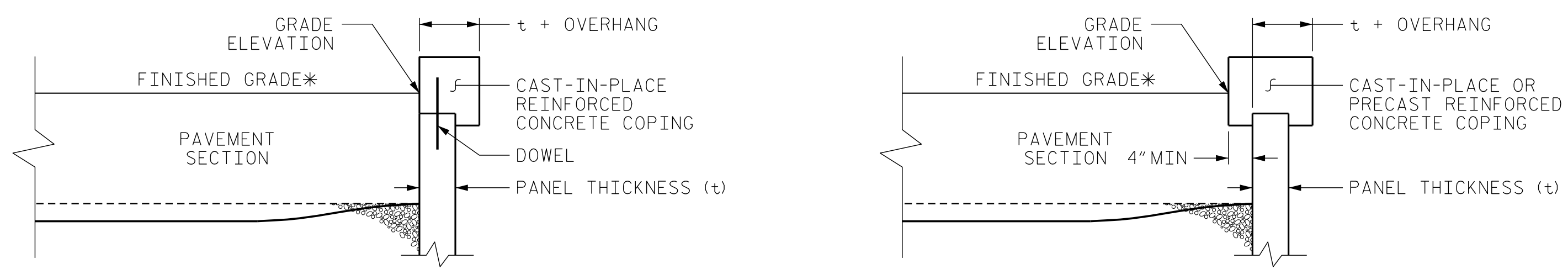
**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**



PRECAST PANELS LEVELING PAD STEP DETAIL

MSE WALL WITH PRECAST PANELS - TYPICAL SECTION

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



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.

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 39+52.37 -Y14A-  
 SHEET 5 OF 6

PREPARED BY: J. NORRIS DATE: 02/19/19  
 REVIEWED BY: B. LACKEY DATE: 02/20/19

Prepared in the Office of:

**CATLIN**  
 Engineers and Scientists  
 Wilmington, North Carolina

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

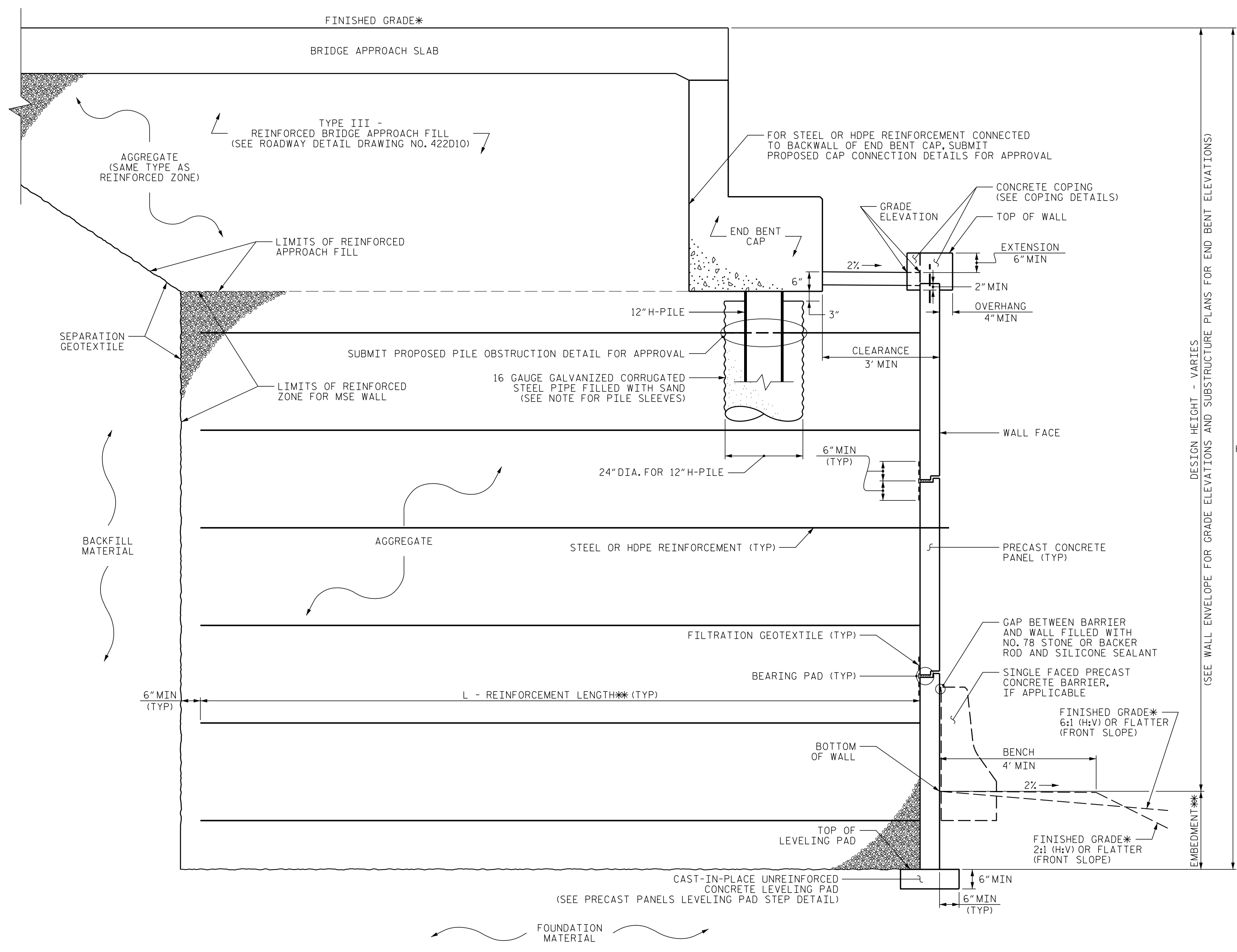
**GEOTECHNICAL ENGINEERING UNIT**

MSE RETAINING WALLS NO. 8-11  
 MSE WALL WITH PRECAST PANELS  
 TYPICAL SECTION & DETAILS

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

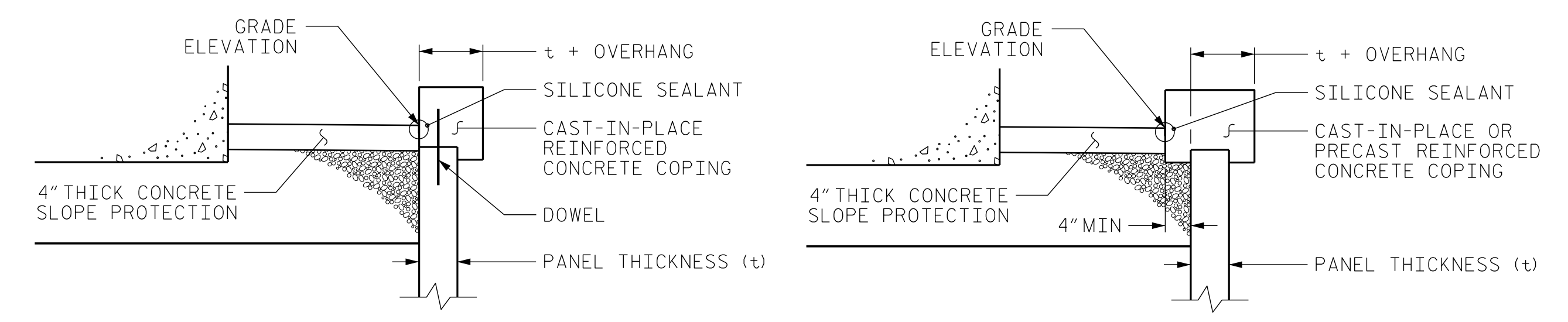
SHEET NO. W-16





**MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION**

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



**COPING DETAILS**

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

**NOTES:**

- FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.
- FOR TYPE III REINFORCED BRIDGE APPROACH FILL, SEE BRIDGE APPROACH FILLS PROVISION AND ROADWAY DETAIL DRAWING NO. 422D10.
- 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 WALL NO. 8, 9, 10 & 11.
- A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 8, 9, 10 & 11.
- A DRAIN IS NOT REQUIRED FOR RETAINING WALL NO. 8, 9, 10 & 11
- PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO. 1 LOCATED AT STATION 38+95.97 -Y14A-, AND FOR END BENT NO. 2 LOCATED AT STATION 40+16.47 -Y14A-.
- BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 8, 9, 10 & 11, 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 NO. FOR THE FOLLOWING:
  - 1) H = DESIGN HEIGHT + EMBEDMENT
  - 2) DESIGN LIFE = 100 YEARS
  - 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 6,800 PSF
  - 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8H
  - 5) 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	120	29	0

DESIGN RETAINING WALL NO. 8, 9, 10 & 11 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

FOUNDATIONS FOR SIGNS, LIGHTING OR SIGNALS WILL BE LOCATED BEHIND RETAINING WALL NO. 8, 9, 10 & 11 AND MAY INTERFERE WITH REINFORCEMENT. BEFORE BEGINNING MSE WALL CONSTRUCTION, SUBMIT PROPOSED CONSTRUCTION METHODS FOR THESE FOUNDATIONS FOR APPROVAL.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 8, 9, 10 & 11.

FOUNDATIONS FOR END BENT NO. 1 LOCATED AT STATION 38+95.97 -Y14A- AND END BENT NO. 2 LOCATED AT STATION 40+16.47 -Y14A- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALL NO. 8, 9, 10 & 11. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

DESIGN RETAINING WALL NO. 8, 9, 10 & 11 FOR A LATERAL LOAD FROM FOUNDATIONS LOCATED BEHIND THE MSE WALL APPLIED AS A FACTORED UNIFORM PRESSURE OF 500 PSF TO THE BACK OF PANELS.

INSTALL PILE SLEEVES FOR END BENT NO. 1 LOCATED AT STATION 38+95.97 -Y14A- AND END BENT NO. 2 LOCATED AT STATION 40+16.47 -Y14A- WHILE CONSTRUCTING RETAINING WALL NO. 8, 9, 10 & 11. 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 WALL NO. 8, 9, 10 & 11 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.


PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 39+52.37 -Y14A-  
SHEET 6 OF 6

PREPARED BY: J. NORRIS      DATE: 02/25/19  
REVIEWED BY: B. LACKEY      DATE: 02/25/19

Prepared in the Office of:



**CATLIN**  
Engineers and Scientists  
Wilmington, North Carolina



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

**GEOTECHNICAL**  
ENGINEERING UNIT

**MSE RETAINING WALLS NO. 8-11  
MSE WALL WITH PRECAST PANELS  
TYPICAL END SECTION & NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-17
2	-	-	4	-	-	

GEOTECHNICAL ENGINEER

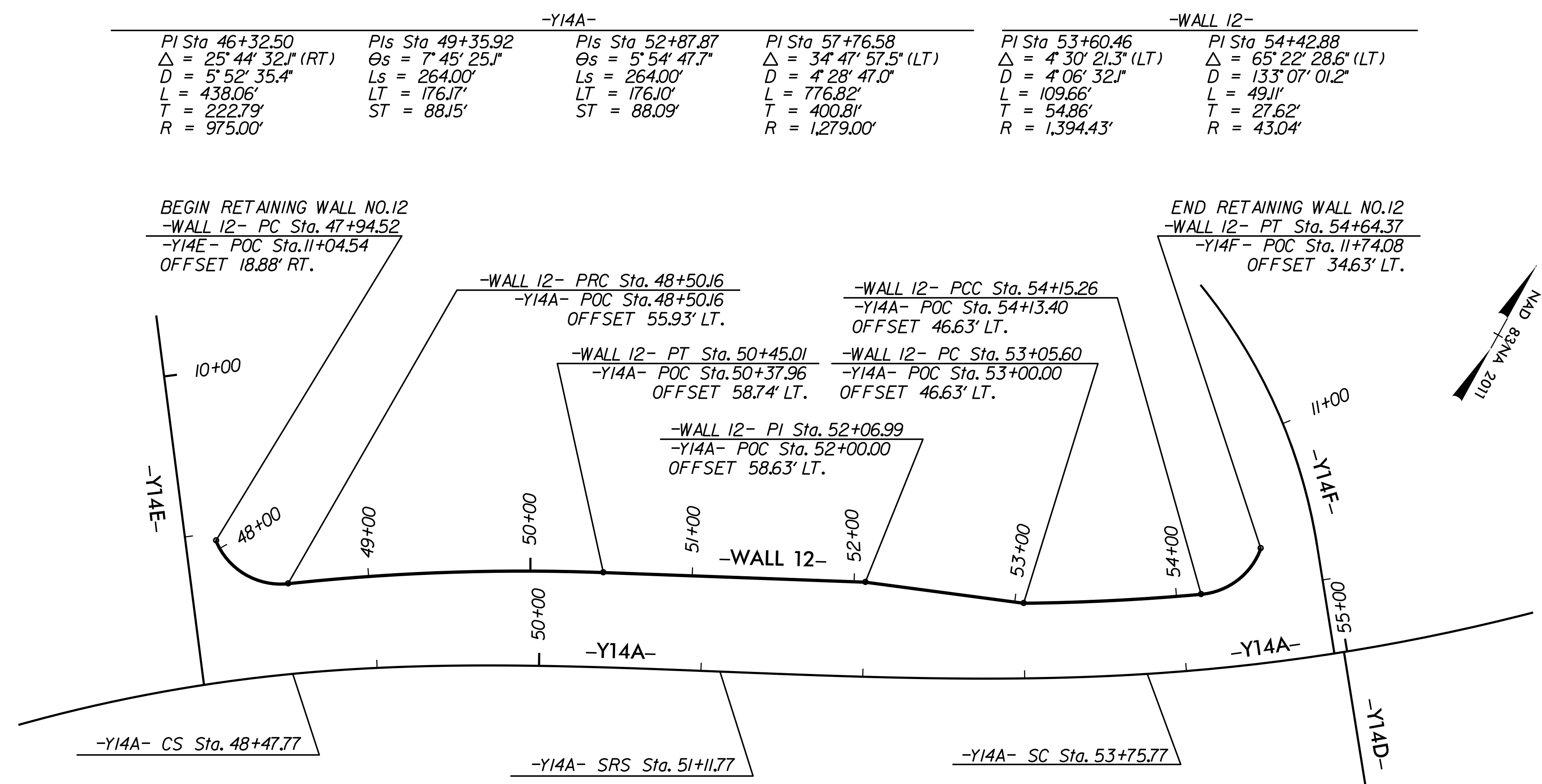
ENGINEER

SEAL 030943

THEIN TUN ZAN

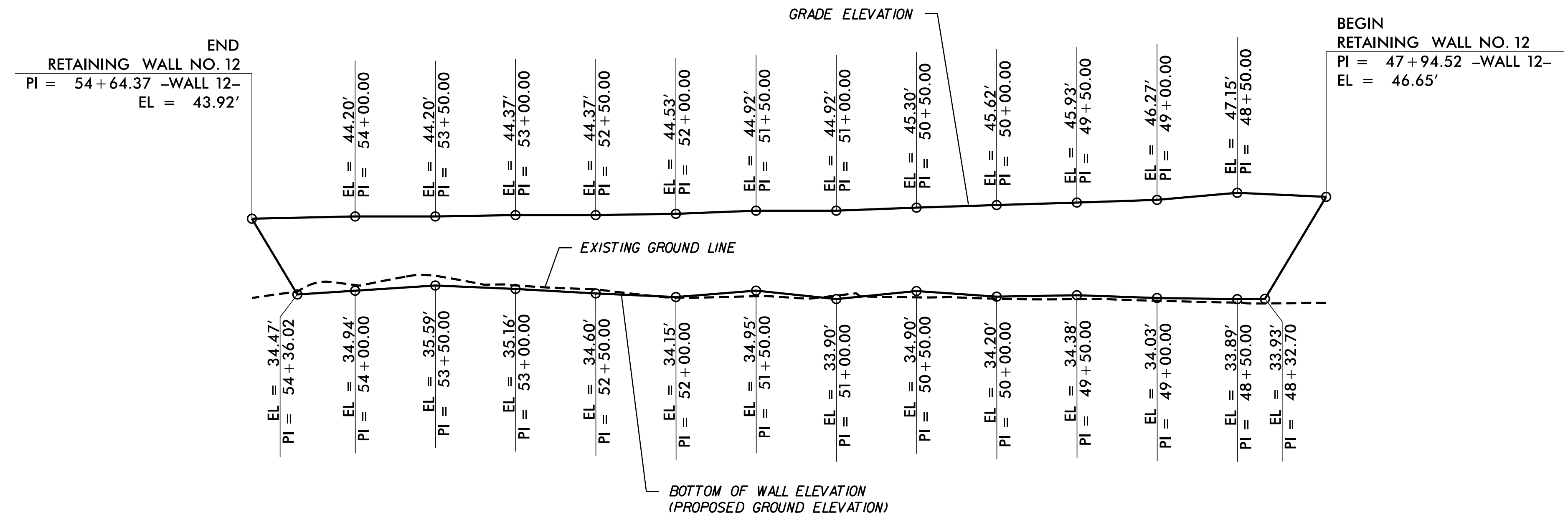
2/28/2019

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RETAINING WALL NO. 12 PLAN VIEW  
NOT TO SCALE

ESTIMATED MSE WALL QUANTITY (SQ. FEET)	
MSE RETAINING WALL NO. 12	8,105 SF



RETAINING WALL NO. 12 WALL ENVELOPE  
EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 48+50 -WALL12- / 48+50 -Y14A-  
SHEET 1 OF 5

PREPARED BY: THEIN TUN ZAN DATE: 01-2019  
REVIEWED BY: JAMES BATTS DATE: 01-2019

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

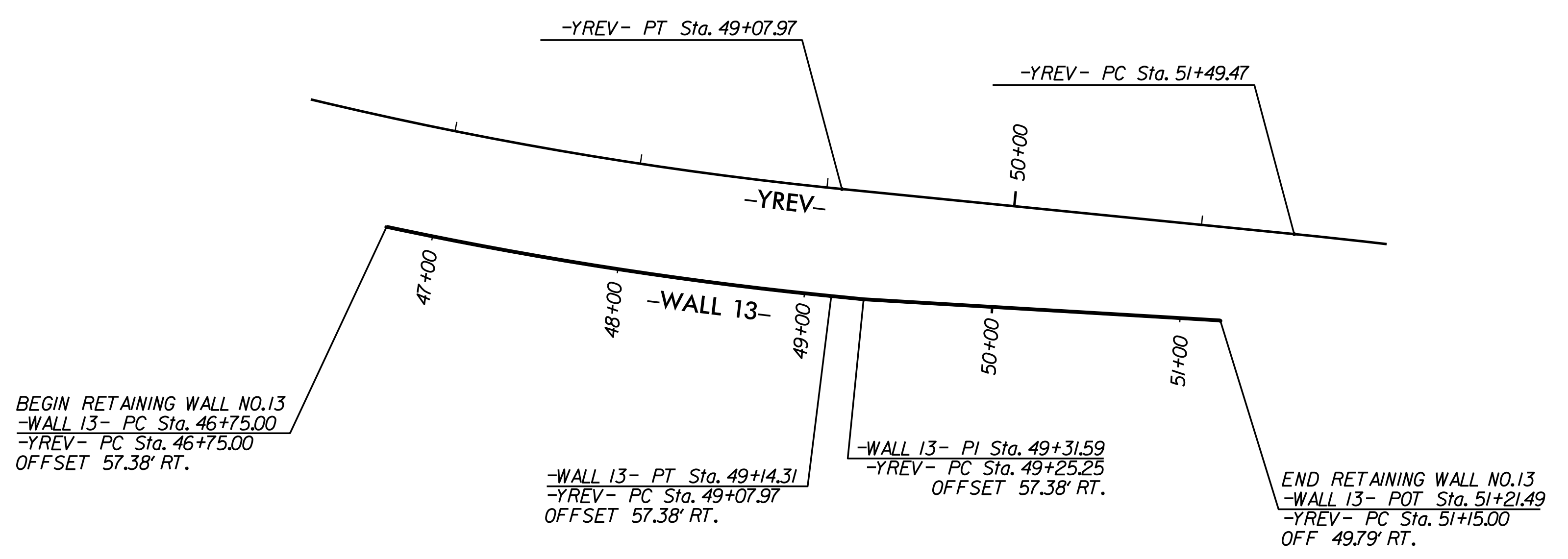
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	-	-	3	-	-
2	-	-	4	-	-

SHEET NO. W-18



-WALL 13-	-YREV-	-YREV-
PI Sta 47+94.77	PI Sta 44+63.55	PI Sta 54+58.41
$\Delta = 6' 19" 34.3" (LT)$	$\Delta = 24' 31" 00.3" (LT)$	$\Delta = 12' 09" 43.1" (RT)$
$D = 2' 38" 36.8"$	$D = 2' 42" 55.6"$	$D = 1' 58" 32.6"$
$L = 239.31'$	$L = 902.86'$	$L = 615.57'$
$T = 119.77'$	$T = 458.45'$	$T = 308.95'$
$R = 2167.38'$	$R = 2110.00'$	$R = 2900.00'$
	$SE = 4\%$	$SE = 4\%$
	$V = 50MPH$	$V = 50MPH$

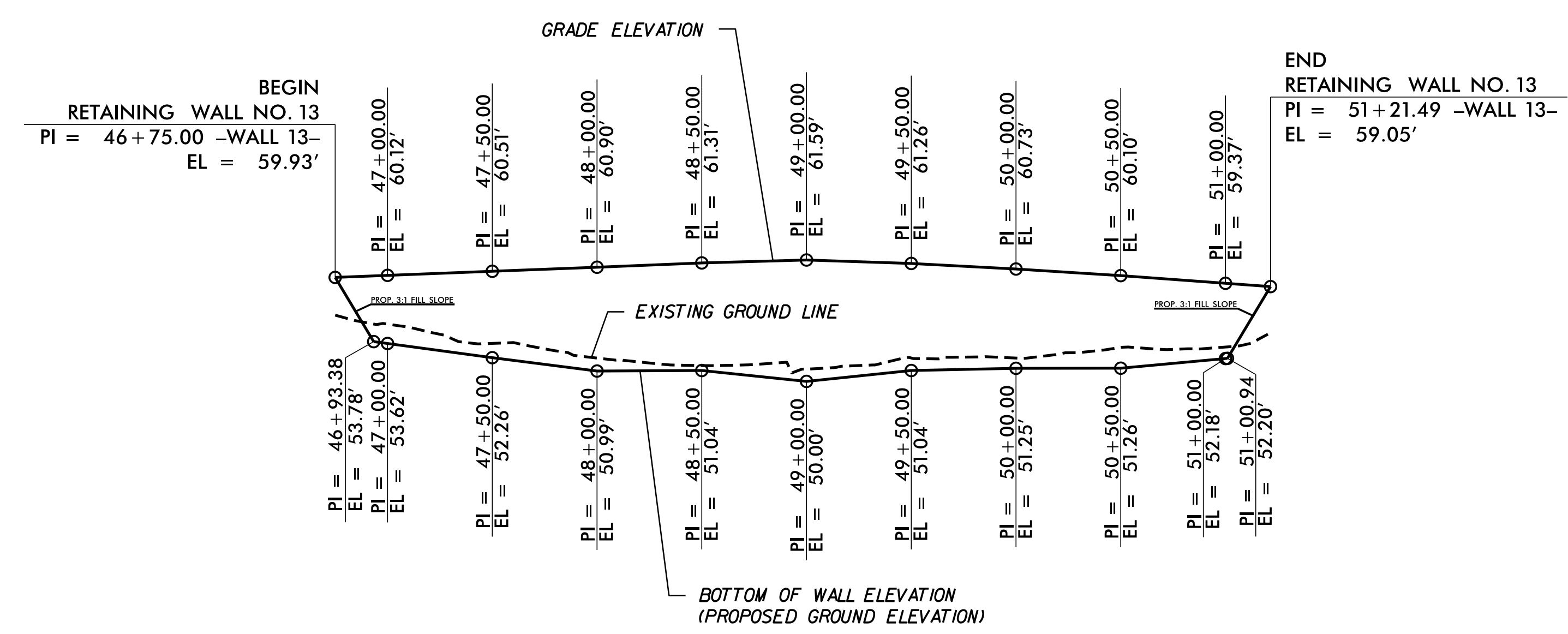
NAD 83/NA 2011



RETAINING WALL NO.13 PLAN VIEW

NOT TO SCALE

ESTIMATED MSE WALL QUANTITY (SQUARE FEET)	
MSE RETAINING WALL NO.13	4,770 SF



RETAINING WALL NO.13 WALL ENVELOPE

EXPOSED WALL FACE VIEW - NOT TO SCALE  
THE WALL ENVELOPE DOES NOT ACCURATELY  
DEPICT THE ACTUAL FACE OF THE WALL

GEOTECHNICAL ENGINEER

ENGINEER

THEIN TUN ZAN

SEAL 030943

DocuSigned by: Thein Tun Zan 2/28/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO.: R-5021

BRUNSWICK COUNTY

STATION: 47+00 -WALL13- / 47+00 -YREV-

SHEET 2 OF 5

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			W-19
2			4			

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019

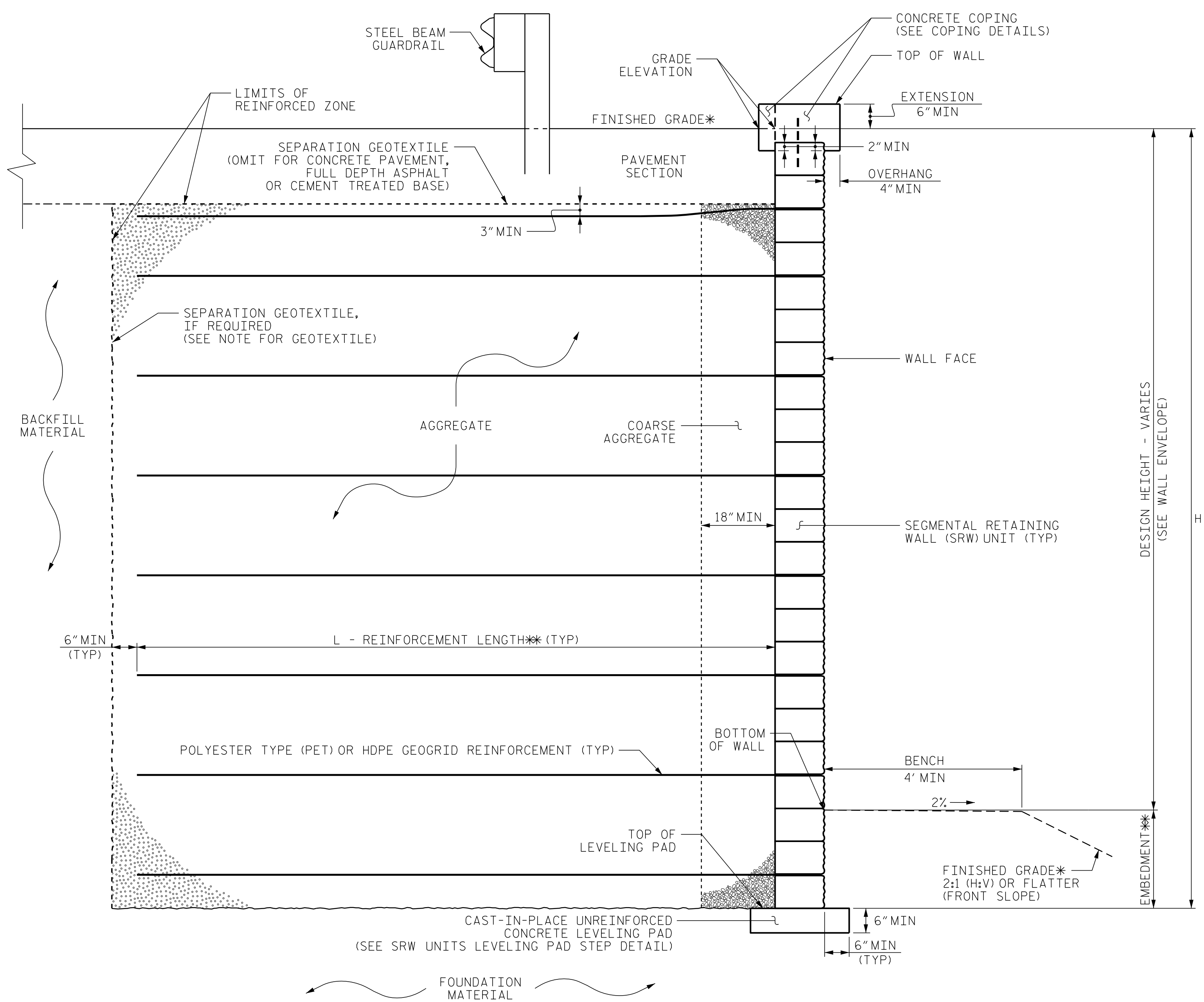
GEOTECHNICAL ENGINEER

ENGINEER

Designed by: Thein Tun Zan      2/28/2019

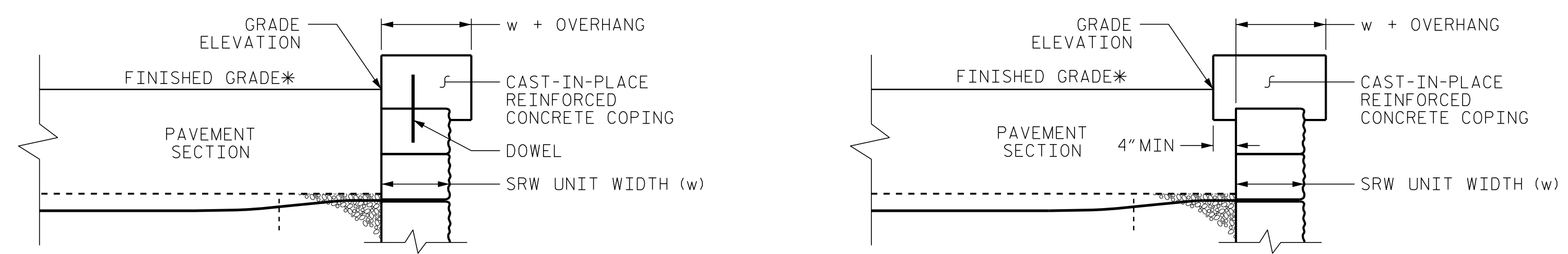
Signature: \_\_\_\_\_      Date: \_\_\_\_\_

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UNLESS ALL SIGNATURES COMPLETED**



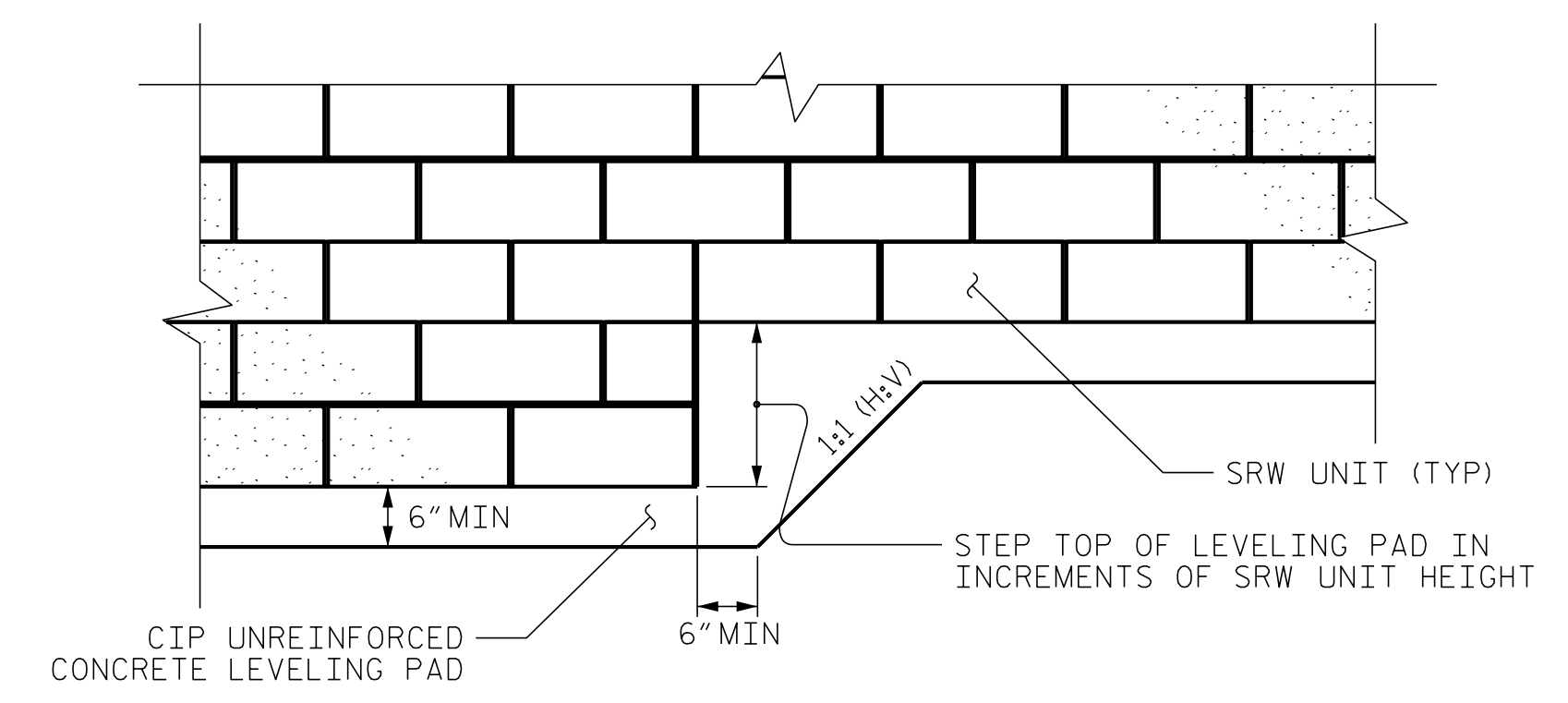
**MSE WALL WITH SRW UNITS - TYPICAL SECTION**

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



**COPING DETAILS**

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



**SRW UNITS LEVELING PAD STEP DETAIL**

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019

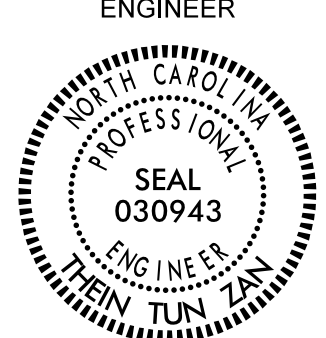
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DIVISION OF HIGHWAYS**

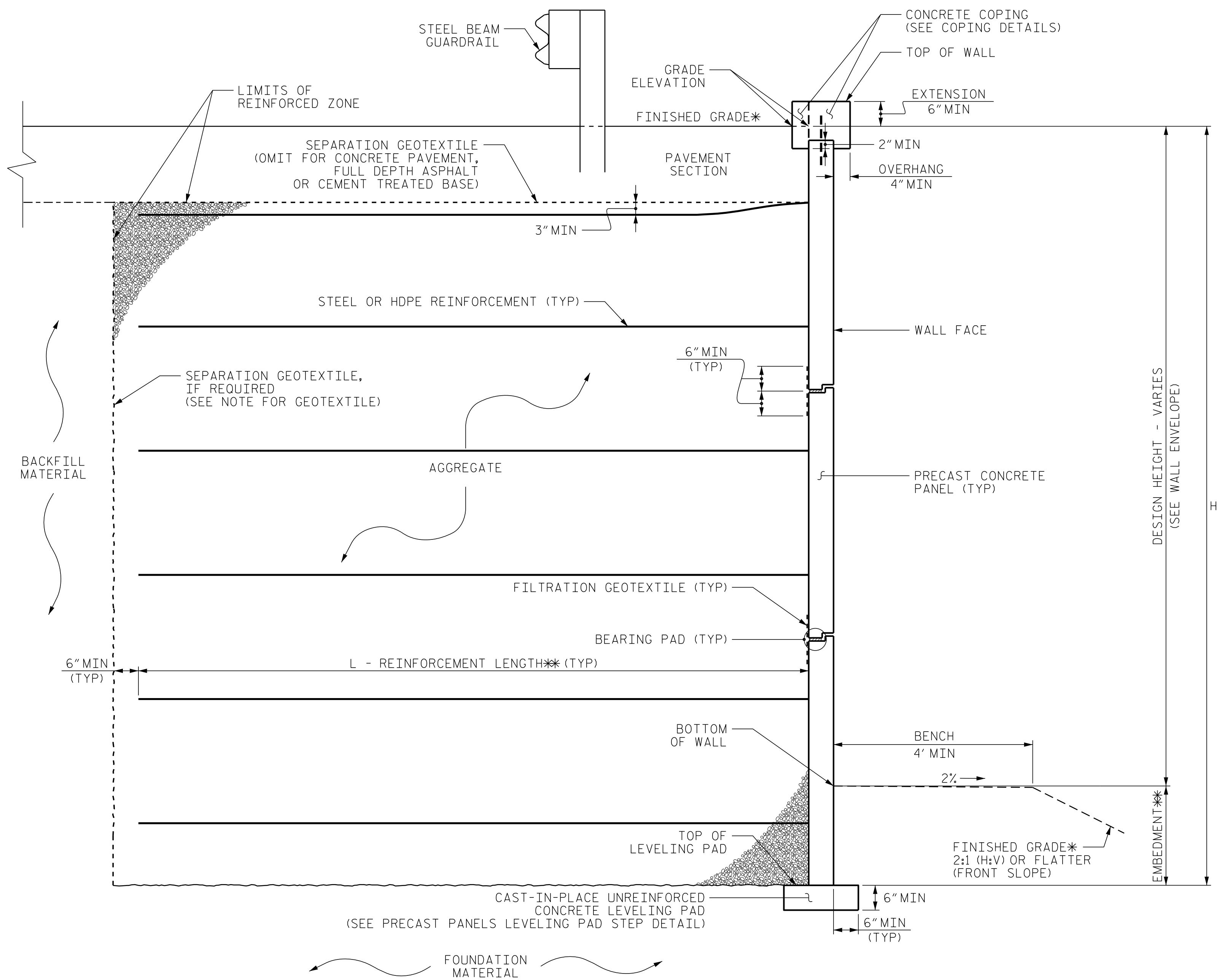
**GEOTECHNICAL  
ENGINEERING UNIT**

PROJECT NO.: R-5021  
BRUNSWICK COUNTY  
STATION: 48+50 -WALL12- & 47+00 -WALL13-  
SHEET 3 OF 5

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	W-20
2	-	-	4	-	-	

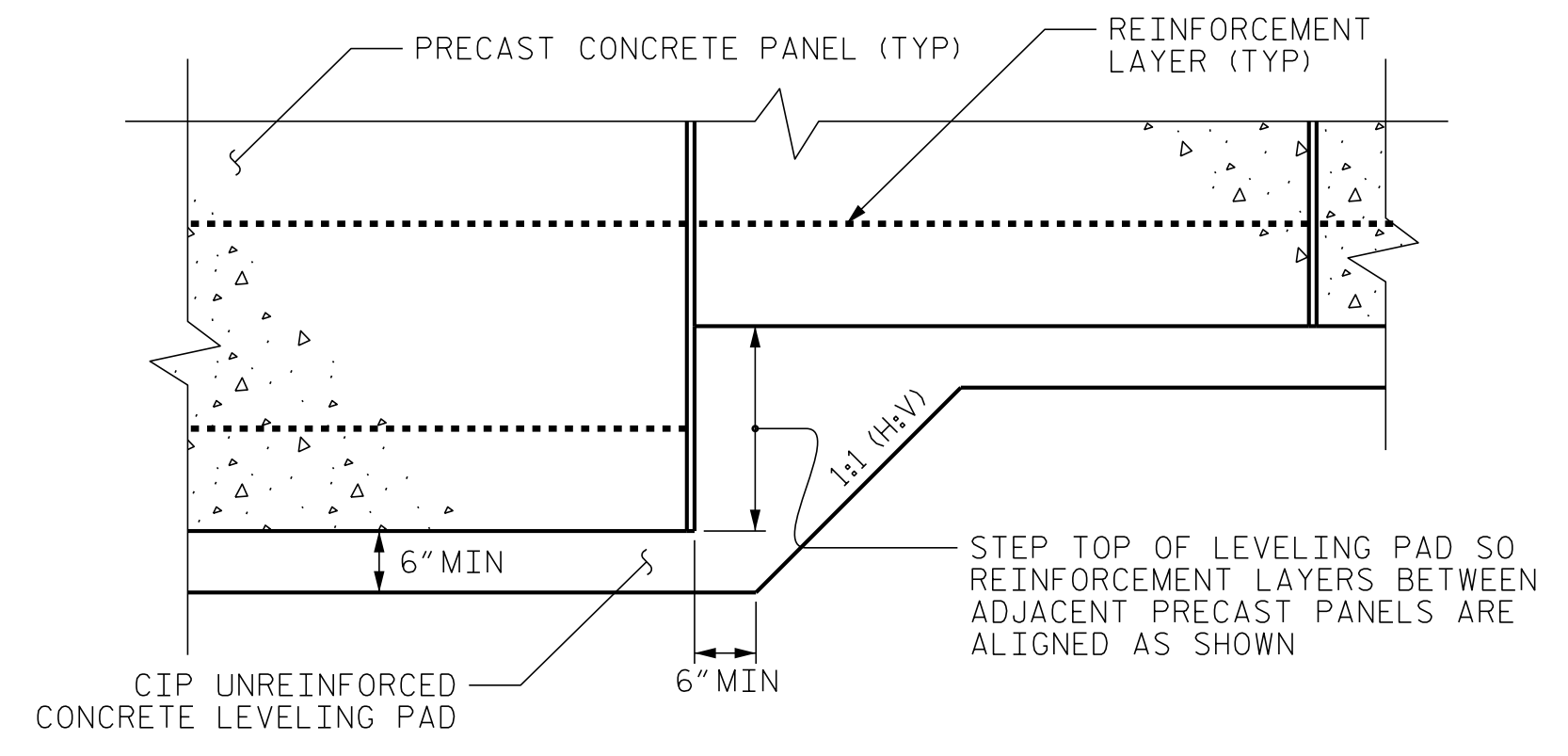


GEOTECHNICAL ENGINEER  
 ENGINEER  
  
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 Thein Tun Zan 2/28/2019  
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**DOCUMENT NOT CONSIDERED FINAL  
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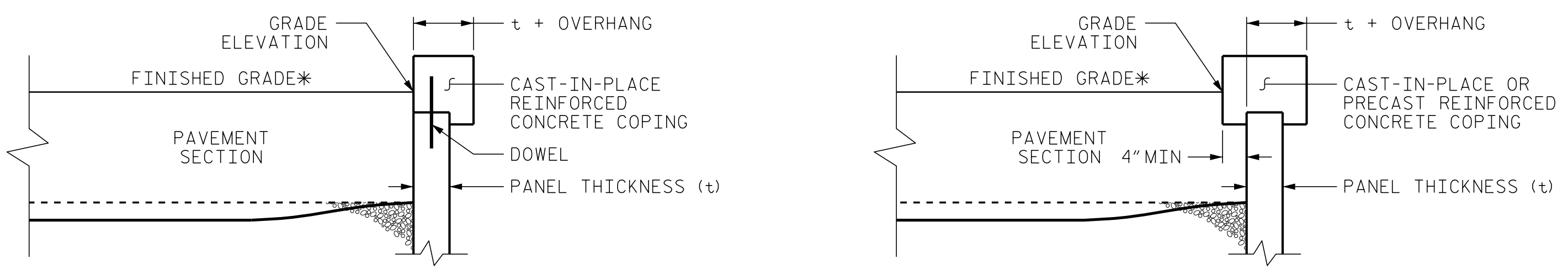


**MSE WALL WITH PRECAST PANELS - TYPICAL SECTION**

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



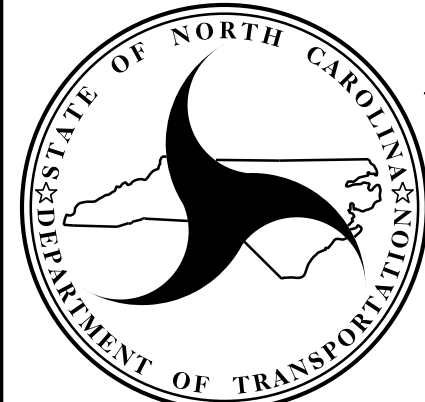
**PRECAST PANELS LEVELING PAD STEP DETAIL**



**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.


PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
 STATION: 48+50 -WALL12- & 47+00 -WALL13-  
 SHEET 4 OF 5

  
**NORTH CAROLINA  
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**GEOTECHNICAL  
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**MSE RETAINING WALL NO. 12 & 13  
MSE WALL WITH PRECAST PANELS  
TYPICAL SECTION & DETAILS**

REVISIONS						SHEET NO. W-21
NO.	BY	DATE	NO.	BY	DATE	
1	-	-	3	-	-	
2	-	-	4	-	-	

PREPARED BY: THEIN TUN ZAN DATE: 01-2019  
 REVIEWED BY: JAMES BATTS DATE: 01-2019

GEOTECHNICAL ENGINEER    DocuSigned by: <i>Thein Tun Zan</i> 2/28/2019 <small>SIGNATURE DATE</small>	ENGINEER          <small>SIGNATURE DATE</small>
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**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 AN MSE WALL SYSTEM WITH SEGMENTAL RETAINING WALL (SRW) UNITS THAT MEET ARTICLE 1040-4 OF THE STANDARD SPECIFICATIONS FOR RETAINING WALL NO. 12 & NO. 13.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALL NO. 12 AND NO. 13.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALL NO. 12 AND NO. 13.

A DRAIN IS NOT REQUIRED FOR RETAINING WALL NO. 12 AND NO. 13.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALL NO. 12 & NO. 13, 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 NO. 12 AND NO. 13 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 3,850 PSF (WALL NO. 12) AND 3,600 PSF (WALL NO. 13)
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.8 H
- 5) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) 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:

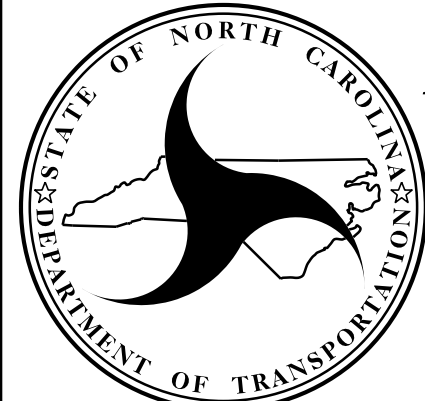
MATERIAL TYPE	UNIT WEIGHT ( $\gamma$ ) PCF	FRICTION ANGLE ( $\phi$ ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	120	30	0

DESIGN RETAINING WALL NO. 12 AND NO. 13 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 WALL NO. 12 AND NO. 13.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO. 12 AND NO. 13 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

PROJECT NO.: R-5021  
 BRUNSWICK COUNTY  
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 SHEET 5 OF 5



**NORTH CAROLINA  
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**GEOTECHNICAL  
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MSE RETAINING WALL NO. 12 & 13 NOTES					
REVISIONS					
NO.	BY	DATE	NO.	BY	DATE
1	-	-	3	-	-
2	-	-	4	-	-
					SHEET NO. W-22

PREPARED BY: THEIN TUN ZAN	DATE: 01-2019
REVIEWED BY: JAMES BATTS	DATE: 01-2019