

51214.01AB

CONTRACT: 11870487

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**MCDOWELL COUNTY**

LOCATION: NC-226 APPROXIMATELY 3.4 MILES NORTH OF US-221

TYPE OF WORK: SOIL NAIL REPAIR OF EXISTING RETAINING WALL  
& MICROPILE SLOPE STABILIZATION

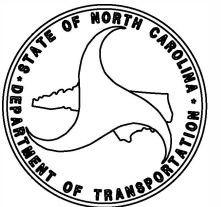


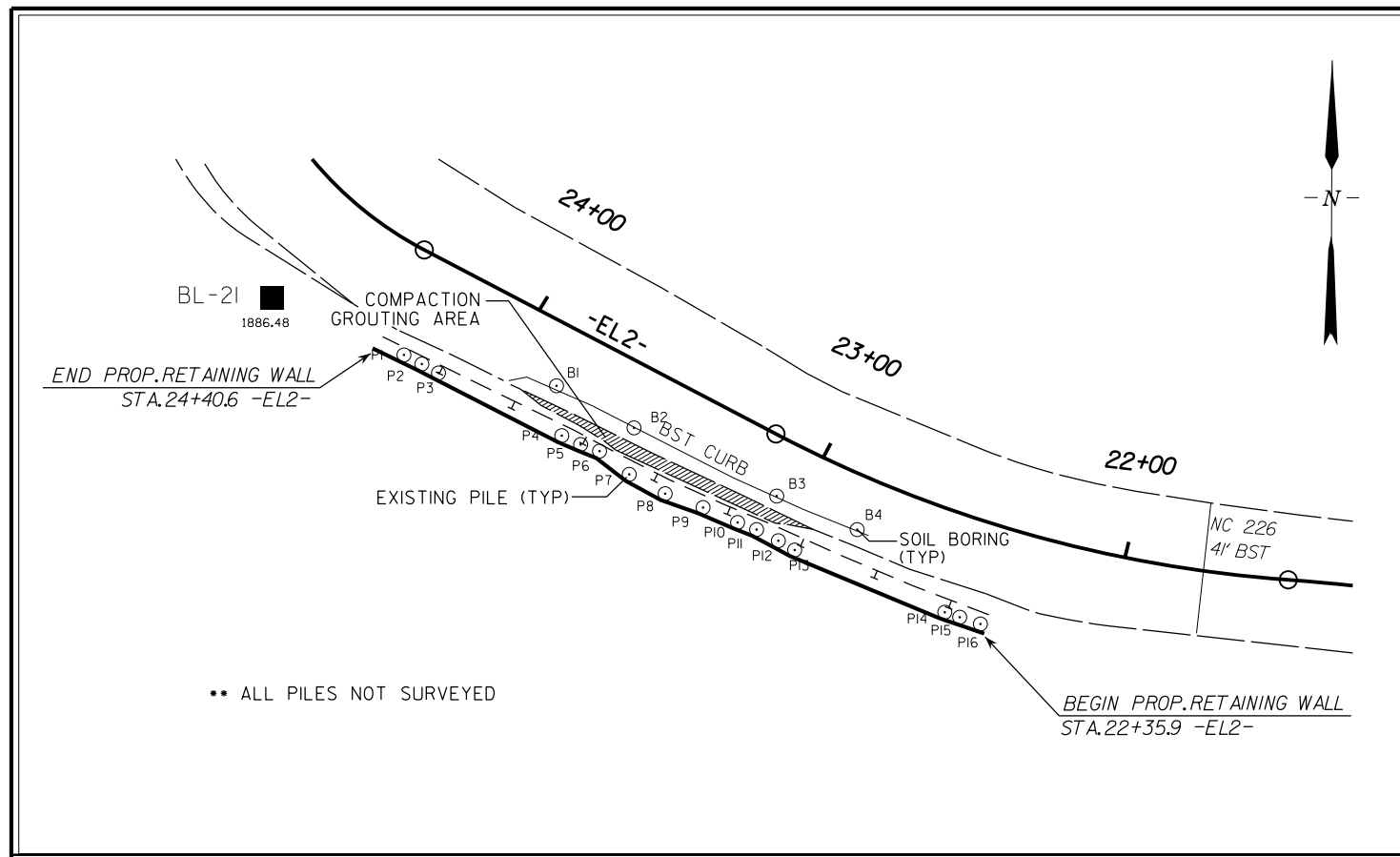
|                 |                             |             |              |
|-----------------|-----------------------------|-------------|--------------|
| STATE           | STATE PROJECT REFERENCE NO. | SHEET NO.   | TOTAL SHEETS |
| N.C.            | 11870487                    | 1           |              |
| STATE PROJ. NO. | F. A. PROJ. NO.             | DESCRIPTION |              |
| 51214.01AB      |                             | CONST.      |              |



Prepared in the Office of:  
**NCDOT DIVISION 13**  
55 Orange St., Asheville NC, 28801

|                                |                         |
|--------------------------------|-------------------------|
| 2018 STANDARD SPECIFICATIONS   |                         |
| RIGHT OF WAY DATE:             | PROJECT ENGINEER        |
| LETTING DATE:<br>MARCH 6, 2019 | PROJECT DESIGN ENGINEER |

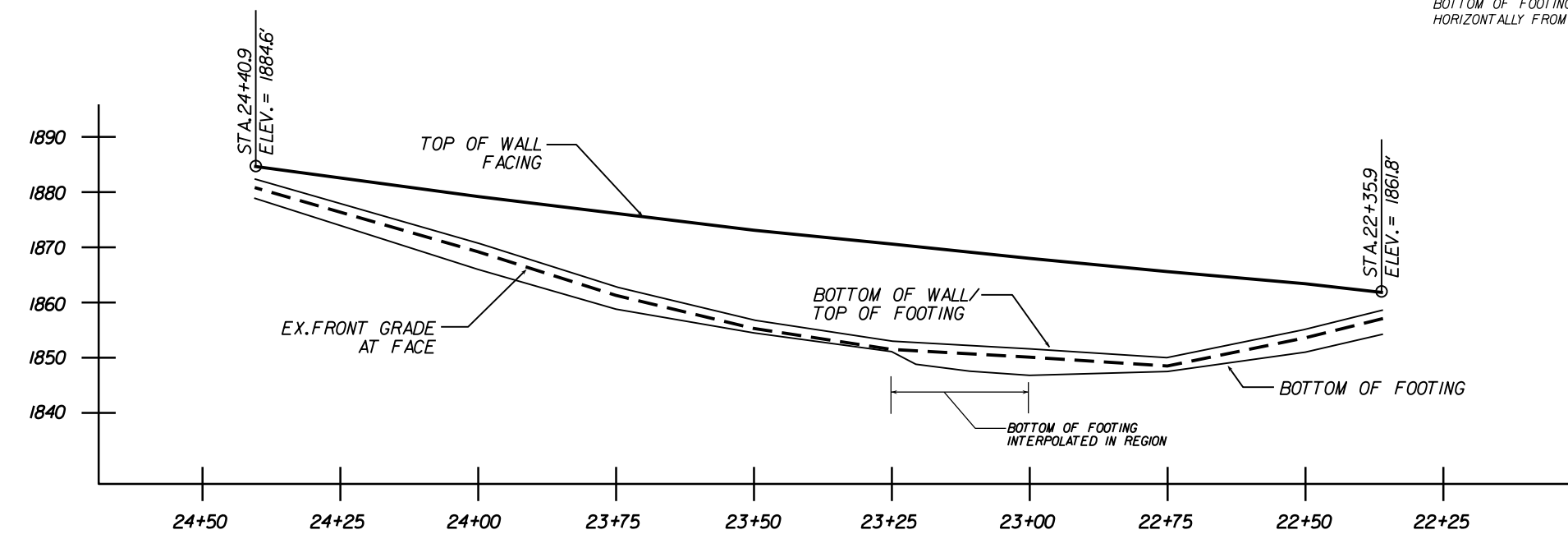




LOCATION SKETCH

| RETAINING WALL ELEVATIONS |                    |                              |                               |                   |                       |
|---------------------------|--------------------|------------------------------|-------------------------------|-------------------|-----------------------|
| STATION                   | TOP OF WALL FACING | EXISTING FRONT GRADE AT FACE | BOTTOM OF WALL/TOP OF FOOTING | BOTTOM OF FOOTING | WALL DESIGN HEIGHT, H |
| 22+35.9                   | 1861.8             | 1857.1                       | 1858.6                        | 1854.2            | 2.2                   |
| 22+50                     | 1863.3             | 1853.6                       | 1855.1                        | 1851.0            | 7.2                   |
| 22+75                     | 1865.5             | 1848.5                       | 1850.0                        | 1847.5            | 14.5                  |
| 23+00                     | 1867.9             | 1850.1                       | 1851.6                        | 1846.8            | 15.3                  |
| 23+25                     | 1870.5             | 1851.5                       | 1853.0                        | 1851.1            | 16.5                  |
| 23+50                     | 1873.0             | 1855.3                       | 1856.8                        | 1854.5            | 15.2                  |
| 23+75                     | 1876.2             | 1861.3                       | 1862.8                        | 1858.8            | 12.4                  |
| 24+00                     | 1879.1             | 1869.2                       | 1870.7                        | 1866.0            | 7.4                   |
| 24+28.9                   | 1883.0             | 1877.5                       | 1879.0                        | 1875.2            | 3.0                   |
| 24+40.6                   | 1884.6             | 1880.9                       | 1882.4                        | 1878.9            | 1.2                   |

NOTES:  
 ALL ELEVATIONS BETWEEN STA. 24+28.9 AND END OF WALL HAVE BEEN EXTRAPOLATED  
 BOTTOM OF WALL/TOP OF FOOTING ASSUMED TO BE 1.5 FEET ABOVE EXISTING FRONT GRADE AT FACE ELEVATION SHOWN ABOVE  
 BOTTOM OF FOOTING IS THE EXISTING GRADE ELEVATION 4 FEET OUT HORIZONTALLY FROM THE FRONT GRADE AT FACE ELEVATION SHOWN ABOVE



| TOTAL STRUCTURE QUANTITIES         |               |
|------------------------------------|---------------|
| SOIL NAIL REPAIR OF RETAINING WALL | 2,525 SQ. FT. |
| SOIL NAIL VERIFICATION TESTS       | 2 EA.         |
| SOIL NAIL PROOF TESTS              | 6 EA.         |
| MICROPILE SLOPE STABILIZATION      | 205 LIN. FT.  |
| DEMONSTRATION MICROPILES           | 1 EA.         |
| MICROPILE VERIFICATION TESTS       | 1 EA.         |
| MICROPILE PROOF TESTS              | 5 EA.         |
| COMPACTION GROUTING                | 1500 CU. FT.  |
| GROUT PIPES                        | 300 LIN. FT.  |

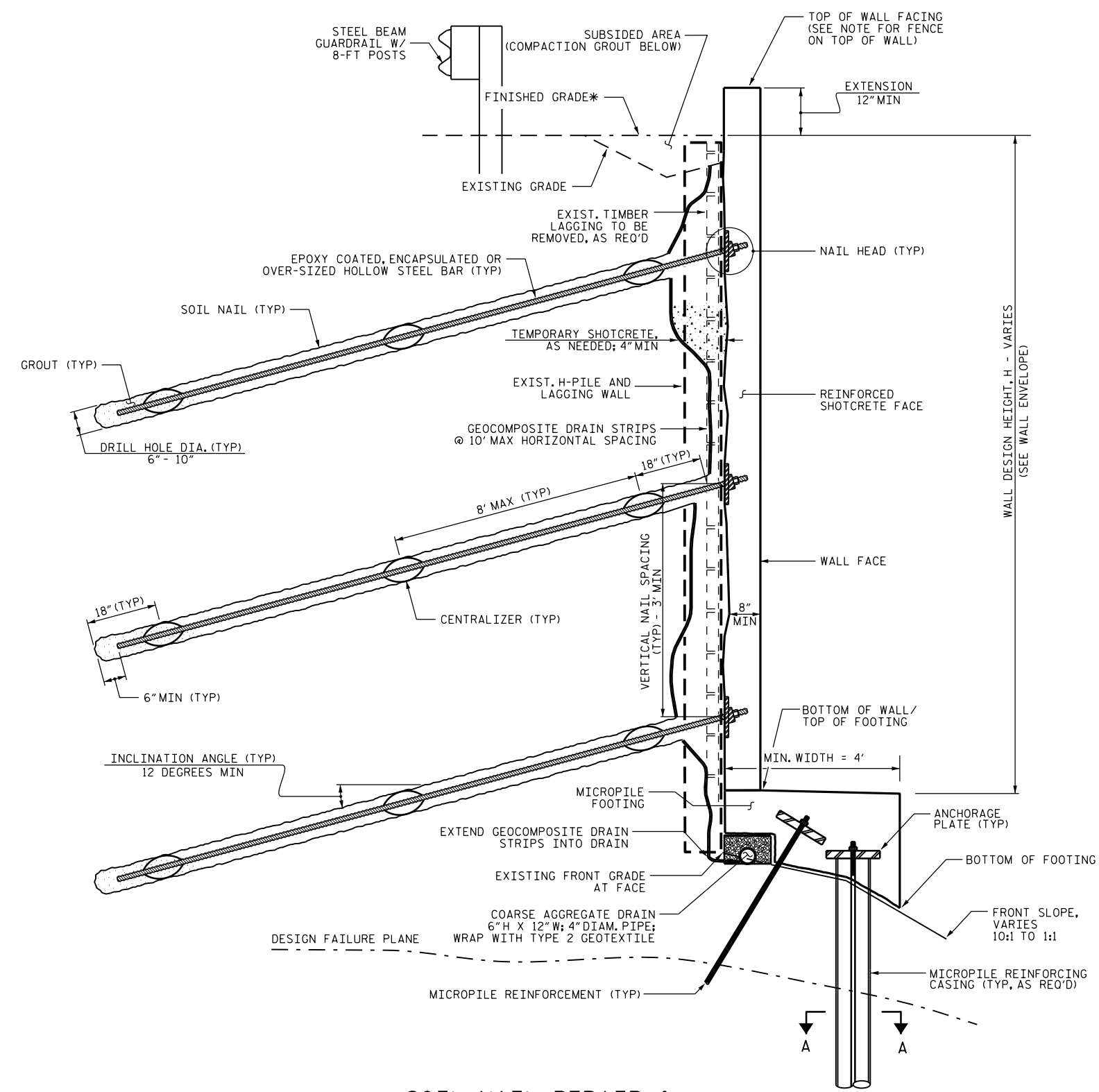
PROJECT NO.: 51214.01AB  
 McDOWELL COUNTY  
 STATION: 22+35.9 -EL2-  
 SHEET 1 OF 2

PREPARED BY: D. Hardister, PE DATE: 11/2018  
 REVIEWED BY: E. Williams, PE DATE: 11/2018

**GEOTECHNICAL ENGINEERING UNIT**  
 EASTERN REGIONAL OFFICE  
 WESTERN REGIONAL OFFICE  
 CONTRACT OFFICE  
 STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

| SOIL NAIL REPAIR OF EXISTING RETAINING WALL & MICROPILE SLOPE STABILIZATION |    |      |     |    |      |
|---|----|------|-----|----|------|
| REVISIONS   |    |      |     |    |      |
| NO.   | BY | DATE | NO. | BY | DATE |
| 1   |    |      | 3   |    |      |
| 2   |    |      | 4   |    |      |

SHEET NO. 1  
 TOTAL SHEETS 2



**NOTES:**

FOR SOIL NAIL REPAIR, SEE SOIL NAIL REPAIR OF RETAINING WALLS PROVISION.

FOR MICROPILES AND MICROPILE FOOTING, SEE MICROPILE SLOPE STABILIZATION PROVISION.

FOR COMPACTION GROUTING AND GROUT PIPES, SEE COMPACTION GROUTING PROVISION.

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

AVOID SOIL NAILS WHEN INSTALLING GUARDRAIL POSTS.

DESIGN SOIL NAIL REPAIR AND MICROPILE SLOPE STABILIZATION FOR INTERNAL, EXTERNAL, AND GLOBAL STABILITY.

BEFORE BEGINNING SOIL NAIL REPAIR DESIGN, SURVEY WALL LOCATION AND SUBMIT A REVISED PROFILE VIEW (ENVELOPE) FOR REVIEW. DO NOT START DESIGN OR CONSTRUCTION UNTIL THE REVISED ENVELOPE IS ACCEPTED.

DESIGN SOIL NAIL REPAIR & MICROPILE SLOPE STABILIZATION FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT
- 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
- 5) DESIGN FAILURE PLANE AT WALL AND FOOTING EQUAL TO THE INFERRED ROCK LINE INDICATED ON THE SUBSURFACE PROFILE IN THE CONTRACT. FAILURE PLANE MAY BE EXTRAPOLATED WHERE DATA IS NOT AVAILABLE.

DESIGN SOIL NAIL REPAIR FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

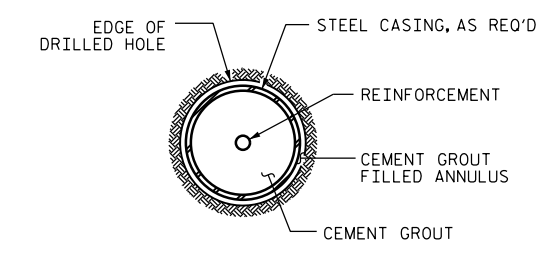
DESIGN SOIL NAIL REPAIR FOR A 300 LB/FT HORIZONTAL TRAFFIC IMPACT LOAD.

REMOVE VEGETATION, ROOT MAT, AND TOPSOIL IN FOOTING AREA BEFORE CONSTRUCTION.

DESIGN AND PERFORM COMPACTION GROUTING FOR AREA SHOWN IN LOCATION SKETCH. THE COMPACTION GROUTING AREA IS APPROXIMATELY 100 FEET LONG AND 7 FEET WIDE. THE MAXIMUM DEPTH FOR COMPACTION GROUTING IS 10 FEET.

INSTALL GROUT PIPES PRIOR TO BEGINNING SOIL NAIL CONSTRUCTION. DO NOT PERFORM COMPACTION GROUTING UNTIL THE SOIL NAIL REPAIR IS COMPLETED. DO NOT DAMAGE THE SOIL NAIL REPAIR WITH COMPACTION GROUTING. MONITOR THE SOIL NAIL REPAIR FOR HORIZONTAL DISPLACEMENT DURING COMPACTION GROUTING. CEASE GROUTING IF DISPLACEMENT IS OBSERVED.

EXISTING GRADE IN AREA OF COMPACTION GROUTING IS UP TO 3 FEET BELOW FUTURE FINISHED GRADE (4 FEET BELOW TOP OF WALL FACING).



**SECTION A-A**

**PROJECT NO.:** 51214.01AB  
**McDOWELL COUNTY**  
**STATION:** 22+35.9 -EL2-  
 SHEET 2 OF 2

**SOIL NAIL REPAIR & MICROPILE SLOPE STABILIZATION - TYPICAL SECTION**

\* SEE ROADWAY PLANS FOR FINISHED GRADE AND DITCH DETAILS.  
 \* CONCEPTUAL MICROPILE ARRANGEMENT SHOWN.

|                               |               |
|-------------------------------|---------------|
| PREPARED BY: D. Hardister, PE | DATE: 11/2018 |
| REVIEWED BY: E. Williams, PE  | DATE: 11/2018 |

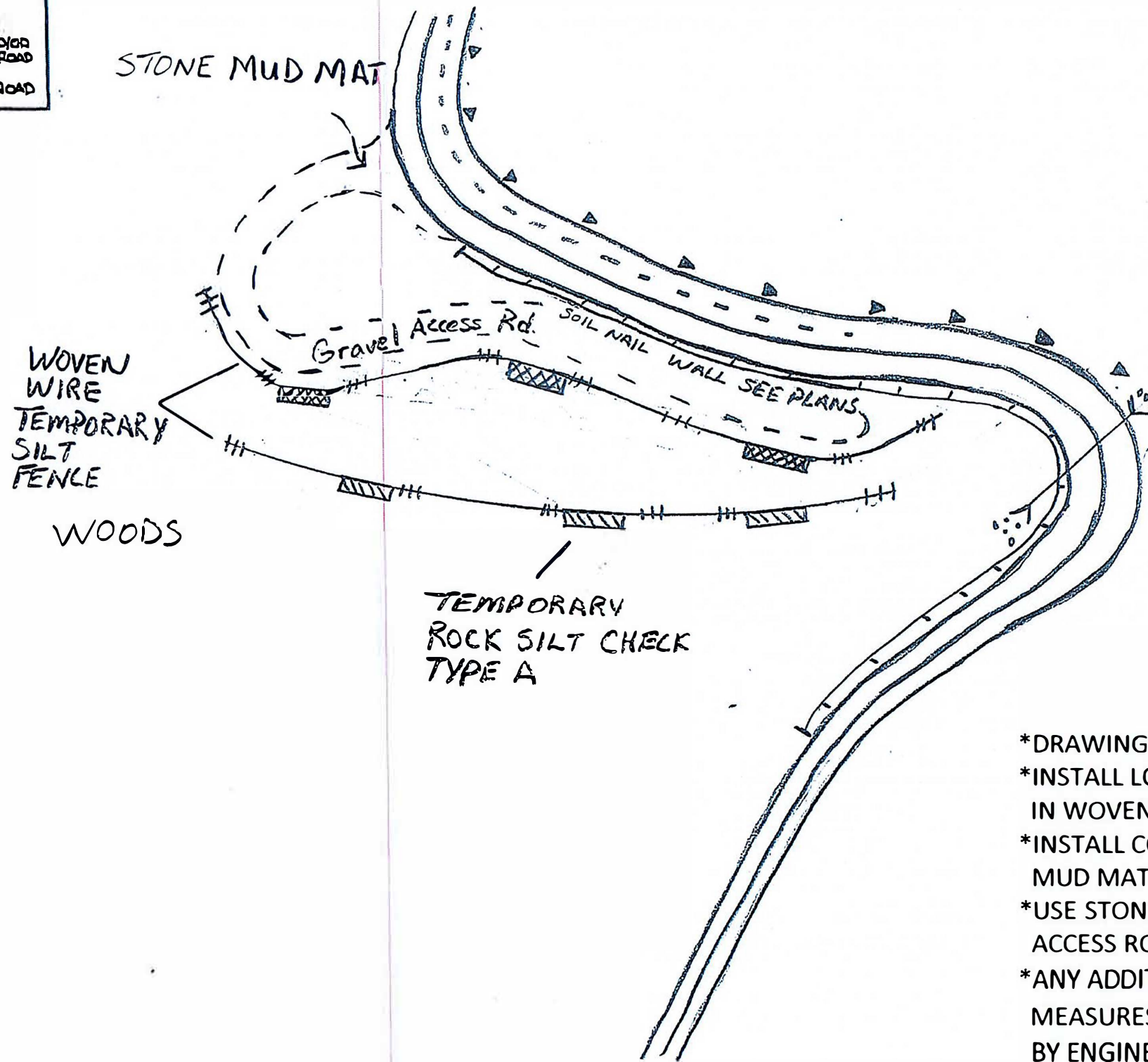
**GEOTECHNICAL ENGINEERING UNIT**  
 EASTERN REGIONAL OFFICE  
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**STATE OF NORTH CAROLINA**  
**DEPARTMENT OF TRANSPORTATION**  
**RALEIGH**

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

# NC-226 SOIL NAIL WALL

## LEGEND

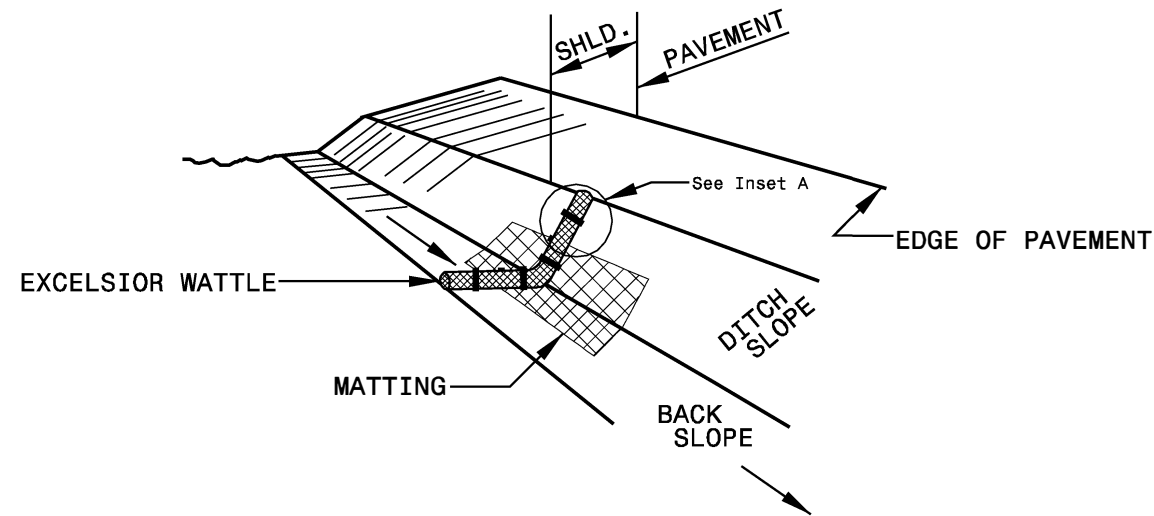
|           |                         |
|-----------|-------------------------|
| ---#---   | TEMPORARY SILT FENCE    |
|           | SILT BASIN              |
| ◀◀◀◀      | DITCH                   |
| ~~~~~     | CREEK                   |
| - - - - - | DIRT AND/OR GRAVEL ROAD |
| =====     | PAVED ROAD              |



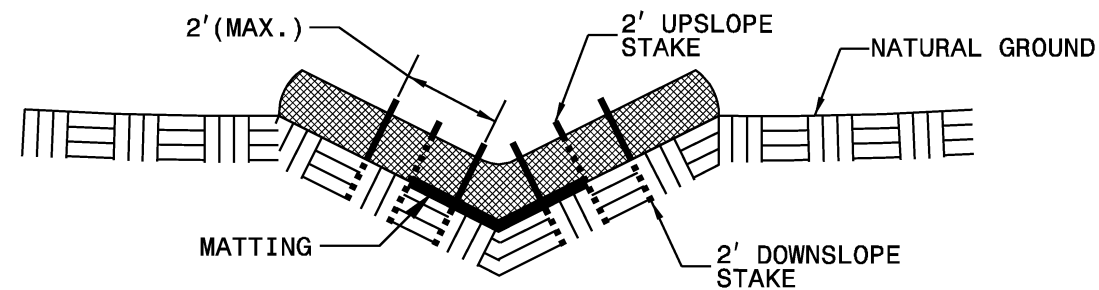
- \*DRAWING NOT TO SCALE
- \*INSTALL LOW & OR ENDPOINT MEASURES IN WOVEN WIRE TEMPORARY SILT FENCE
- \*INSTALL CONSTRUCTION ENTRANCE STONE MUD MAT
- \*USE STONE/GRAVEL TO CONSTRUCT/PROTECT ACCESS ROAD
- \*ANY ADDITIONAL EROSION CONTROL MEASURES MAY BE DEEMED NECESSARY BY ENGINEER

|                         |                     |
|-------------------------|---------------------|
| PROJECT REFERENCE NO.   | SHEET NO.           |
| 11870487                |                     |
| RW. SHEET NO.           |                     |
| ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER |

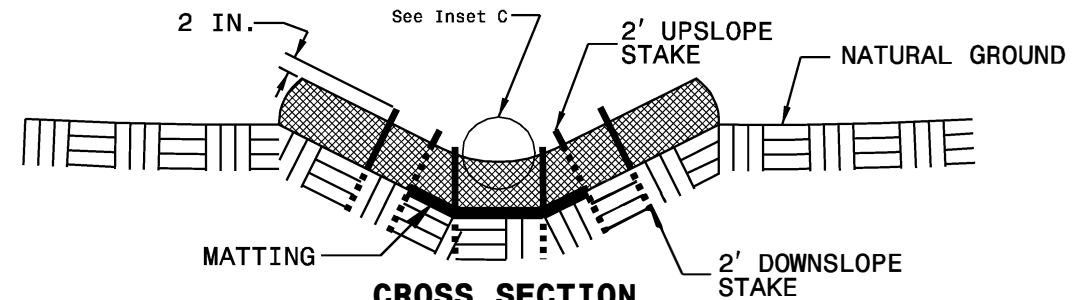
# WATTLE WITH POLYACRYLAMIDE (PAM) DETAIL



**ISOMETRIC VIEW**



**CROSS SECTION VEE DITCH**



**CROSS SECTION TRAPEZOIDAL DITCH**

**NOTES:**

USE MINIMUM 12 IN. DIAMETER EXCELSIOR WATTLE.

USE 2 FT. WOODEN STAKES WITH A 2 IN. BY 2 IN. NOMINAL CROSS SECTION.

ONLY INSTALL WATTLE(S) TO A HEIGHT IN DITCH SO FLOW WILL NOT WASH AROUND WATTLE AND SCOUR DITCH SLOPES AND AS DIRECTED.

INSTALL A MINIMUM OF 2 UPSLOPE STAKES AND 4 DOWNSLOPE STAKES AT AN ANGLE TO WEDGE WATTLE TO BOTTOM OF DITCH.

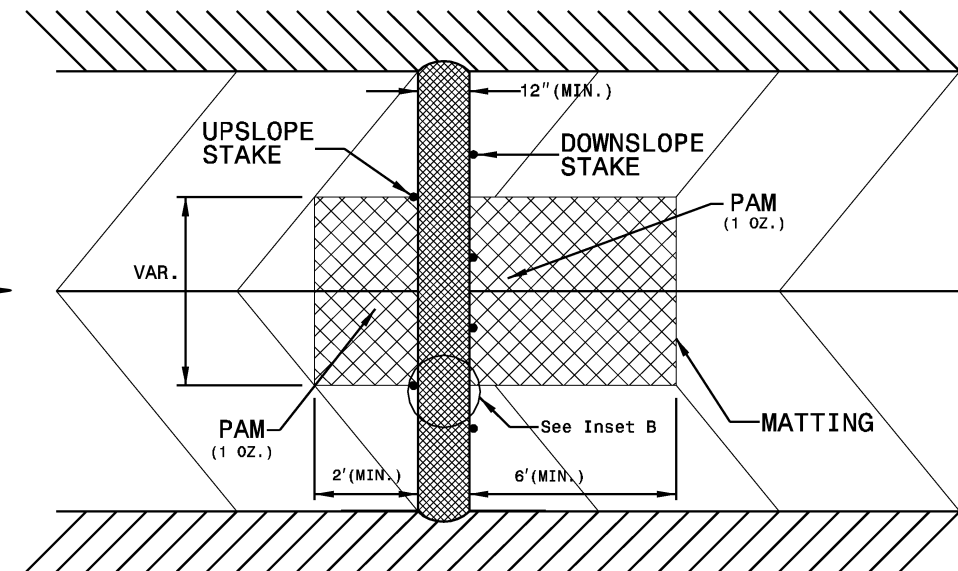
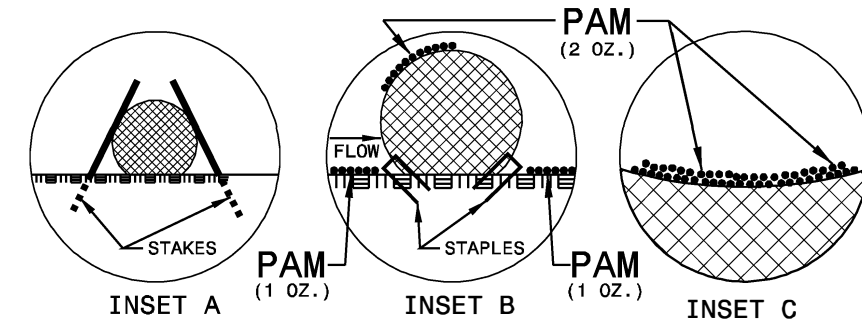
PROVIDE STAPLES MADE OF 0.125 IN. DIAMETER STEEL WIRE FORMED INTO A U SHAPE NOT LESS THAN 12" IN LENGTH.

INSTALL STAPLES APPROXIMATELY EVERY 1 LINEAR FOOT ON BOTH SIDES OF WATTLE AND AT EACH END TO SECURE IT TO THE SOIL.

INSTALL MATTING IN ACCORDANCE WITH SECTION 1631 OF THE STANDARD SPECIFICATIONS.

PRIOR TO POLYACRYLAMIDE (PAM) APPLICATION, OBTAIN A SOIL SAMPLE FROM PROJECT LOCATION, AND FROM OFFSITE MATERIAL, AND ANALYZE FOR APPROPRIATE PAM FLOCCULANT TO BE APPLIED TO EACH WATTLE.

INITIALLY APPLY 2 OUNCES OF ANIONIC OR NEUTRALLY CHARGED PAM OVER WATTLE WHERE WATER WILL FLOW AND 1 OUNCE OF PAM ON MATTING ON EACH SIDE OF WATTLE. REAPPLY PAM AFTER EVERY RAINFALL EVENT THAT IS EQUAL TO OR EXCEEDS 0.50 IN.



**TOP VIEW**

**DIVISION OF HIGHWAYS**  
**STATE OF NORTH CAROLINA**

***SOIL STABILIZATION TIMEFRAMES***

| <i>SITE DESCRIPTION</i>                      | <i>STABILIZATION TIME</i> | <i>TIMEFRAME EXCEPTIONS</i>  |
|--|---------------------------|--|
| PERIMETER DIKES, SWALES, DITCHES AND SLOPES  | 7 DAYS                    | NONE   |
| HIGH QUALITY WATER (HOW) ZONES               | 7 DAYS                    | NONE   |
| SLOPES STEEPER THAN 3:1                      | 7 DAYS                    | IF SLOPES ARE 10' OR LESS IN LENGTH AND ARE NOT STEEPER THAN 2:1, 14 DAYS ARE ALLOWED. |
| SLOPES 3:1 OR FLATTER                        | 14 DAYS                   | 7 DAYS FOR SLOPES GREATER THAN 50' IN LENGTH.  |
| ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1 | 14 DAYS                   | NONE, EXCEPT FOR PERIMETERS AND HOW ZONES.   |