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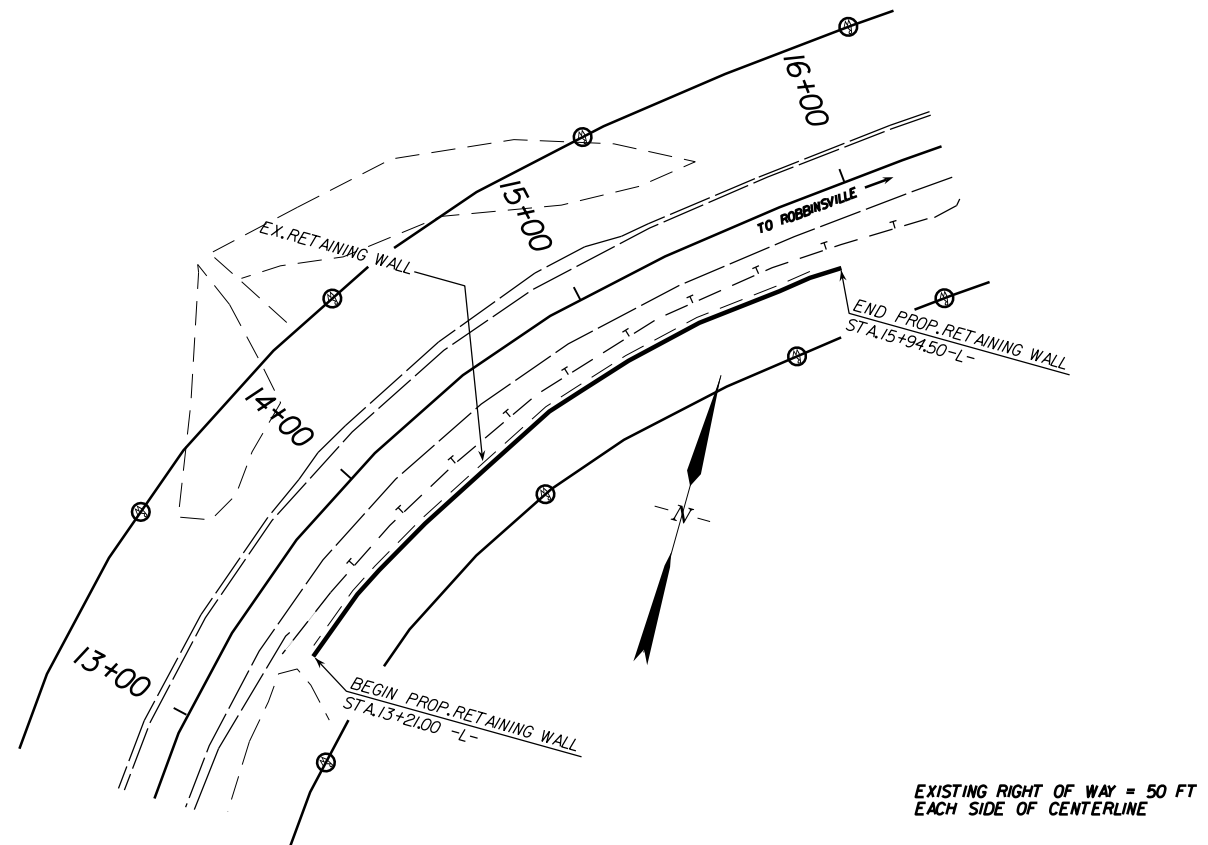
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GEOTECHNICAL ENGINEER ENGINEER

SEAL 23481
NORTH CAROLINA PROFESSIONAL ENGINEER
J. Dean Hardister

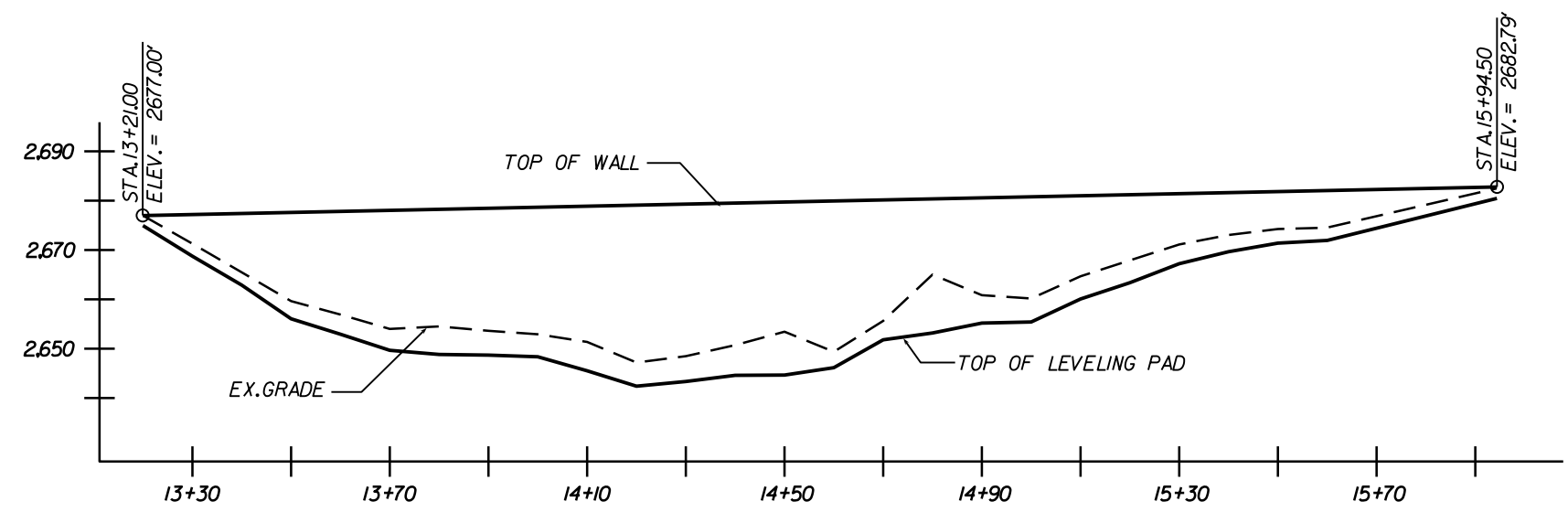
DocuSigned by: J. Dean Hardister
DATE SIGNATURE DATE

12/18/2017



LOCATION SKETCH

RETAINING WALL ELEVATIONS					
STATION	RIGHT OFFSET	TOP OF WALL	EXISTING GRADE	TOP OF LEVELING PAD	H
13+21	25.80	2677.00	2677.00	2674.00	2.50
13+30	25.89	2677.19	2670.47	2667.84	8.85
13+50	26.17	2677.63	2658.83	2655.16	21.97
13+70	26.57	2678.07	2653.19	2648.69	28.88
13+90	27.62	2678.51	2652.81	2647.81	30.20
14+10	27.62	2678.95	2650.55	2645.55	32.90
14+30	27.45	2679.39	2647.67	2642.67	36.22
14+50	25.51	2679.83	2652.63	2647.63	31.70
14+70	25.71	2680.27	2654.82	2649.82	29.95
14+90	24.27	2680.71	2660.03	2655.03	25.18
15+10	23.99	2681.18	2663.86	2658.86	21.82
15+30	24.22	2681.59	2670.31	2665.31	15.78
15+50	24.73	2682.03	2673.44	2668.44	13.09
15+70	24.50	2682.47	2676.83	2674.83	7.14
15+94.5	24.60	2682.79	2682.79	2679.79	2.50



PROJECT NO.: 41665.10B
GRAHAM COUNTY
STATION: 13+21.00 -L-
SHEET 1 OF 1

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

RETAINING WALL NO. 1

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	1
1			3			TOTAL SHEETS
2			4			4

PREPARED BY: D. Hardister, PE DATE: 12/2017
REVIEWED BY: E. Williams, PE DATE: 12/2017

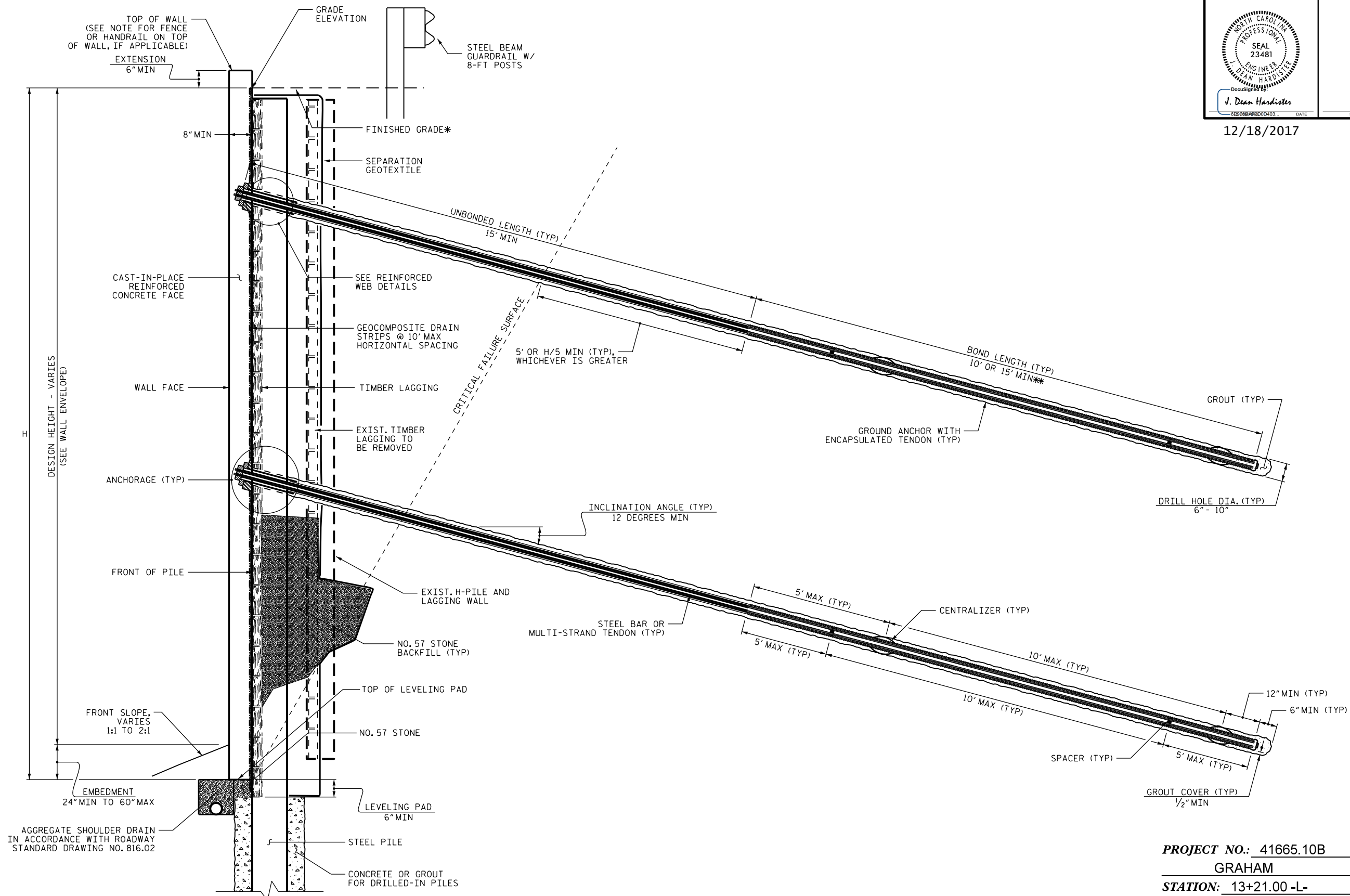
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 23481

J. Dean Hardister

12/18/2017



ANCHORED WALL - TYPICAL SECTION

(DOUBLE ROW OF GROUND ANCHORS SHOWN, AS NEEDED.)
*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.
**SEE ANCHORED RETAINING WALLS PROVISION FOR BOND LENGTH REQUIREMENTS.

PROJECT NO.: 41665.10B
GRAHAM COUNTY
STATION: 13+21.00 -L-
SHEET 1 OF 2

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
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STATE OF NORTH CAROLINA
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RALEIGH

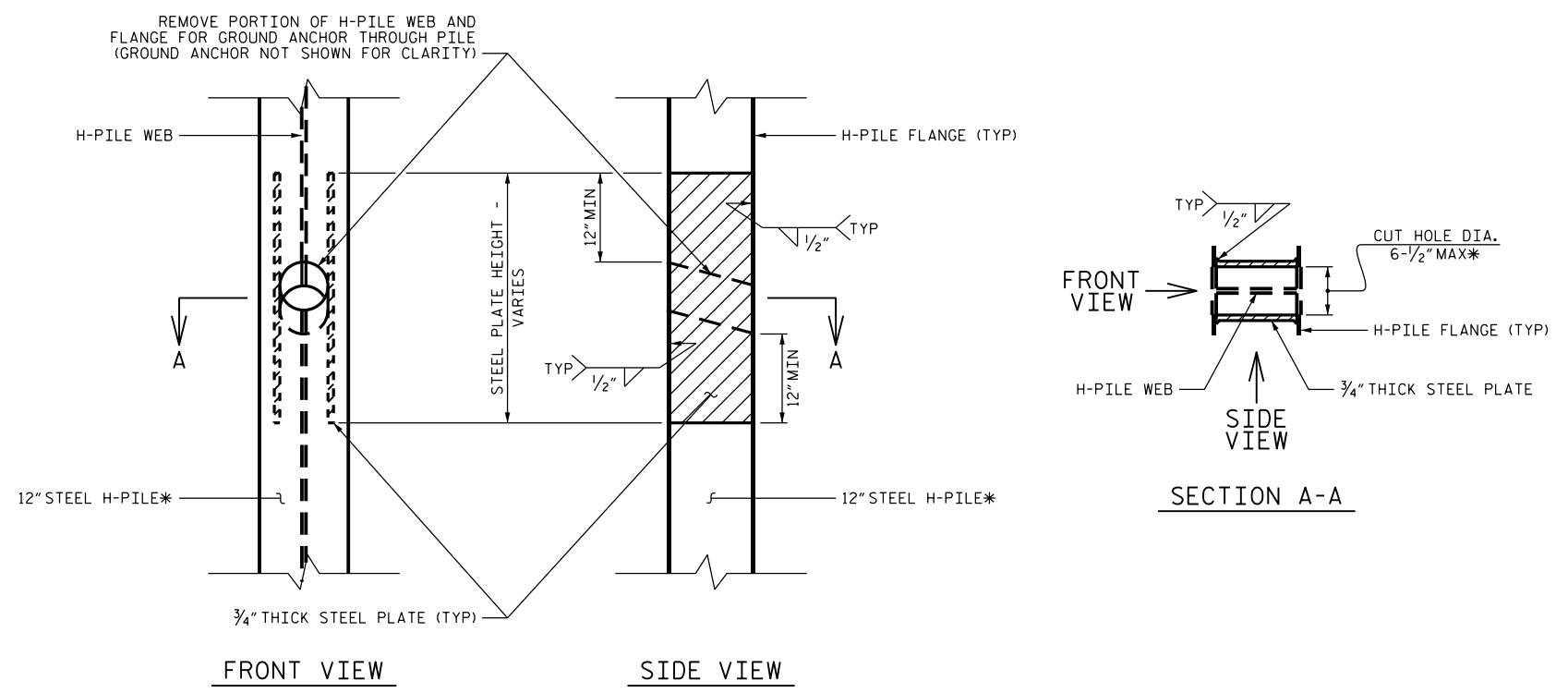
RETAINING WALL NO. 1
OPTION #1
ANCHORED RETAINING WALL

PREPARED BY: D. Hardister, PE	DATE: 12/2017
REVIEWED BY: E. Williams, PE	DATE: 12/2017

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	2
1	-	-	3	-	-	TOTAL SHEETS
2	-	-	4	-	-	4

NOTES:

- FOR ANCHORED RETAINING WALLS, SEE ANCHORED RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- A FENCE IS REQUIRED ON TOP OF RETAINING WALL NO.1. SEE ROADWAY PLANS FOR FENCE ATTACHMENT DETAILS.
- DESIGN RETAINING WALL NO.1 FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
- BEFORE BEGINNING ANCHORED WALL DESIGN FOR RETAINING WALL NO.1, 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.1 FOR THE FOLLOWING:
 - 1) H = DESIGN HEIGHT + EMBEDMENT
 - 2) DESIGN LIFE = 100 YEARS
 - 3) IN-SITU ASSUMED MATERIAL PARAMETERS (SOIL):
 - UNIT WEIGHT, $\gamma = 120$ LB/CF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ LB/SF
 - 4) IN-SITU ASSUMED MATERIAL PARAMETERS (WEATHERED ROCK):
 - UNIT WEIGHT, $\gamma = 135$ LB/CF
 - FRICTION ANGLE, $\phi = 40$ DEGREES
 - COHESION, $c = 50$ LB/SF
- DESIGN RETAINING WALL NO.1 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.
- DESIGN RETAINING WALL NO.1 FOR A PIPE EXTENDING UNDER OR THROUGH THE WALL. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING ANCHORED WALL DESIGN OR CONSTRUCTION.
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH GROUND ANCHORS FOR RETAINING WALL NO.1.



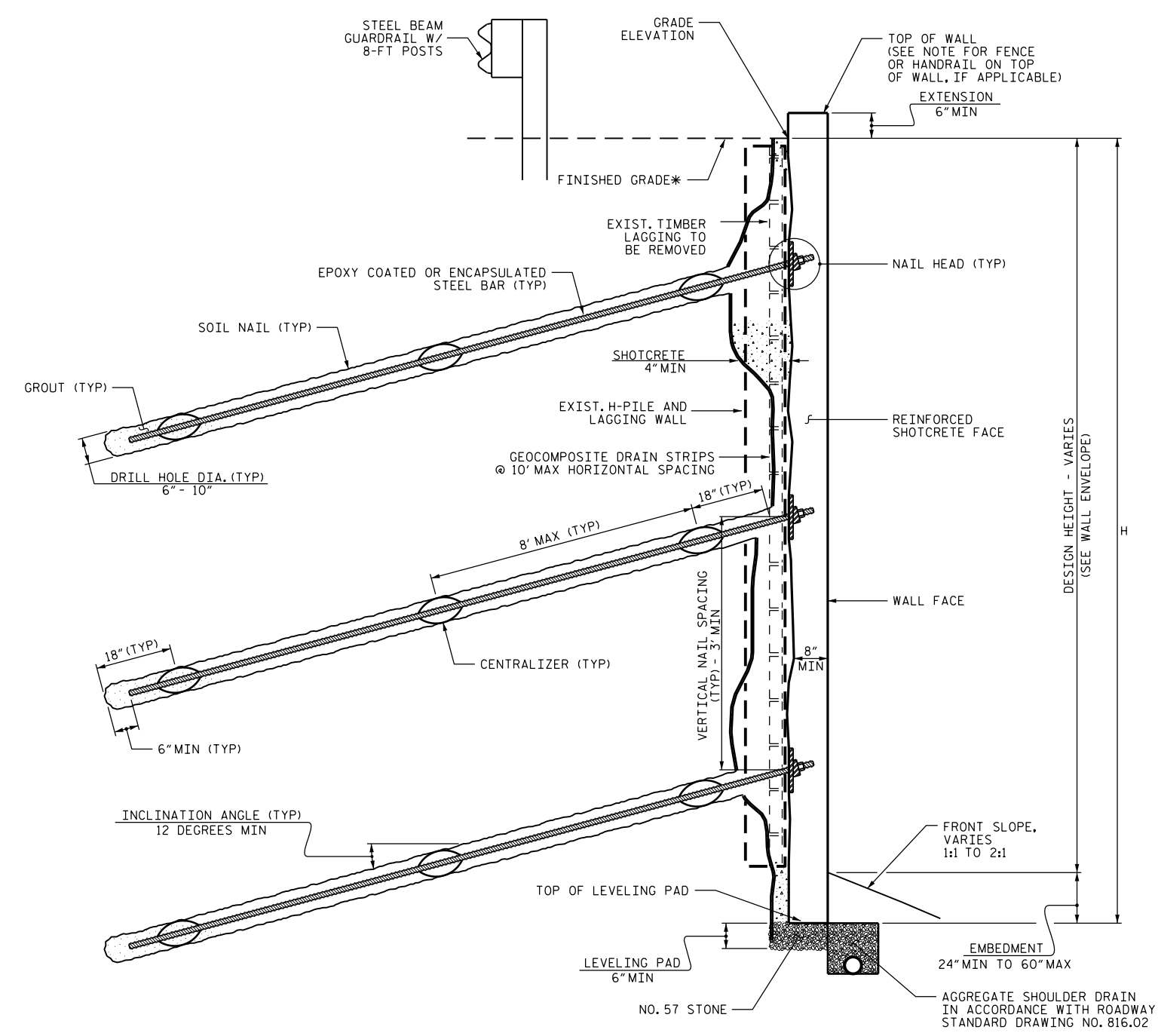
REINFORCED WEB DETAILS
 *DETAILS SHOWN ARE FOR 12" H-PILES WITH 6" DIA. GROUND ANCHORS. FOR DIFFERENT DIAMETER ANCHORS, SUBMIT ALTERNATE REINFORCED WEB DETAILS FOR ACCEPTANCE.

TOTAL STRUCTURE QUANTITIES - OPTION #1	
RETAINING WALL NO.1	6,250 SQ. FT.

PROJECT NO.: 41665.10B
 GRAHAM COUNTY
 STATION: 13+21.00 -L-
 SHEET 2 OF 2

PREPARED BY: D. Hardister, PE DATE: 12/2017
 REVIEWED BY: E. Williams, PE DATE: 12/2017

<p> GEOTECHNICAL ENGINEERING UNIT <input type="checkbox"/> EASTERN REGIONAL OFFICE <input checked="" type="checkbox"/> WESTERN REGIONAL OFFICE <input type="checkbox"/> CONTRACT OFFICE STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH </p>	RETAINING WALL NO. 1 OPTION #1 ANCHORED RETAINING WALL																												
	<table border="1"> <thead> <tr> <th colspan="6">REVISIONS</th> </tr> <tr> <th>NO.</th> <th>BY</th> <th>DATE</th> <th>NO.</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-</td> <td>-</td> <td>3</td> <td>-</td> <td>-</td> </tr> <tr> <td>2</td> <td>-</td> <td>-</td> <td>4</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	REVISIONS						NO.	BY	DATE	NO.	BY	DATE	1	-	-	3	-	-	2	-	-	4	-	-	<table border="1"> <tr> <td>SHEET NO.</td> <td>3</td> </tr> <tr> <td>TOTAL SHEETS</td> <td>4</td> </tr> </table>	SHEET NO.	3	TOTAL SHEETS
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TOTAL SHEETS	4																												



SOIL NAIL WALL - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.

NOTES:

- FOR SOIL NAIL RETAINING WALLS, SEE SOIL NAIL RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- A FENCE IS REQUIRED ON TOP OF RETAINING WALL NO.1. SEE ROADWAY PLANS FOR FENCE ATTACHMENT DETAILS.
- DESIGN RETAINING WALL NO.1 FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.
- BEFORE BEGINNING SOIL NAIL WALL DESIGN FOR RETAINING WALL NO.1, 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.
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 - 2) DESIGN LIFE = 100 YEARS
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 - UNIT WEIGHT, $\gamma = 120$ LB/CF
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- DESIGN RETAINING WALL NO.1 FOR A PIPE EXTENDING THROUGH THE WALL. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING SOIL NAIL WALL DESIGN OR CONSTRUCTION.
- EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES WILL INTERFERE WITH SOIL NAILS FOR RETAINING WALL NO.1.

TOTAL STRUCTURE QUANTITIES - OPTION #2

RETAINING WALL NO.1	6,250	SO. FT.
SOIL NAIL VERIFICATION TESTS	2	EA.
SOIL NAIL PROOF TESTS	10	EA.

PROJECT NO.: 41665.10B
GRAHAM COUNTY
STATION: 13+21.00 -L-
 SHEET 1 OF 1

PREPARED BY: D. Hardister, PE DATE: 12/2017
 REVIEWED BY: E. Williams, PE DATE: 12/2017

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**RETAINING WALL NO. 1
 OPTION #2
 SOIL NAIL RETAINING WALL**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	4
1	-	-	3	-	-	TOTAL SHEETS
2	-	-	4	-	-	4