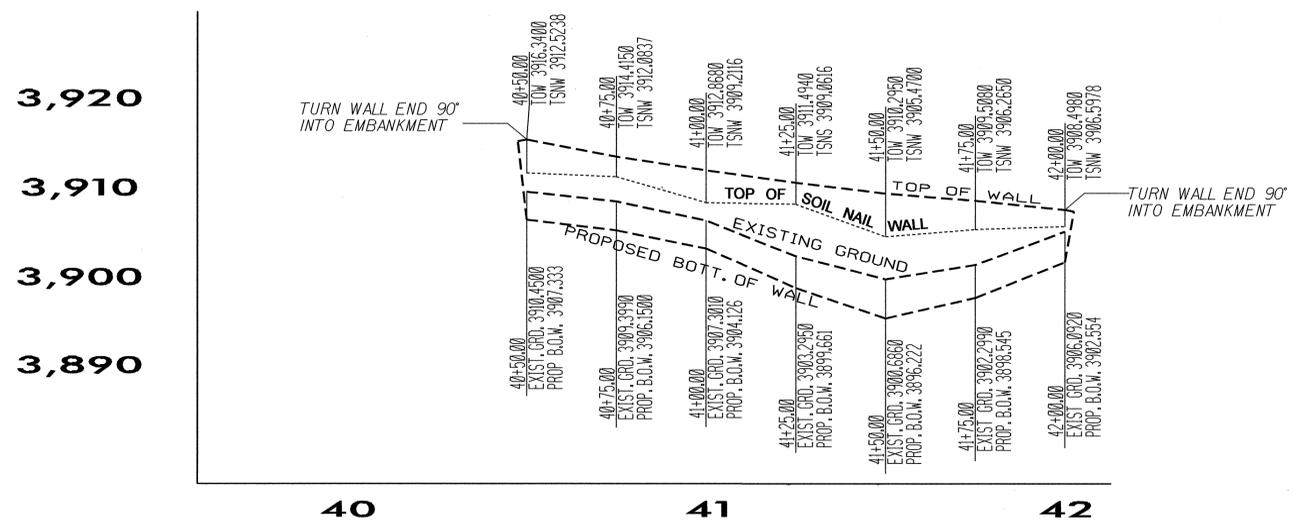


LOCATION SKETCH

SITE 1 WALL 1



| TOTAL BILL OF MATERIAL | |
|--|--------------|
| SMSE RETAINING WALL AT STA. 40+50 TO 42+00 -L- | 1545 SQ. FT. |

| ESTIMATED QUANTITIES | |
|---|--------------|
| PERMANENT SOIL NAIL WALL AT STA. 40+50 TO 42+00 -L- | 1050 SQ. FT. |

GEOTECHNICAL ENGINEER

ENGINEER

Shane Clark 7/21/10
SIGNATURE DATE

PROJECT NO.: R-2710
 WATAUGA COUNTY
 STATION: 40+50.00 -L- TO 42+00.00 -L-
 SHEET 1 OF 9

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

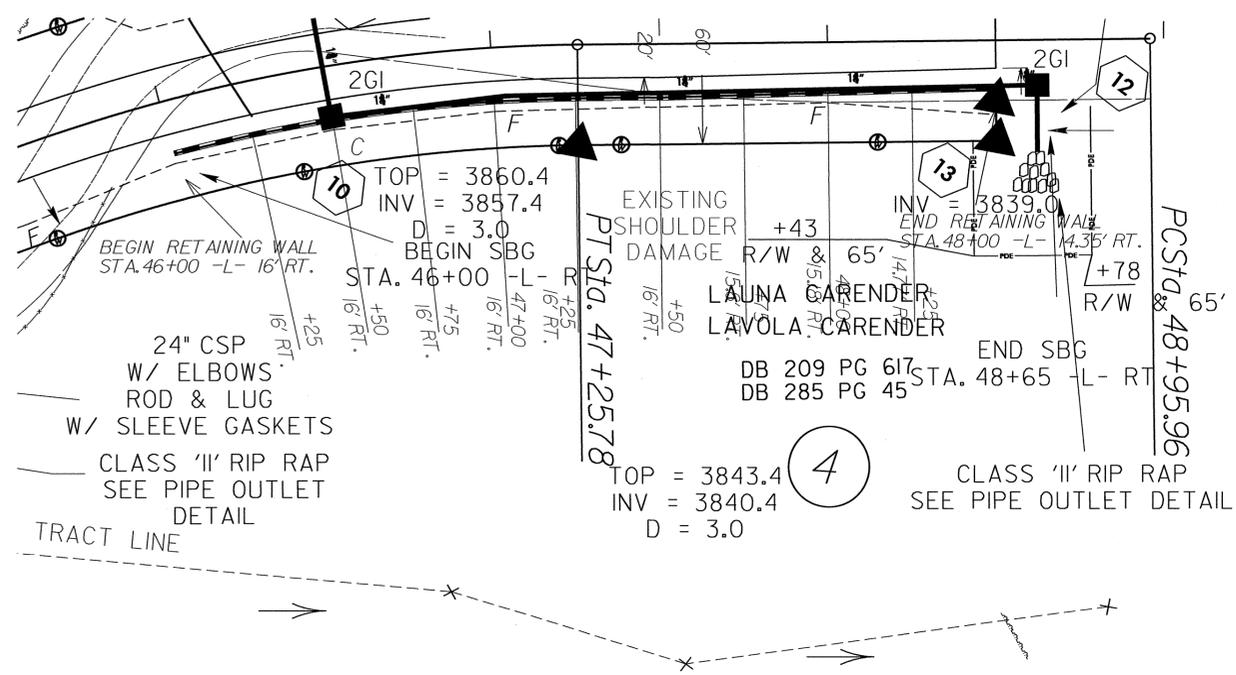
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL
 SITE #1, WALL #1

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

PREPARED BY: E.J.S./J.T.W. DATE: 7.6.10
 REVIEWED BY: S.C.C. DATE: 7.21.10

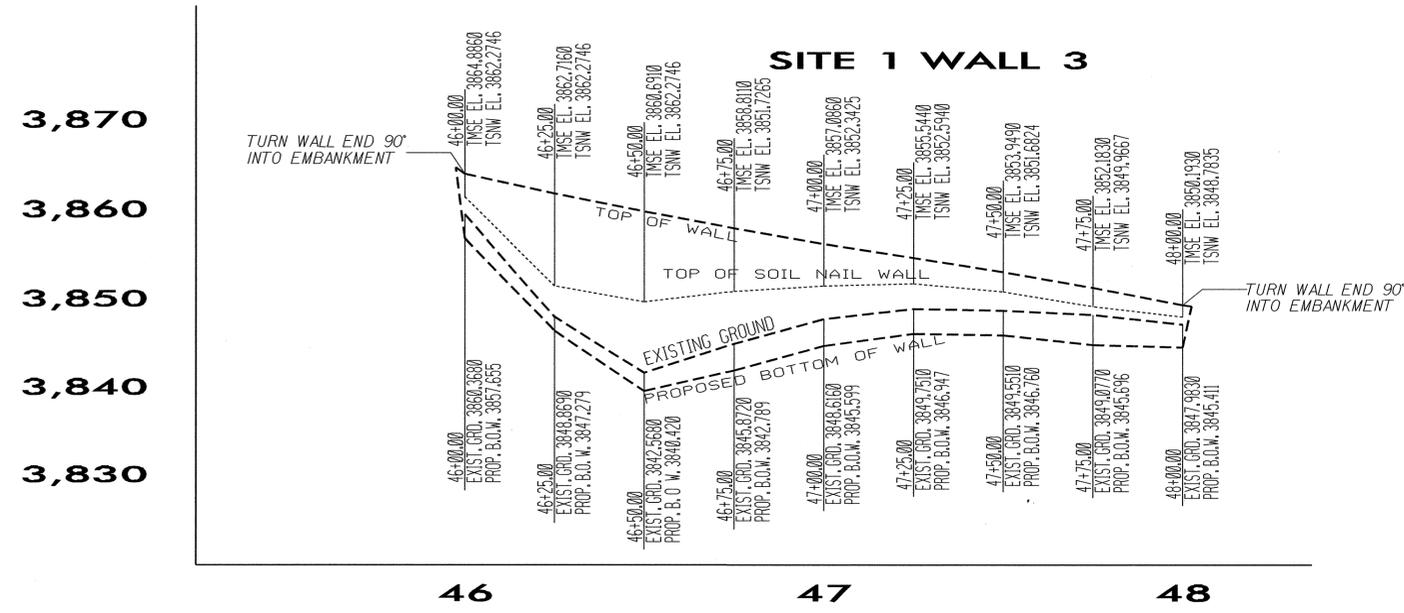
BM - 1 8" SPIKE IN BASE OF 10" BIRCH TREE ON SOUTH SIDE OF CREEK STA. 39+24.00 -L- 144.00' RT.
 EL. = 3905.36' N 894903 E 1164803



LOCATION SKETCH

| TOTAL BILL OF MATERIAL | |
|---|--------------|
| SMSE RETAINING WALL AT STA. 46+00 TO 48+00 -L- | 2293 SQ. FT. |

| ESTIMATED QUANTITIES | |
|--|--------------|
| PERMANENT SOIL NAIL WALL AT STA. 46+00 TO 48+00 -L- | 1242 SQ. FT. |



PROJECT NO.: R-2710
 WATAUGA COUNTY
 STATION: 46+00.00 -L- TO 48+00.00 -L-
 SHEET 3 OF 9

PREPARED BY: E.J.S./J.T.W. DATE: 7.6.10
 REVIEWED BY: S.C.C. DATE: 7.21.10

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL
 SITE #1, WALL #3

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

GEOTECHNICAL ENGINEER

ENGINEER

SEAL 29869

North Carolina Professional Engineers - State of North Carolina

Signature: *Shawn Clark* 7/6/10
 DATE: 7/6/10

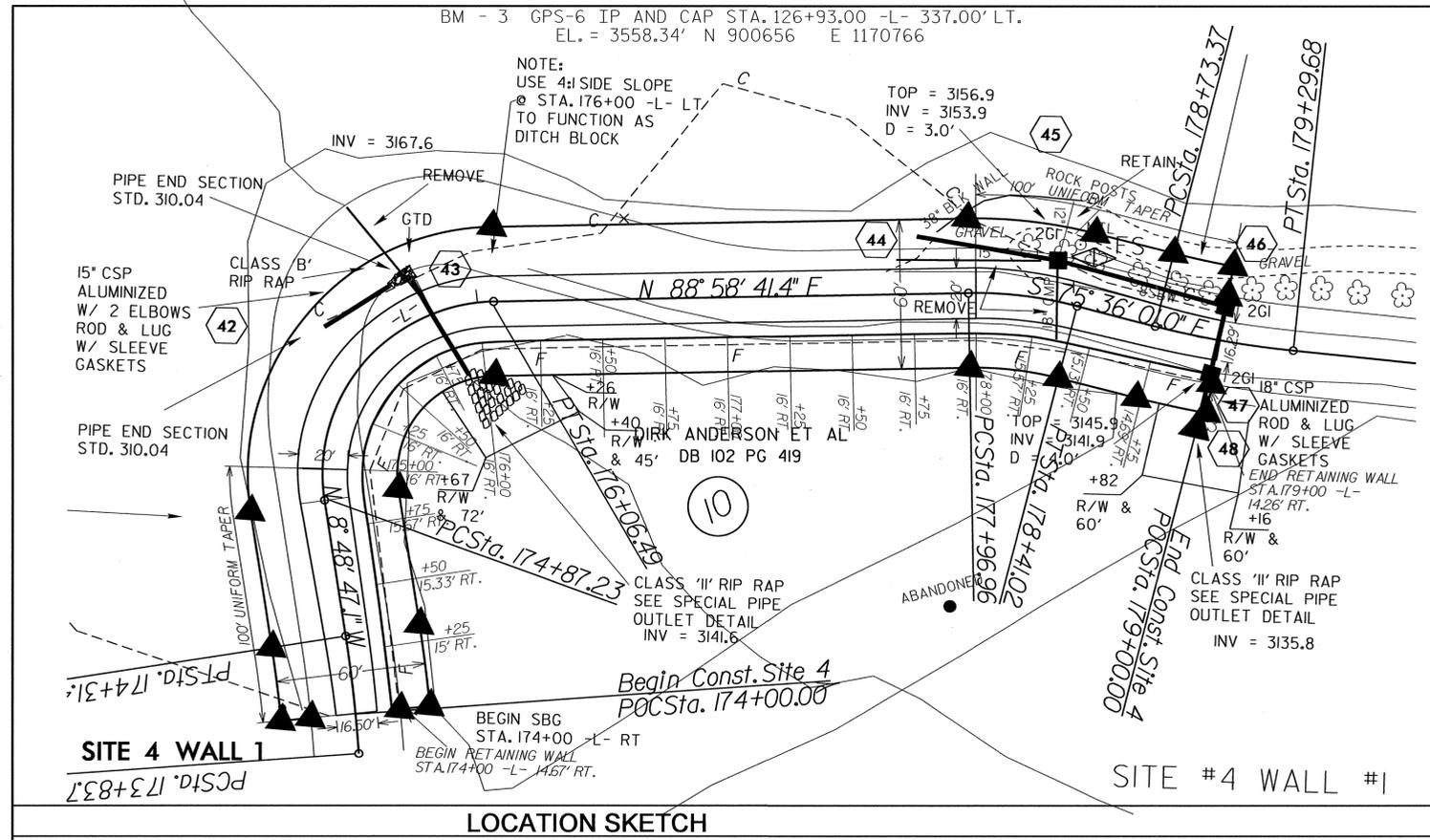
GEOTECHNICAL ENGINEER

ENGINEER

Shane Clark 7/20/10

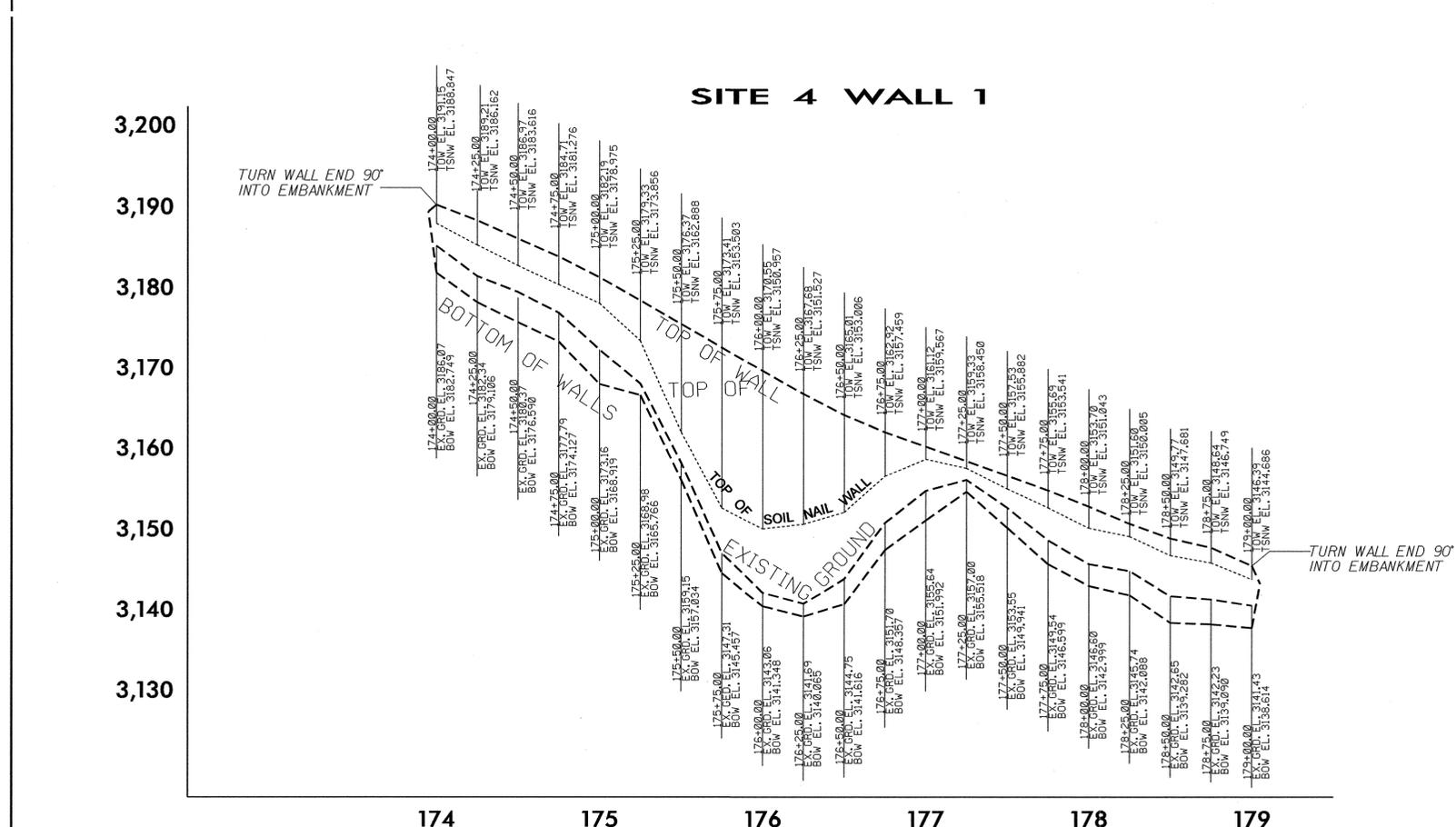
SIGNATURE DATE

SIGNATURE DATE



| TOTAL BILL OF MATERIAL | |
|--|--------------|
| SMSE RETAINING WALL AT STA. 174+00 TO 179+00 -L- | 6877 SQ. FT. |

| ESTIMATED QUANTITIES | |
|---|--------------|
| PERMANENT SOIL NAIL WALL AT STA. 174+00 TO 179+00 -L- | 3823 SQ. FT. |



PROJECT NO.: R-2710

WATAUGA COUNTY

STATION: 174+0.00 -L- TO 179+00.00 -L-

SHEET 4 OF 9

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE

WESTERN REGIONAL OFFICE

CONTRACT OFFICE

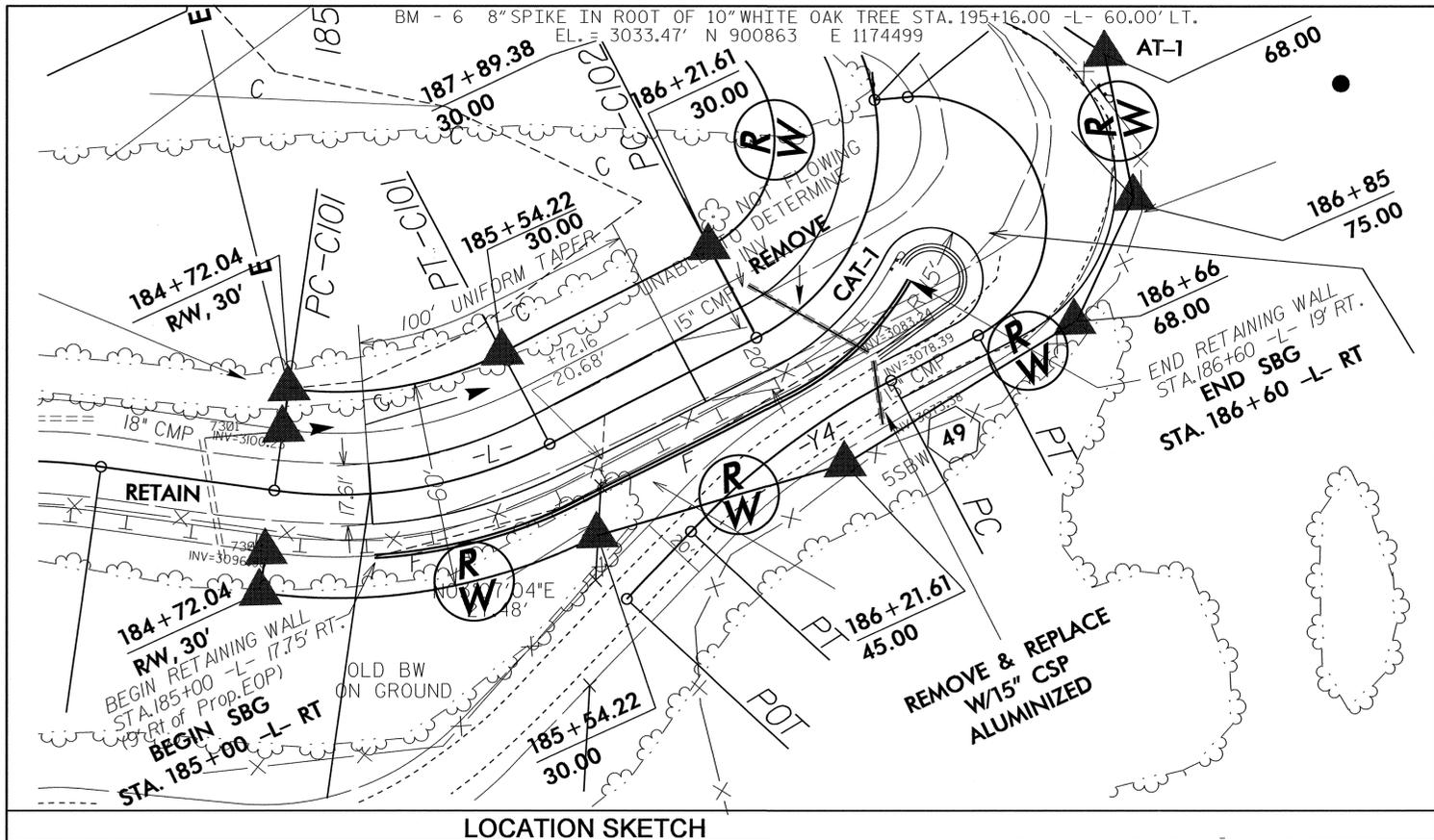
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL
SITE #4, WALL #1

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

PREPARED BY: E.J.S./J.T.W. DATE: 7.6.10

REVIEWED BY: S.C.C. DATE: 7.21.10



GEOTECHNICAL ENGINEER

ENGINEER

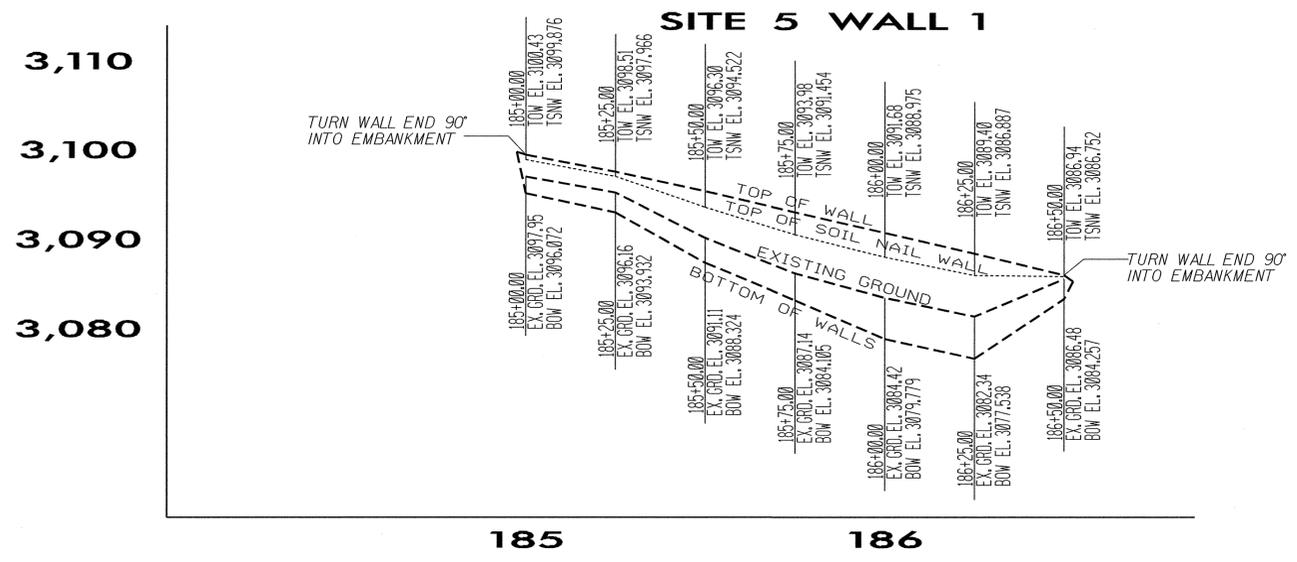
NORTH CAROLINA PROFESSIONAL SEAL 29869

ENGINEER
SHANE C. CLARK

Signature: *Shane C. Clark* Date: 7/21/10

| TOTAL BILL OF MATERIAL | |
|--|--------------|
| SMSE RETAINING WALL AT STA. 185+00 TO 186+50 -L- | 1247 SQ. FT. |

| ESTIMATED QUANTITIES | |
|---|-------------|
| PERMANENT SOIL NAIL WALL AT STA. 185+00 TO 186+50 -L- | 982 SQ. FT. |



PROJECT NO.: R-2710
 WATAUGA COUNTY
 STATION: 185+00.00 -L- TO 186+50.00 -L-
 SHEET 5 OF 9

PREPARED BY: E.J.S./J.T.W. DATE: 7.6.10
 REVIEWED BY: S.C.C. DATE: 7.21.10

GEOTECHNICAL ENGINEERING UNIT

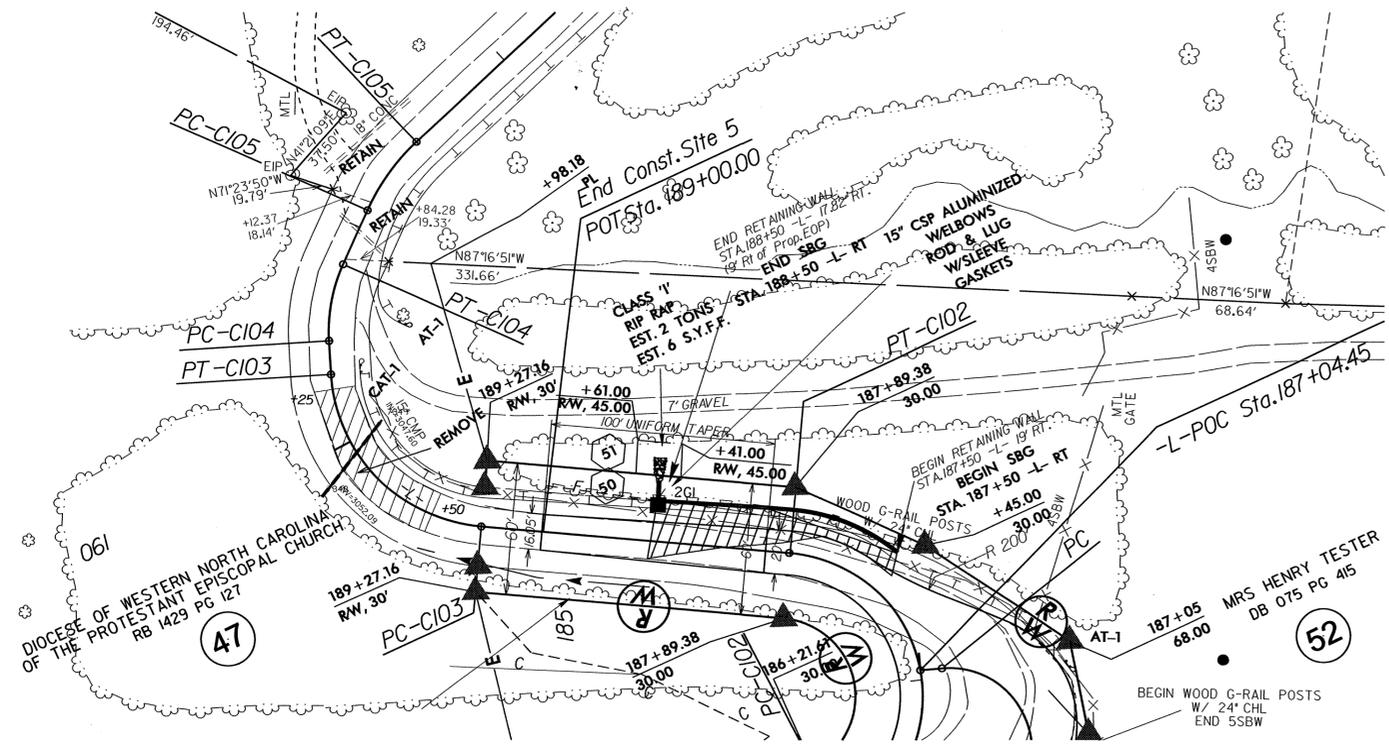
EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL
 SITE #5, WALL #1

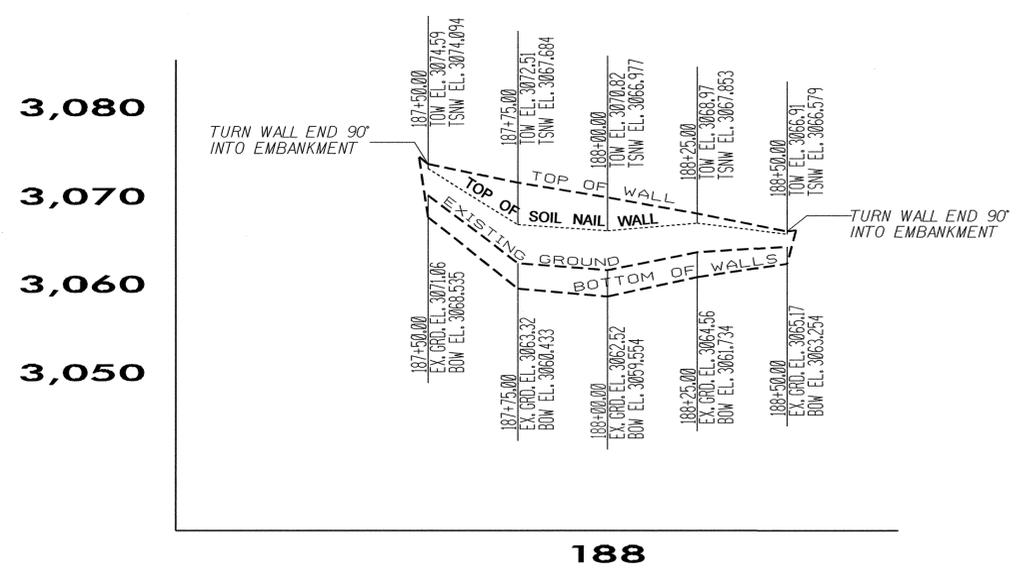
| REVISIONS | | | | | |
|-----------|----|------|-----|----|------|
| NO. | BY | DATE | NO. | BY | DATE |
| 1 | - | - | 3 | - | - |
| 2 | - | - | 4 | - | - |

BM - 6 8" SPIKE IN ROOT OF 10" WHITE OAK TREE STA. 195+16.00 -L- 60.00' LT.
 EL. = 3033.47' N 900863 E 1174499



LOCATION SKETCH

SITE 5 WALL 2



188

| TOTAL BILL OF MATERIAL | |
|---|-------------|
| SMSE RETAINING WALL AT STA. 187+50 TO 188+50 -L- | 898 SQ. FT. |

| ESTIMATED QUANTITIES | |
|--|-------------|
| PERMANENT SOIL NAIL WALL AT STA. 187+50 TO 188+00 -L- | 651 SQ. FT. |

GEOTECHNICAL ENGINEER

ENGINEER

SEAL
29869

THANE C. CLARK

7/21/10

SIGNATURE DATE

PROJECT NO.: R-2710
WATAUGA COUNTY
 STATION: 187+50.00 -L- TO 188+50 -L-
 SHEET 6 OF 9

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

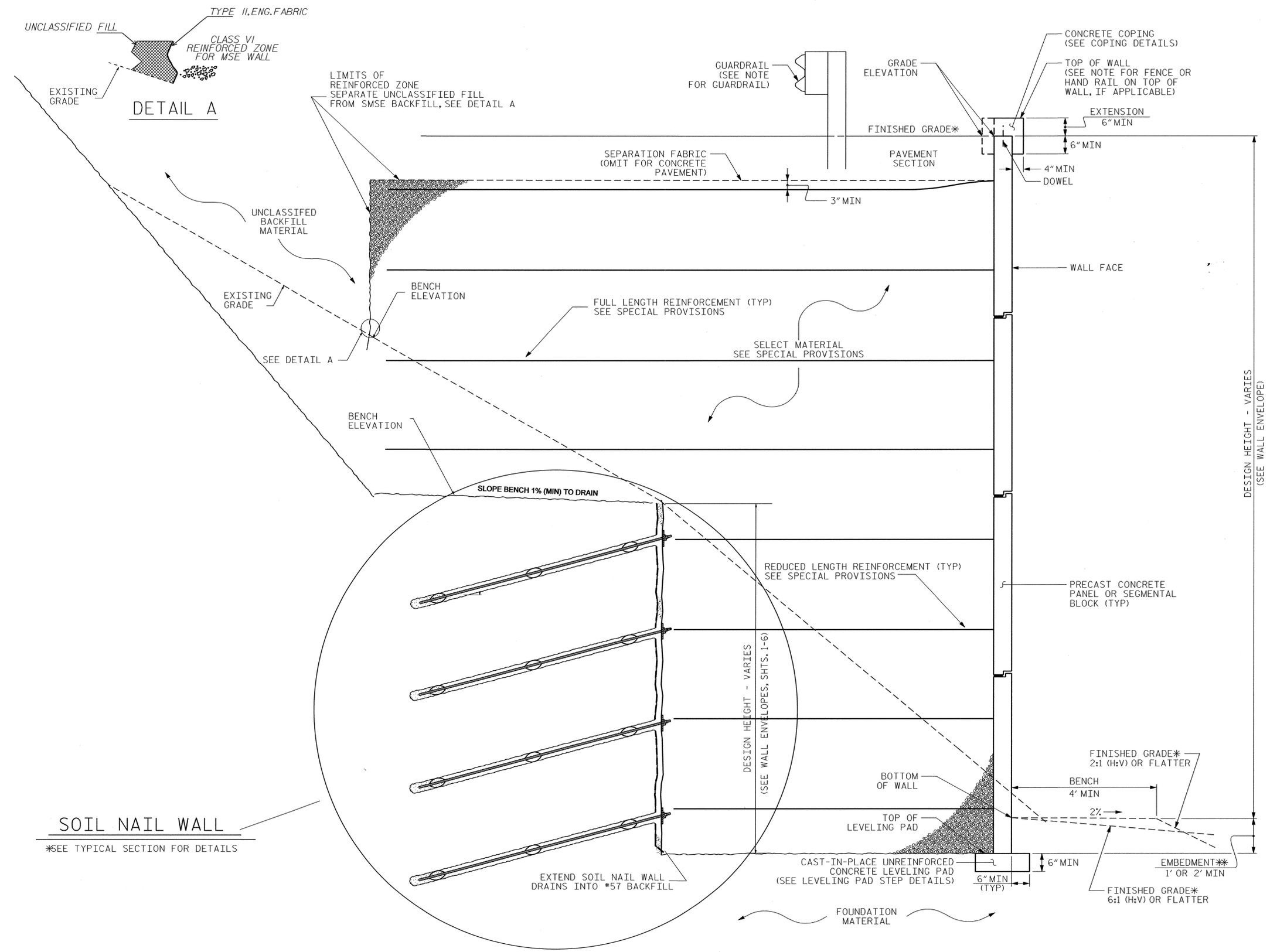
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SHORED MECHANICALLY STABILIZED EARTH (SMSE) WALL
 SITE #5, WALL #2

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

PREPARED BY: E.J.S./J.T.W. DATE: 6.29.10
 REVIEWED BY: S.C.C. DATE: 7.21.10

| | |
|---|--|
| GEOTECHNICAL ENGINEER  SIGNATURE: <i>Shane C. Clark</i> DATE: 7/21/10 | ENGINEER SIGNATURE: _____ DATE: _____ |
|---|--|



SOIL NAIL WALL

*SEE TYPICAL SECTION FOR DETAILS

SMSE WALL WITH PRECAST PANELS TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
**SEE SMSE RETAINING WALLS PROVISION FOR EMBEDMENT REQUIREMENTS.

PROJECT NO.: WATAUGA
WATAUGA COUNTY
STATION: VARIES
SHEET 7 OF 9

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

| | |
|------------------|---------------|
| PREPARED BY: JS | DATE: 3-23-10 |
| REVIEWED BY: SCC | DATE: 7-21-10 |

| | |
|--|---|
| GEOTECHNICAL ENGINEER  Shane C. Clark <small>SIGNATURE DATE</small> | ENGINEER <small>SIGNATURE DATE</small> |
|--|---|

NOTES

FOR SHORED MECHANICALLY STABILIZED EARTH (SMSE) RETAINING WALLS, SEE SHORED MECHANICALLY STABILIZED EARTH RETAINING WALLS.

FOR 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.

USE AN SMSE WALL SYSTEM WITH PRECAST PANELS FOR RETAINING WALLS.

CAST-IN-PLACE REINFORCED CONCRETE COPING IS REQUIRED FOR RETAINING WALLS.

A DRAIN IS REQUIRED FOR RETAINING WALL.

BEFORE BEGINNING SMSE WALL DESIGN FOR RETAINING WALLS, SURVEY EXISTING GROUND ELEVATIONS SHOWN ON THE WALL PROFILE VIEW (WALL ENVELOPE) AND SUBMIT A REVISED WALL ENVELOPE FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THIS ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALLS FOR WALL HEIGHTS EQUAL TO THE DESIGN HEIGHT (DIFFERENCE BETWEEN GRADE ELEVATION AND BOTTOM OF WALL ELEVATION) PLUS EMBEDMENT (DIFFERENCE BETWEEN BOTTOM OF WALL ELEVATION AND TOP OF LEVELING PAD ELEVATION).

DESIGN RETAINING WALLS FOR THE FOLLOWING:
 1) MINIMUM SERVICE LIFE = 100 YEARS
 2) ALLOWABLE BEARING CAPACITY = 3500 PSF
 3) SELECT MATERIAL PARAMETERS:

| MATERIAL STANDARD SIZE NO. (IN ACCORDANCE WITH SECTIONS 1005 AND 1014 OF THE STANDARD SPECIFICATIONS) | UNIT WEIGHT (gamma) PCF | FRICTION ANGLE (phi) DEGREES | COHESION (c) PSF |
|--|-------------------------------|---------------------------------|---------------------|
| 57, 67 AND 78M | 110 | 38 | 0 |

6) IN-SITU ASSUMED MATERIAL PARAMETERS:

| MATERIAL TYPE | UNIT WEIGHT (gamma) PCF | FRICTION ANGLE (phi) DEGREES | COHESION (c) PSF |
|---------------|-------------------------------|---------------------------------|---------------------|
| BACKFILL | 115 | 32 | 0 |
| FOUNDATION | 120 | 36 | 0 |

DESIGN RETAINING WALLS FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

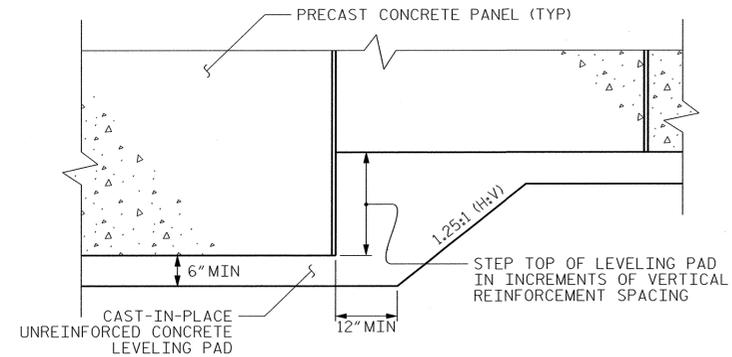
DESIGN RETAINING WALLS FOR DRAINAGE PIPES THAT EXTEND THROUGH OR UNDER THE WALL, WHERE APPLICABLE. VERIFY PIPE LOCATIONS AND ELEVATIONS BEFORE BEGINNING MSE WALL DESIGN OR CONSTRUCTION.

EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS.

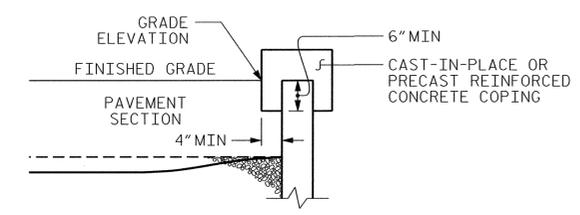
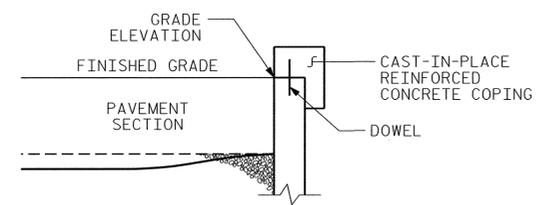
DO NOT PLACE LEVELING PAD CONCRETE, SELECT MATERIAL OR REINFORCEMENT FOR RETAINING WALLS UNTIL OBTAINING APPROVAL OF THE EXCAVATION DEPTH AND FOUNDATION MATERIAL.

THE WALL DESIGNER SHALL CONSULT WITH THE TEMPORARY SHORING DESIGNER TO VERIFY LOCATIONS WHERE "TEMPORARY SHORING" MAY BE REQUIRED FOR RETAINING WALLS IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS. IN LOCATIONS WHERE "PERMANENT SOIL NAIL SHORING FOR WALL CONSTRUCTION" IS USED, PAYMENT WILL NOT BE MADE FOR FOR "TEMPORARY SHORING" FOR TRAFFIC CONTROL.

THE WALL DESIGNER IS RESPONSIBLE FOR DETERMINING GLOBAL STABILITY FOR THE SOIL NAIL WALL AND THE SMSE WALL. SUBMIT THESE RESULTS WITH THE WALL DESIGN PACKAGE.



LEVELING PAD STEP DETAILS



COPING DETAILS

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

PROJECT NO.: R-2710
WATAUGA COUNTY
STATION: VARIES
 SHEET 8 OF 9

| | |
|------------------|---------------|
| PREPARED BY: JS | DATE: 3-23-10 |
| REVIEWED BY: SCC | DATE: 7-21-10 |

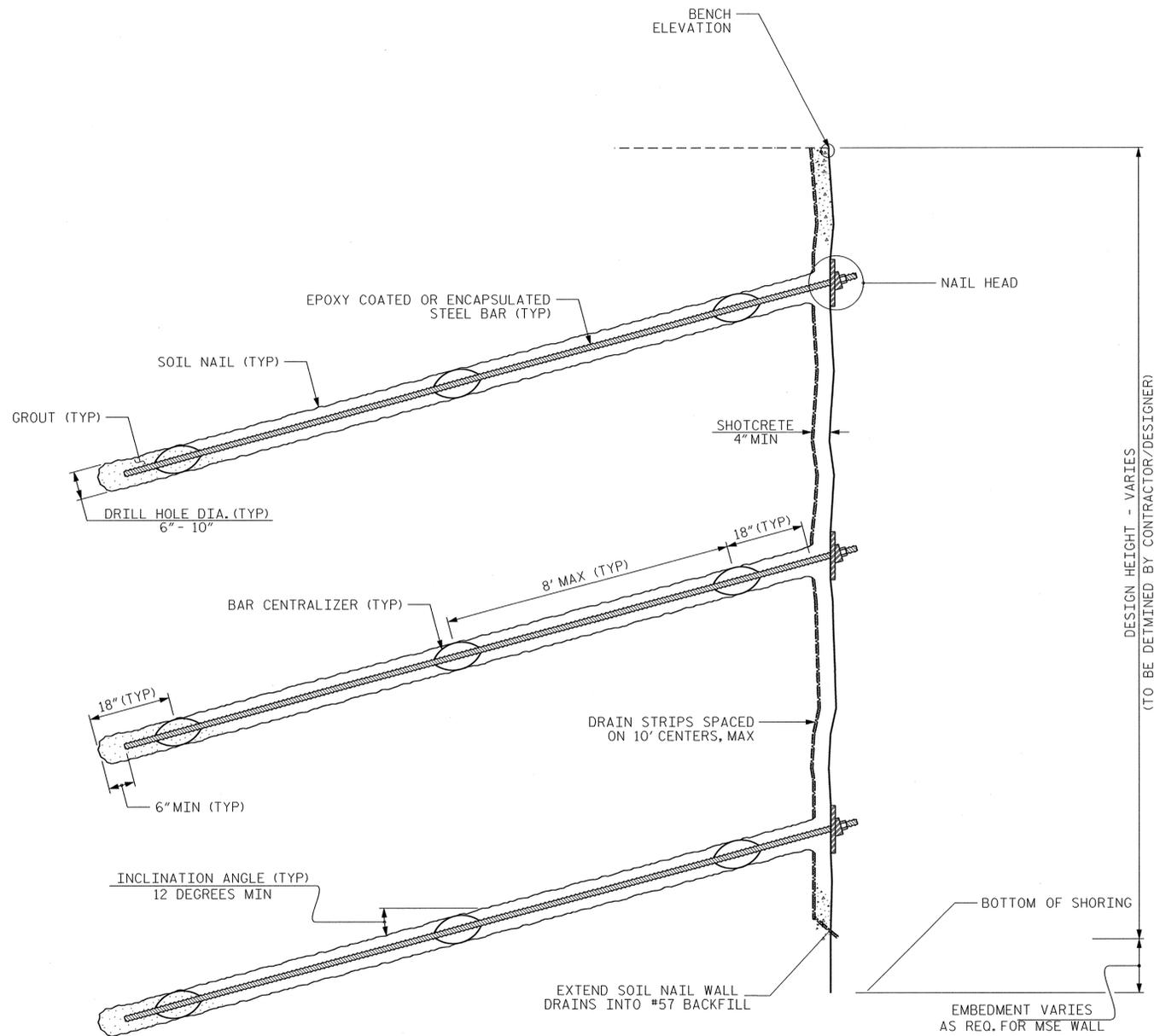
GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

| SHORED MSE WALL (SMSE) DETAILS | | | | | |
|--------------------------------|----|------|-----|----|--------------|
| REVISIONS | | | | | |
| NO. | BY | DATE | NO. | BY | DATE |
| 1 | | | 3 | | |
| 2 | | | 4 | | |
| | | | | | SHEET NO. |
| | | | | | TOTAL SHEETS |

| | |
|---|--|
| GEOTECHNICAL ENGINEER  SIGNATURE: <i>Wayne C. Clark</i> DATE: 7/21/10 | ENGINEER SIGNATURE: _____ DATE: _____ |
|---|--|



SOIL NAIL WALL TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.

NOTES

- FOR PERMANENT SOIL NAIL SHORING, SEE SHORED MECHANICALLY STABILIZED EARTH RETAINING WALLS SPECIAL PROVISION.
- BEFORE BEGINNING SOIL NAIL SHORING DESIGN, SURVEY EXISTING GROUND ELEVATIONS SHOWN ON THE WALL PROFILE VIEW (WALL ENVELOPE) AND SUBMIT A PROPOSED WALL ENVELOPE FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THIS ENVELOPE IS ACCEPTED.
- DESIGN SHORING FOR HEIGHTS EQUAL TO THE DESIGN HEIGHT (DIFFERENCE BETWEEN GRADE ELEVATION AND BOTTOM OF WALL ELEVATION) PLUS EMBEDMENT (DIFFERENCE BETWEEN BOTTOM OF WALL ELEVATION AND TOP OF LEVELING PAD ELEVATION).
- DESIGN SOIL NAIL SHORING FOR THE FOLLOWING:
 - 1) MINIMUM SERVICE LIFE = 100 YEARS
 - 2) IN-SITU ASSUMED MATERIAL PARAMETERS:
 - UNIT WEIGHT, $\gamma = 120$ PCF
 - FRICTION ANGLE, $\phi = 30$ DEGREES
 - COHESION, $c = 0$ PSF
- DESIGN SOIL NAIL SHORING FOR A LIVE LOAD (TRAFFIC) SURCHARGE. WHERE APPLICABLE, DESIGN SOIL NAIL SHORING FOR A PIPE EXTENDING THROUGH THE WALL AS SHOWN. VERIFY PIPE LOCATION AND ELEVATION BEFORE BEGINNING SOIL NAIL SHORING DESIGN OR CONSTRUCTION.
- "TOP OF SOIL NAIL WALL" AS SHOWN IN WALL ENVELOPES REPRESENTS THE APPROXIMATE GRADE ELEVATION A DISTANCE OF 0.5 TIMES WALL PROPOSED WALL HEIGHT AT THAT STATION.
- THE ESTIMATED SOIL NAIL WALL QUANTITY IS BASED ON THE 0.5 TIMES H OFFSET AND DOES NOT INCLUDE ANY ADDITIONAL AMOUNT FOR THE WALL TURNBACKS AT EACH END.

PROJECT NO.: R-2710
WATAUGA COUNTY
STATION: VARIES
 SHEET 9 OF 9

GEOTECHNICAL ENGINEERING UNIT

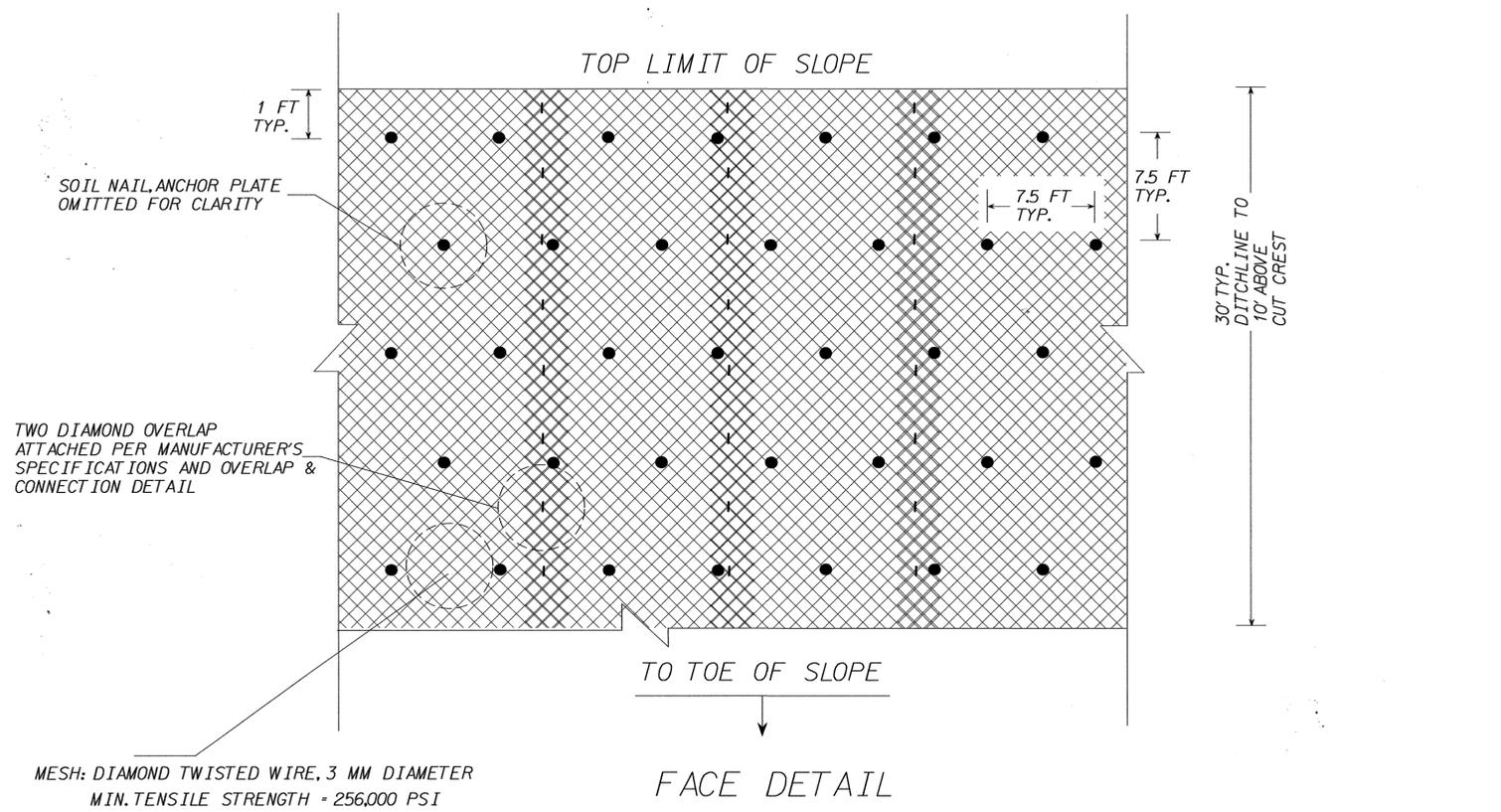
EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACT OFFICE

**STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH**

| PERMANENT SOIL NAIL WALL DETAILS | | | | | |
|----------------------------------|----|------|-----|----|------|
| REVISIONS | | | | | |
| NO. | BY | DATE | NO. | BY | DATE |
| 1 | - | - | 3 | - | - |
| 2 | - | - | 4 | - | - |

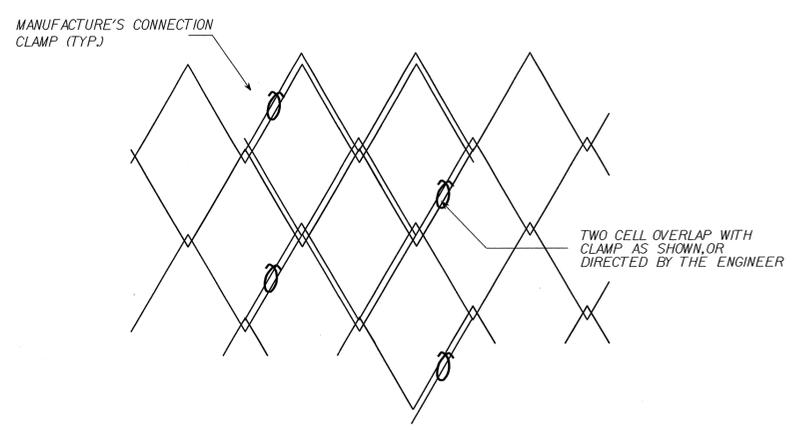
| | |
|------------------|---------------|
| PREPARED BY: JS | DATE: 3-23-10 |
| REVIEWED BY: SCC | DATE: 7-21-10 |

| | |
|---|--------------------------------|
| GEOTECHNICAL ENGINEER  S. Clark 7/21/10 SIGNATURE DATE | ENGINEER SIGNATURE DATE |
|---|--------------------------------|



MESH: DIAMOND TWISTED WIRE, 3 MM DIAMETER
 MIN. TENSILE STRENGTH - 256,000 PSI
 MIN. LONGITUDINAL TENSILE - 21,700 PSI
 MIN. HORIZONTAL TENSILE - 8,600 PSI
 GALVANIZED 95% ZINC/5% ALUMINUM, 0.49 OZ/FT
 MESH OPENINGS = 3.25" X 5.4"

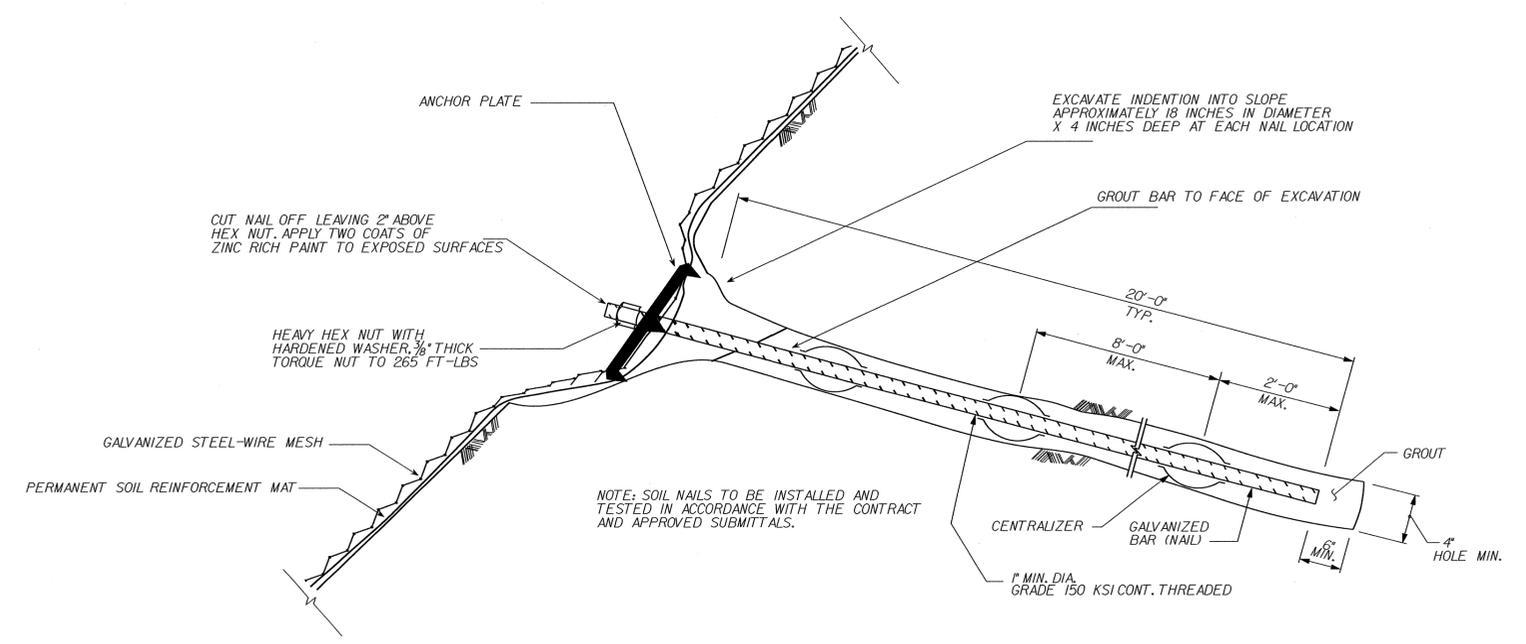
FACE DETAIL



MESH OVERLAP & CONNECTION DETAIL

NOTES:

- 1) WIRE MESH SHALL BE INSTALLED ROCK/WEATHERED ROCK CUT SLOPES AS DIRECTED THE ENGINEER. AREAS TO BE ANCHORED MUST BE APPROVED BY THE ENGINEER PRIOR TO ORDERING MATERIALS OR BEGINNING CONSTRUCTION.
- 2) SOIL NAIL LENGTH = 20 FT (TYP)
- 3) DESIGN TEST LOAD (DTL) = 60 KIPS
- 4) INSTALL NAILS INTO SLOPE WITH AN INCLINATION OF 15 DEGREES (+/- 2) TO THE HORIZONTAL



TYPICAL SECTION

| TOTAL BILL OF MATERIAL | |
|----------------------------------|---------------|
| SOIL NAIL SLOPE STABILIZATION | 2500 SQ. YDS. |
| PERMANENT SOIL REINFORCEMENT MAT | 1000 SQ. YDS. |
| SUPPLIMENTAL SOIL NAILS (20 FT) | 25 EACH |

PROJECT NO.: R-2710
 WATAUGA COUNTY
 STATION: VARIES
 SHEET 1 OF 1

GEOTECHNICAL ENGINEERING UNIT

EASTERN REGIONAL OFFICE
 WESTERN REGIONAL OFFICE
 CONTRACTS

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH



| SOIL NAIL SLOPE STABILIZATION | | | | | |
|-------------------------------|----|------|-----|----|--------------|
| REVISIONS | | | | | |
| NO. | BY | DATE | NO. | BY | DATE |
| 1 | | | 3 | | |
| 2 | | | 4 | | |
| | | | | | SHEET NO. |
| | | | | | TOTAL SHEETS |

PREPARED BY: JCK DATE: 1/10
 REVIEWED BY: SCC DATE: 7/21/10