STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

PROPOSAL

INCLUDES ADDENDUM No. 1 DATED 09-03-15

DATE AND TIME OF BID OPENING: **SEPTEMBER 15, 2015 AT 2:00 PM**

CONTRACT ID	C203593
WBS	34518.3.6

FEDERAL-AID NO.	STATE FUNDED
COUNTY	ASHE, WATAUGA
T.I.P. NO.	R-2915A
MILES	2.841
ROUTE NO.	US 221
LOCATION	US-221 FROM US-421 IN WATAUGA COUNTY TO SR-1003 (IDLEWOOD RD) IN ASHE COUNTY.
TYPE OF WORK	GRADING, DRAINAGE, PAVING, SIGNALS, CULVERTS, AND STRUCTURES.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A ROADWAY & STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C203593 IN ASHE AND WATAUGA COUNTIES, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C203593**; has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to be bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2012 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **C203593** in **Ashe and Watauga Counties**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2012* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer.

The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

An increase or decrease in the quantity of an item will not be regarded as sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided for the contract.

Accompanying this bid is a bid bond secured by a corporate surety, or certified check payable to the order of the Department of Transportation, for five percent of the total bid price, which deposit is to be forfeited as liquidated damages in case this bid is accepted and the Bidder shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by him, as provided in the *Standard Specifications*; otherwise said deposit will be returned to the Bidder.

State Contract Officer

DocuSigned by:
Randy A Garris
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9/3/2015

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GENERAL

NOTICE TO BIDDERS (2 projects):
(7-1-95) (Rev. 1-21-14) 103 SP1 G03 A

TIP R-2915A Watauga & Ashe County
Project Description: US 221 from US 421 in Watauga County to SR 1003 (Idlewild Road) in Ashe County

TIP R-2915B Ashe County
Project Description: US 221 from SR 1003 (Idlewild Road) to North of South Fork New River

On the above projects, the following Proposals are available.

Proposal No. 1	TIP R-2915A
Proposal No. 2	TIP R-2915B
Combined Proposal No. 3	TIP R-2915 A & B

Contractors may submit bids on Proposal No. 1, Proposal No. 2, the Combined Proposal No. 3, (which includes the 2 projects), or on any combination of Proposals No. 1, 2, or 3. The selection of the low bidder will be made as described below:

In determining the low bidder on these projects, the lowest bid received on Proposal No. 1 and Proposal No. 2, will be added together and the resulting total will be compared with the lowest bid received on the Combined Proposal No. 3. In the event the lowest bid on the Combined Proposal No. 3 is equal to or less than the total of the lowest bids on Proposal No. 1 and Proposal No. 2, the Contractor submitting the lowest bid on the Combined Proposal No. 3 will be considered the low bidder. In the event the lowest bid on the Combined Proposal No. 3 is higher than the total of the lowest bids on Proposal No. 1 and Proposal No. 2; or if no bid has been received on the Combined Proposal No. 3, the Contractors who have submitted the lowest bid on Proposal No. 1 and Proposal No. 2, will be considered the low bidders.

If a bid is received for the Combined Proposal No. 3 and acceptable bids are not received on Proposal No. 1 or Proposal No. 2, the Engineer's Estimate will be substituted for the proposal on which an acceptable bid was not received for comparison with the low bid received for Combined Proposal No. 3. The determination of the low bidder will be made so as to result in the best advantage to the State.

If bids are not received for Proposal No.1 and Proposal No.2 then the lowest acceptable bid received on Combined Proposal No.3 will be considered the low bidder.

These procedures are for the determination of the low bidder only and should not be confused with the award of the contract that will be by the Department as usual. Nothing in this provision shall be construed as invalidating any right reserved to the Department in Article 103-1 of the *2012 Standard Specifications*.

CONTRACT TIME AND LIQUIDATED DAMAGES:
(8-15-00) (Rev. 12-18-07) 108 SP1 G07 A

The date of availability for this contract is **April 1, 2016**, except that work in jurisdictional waters and wetlands shall not begin until a meeting between the DOT, Regulatory Agencies, and the Contractor is held as stipulated in the permits contained elsewhere in this proposal. This delay in availability has been considered in determining the contract time for this project.

The completion date for this contract is **November 27, 2020**.

Except where otherwise provided by the contract, observation periods required by the contract will not be a part of the work to be completed by the completion date and/or intermediate contract times stated in the contract. The acceptable completion of the observation periods that extend beyond the final completion date shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are **Two Hundred Dollars ($ 200.00)** per calendar day. These liquidated damages will not be cumulative with any liquidated damages which may become chargeable under Intermediate Contract Time Number 1.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:
(7-1-95) (Rev. 2-21-12) 108 SP1 G13 A

Except for that work required under the Project Special Provisions entitled *Planting, Reforestation* and/or *Permanent Vegetation Establishment,* included elsewhere in this proposal, the Contractor will be required to complete all work included in this contract and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is **April 1, 2016**.

The completion date for this intermediate contract time is **June 1, 2020**.

The liquidated damages for this intermediate contract time are **Two Thousand Dollars ($ 2,000.00)** per calendar day.

Upon apparent completion of all the work required to be completed by this intermediate date, a final inspection will be held in accordance with Article 105-17 and upon acceptance, the Department will assume responsibility for the maintenance of all work except *Planting, Reforestation* and/or *Permanent Vegetation Establishment*. The Contractor will be responsible for and shall make corrections of all damages to the completed roadway caused by his planting operations, whether occurring prior to or after placing traffic through the project.

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **-L- (US 221)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday-Friday: 6:00AM to 8:00AM, 4:00PM to 6:00PM
Saturday: 10:00 AM to 6:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **-L- (US 221) and US 421**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For unexpected occurrence that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **6:00 AM** December 31st and **6:00 PM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **6:00 PM** the following Tuesday.

3. For **Easter**, between the hours of **6:00 AM** Thursday and **6:00 PM** Monday.

4. For **Memorial Day**, between the hours of **6:00 AM** Friday and **6:00 PM** Tuesday.

5. For **Independence Day**, between the hours of **6:00 AM** the day before Independence Day and **6:00 PM** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 AM** the Thursday before Independence Day and **6:00 PM** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 AM** Friday and **6:00 PM** Tuesday.

7. For **Thanksgiving Day**, between the hours of **6:00 AM** Tuesday and **6:00 PM** Monday.

8. For **Christmas**, between the hours of **6:00 AM** the Friday before the week of Christmas Day and **6:00 PM** the following Tuesday after the week of Christmas Day.

9. For **Fall Foliage Season**, **all weekends in October**, between the hours of **6:00 AM** Friday to **6:00 PM** Sunday.

10. For **Appalachian State University Home Football Games**, between the hours of **12:00 PM (Noon)** the day before the game to **8:00 AM** the Monday after the game.

11. For **Christmas in July** occurring in West Jefferson, between 24 hours before the start and 24 hours after the end of **Christmas in July**.

12. For **Blue Ridge Brutal Bike Race Events**, between 24 hours before the start and 24 hours after the end of the **Blue Ridge Brutal Bike Race Events**.

13. For **Blood, Sweat & Gears Bike Race Events**, between 24 hours before the start and 24 hours after the end of the **Blood, Sweat & Gears Bike Race Events**.

14. For **Blue Ridge Relays Race Events**, between 24 hours before the start and 24 hours after the end of the **Blue Ridge Relays Race Events**.

15. For **Martin Luther King, Jr. Day**, between the hours of **4:00 PM** Friday and **8:00 AM** Tuesday.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per hour.

PERMANENT VEGETATION ESTABLISHMENT:

(2-16-12) (Rev. 10-15-13) 104 SP1 G16

Establish a permanent stand of the vegetation mixture shown in the contract. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish permanent vegetation on all erodible areas within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the applicable section of the *2012 Standard Specifications*. All work required for initial vegetation planting shall be performed as a part of the work necessary for the completion and acceptance of the Intermediate Contract Time (ICT). Between the time of ICT and Final Project acceptance, or otherwise referred to as the vegetation establishment period, the Department will be

responsible for preparing the required National Pollutant Discharge Elimination System (NPDES) inspection records.

Once the Engineer has determined that the permanent vegetation establishment requirement has been achieved at an 80% vegetation density (the amount of established vegetation per given area to stabilize the soil) and no erodible areas exist within the project limits, the Contractor will be notified to remove the remaining erosion control devices that are no longer needed. The Contractor will be responsible for, and shall correct any areas disturbed by operations performed in permanent vegetation establishment and the removal of temporary erosion control measures, whether occurring prior to or after placing traffic on the project.

Payment for *Response for Erosion Control, Seeding and Mulching, Repair Seeding, Supplemental Seeding, Mowing, Fertilizer Topdressing, Silt Excavation,* and *Stone for Erosion Control* will be made at contract unit prices for the affected items. Work required that is not represented by contract line items will be paid in accordance with Articles 104-7 or 104-3 of the *2012 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

CONSTRUCTION MORATORIUM:
(7-15-14) SP1 G18A

No in-water work or land disturbance within the 25 ft. wide buffer zone will be allowed from October 15 through April 15 of any year.

DELAY IN RIGHT OF ENTRY
(7-1-95) (Rev. 7-15-14) 108 SP1 G22

The Contractor will **not** be allowed right of entry to the following parcel(s) prior to the listed date(s) unless otherwise permitted by the Engineer.

Parcel No.	Property Owner	Date
001	High Country Commercial Property, LLC	9/08/15
001A	Ask Given, LLC	10/15/15
002	Maurice J. Yates	11/30/15
003	Deep Gap Assoc., LLC	10/30/15
004A	Joyce Ann M. Bowman	1/01/16
006	Mary Sue Payne	10/15/15
006-S	Lamar	11/30/15
007	Shelter Concepts, LLC	9/08/15
010	Frontier National Gas Company, LLC	1/01/16
012	Ernest J. Buchacher	10/30/15
013	Harold Charles Style and Lauren Doble Style	10/31/15
014	James Barry Greene	10/30/15
016	Jan Ruth Wellborn and Darin Ray Church	10/15/15

018	Jan Ruth Wellborn	10/15/15
019	Johnny H. Anderson	11/30/15
020	Jan Ruth Wellborn Roark	10/15/15
021	Wellborn Revocable Family Trust	10/15/15
021A	Wellborn Revocable Family Trust	10/15/15
022	Phil Wellborn	10/15/15
023	Harold E. Steelman, Jr.	11/30/15
025	Deborah R. Wellborn	11/30/15
026	Dorothy Blevins Heirs	11/30/15
030	Terry Vandyke	10/30/15
037	Aurelia S. Leonard	10/30/15
044	Gap Creek Cemetery	9/30/15
047	Robert Paul Sheets	11/30/15
047-S	Toby Outdoor, LLC	11/30/15
048	Timothy A. Miller	11/30/15
049	Carol Fairchild	11/30/15
059	Emmanuel Baptist Church	10/30/15
060	Samuel B. Church	1/01/16
061	Samuel B. Church	11/30/15
061-S	Capital Outdoor, Inc.	11/30/15
061-S1	Aum Siddhivinayak, LLC	11/30/15
062	Nell Hubbard Domeck	1/01/16
063	Kermit Lee Miller	10/30/15
064	Kermit Lee Miller	10/30/15
064-S	Toby Outdoor, LLC	11/30/15
065	James Dale Miller Heirs	10/30/15
066	James Dale Miller Heirs	11/30/15
066-S	Image Designers Outdoor Advertising	11/30/15
067	James Cline Church	10/30/15
067-S	Lamar	11/30/15
067-S1	Lamar	11/30/15
068B	Robert W. Wagner & Teresa M. Wagner	10/30/15
070	Norman Cheek (Heirs)	10/30/15
072	Bernard A. Miller	9/08/15
074	Ian Nathaniel Cheek	10/30/15
077	Ronald D. Cheek	11/30/15
078A	Seth Ryan Osborne	10/30/15
079	Donald E. Blackburn	10/30/15
080	Rock Gap Limited Partnership	10/30/15.
081	Claude W. Sluder	10/30/15
084	Alexis Alba	9/30/15

085-Z	Matthew D. Stevens	9/30/15
090	James T. Cade	9/30/15
095	Ray T. Smith, ETAL.	10/30/15
095-S	Lamar Outdoor Advertising Company	11/30/15
095-S1	Lamar Outdoor Advertising Company	11/30/15
095-S2	Lamar Outdoor Advertising Company	11/30/15

MAJOR CONTRACT ITEMS:

(2-19-02) 104 SP1 G28

The following listed items are the major contract items for this contract (see Article 104-5 of the *2012 Standard Specifications*):

Line #		Description
6	—	Unclassified Excavation
52	—	Aggregate Base Course

SPECIALTY ITEMS:

(7-1-95)(Rev. 1-17-12) 108-6 SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the *2012 Standard Specifications*).

Line #	Description
104 - 115	Guardrail
116 - 120	Fencing
126 - 147	Signing
165 - 167 and 176 - 177	Long-Life Pavement Markings
168	Removable Tape
179	Permanent Pavement Markers
182 - 193	Utility Construction
194 - 227 and 229	Erosion Control
228	Reforestation
230 - 247	Signals/ITS System

FUEL PRICE ADJUSTMENT:

(11-15-05) (Rev. 2-18-14) 109-8 SP1 G43

Revise the *2012 Standard Specifications* as follows:

Page 1-83, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is **$ 1.7405** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

The pay items and the fuel factor used in calculating adjustments to be made will be as follows:

Description	Units	Fuel Usage Factor Diesel
Unclassified Excavation	Gal/CY	0.29
Borrow Excavation	Gal/CY	0.29
Class IV Subgrade Stabilization	Gal/Ton	0.55
Aggregate Base Course	Gal/Ton	0.55
Sub-Ballast	Gal/Ton	0.55
Asphalt Concrete Base Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	2.90
Open-Graded Asphalt Friction Course	Gal/Ton	2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	2.90
Aggregate for Cement Treated Base Course	Gal/Ton	0.55
Portland Cement for Cement Treated Base Course	Gal/Ton	0.55
__" Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to __" Pavement	Gal/SY	0.245

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-19-15) 108-2 SP1 G58

The Contractor's attention is directed to the Standard Special Provision entitled *Availability of Funds Termination of Contracts* included elsewhere in this proposal. The Department of Transportation's schedule of estimated completion progress for this project as required by that Standard Special Provision is as follows:

2016	(7/01/15 - 6/30/16)	**8**	% of Total Amount Bid
2017	(7/01/16 - 6/30/17)	**34**	% of Total Amount Bid
2018	(7/01/17 - 6/30/18)	**26**	% of Total Amount Bid
2019	(7/01/18 - 6/30/19)	**20**	% of Total Amount Bid
2020	(7/01/19 - 6/30/20)	**12**	% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2012 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE:

(10-16-07)(Rev. 12-17-13) 102-15(J) SP1 G66

Description

The purpose of this Special Provision is to carry out the North Carolina Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with State funds.

Definitions

Additional MBE/WBE Subcontractors - Any MBE/WBE submitted at the time of bid that will not be used to meet either the MBE or WBE goal. No submittal of a Letter of Intent is required, unless the additional participation is used for banking purposes.

Committed MBE/WBE Subcontractor - Any MBE/WBE submitted at the time of bid that is being used to meet either the MBE or WBE goal by submission of a Letter of Intent. Or any MBE or WBE used as a replacement for a previously committed MBE or WBE firm.

Contract Goals Requirement - The approved MBE and WBE participation at time of award, but not greater than the advertised contract goals for each.

Goal Confirmation Letter - Written documentation from the Department to the bidder confirming the Contractor's approved, committed MBE and WBE participation along with a listing of the committed MBE and WBE firms.

Manufacturer - A firm that operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor.

MBE Goal - A portion of the total contract, expressed as a percentage, that is to be performed by committed MBE subcontractor(s).

Minority Business Enterprise (MBE) - A firm certified as a Disadvantaged Minority-Owned Business Enterprise through the North Carolina Unified Certification Program.

Regular Dealer - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Brokers and packagers are not regarded as manufacturers or regular dealers within the meaning of this section.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program in accordance with 49 CFR Part 26.

United States Department of Transportation (USDOT) - Federal agency responsible for issuing regulations (49 CFR Part 26) and official guidance for the DBE program.

WBE Goal - A portion of the total contract, expressed as a percentage, that is to be performed by committed WBE subcontractor(s).

Women Business Enterprise (WBE) - A firm certified as a Disadvantaged Women-Owned Business Enterprise through the North Carolina Unified Certification Program.

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Contractor enters the payments made to MBE and WBE subcontractors who have performed work on the project. https://apps.dot.state.nc.us/Vendor/PaymentTracking/

DBE-IS *Subcontractor Payment Information* - Form for reporting the payments made to all MBE/WBE firms working on the project. This form is for paper bid projects only. http://www.ncdot.org/doh/forms/files/DBE-IS.xls

RF-1 *MBE/WBE Replacement Request Form* - Form for replacing a committed MBE or WBE. http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf

SAF *Subcontract Approval Form* - Form required for approval to sublet the contract. http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip

JC-1 *Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks. http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf

Letter of Intent - Form signed by the Contractor and the MBE/WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE/WBE for the amount listed at the time of bid. http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf

Listing of MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet this MBE and WBE goals. This form is for paper bids only. http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs quoted on the project. This sheet is submitted with good faith effort packages. http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls

MBE and WBE Goal

The following goals for participation by Minority Business Enterprises and Women Business Enterprises are established for this contract:

(A) Minority Business Enterprises **5.0 %**

(1) *If the MBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that MBEs participate in at least the percent of the contract as set forth above as the MBE goal.

(2) *If the MBE goal is zero*, the Contractor shall make an effort to recruit and use MBEs during the performance of the contract. Any MBE participation obtained shall be reported to the Department.

(B) Women Business Enterprises **8.0 %**

(1) *If the WBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that WBEs participate in at least the percent of the contract as set forth above as the WBE goal.

(2) *If the WBE goal is zero*, the Contractor shall make an effort to recruit and use WBEs during the performance of the contract. Any WBE participation obtained shall be reported to the Department.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as MBE and WBE certified shall be used to meet the MBE and WBE goals respectively. The Directory can be found at the following link. https://partner.ncdot.gov/VendorDirectory/default.html

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

Listing of MBE/WBE Subcontractors

At the time of bid, bidders shall submit all MBE and WBE participation that they anticipate to use during the life of the contract. Only those identified to meet the MBE goal and the WBE goal will be considered committed, even though the listing shall include both committed MBE/WBE subcontractors and additional MBE/WBE subcontractors. Any additional MBE/WBE subcontractor participation above the goal for which letters of intent are received will follow the banking guidelines found elsewhere in this provision. All other additional MBE/WBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goals. Only those firms with current MBE and

WBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of MBE and WBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of MBE and WBE participation in the appropriate section of Expedite, the bidding software of Bid Express®.

(1) Submit the names and addresses of MBE and WBE firms identified to participate in the contract. If the bidder uses the updated listing of MBE and WBE firms shown in Expedite, the bidder may use the dropdown menu to access the name and address of the firms.

(2) Submit the contract line numbers of work to be performed by each MBE and WBE firm. When no figures or firms are entered, the bidder will be considered to have no MBE or WBE participation.

(3) The bidder shall be responsible for ensuring that the MBE and WBE are certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving either the MBE or WBE goal.

(B) Paper Bids

(1) *If either the MBE or WBE goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of MBE/WBE participation, including the names and addresses on *Listing of MBE and WBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the MBE and WBE participation for the contract.

(b) If bidders have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have MBE and WBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.

(c) The bidder shall be responsible for ensuring that the MBE/WBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's

or WBE's participation will not count towards achieving the corresponding goal.

(2) *If either the MBE or WBE goal is zero,* entries on the *Listing of MBE and WBE Subcontractors* are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

MBE or WBE Prime Contractor

When a certified MBE or WBE firm bids on a contract that contains MBE and WBE goals, the firm is responsible for meeting the goals or making good faith efforts to meet the goals, just like any other bidder. In most cases, a MBE or WBE bidder on a contract will meet one of the goals by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the MBE or WBE bidder and any other similarly certified subcontractors will count toward the goal. The MBE or WBE bidder shall list itself along with any MBE or WBE subcontractors, if any, in order to receive credit toward the goals.

For example, on a proposed contract, the WBE goal is 10%, and the MBE goal is 8%. A WBE bidder puts in a bid where they will perform 40% of the contract work and have a WBE subcontractor which will perform another 5% of the work. Together the two WBE firms submit on the *Listing of MBE and WBE Subcontractors* a value of 45% of the contract which fulfills the WBE goal. The 8% MBE goal shall be obtained through MBE participation with MBE certified subcontractors or documented through a good faith effort. It should be noted that you cannot combine the two goals to meet an overall value. The two goals shall remain separate.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE and WBE Subcontractor* just as a non-MBE/WBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each MBE/WBE that will be used to meet the MBE and WBE goals of the contract, indicating the bidder's commitment to use the MBE/WBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 12:00 noon on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed MBE and WBE to be used toward the MBE and WBE goals, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the MBE/WBE goal. If the lack of this participation drops the commitment below either the MBE or WBE goal, the

Contractor shall submit evidence of good faith efforts for the goal not met, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 12:00 noon on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 12:00 noon on the next official state business day.

Submission of Good Faith Effort

If the bidder fails to meet or exceed either the MBE or the WBE goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal(s).

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it would be due in the office of the State Contractor Utilization Engineer the next official state business day. If the contractor cannot send the information electronically, then one complete set and 9 copies of this information shall be received under the same time constraints above.

Note: Where the information submitted includes repetitious solicitation letters, it will be acceptable to submit a representative letter along with a distribution list of the firms that were solicited. Documentation of MBE/WBE quotations shall be a part of the good faith effort submittal. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Consideration of Good Faith Effort for Projects with MBE/WBE Goals More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient MBE/WBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought MBE/WBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goals and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

(A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified MBEs/WBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the MBEs/WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs/WBEs within the Division and surrounding Divisions where the project is located.

The bidder must determine with certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the MBE and WBE goals will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate MBE/WBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.

(2) Negotiate with subcontractors to assume part of the responsibility to meet the contract MBE/WBE goals when the work to be sublet includes potential for MBE/WBE participation (2^{nd} and 3^{rd} tier subcontractors).

(C) Providing interested MBEs/WBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(D) (1) Negotiating in good faith with interested MBEs/WBEs. It is the bidder's responsibility to make a portion of the work available to MBE/WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE subcontractors and suppliers, so as to facilitate MBE/WBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of MBEs/WBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for MBEs/WBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE/WBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs/WBEs is not in itself sufficient reason for a bidder's failure to meet the contract MBE or WBE goals, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from MBEs/WBEs if the price difference is excessive or unreasonable.

(E) Not rejecting MBEs/WBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(F) Making efforts to assist interested MBEs/WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested MBEs/WBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of MBEs/WBEs. Contact within 7 days from the bid opening the Business Development Manager in the Business Opportunity and Work Force Development Unit to give notification of the bidder's inability to get MBE or WBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the MBE and WBE goal.

In addition, the Department may take into account the following:

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the MBE and WBE goals.

(2) The bidders' past performance in meeting the MBE and WBE goals.

(3) The performance of other bidders in meeting the MBE and WBE goals. For example, when the apparent successful bidder fails to meet the goals, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goals. If the apparent successful bidder fails to meet the MBE and WBE goals, but meets or exceeds the average MBE and WBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the MBE and WBE goals can be met or that an adequate good faith effort has been made to meet the MBE and WBE goals.

Non-Good Faith Appeal

The State Contractor Utilization Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the State Contractual Services Engineer or at DBE@ncdot.gov. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting MBE/WBE Participation Toward Meeting MBE/WBE Goals

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by a committed MBE/WBE will be based upon the value of work actually performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting MBE/WBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 *(Joint Check Notification Form)* and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

(C) Subcontracts (Non-Trucking)

A MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the MBE contract goal requirement. The same holds for work that a WBE subcontracts to another WBE firm. Work that a MBE subcontracts to a non-MBE firm does not count toward the MBE contract goal requirement. Again, the same holds true for the work that a WBE subcontracts to a non-WBE firm. If a MBE or WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function. The MBE/WBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption may be subject to review by the Office of Inspector General, NCDOT.

(D) Joint Venture

When a MBE or WBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Suppliers

A contractor may count toward its MBE or WBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a MBE or WBE regular dealer and 100 percent of such expenditures from a MBE or WBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its MBE or WBE requirement the following expenditures to MBE/WBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a MBE/WBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.

(2) With respect to materials or supplies purchased from a MBE/WBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE/WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors.

(B) MBE/WBE Utilization in Trucking

The following factors will be used to determine if a MBE or WBE trucking firm is performing a commercially useful function:

(1) The MBE/WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and

there shall not be a contrived arrangement for the purpose of meeting the MBE or WBE goal.

(2) The MBE/WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

(3) The MBE/WBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

(4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the goal requirement. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime liable for meeting the goal.

(5) The MBE/WBE may also subcontract the work to a non-MBE/WBE firm, including from an owner-operator. The MBE/WBE who subcontracts the work to a non-MBE/WBE is entitled to credit for the total value of transportation services provided by the non-MBE/WBE subcontractor not to exceed the value of transportation services provided by MBE/WBE-owned trucks on the contract. Additional participation by non-MBE/WBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the MBE/WBE and the Contractor will not count towards the MBE/WBE contract requirement.

(6) A MBE/WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE/WBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the MBE/WBE, so long as the lease gives the MBE/WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE/WBE's credit as long as the driver is under the MBE/WBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the MBE/WBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted by Letter of Intent exceeds the algebraic sum of the MBE or WBE goal by $1,000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the apparent lowest responsive bidder fails to submit sufficient participation by MBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the MBE goal as long as there are adequate funds available from the bidder's MBE bank account.

When the apparent lowest responsive bidder fails to submit sufficient participation by WBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the WBE goal as long as there are adequate funds available from the bidder's WBE bank account.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE firm (or an approved substitute MBE or WBE firm) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another MBE/WBE subcontractor, a non-MBE/WBE subcontractor, or with the Contractor's own forces or those of an affiliate. A MBE/WBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the termination.

All requests for replacement of a committed MBE/WBE firm shall be submitted to the Engineer for approval on Form RF-1 *(Replacement Request).* If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

The Contractor shall comply with the following for replacement of a committed MBE/WBE:

(A) Performance Related Replacement

When a committed MBE is terminated for good cause as stated above, an additional MBE that was submitted at the time of bid may be used to fulfill the MBE commitment. The same holds true if a committed WBE is terminated for good cause, an additional WBE that was submitted at the time of bid may be used to fulfill the WBE goal. A good faith effort will only be required for removing a committed MBE/WBE if there were no

additional MBEs/WBEs submitted at the time of bid to cover the same amount of work as the MBE/WBE that was terminated.

If a replacement MBE/WBE is not found that can perform at least the same amount of work as the terminated MBE/WBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

(1) Copies of written notification to MBEs/WBEs that their interest is solicited in contracting the work defaulted by the previous MBE/WBE or in subcontracting other items of work in the contract.

(2) Efforts to negotiate with MBEs/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBEs/WBEs who were contacted.
(b) A description of the information provided to MBEs/WBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why MBE/WBE quotes were not accepted.

(4) Efforts made to assist the MBEs/WBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

(1) When a committed MBE/WBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement MBE/WBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.

(2) When a committed MBE/WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE/WBE firm, the Contractor shall take all necessary and reasonable steps to replace the MBE/WBE subcontractor with another similarly certified MBE/WBE subcontractor to perform at least the same amount of work to meet the MBE/WBE goal requirement. If a MBE/WBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed MBE/WBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a MBE/WBE based upon the Contractor's commitment, the MBE/WBE shall participate in additional work to the same extent as the MBE/WBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed MBE/WBE, the Contractor shall seek participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a MBE/WBE, the Contractor shall seek additional participation by MBEs/WBEs equal to the reduced MBE/WBE participation caused by the changes.

Reports and Documentation

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a MBE/WBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving MBE/WBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a MBE/WBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for MBE/WBE credit.

Reporting Minority and Women Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all MBE and WBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

(A) Withholding of money due in the next partial pay estimate; or

(B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to MBEs/WBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future DOT projects until the required information is submitted.

Contractors reporting transportation services provided by non-MBE/WBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

(A) Electronic Bids Reporting

The Contractor shall report the accounting of payments through the Department's Payment Tracking System.

(B) Paper Bids Reporting

The Contractor shall report the accounting of payments on the Department's DBE-IS *(Subcontractor Payment Information)* with each invoice. Invoices will not be processed for payment until the DBE-IS is received.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2012 Standard Specifications* may be cause to disqualify the Contractor.

CONTRACTOR'S LICENSE REQUIREMENTS:
(7-1-95) 102-14 SP1 G88

If the successful bidder does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87* of the *General Statutes* (licensing of electrical contractors).

SUBSURFACE INFORMATION:
(7-1-95) 450 SP1 G112 D

Subsurface information is available on the roadway and structure portions of this project.

SUBSURFACE INFORMATION: (For Natural Gas Pipeline Installation)
(7-1-95) 450 SP1 G112 (Rev)

Subsurface information, as provided by Frontier Natural Gas, is available regarding the installation of the **natural gas pipeline** on this project and may be obtained at the web address below. From that link, navigate to the correct letting year and month, then select **"Plans and Proposals", "Ashe-Watauga R-2915A", "Utility Postings".**

http://dotw-xfer01.dot.state.nc.us/dsplan

LOCATING EXISTING UNDERGROUND UTILITIES:
(3-20-12) 105 SP1 G115

Revise the *2012 Standard Specifications* as follows:

Page 1-43, Article 105-8, line 28, after the first sentence, add the following:

Identify excavation locations by means of pre-marking with white paint, flags, or stakes or provide a specific written description of the location in the locate request.

VALUE ENGINEERING PROPOSAL:
(05-19-15) 104 SP01 G116

Revise the *2012 Standard Specifications* as follows:

Page 1-36, Subarticle 104-12(B) Evaluation of Proposals, lines 42-44, replace the fourth sentence of the second paragraph with the following:

Pending execution of a formal supplemental agreement implementing an approved VEP and transferal of final plans (hard copy and electronic) sealed by an engineer licensed in the State of North Carolina incorporating an approved VEP to the Resident Engineer and the State Value Management Engineer, the Contractor shall remain obligated to perform the work in accordance with the terms of the existing contract.

Page 1-37, Subarticle 104-12(D) Preliminary Review, lines 9-12, replace the first sentence of the first paragraph with the following:

Should the Contractor desire a preliminary review of a possible VEP, before expending considerable time and expense in full development, a copy of the Preliminary VEP shall be submitted to the Resident Engineer and the State Value Management Engineer at ValueManagementUnit@ncdot.gov.

Page 1-37, Subarticle 104-12(E) Final Proposal, lines 22-23, replace the first sentence of the first paragraph with the following:

A copy of the Final VEP shall be submitted by the Contractor to the Resident Engineer and the State Value Management Engineer at ValueManagementUnit@ncdot.gov.

Page 1-38, Subarticle 104-12(F) Modifications, lines 2-8, replace the first paragraph with the following:

To facilitate the preparation of revisions to contract drawings, the Contractor may purchase reproducible copies of drawings for his use through the Department's Value Management Unit. The preparation of new design drawings by or for the Contractor shall be coordinated with the appropriate Design Branch through the State Value Management Engineer. The Contractor shall provide, at no charge to the Department, one set of reproducible drawings of the approved design needed to implement the VEP. Drawings (hard copy and electronic) which are sealed by an engineer licensed in the State of North Carolina shall be submitted to the State Value Management Engineer no later than ten (10) business days after acceptance of a VEP unless otherwise permitted.

Page 1-38, Subarticle 104-12(F) Modifications, line 17, add the following at the end of the third paragraph:

Supplemental agreements executed for design-bid-build contracts shall reflect any realized savings in the corresponding line items. Supplemental agreements executed for design-build contracts shall add one line item deducting the full savings from the total contract price and one line item crediting the Contractor with 50% of the total VEP savings.

Page 1-38, Subarticle 104-12(F) Modifications, lines 45-47, replace the eighth paragraph with the following:

Unless and until a supplemental agreement is executed and issued by the Department and final plans (hard copy and electronic) sealed by an engineer licensed in the State of North Carolina incorporating an approved VEP have been provided to the Resident Engineer and the State Value Management Engineer, the Contractor shall remain obligated to perform the work in accordance with the terms of the existing contract.

RESOURCE CONSERVATION AND ENV. SUSTAINABLE PRACTICES:

(5-21-13) (Rev. 5-19-15) 104-13 SP1 G118

In accordance with North Carolina Executive Order 156, NCGS 130A-309.14(3), and NCGS 136-28.8, it is the objective of the Department to aid in the reduction of materials that become a part of our solid waste stream, to divert materials from landfills, to find ways to recycle and reuse materials, to consider and minimize, where economically feasible, the environmental impacts associated with agency land use and acquisition, construction, maintenance and facility management for the benefit of the Citizens of North Carolina.

To achieve the mission of reducing environmental impacts across the state, the Department is committed to supporting the efforts to initiate, develop and use products and construction methods that incorporate the use of recycled, solid waste products and environmentally sustainable practices in accordance with Article 104-13 of the *Standard Specifications*.

Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills and any practice that minimizes the environmental impact on the project annually on the Project Construction Reuse and Recycling Reporting Form. The Project Construction Reuse and Recycling Reporting Form and a location tool for local recycling facilities are available at:
http://connect.ncdot.gov/resources/Environmental/Pages/North-Carolina-Recycling-Locations.aspx.

Submit the Project Construction Reuse and Recycling Reporting Form by August 1 annually to valuemanagementunit@ncdot.gov. For questions regarding the form or reporting, please contact the State Value Management Engineer at 919-707-4810.

DOMESTIC STEEL:

(4-16-13) 106 SP1 G120

Revise the *2012 Standard Specifications* as follows:

P**age 1-49, Subarticle 106-1(B) Domestic Steel, lines 2-7,** replace the first paragraph with the following:

All steel and iron products that are permanently incorporated into this project shall be produced in the United States except minimal amounts of foreign steel and iron products may be used provided the combined material cost of the items involved does not exceed 0.1% of the total amount bid for the entire project or $2,500, whichever is greater. If invoices showing the cost of the material are not provided, the amount of the bid item involving the foreign material will be used for calculations. This minimal amount of foreign produced steel and iron products permitted for use is not applicable to high strength fasteners. Domestically produced high strength fasteners are required.

PORTABLE CONCRETE BARRIER - (Partial Payments for Materials):
(7-1-95) (Rev. 8-16-11) 1170-4 SP1 G121

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of portable concrete barrier, provided that these materials have been delivered on the project and stored in an acceptable manner, and further provided the documents listed in Subarticle 109-5(C) of the *2012 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2012 Standard Specifications* will apply to the portable concrete barrier.

MAINTENANCE OF THE PROJECT:
(11-20-07) (Rev. 1-17-12) 104-10 SP1 G125

Revise the *2012 Standard Specifications* as follows:

Page 1-35, Article 104-10 Maintenance of the Project, line 25, add the following after the first sentence of the first paragraph:

All guardrail/guiderail within the project limits shall be included in this maintenance.

Page 1-35, Article 104-10 Maintenance of the Project, line 30, add the following as the last sentence of the first paragraph:

The Contractor shall perform weekly inspections of guardrail and guiderail and shall report damages to the Engineer on the same day of the weekly inspection. *Where damaged guardrail or guiderail is repaired or replaced as a result of maintaining the project in* accordance with this article, such repair or replacement shall be performed within 7 consecutive calendar days of such inspection report.

Page 1-35, Article 104-10 Maintenance of the Project, lines 42-44, replace the last sentence of the last paragraph with the following:

The Contractor will not be directly compensated for any maintenance operations necessary, except for maintenance of guardrail/guiderail, as this work will be considered incidental to the work covered by the various contract items. The provisions of Article 104-7, Extra Work, and Article 104-8, Compensation and Record Keeping will apply to authorized maintenance of guardrail/guiderail. Performance of weekly inspections of guardrail/guiderail, and the damage reports required as described above, will be considered to be an incidental part of the work being paid for by the various contract items.

COOPERATION BETWEEN CONTRACTORS:
(7-1-95) 105-7 SP1 G133

The Contractor's attention is directed to Article 105-7 of the *2012 Standard Specifications*.

R-2915B (C203594), located adjacent to R-2915A in Ashe County, is scheduled to be let simultaneously with this project. R-2915C, located in the vicinity of R-2915A in Ashe County,

is anticipated to be let during the construction of this project. R-2915D (C203536), located in the vicinity of R-2915A in Ashe County, will be under construction and will not be completed prior to the letting of this project.

The Contractor on this project shall cooperate with the Contractor working within or adjacent to the limits of this project to the extent that the work can be carried out to the best advantage of all concerned.

BID DOCUMENTATION:
(1-1-02) (Rev.8-18-15) 103 SP1 G142

General

The successful Bidder (Contractor) shall submit the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation used to prepare the bid for this contract to the Department within 10 days after receipt of notice of award of contract. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility selected by the Department.

The Department will not execute the contract until the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation has been received by the Department.

Terms

Bid Documentation - Bid Documentation shall mean all written information, working papers, computer printouts, electronic media, charts, and all other data compilations which contain or reflect information, data, and calculations used by the Bidder in the preparation of the bid. The term *bid documentation* includes, but is not limited to, contractor equipment rates, contractor overhead rates, labor rates, efficiency or productivity factors, arithmetical calculations, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by the Bidder in formulating and determining the bid. The term *bid documentation* also includes any manuals, which are standard to the industry used by the Bidder in determining the bid. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the publication and the publisher. *Bid Documentation* does not include bid documents provided by the Department for use by the Bidder in bidding on this project. The Bid Documentation can be in the form of electronic submittal (i.e. thumb drive) or paper. If the Bidder elects to submit the Bid Documentation in electronic format, the Department requires a backup submittal (i.e. a second thumb drive) in case one is corrupted.

Contractor's Representative - Officer of the Contractor's company; if not an officer, the Contractor shall supply a letter signed and notarized by an officer of the Contractor's company, granting permission for the representative to sign the escrow agreement on behalf of the Contractor.

Escrow Agent - Officer of the select banking institution or other bonded document storage facility authorized to receive and release bid documentation.

Escrow Agreement Information
A draft copy of the Escrow Agreement will be mailed to the Bidder after the notice of award for informational purposes. The Bidder and Department will sign the actual Escrow Agreement at the time the bid documentation is delivered to the Escrow Agent.

Failure to Provide Bid Documentation

The Bidder's failure to provide the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation within 10 days after the notice of award is received may be just cause for rescinding the award of the contract and may result in the removal of the Bidder from the Department's list of qualified bidders for a period of up to 180 days. Award may then be made to the next lowest responsible bidder or the work may be readvertised and constructed under the contract or otherwise, as the Department may decide.

Submittal of Bid Documentation

(A) Appointment – Email specs@ncdot.gov or call 919.707.6900 to schedule an appointment.

(B) Delivery - A representative of the Bidder shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within 10 days after the notice of award is received.

(C) Packaging – The container shall be no larger than 15.5 inches in length by 12 inches wide by 11 inches high and shall be water resistant. The container shall be clearly marked on the face and the back of the container with the following information: Bid Documentation, Bidder's Name, Bidder's Address, Date of Escrow Submittal, Contract Number, TIP Number if applicable, and County.

Affidavit

Bid documentation will be considered a certified copy if the Bidder includes an affidavit stating that the enclosed documentation is an EXACT copy of the original documentation used by the Bidder to determine the bid for this project. The affidavit shall also list each bid document with sufficient specificity so a comparison may be made between the list and the bid documentation to ensure that all of the bid documentation listed in the affidavit has been enclosed for escrow. The affidavit shall attest that the affiant has personally examined the bid documentation, that the affidavit lists all of the documents used by the Bidder to determine the bid for this project, and that all bid documentation has been included. The affidavit shall be signed by a chief officer of the company, have the person's name and title typed below the signature, and the signature shall be notarized at the bottom of the affidavit.

Verification

Upon delivery of the bid documentation, the Department's Contract Officer and the Bidder's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Bidder's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Bidder's representative, immediately place the complete bid documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to the Escrow Agent for placement in a safety deposit box, vault, or other secure accommodation.

Confidentiality of Bid Documentation

The bid documentation and affidavit in escrow are, and will remain, the property of the Bidder. The Department has no interest in, or right to, the bid documentation and affidavit other than to verify the contents and legibility of the bid documentation unless the Contractor gives written notice of intent to file a claim, files a written claim, files a written and verified claim, or initiates litigation against the Department. In the event of such written notice of intent to file a claim, filing of a written claim, filing a written and verified claim, or initiation of litigation against the Department, or receipt of a letter from the Contractor authorizing release, the bid documentation and affidavit may become the property of the Department for use in considering any claim or in litigation as the Department may deem appropriate.

Any portion or portions of the bid documentation designated by the Bidder as a *trade secret* at the time the bid documentation is delivered to the Department's Contract Officer shall be protected from disclosure as provided by *G.S. 132-1.2*.

Duration and Use

The bid documentation and affidavit shall remain in escrow until 60 calendar days from the time the Contractor receives the final estimate; or until such time as the Contractor:

(A) Gives written notice of intent to file a claim,
(B) Files a written claim,
(C) Files a written and verified claim,
(D) Initiates litigation against the Department related to the contract; or
(E) Authorizes in writing its release.

Upon the giving of written notice of intent to file a claim, filing a written claim, filing a written and verified claim, or the initiation of litigation by the Contractor against the Department, or receipt of a letter from the Contractor authorizing release, the Department may obtain the release and custody of the bid documentation.

The Bidder certifies and agrees that the sealed container placed in escrow contains all of the bid documentation used to determine the bid and that no other bid documentation shall be relevant or material in litigation over claims brought by the Contractor arising out of this contract.

Release of Bid Documentation to the Contractor

If the bid documentation remains in escrow 60 calendar days after the time the Contractor receives the final estimate and the Contractor has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the Department related to the contract, the Department will instruct the Escrow Agent to release the sealed container to the Contractor.

The Contractor will be notified by certified letter from the Escrow Agent that the bid documentation will be released to the Contractor. The Contractor or his representative shall retrieve the bid documentation from the Escrow Agent within 30 days of the receipt of the certified letter. If the Contractor does not receive the documents within 30 days of the receipt of the certified letter, the Department will contact the Contractor to determine final dispersion of the bid documentation.

Payment

The cost of the escrow will be borne by the Department. There will be no separate payment for all costs of compilation of the data, container, or verification of the bid documentation. Payment at the various contract unit or lump sum prices in the contract will be full compensation for all such costs.

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

(A) The Contractor shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department. The Contractor will not be responsible for damage due to faulty design, normal wear and tear, for negligence on the part of the Department, and/or for use in excess of the design.

(B) Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Contractor is responsible for invoking the warranted repair work with the manufacturer. The Contractor's responsibility shall be limited to the term of the manufacturer's guarantee. NCDOT would be afforded the same warranty as provided by the Manufacturer.

This guarantee provision shall be invoked only for major components of work in which the Contractor would be wholly responsible for under the terms of the contract. Examples would include pavement structures, bridge components, and sign structures. This provision will not be used as a mechanism to force the Contractor to return to the project to make repairs or perform additional work that the Department would normally compensate the Contractor for. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders,) are not parts of this guarantee.

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project.

To ensure uniform application statewide the Division Engineer will forward details regarding the circumstances surrounding any proposed guarantee repairs to the Chief Engineer for review and approval prior to the work being performed.

OUTSOURCING OUTSIDE THE USA:
(9-21-04) (Rev. 5-16-06) SP1 G150

All work on consultant contracts, services contracts, and construction contracts shall be performed in the United States of America. No work shall be outsourced outside of the United States of America.

Outsourcing for the purpose of this provision is defined as the practice of subcontracting labor, work, services, staffing, or personnel to entities located outside of the United States.

The North Carolina Secretary of Transportation shall approve exceptions to this provision in writing.

GIFTS FROM VENDORS AND CONTRACTORS:
(12-15-09) 107-1 SP1 G152

By Executive Order 24, issued by Governor Perdue, and *N.C.G.S.§ 133-32,* it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, landlord, offeror, seller, subcontractor, supplier, or vendor), to make gifts or to give favors to any State employee of the Governor's Cabinet Agencies (i.e. Administration, Commerce, Correction, Crime Control and Public Safety, Cultural Resources, Environment and Natural Resources, Health and Human Services, Juvenile Justice and Delinquency Prevention, Revenue, Transportation, and the Office of the Governor). This prohibition covers those vendors and contractors who:

(A) Have a contract with a governmental agency; or
(B) Have performed under such a contract within the past year; or
(C) Anticipate bidding on such a contract in the future.

For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review Executive Order 24 and *N.C.G.S. § 133-32*.

Executive Order 24 also encouraged and invited other State Agencies to implement the requirements and prohibitions of the Executive Order to their agencies. Vendors and contractors should contact other State Agencies to determine if those agencies have adopted Executive Order 24.

LIABILITY INSURANCE:
(5-20-14) SP1 G160

Revise the *2012 Standard Specifications* as follows:

Page 1-60, Article 107-15 LIABILITY INSURANCE, line 16, add the following as the second sentence of the third paragraph:

Prior to beginning services, all contractors shall provide proof of coverage issued by a workers' compensation insurance carrier, or a certificate of compliance issued by the Department of Insurance for self-insured subcontractors, irrespective of whether having regularly in service fewer than three employees.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:
(1-16-07) (Rev 9-18-12) 105-16, 225-2, 16 SP1 G180

General

Schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting sedimentation and turbidity of surface waters. Comply with the requirements herein regardless of whether or not a National Pollution discharge Elimination System (NPDES) permit for the work is required.

Establish a chain of responsibility for operations and subcontractors' operations to ensure that the *Erosion and Sediment Control/Stormwater Pollution Prevention Plan* is implemented and maintained over the life of the contract.

(A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control/Stormwater Supervisor to manage the Contractor and subcontractor operations, insure compliance with Federal, State and Local ordinances and regulations, and manage the Quality Control Program.

(B) *Certified Foreman* - Provide a certified, trained foreman for each construction operation that increases the potential for soil erosion or the possible sedimentation and turbidity of surface waters.

(C) *Certified Installer* - Provide a certified installer to install or direct the installation for erosion or sediment/stormwater control practices.

(D) *Certified Designer* - Provide a certified designer for the design of the erosion and sediment control/stormwater component of reclamation plans and, if applicable, for the design of the project erosion and sediment control/stormwater plan.

Roles and Responsibilities

(A) *Certified Erosion and Sediment Control/Stormwater Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring the erosion and sediment control/stormwater plan is adequately implemented and maintained on the project and for

conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. Perform the following duties:

(1) Manage Operations - Coordinate and schedule the work of subcontractors so that erosion and sediment control/stormwater measures are fully executed for each operation and in a timely manner over the duration of the contract.

(a) Oversee the work of subcontractors so that appropriate erosion and sediment control/stormwater preventive measures are conformed to at each stage of the work.
(b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.
(c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.
(d) Implement the erosion and sediment control/stormwater site plans requested.
(e) Provide any needed erosion and sediment control/stormwater practices for the Contractor's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
(f) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Contractor in jurisdictional areas.
(g) Conduct all erosion and sediment control/stormwater work in a timely and workmanlike manner.
(h) Fully perform and install erosion and sediment control/stormwater work prior to any suspension of the work.
(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.
(j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces or any location where sediment leaves the Right-of-Way.
(k) Have available a set of erosion and sediment control/stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel as well as regulatory agencies.

(2) Requirements set forth under the NPDES Permit - The Department's NPDES Stormwater permit (NCS000250) outlines certain objectives and management measures pertaining to construction activities. The permit references *NCG010000, General Permit to Discharge Stormwater* under the NPDES, and states that the Department shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program for construction activities

disturbing one or more acres of land. The Department further incorporates these requirements on all contracted bridge and culvert work at jurisdictional waters, regardless of size. Some of the requirements are, but are not limited to:

(a) Control project site waste to prevent contamination of surface or ground waters of the state, i.e. from equipment operation/maintenance, construction materials, concrete washout, chemicals, litter, fuels, lubricants, coolants, hydraulic fluids, any other petroleum products, and sanitary waste.
(b) Inspect erosion and sediment control/stormwater devices and stormwater discharge outfalls at least once every 7 calendar days, twice weekly for construction related *Federal Clean Water Act, Section 303(d)* impaired streams with turbidity violations, and within 24 hours after a significant rainfall event of 0.5 inch that occurs within a 24 hour period.
(c) Maintain an onsite rain gauge or use the Department's Multi-Sensor Precipitation Estimate website to maintain a daily record of rainfall amounts and dates.
(d) Maintain erosion and sediment control/stormwater inspection records for review by Department and Regulatory personnel upon request.
(e) Implement approved reclamation plans on all borrow pits, waste sites and staging areas.
(f) Maintain a log of turbidity test results as outlined in the Department's Procedure for Monitoring Borrow Pit Discharge.
(g) Provide secondary containment for bulk storage of liquid materials.
(h) Provide training for employees concerning general erosion and sediment control/stormwater awareness, the Department's NPDES Stormwater Permit NCS000250 requirements, and the applicable requirements of the *General Permit, NCG010000*.
(i) Report violations of the NPDES permit to the Engineer immediately who will notify the Division of Water Quality Regional Office within 24 hours of becoming aware of the violation.

(3) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions/conditions of permits. The quality control program shall:

(a) Follow permit requirements related to the Contractor and subcontractors' construction activities.
(b) Ensure that all operators and subcontractors on site have the proper erosion and sediment control/stormwater certification.
(c) Notify the Engineer when the required certified erosion and sediment control/stormwater personnel are not available on the job site when needed.
(d) Conduct the inspections required by the NPDES permit.
(e) Take corrective actions in the proper timeframe as required by the NPDES permit for problem areas identified during the NPDES inspections.

(f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch/seed or vegetative cover on a section-by-section basis.

(g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.

(h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.

(i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.

(j) The Contractor's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.

(B) *Certified Foreman* - At least one Certified Foreman shall be onsite for each type of work listed herein during the respective construction activities to control erosion, prevent sedimentation and follow permit provisions:

(1) Foreman in charge of grading activities
(2) Foreman in charge of bridge or culvert construction over jurisdictional areas
(3) Foreman in charge of utility activities

The Contractor may request to use the same person as the Level II Supervisor and Level II Foreman. This person shall be onsite whenever construction activities as described above are taking place. This request shall be approved by the Engineer prior to work beginning.

The Contractor may request to name a single Level II Foreman to oversee multiple construction activities on small bridge or culvert replacement projects. This request shall be approved by the Engineer prior to work beginning.

(C) *Certified Installers* - Provide at least one onsite, Level I Certified Installer for each of the following erosion and sediment control/stormwater crew:

(1) Seeding and Mulching
(2) Temporary Seeding
(3) Temporary Mulching
(4) Sodding
(5) Silt fence or other perimeter erosion/sediment control device installations
(6) Erosion control blanket installation
(7) Hydraulic tackifier installation
(8) Turbidity curtain installation
(9) Rock ditch check/sediment dam installation
(10) Ditch liner/matting installation
(11) Inlet protection
(12) Riprap placement

(13) Stormwater BMP installations (such as but not limited to level spreaders, retention/detention devices)
(14) Pipe installations within jurisdictional areas

If a Level I *Certified Installer* is not onsite, the Contractor may substitute a Level II Foreman for a Level I Installer, provided the Level II Foreman is not tasked to another crew requiring Level II Foreman oversight.

(D) *Certified Designer* - Include the certification number of the Level III Certified Designer on the erosion and sediment control/stormwater component of all reclamation plans and if applicable, the certification number of the Level III Certified Designer on the design of the project erosion and sediment control/stormwater plan.

Preconstruction Meeting

Furnish the names of the *Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers* and *Certified Designer* and notify the Engineer of changes in certified personnel over the life of the contract within 2 days of change.

Ethical Responsibility

Any company performing work for the North Carolina Department of Transportation has the ethical responsibility to fully disclose any reprimand or dismissal of an employee resulting from improper testing or falsification of records.

Revocation or Suspension of Certification

Upon recommendation of the Chief Engineer to the certification entity, certification for *Supervisor, Certified Foremen, Certified Installers* and *Certified Designer* may be revoked or suspended with the issuance of an *Immediate Corrective Action (ICA), Notice of Violation (NOV),* or C*ease and Desist Order* for erosion and sediment control/stormwater related issues.

The Chief Engineer may recommend suspension or permanent revocation of certification due to the following:

(A) Failure to adequately perform the duties as defined within this certification provision.
(B) Issuance of an ICA, NOV, or Cease and Desist Order.
(C) Failure to fully perform environmental commitments as detailed within the permit conditions and specifications.
(D) Demonstration of erroneous documentation or reporting techniques.
(E) Cheating or copying another candidate's work on an examination.
(F) Intentional falsification of records.
(G) Directing a subordinate under direct or indirect supervision to perform any of the above actions.
(H) Dismissal from a company for any of the above reasons.

(I) Suspension or revocation of one's certification by another entity.

Suspension or revocation of a certification will be sent by certified mail to the certificant and the Corporate Head of the company that employs the certificant.

A certificant has the right to appeal any adverse action which results in suspension or permanent revocation of certification by responding, in writing, to the Chief Engineer within 10 calendar days after receiving notice of the proposed adverse action.

Chief Engineer
1536 Mail Service Center
Raleigh, NC 27699-1536

Failure to appeal within 10 calendar days will result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified will result in a waiver of all future appeal rights regarding the adverse action taken. The certificant will not be allowed to perform duties associated with the certification during the appeal process.

The Chief Engineer will hear the appeal and make a decision within 7 days of hearing the appeal. Decision of the Chief Engineer will be final and will be made in writing to the certificant.

If a certification is temporarily suspended, the certificant shall pass any applicable written examination and any proficiency examination, at the conclusion of the specified suspension period, prior to having the certification reinstated.

Measurement and Payment

Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers and *Certified Designer* will be incidental to the project for which no direct compensation will be made.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 3-19-13) 105-16, 230, 801 SP1 G181

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

If during any operating day, the downstream water quality exceeds the standard, the Contractor shall do all of the following:

(A) Either cease discharge or modify the discharge volume or turbidity levels to bring the downstream turbidity levels into compliance, or

(B) Evaluate the upstream conditions to determine if the exceedance of the standard is due to natural background conditions. If the background turbidity measurements exceed the standard, operation of the pit and discharge can continue as long as the stream turbidity levels are not increased due to the discharge.

(C) Measure and record the turbidity test results (time, date and sampler) at all defined sampling locations 30 minutes after startup and at a minimum, one additional sampling of all sampling locations during that 24-hour period in which the borrow pit is discharging.

(D) Notify DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2012 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

The discharge shall be closely monitored when water from the dewatering activities is introduced into jurisdictional wetlands. Any time visible sedimentation (deposition of sediment) on the wetland surface is observed, the dewatering activity will be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation will be considered an indication of possible adverse impacts on wetland use.

The Engineer will perform independent turbidity tests on a random basis. These results will be maintained in a log within the project records. Records will include, at a minimum, turbidity test results, time, date and name of sampler. Should the Department's test results exceed those of the Contractor's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Contractor.

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix*, available at http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/TurbidityReductionOptionSheet.pdf to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources

or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

The Contractor may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

No additional compensation for monitoring borrow pit discharge will be paid.

EMPLOYMENT:

(11-15-11) (Rev. 1-17-12) 108, 102 SP1 G184

Revise the *2012 Standard Specifications* as follows:

Page 1-20, Subarticle 102-15(O), delete and replace with the following:

(O) Failure to restrict a former Department employee as prohibited by Article 108-5.

Page 1-65, Article 108-5 Character of Workmen, Methods, and Equipment, line 32, delete all of line 32, the first sentence of the second paragraph and the first word of the second sentence of the second paragraph.

STATE HIGHWAY ADMINISTRATOR TITLE CHANGE:

(9-18-12) SP1 G185

Revise the *2012 Standard Specifications* as follows:

Replace all references to "State Highway Administrator" with "Chief Engineer".

SUBLETTING OF CONTRACT:

(11-18-2014) 108-6 SP1 G186

Revise the *2012 Standard Specifications* as follows:

Page 1-66, Article 108-6 Subletting of Contract, line 37, add the following as the second sentence of the first paragraph:

All requests to sublet work shall be submitted within 30 days of the date of availability or prior to expiration of 20% of the contract time, whichever date is later, unless otherwise approved by the Engineer.

Page 1-67, Article 108-6 Subletting of Contract, line 7, add the following as the second sentence of the fourth paragraph:

Purchasing materials for subcontractors is not included in the percentage of work required to be performed by the Contractor. If the Contractor sublets items of work but elects to purchase material for the subcontractor, the value of the material purchased will be included in the total dollar amount considered to have been sublet.

MOBILIZATION:

(09-15-15) 800 SP1 G194

Revise the *2012 Standard Specifications* as follows:

Page 8-1, Subarticle 800-2 Measurement and Payment, add the following as the 5th paragraph:

For projects that have a delayed availability date of 90 calendar days or more after contract execution, the first mobilization payment may be for the verified actual cost of paid bond premiums. This payment will only be made upon request by the contractor with supporting documentation including invoice and proof of payment. This payment will be limited to 1% of the amount bid for the contract and the subsequent mobilization payment will be reduced by an equal amount to follow the payment schedule as shown above. In no case will more than 5% of the amount bid for the contract be paid before the last partial pay estimate.

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING - METHOD III:

(4-6-06) (Rev.8-18-15) 200 SP2 R02B

Perform clearing on this project to the limits established by Method "III" shown on Standard Drawing No. 200.03 of the *2012 Roadway Standard Drawings*. Conventional clearing methods may be used except where permit drawings or conditions have been included in the proposal which require certain areas to be cleared by hand methods.

BUILDING REMOVAL:

(1-1-02) (Rev. 7-8-14) 215 SP2 R15

Remove the buildings listed below, including any underground storage tanks and appurtenances, in accordance with Section 215 of the *2012 Standard Specifications*:

Parcel	Location	Description
008	Rt. of Survey Station 31+20 to 34+00, Line-Y1-	One Story Brick and Block Business (3,281 SF)
013	Rt. of Survey Station 37+40 to SS 41+30, –Y1-	One and half story brick dwelling (4,160 SF); Garage with unfinished apartment (1200 SF); partially outside right of way and/or construction limits.
016	Rt. Survey Station 14+00 to SS 15+20 –L-	One Story Frame/Brick Dwelling with crawl space foundation and small cellar (1,573 SF) and Storage Shed (181 SF)
018	Rt. of Survey Station 14+00 to 17+05, Line –L-	Barn (600 SF), Shed/Storage Building (200 SF)
021	Rt. of Survey Station 19+00 to SS 37+00 –L-	One Story Brick Dwelling (2,000 SF) with carport (600 SF) and Storage Shed (140 SF)
023	Lt. of Survey Station 21+40 to 26+50, Line-L-	One Story Framed Dwelling (1,620 SF), partially outside right of way and/or construction limits.
024	Lt. of Survey Station 26+50 to 27+60, Line-L-	One Story Framed Dwelling (1,489 SF), partially outside right of way and/or construction limits.
025	Rt. of Survey Station 21+90 to SS 30+00, Line –L-	One Story Framed Dwelling (2,000 SF), One Story Brick Dwelling, Shed (200 SF)
026	Lt. of Survey Station 27+64 to 30+23, Line -L-	One Story Doublewide (2000 SF), One Story Framed Dwelling (1,932 SF), Shed (160 SF); Shed (144 SF); partially outside right of way and/or construction limits.
029	Lt. of Survey Station 37+00 to 42+00, Line –L-	Singlewide Mobile Home (1,162 SF); One car detached garage (750 SF), One shed/carport (375 SF); partially outside right of way and/or construction limits.
030	Rt. of Survey Station 42+00 to 45+25, Line –L-	One Story Block Dwelling, Shed (312 SF), partially outside right of way and/or construction limits.

037	Lt. of Survey Station 62+30 to SS 64+00, Line –L-	Two story frame dwelling (1,225 SF), Shed (414 SF); partially outside right of way and/or construction limits.
041	Rt. of Survey Station 67+90 to SS 68+60, Line –L-	Detached Garage and workshop with lift (1,611 SF) and deck (60 SF), partially outside right of way and/or construction limits.
047	Rt. of Survey Station 71+90 to SS 75+50, Line –L-	One Story Metal Business (13,550 SF), partially outside right of way and/or construction limits.
048	Rt. of Survey Station 75+50 to SS 77+05, Line –L-	One Story Brick Business (2,100 SF), partially outside right of way and/or construction limits.
049	Rt. of Survey Station 77+10 to 78+60, Line-L-	Singlewide Mobile Home (980 SF); partially outside right of way and/or construction limits.
054	Lt. of Survey Station 78+65 to 81+25, Line-L-	One Story Brick Dwelling (1,478 SF)
060	Lt. of Survey Station 83+90 to SS 89+00, Line –L-	1 Story Metal Business (4000 SF), partially outside right of way and/or construction limits
061	Rt. of Survey Station 82+10 to SS 85+00, Line –L-	One Story Brick Business (1,650 SF), Shed (110 SF), partially outside right of way and/or construction limits.
066	Rt. of Survey Station 92+3.52 to 97+20, Line-L-	One Story Framed Dwelling (1,444 SF), Shed (150 SF); Barn (150 SF), partially outside right of way and/or construction limits.
070	Rt. of Survey Station 107+80 to 117+86, Line-L-	Metal Building (1,800 SF), partially outside right of way and/or construction limits.
071	Rt. of Survey Station 110+20 to 112+30, Line-L-	One Story Brick Dwelling (1,782 SF)
073	Lt. of Survey Station 114+10 to 115+65, Line-L-	One Story Framed Dwelling (1,008 SF), partially outside right of way and/or construction limits.
074	Lt. of Survey Station 115+65 to 118+32, Line-L-	Shed (256 SF); Shed (180 SF)
077	Lt. of Survey Station 118+00 to 123+00, Line-L-	Fuel Pump Island (576 SF); Garage with Concrete Slab (1,092 SF)
079	Rt. of Survey Station 126+50 to 135+45, Line-L-	Pool (480 SF); One Story Brick Dwelling (2,600 SF); Shed (1,170 SF); Shed (200 SF); partially outside right of way and/or construction limits.
081	Rt. of Survey Station 135+50 to SS 138+20, Line –L-	One Story Brick Dwelling (1,671 SF).
087	Rt. of Survey Station 143+00 to SS 145+10, Line –L-	One Story Framed Dwelling (847 SF); Canopy/Carport (360 SF); Storage Building with shed attached (230 SF); Stucco Storage/Well House (90 SF).
095	Rt. of Survey Station 157+70	Barn (830 SF)

NOTE - When the description of the work indicates a building partially inside and partially outside the right of way and/or construction area, but does not require the building to be cut off, the entire building shall be removed.

TEMPORARY PAVEMENT:

Construct the temporary pavement required on this project in accordance with the plans or as directed by the Engineer.

After the temporary pavement has served its purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Place pavement and earth material removed from the temporary pavement areas in embankments or dispose of in waste areas furnished by the Contractor.

Aggregate base course, incidental stone base, and earth material that is removed will be measured and will be paid at the contract unit price per cubic yard for *Unclassified Excavation*. Pavement that is removed will be measured and will be paid at the contract unit price per square yard for *Removal of Existing Pavement*. Pavement that is milled will be measured and paid at the contract unit price per square yard for the applicable milling depth pay item. Pipe culverts removed remain the property of the Contractor. Pipe culverts that are removed will be measured and will be paid at the contract unit price per linear foot for *Pipe Removal*. Payment for the construction of the temporary pavement and incidental stone base will be made at the contract unit prices for the various items involved.

Such prices and payments will be full compensation for constructing the temporary pavement and for the work of removing aggregate base course, incidental stone base, earth material, and pavement; removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02) 235, 560 SP2 R45 B

Description

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *2012 Standard Specifications*.

Measurement and Payment

When the Contractor elects to obtain material from an area located beneath a proposed fill sections which does not require excavation for any reason other than to generate acceptable shoulder and fill slope material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow* or *Shoulder Borrow* in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material

with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation or clearing and grubbing operations that is placed directly on shoulders or slope areas, will not be measured separately for payment, as payment for the work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulders or slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *2012 Standard Specifications*.

SURCHARGES AND WAITING PERIODS:

(2-17-04) (Rev. 08-18-15) 235 SP2 R65

Revise the *2012 Standard Specifications* as follows:

Page 2-22, Article 235-1 DESCRIPTION, add the following:

Surcharges and waiting periods may be required for embankments and retaining walls to minimize and control the effects of settlement on structures, approach slabs, pavements, pipes, utilities, etc.

Page 2-24, Article 235-3 CONSTRUCTION METHODS, add the following:

(E) Surcharges and Waiting Periods

Place surcharges at locations shown in the plans. Unless required otherwise in the contract, surcharge embankments after embankments are constructed to the grade and cross section shown in the plans. Construct surcharges with side slopes as directed, 2:1 (H:V) end slopes outside of surcharge limits and surcharge heights shown in the plans. Place and compact surcharge material in accordance with Subarticles 235-3(B) and 235-3(C). Construct and maintain adequate drainage of surface runoff to prevent erosion of surcharge material.

Waiting period durations are in accordance with the contract and as directed. Surcharge waiting periods apply to surcharge locations shown in the plans and begin after surcharges are constructed to the height shown in the plans.

Unless required otherwise in the contract, bridge waiting periods are required in accordance with the following:

(1) Apply to bridge embankments and retaining walls within 100 ft of end bent and bent locations shown in the plans and

(2) Begin after bridge embankments and retaining walls are constructed to the elevations noted in the plans.

Unless required otherwise in the contract, embankment waiting periods are required in accordance with the following:

(1) Apply to embankment locations shown in the plans and retaining walls for embankments with waiting periods and

(2) Begin after embankments and retaining walls are constructed to the elevations, grade and cross section shown in the plans.

Except for maintaining embankments, do not perform any work on embankments or structures with waiting periods until waiting periods end unless otherwise approved. Place and compact additional material in accordance with Subarticles 235-3(B) and 235-3(C) to maintain embankment grade elevations during waiting periods. Remove surcharges to the grade and cross section shown in the plans after surcharge waiting periods end.

Page 2-24, Article 235-5 MEASUREMENT AND PAYMENT, add the following:

Borrow Excavation for surcharge material and additional material for maintaining embankment grade elevations will be measured and paid in accordance with Article 230-5. *Unclassified Excavation* for surcharge material, additional material for maintaining embankment grade elevations and removing surcharges will be measured and paid in accordance with Article 225-7. When there is no pay item for *Borrow Excavation* or *Unclassified Excavation* in the contract, surcharge material and removing surcharges will be included in the lump sum payment for *Grading*. Additional material for maintaining embankment grade elevations will be paid as extra work in accordance with Article 104-7.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS:

(4-16-02) (Rev. 5-19-15) 235 SP02 R70

Description

This specification allows the Contractor an option, with the approval of the Engineer, to use coal combustion products (CCPs) in embankments as a substitute for conventional borrow material. The amount of CCPs allowed to be used for this project will be less than 80,000 tons total and less than 8,000 tons per acre.

Materials

Supply coal combustion products from the Department list of potential suppliers maintained by the Value Management Unit. Site specific approval of CCP material will be required prior to beginning construction.

The following CCPs are unacceptable:
(A) Frozen material,
(B) Ash from boilers fired with both coal and petroleum coke, and
(C) Material with a maximum dry unit weight of less than 65 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C.

Collect and transport CCPs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the CCPs as needed and transport in covered trucks to prevent dusting.

Preconstruction Requirements

When CCPs are to be used as a substitute for earth borrow material, request written approval from the Engineer at least ninety (90) days in advance of the intent to use CCPs and include the following details using the NCDOT Form #CCP-2015-V1 in accordance with NCGS § 130A-309.215(b)(1):

(A) Description, purpose and location of project.
(B) Estimated start and completion dates of project.
(C) Estimated volume of CCPs to be used on project with specific locations and construction details of the placement.
(D) Toxicity Characteristic Leaching Procedure analysis from a representative sample of each different CCP source to be used in the project for, at minimum, all of the following constituents: arsenic, barium, cadmium, lead, chromium, mercury, selenium, and silver.
(E) The names, address, and contact information for the generator of the CCPs.
(F) Physical location of the project at which the CCPs were generated.

Submit the form to the Engineer and the State Value Management Engineer at valuemanagement@ncdot.gov for review. The Engineer and the State Value Management Engineer will coordinate the requirements of NCGS § 130A-309.215(a)(1) and notify the Contractor that all the necessary requirements have been met before the placement of structural fill using coal combustion products is allowed.

Construction Methods

In accordance with the detail in the plans, place CCPs in the core of the embankment section with at least 4 feet of earth cover to the outside limits of the embankments or subgrade and at least 5 feet above the seasonal high ground-water table. CCPs used in embankments shall not be placed as follows:

(A) Within 50 feet of any property boundary.
(B) Within 300 horizontal feet of a private dwelling or well.
(C) Within 50 horizontal feet of the top of the bank of a perennial stream or other surface water body.
(D) Within a 100-year floodplain except as authorized under NCGS § 143-215.54A(b). A site located in a floodplain shall not restrict the flow of the 100-year floodplain or result in washout of solid waste so as to pose a hazard to human life, wildlife or land and water resources.
(E) Within 50 horizontal feet of a wetland, unless, after consideration of the chemical and physical impact on the wetland, the United States Army Corps of Engineers issues a permit or waiver for the fill.

Construct embankments by placing CCPs in level uniform lifts with no more than a lift of 10 inches and compacted to at least a density of 95 percent as determined by test methods in AASHTO T-99, Determination of Maximum Dry Density and Optimum Moisture Content, Method A or C depending upon particle size of the product. Provide a moisture content at the time of compaction of within 4 percent of optimum but not greater than one percent above optimum as determined by AASHTO T-99, Method A or C.

Divert surface waters resulting from precipitation from the CCPs placement area during filling and construction activities. Construct embankments such that rainfall will not run directly off of the CCPs. Provide dust control to minimize airborne emissions. Construct fill in a manner that prevents water from accumulating and ponding and do not pump nor discharge waters from CCP's filling and construction areas.

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *2012 Standard Specifications*.

PIPE INSTALLATION:
(11-20-12) (Rev. 8-18-15) 300 SP3 R01

Revise the *2012 Standard Specifications* as follows:

Page 3-1, Article 300-2, Materials, line 15, in the materials table, replace "Flowable Fill" and "Geotextiles" with the following:

Item	**Section**
Flowable Fill, Excavatable	1000-6
Grout, Type 2	1003
Geotextiles, Type 4	1056

Page 3-1, Article 300-2, Materials, lines 23-24, replace sentence with the following:

Provide foundation conditioning geotextile and geotextile to wrap pipe joints in accordance with Section 1056 for Type 4 geotextile.

Page 3-3, Subarticle 300-6(A), Rigid Pipe, line 2, in the first paragraph, replace "an approved non-shrink grout." with "grout." and line 4, in the second paragraph, replace "filtration geotextile" with "geotextile".

Page 3-3, Article 300-7, Backfilling, lines 37-38, in the first and second sentences of the fifth paragraph, replace "Excavatable flowable fill" with "Flowable fill".

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12) 300, 340, 450, 1000, 1530, 1540, 1550 SP3 R30

Description

This work consists of all work necessary to place flowable fill in accordance with these provisions, the plans, and as directed.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Flowable Fill	1000-6

Construction Methods

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions dictate. The Contractor shall provide a method to plug the ends of the existing pipe in order to contain the flowable fill.

Measurement and Payment

At locations where flowable fill is called for on the plans and a pay item for flowable fill is included in the contract, *Flowable Fill* will be measured in cubic yards and paid as the actual number of cubic yards that have been satisfactorily placed and accepted. Such price and payment will be full compensation for all work covered by this provision including, but not limited to, the mix design, furnishing, hauling, placing and containing the flowable fill.

Payment will be made under:

Pay Item	Pay Unit
Flowable Fill	Cubic Yard

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-17-12) 422 SP4 R02

Description

Bridge approach fills include bridge approach fills for sub regional tier bridges and reinforced bridge approach fills. Construct bridge approach fills in accordance with the contract and Standard Drawing No. 422.10 or 422.11 of the *2012 Roadway Standard Drawings*. Define "geosynthetics" as geotextiles or geomembranes.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Geotextiles	1056
Portland Cement Concrete	1000
Select Material	1016
Subsurface Drainage Materials	1044
Wire Staples	1060-8(D)

For bridge approach fills for sub regional tier bridges, provide Type 1 geotextile for filtration geotextiles. For reinforced bridge approach fills, provide Type 5 geotextile for geotextile reinforcement and Type 1 geotextile and No. 78M stone for drains. Use Class B concrete for concrete pads.

Use Class III or V select material for reinforced bridge approach fills and only Class V select material (standard size No. 78M stone) for bridge approach fills for sub regional tier bridges. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For drains and PVC pipes behind end bents, use pipes with perforations that meet AASHTO M 278.

Use PVC, HDPE or linear low density polyethylene (LLDPE) geomembranes for reinforced bridge approach fills. For PVC geomembranes, provide grade PVC30 geomembranes that meet ASTM D7176. For HDPE and LLDPE geomembranes, use geomembranes with a nominal thickness of at least 30 mils that meet Geosynthetic Research Institute Standard Specifications GM13 or GM17, respectively. Handle and store geomembranes in accordance with Article 1056-2 of the *2012 Standard Specifications*. Provide material certifications for geomembranes in accordance with Article 1056-3 of the *2012 Standard Specifications*.

Construction Methods

Excavate as necessary for bridge approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geomembranes or filtration geotextiles until excavation dimensions and foundation material are approved. Attach geomembranes and filtration geotextiles to end bent cap back and wing walls with adhesives, tapes or other approved methods. Glue or weld geomembrane seams to prevent leakage.

For reinforced bridge approach fills, place geotextile reinforcement within 3" of locations shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and in slight tension free of kinks, folds, wrinkles or creases. Install geotextile reinforcement with the orientation, dimensions and number of layers shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings*. Place first layer of geotextile reinforcement directly on geomembranes with no void or material in between. Install geotextile reinforcement with the machine direction (MD) parallel to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextile reinforcement in the MD so seams are perpendicular to the roadway centerline. Wrap geotextile reinforcement at end bent cap back and wing walls as shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and directed by the Engineer. Extend geotextile reinforcement at least 4 ft back behind end bent cap back and wing walls into select material.

Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geosynthetics.

For reinforced bridge approach fills, construct one foot square drains consisting of 4" diameter continuous perforated PVC pipes surrounded by No. 78M stone wrapped in Type 1 geotextiles. Install drains in accordance with Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings*. For bridge approach fills for sub regional tier bridges, install 4" diameter continuous perforated PVC drain pipes in accordance with Standard Drawing No. 422.11 of the *2012 Roadway Standard Drawings*.

Use solvent cement to connect PVC pipes so joints do not leak. Connect perforated pipes to outlet pipes just behind wing walls. Provide drain pipes and drains with positive drainage towards outlets. Place pipe sleeves in or under wing walls for outlet pipes so positive drainage is maintained. Use sleeves that can withstand wing wall loads.

Place select material in 8" to 10" thick lifts. Use only hand operated compaction equipment to compact select material for bridge approach fills. Compact Class III select material in accordance with Subarticle 235-3(C) of the *2012 Standard Specifications*. Compact No. 78M stone with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, drain pipes or drains when placing and compacting select material. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics, drain pipes or drains until they are covered with at least 8" of select material. Replace any damaged geosynthetics, drain pipes or drains to the satisfaction of the Engineer.

Cover open ends of outlet pipes with rodent screens as shown in Standard Drawing No. 815.03 of the *2012 Roadway Standard Drawings*. Connect ends of outlet pipes to concrete pads or existing drainage structures as directed by the Engineer. Construct concrete pads with an Ordinary surface finish that meets Subarticle 825-6(B) of the *2012 Standard Specifications*.

Measurement and Payment

Reinforced Bridge Approach Fill, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Reinforced Bridge Approach Fill, Station* ____ will be full compensation for labor, tools, equipment and reinforced bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting select material, connecting outlet pipes to existing drainage structures and supplying select materials, geosynthetics, drains, pipe sleeves and outlet components and any incidentals necessary to construct all reinforced bridge approach fills at each bridge.

Bridge Approach Fill - Sub Regional Tier, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Bridge Approach Fill - Sub Regional Tier, Station* ____ will be full compensation for labor, tools, equipment and bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting No. 78M stone, connecting outlet pipes to existing drainage structures and supplying No. 78M stone, filtration geotextiles, drain pipes, pipe sleeves and outlet components and any incidentals necessary to construct all bridge approach fills at each sub regional tier bridge.

Payment will be made under:

Pay Item	**Pay Unit**
Reinforced Bridge Approach Fill, Station ____	Lump Sum
Bridge Approach Fill - Sub Regional Tier, Station ____	Lump Sum

PREPARATION OF SUBGRADE AND BASE:

(1-16-96) 610 SP5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2012 Standard Specifications* except use an automatically controlled fine grading machine using string lines, laser controls or other approved methods to produce final subgrade and base surfaces meeting the lines, grades and cross sections required by the plans or established by the Engineer.

No direct payment will be made for the work required by this provision as it will be considered incidental to other work being paid for by the various items in the contract.

CLASS IV SUBGRADE STABILIZATION IN LIEU OF CHEMICAL STABILIZATION:

(6-16-15) 501, 542 SP05 R017

Description

In lieu of chemical stabilization, provide Class IV Subgrade Stabilization by replacing 8” of subgrade soils with geotextile and Class IV select material. This substitution is allowed in full typical section width and cannot result in chemically stabilized sections less than 1,000 feet in length, unless otherwise approved by the Engineer. Notify the Engineer at least 30 days in advance of starting Class IV Subgrade Stabilization in lieu of Chemical Stabilization.

Materials

Refer to the *2012 Standard Specifications*.

Item	Section
Geotextile for Soil Stabilization, Type 4	1056
Select Material, Class IV	1016

Use Class IV Select Material for Class IV Subgrade Stabilization.

Construction Methods

Install geotextile for soil stabilization in accordance with Article 270-3 in the *2012 Standard Specifications*. Place Class IV subgrade stabilization (standard size no. ABC) by end dumping ABC on geotextiles. Do not operate heavy equipment on geotextiles until geotextiles are covered with Class IV subgrade stabilization. Compact ABC to 97% of AASHTO T 180 as modified by the Department.

Maintain Class IV subgrade stabilization in an acceptable condition and minimize the use of heavy equipment on ABC in order to avoid damaging aggregate subgrades. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate subgrades.

Measurement and Payment

Class IV Subgrade Stabilization in Lieu of Chemical Stabilization will be paid at the prices established in the contract that relate to the chemical stabilization type that is being replaced (Lime or Cement). No direct payment will be made for additional excavation required to accommodate this alternate.

The total amount paid for this subgrade stabilization alternative will be limited to the contract amounts per square yard for replacement for Portland cement or lime, theoretical tons of Portland cement or lime replaced, mixing of cement or lime, and theoretical gallons of asphalt curing seal replaced at the rate of 0.15 gallons per square yard.

A Supplement Agreement will be executed prior to starting the work to create a square yard price for the *Class IV Subgrade Stabilization in Lieu of Chemical Stabilization* and deleting the quantities associated with the work being replaced.

ASPHALT PAVEMENTS - SUPERPAVE:

(6-19-12) (Rev. 4-21-15) 605, 609, 610, 650 SP6 R01

Revise the *2012 Standard Specifications* as follows:

Page 6-3, Article 605-7 APPLICATION RATES AND TEMPERATURES, replace this article, including Table 601-1, with the following:

Apply tack coat uniformly across the existing surface at target application rates shown in Table 605-1.

TABLE 605-1
APPLICATION RATES FOR TACK COAT

Existing Surface	Target Rate (gal/sy)
	Emulsified Asphalt
New Asphalt	0.04 ± 0.01
Oxidized or Milled Asphalt	0.06 ± 0.01
Concrete	0.08 ± 0.01

Apply tack coat at a temperature within the ranges shown in Table 605-2. Tack coat shall not be overheated during storage, transport or at application.

TABLE 605-2
APPLICATION TEMPERATURE FOR TACK COAT

Asphalt Material	Temperature Range
Asphalt Binder, Grade PG 64-22	350 - 400°F
Emulsified Asphalt, Grade RS-1H	130 - 160°F
Emulsified Asphalt, Grade CRS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-1H	130 - 160°F
Emulsified Asphalt, Grade HFMS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-2	130 - 160°F

Page 6-7, Article 609-3 FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS, lines 35-37, delete the second sentence of the second paragraph.

Page 6-18, Article 610-1 DESCRIPTION, lines 40-41, delete the last sentence of the last paragraph.

Page 6-19, Subarticle 610-3(A) Mix Design-General, line 5, add the following as the first paragraph:

Warm mix asphalt (WMA) is allowed for use at the Contractor's option in accordance with the NCDOT Approved Products List for WMA Technologies available at:

https://connect.ncdot.gov/resources/Materials/MaterialsResources/Warm%20Mix%20Asphalt%20Approved%20List.pdf

Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF), replace Table 610-1 with the following:

TABLE 610-1
DESIGN MIXING TEMPERATURE AT THE ASPHALT PLANT[A]

Binder Grade	HMA JMF Temperature	WMA JMF Temperature Range
PG 64-22	300ºF	225 - 275ºF
PG 70-22	315ºF	240 - 290ºF
PG 76-22	335ºF	260 - 310ºF

A. The mix temperature, when checked in the truck at the roadway, shall be within plus 15º and minus 25º of the temperature specified on the JMF.

Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF), lines 4-6, delete first sentence of the second paragraph. Line 7, in the second sentence of the second paragraph, replace "275ºF" with "275ºF or greater."

Page 6-22, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES, lines 15-17, replace the second sentence of the first paragraph with the following:

Do not place asphalt material when the air or surface temperatures, measured at the location of the paving operation away from artificial heat, do not meet Table 610-5.

Page 6-23, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES, replace Table 610-5 with the following:

TABLE 610-5
PLACEMENT TEMPERATURES FOR ASPHALT

Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F[A]
S9.5C, S12.5C	45°F[A]
S9.5D, S12.5D	50°F

A. For the final layer of surface mixes containing recycled asphalt shingles (RAS), the minimum surface and air temperature shall be 50ºF.

Page 6-26, Article 610-7 HAULING OF ASPHALT MIXTURE, lines 22-23, in the fourth sentence of the first paragraph replace "so as to overlap the top of the truck bed and" with "to".

Page 6-41, Subarticle 650-3(B) Mix Design Criteria, replace Table 650-1 with the following:

TABLE 650-1
OGAFC GRADATION CRITERIA

Sieve Size (mm)	*Type FC-1*	*Type FC-1 Modified*	*Type FC-2 Modified*
19.0	-	-	100
12.5	100	100	**80** - 100
9.50	75 - 100	75 - 100	55 - **80**
4.75	25 - 45	25 - 45	15 - **30**
2.36	5 - 15	5 - 15	5 - **15**
0.075	1.0 - 3.0	1.0 - 3.0	2.0 - 4.0

ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:
(11-21-00) (Rev. 7-17-12) 609 SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

Asphalt Concrete Base Course	Type B 25.0__	4.4%
Asphalt Concrete Intermediate Course	Type I 19.0__	4.8%
Asphalt Concrete Surface Course	Type S 4.75A	6.8%
Asphalt Concrete Surface Course	Type SA-1	6.8%
Asphalt Concrete Surface Course	Type SF 9.5A	6.7%
Asphalt Concrete Surface Course	Type S 9.5__	6.0%
Asphalt Concrete Surface Course	Type S 12.5__	5.6%

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2012 Standard Specifications.*

ASPHALT PLANT MIXTURES:
(7-1-95) 609 SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:
(11-21-00) 620 SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2012 Standard Specifications.*

The base price index for asphalt binder for plant mix is **$ 479.62** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **August 1, 2015**.

RIPRAP ENERGY DISSIPATOR BASIN:

(10-14-09) (Rev. 2-7-14) SPI 8-44

Description

This work consists of the construction and maintenance of an armored outlet structure located at culvert outlets or ditch termini.

Materials

Refer to Division 10 of the *Standard Specifications.*

Item	Section
Class I Riprap	1042
Geotextile for Drainage, Type 2	1056

Construction Methods

Riprap energy dissipators shall be constructed in accordance with the detail shown in the plans or as directed. From the outlet, invert of a culvert or bottom of a ditch excavation will drop to a specified depth. Excavation will continue to widen through the dissipator. Riprap shall be placed along the banks and bottom of the dissipator and along the apron.

Excavate ditch in accordance with Section 240 of the *Standard Specifications*.

The quantity of energy dissipator material may be affected by site conditions during construction of the project. The quantity of materials may be increased, decreased, or eliminated at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Measurement and Payment

Energy Dissipator Basin will be paid on a lump sum basis. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing and placing stone, filter fabric, materials, labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Energy Dissipator Basin	Lump Sum

25' CLEAR SPAN GUARDRAIL SECTION:

(9-19-06) SPI 8-10

Description

The 25' Clear Span Guardrail Sections shall be constructed in accordance with Section 862 of the *Standard Specifications*, in accordance with Standard Drawing 862.01 of the *Roadway Standard Drawings,* and as directed by the Engineer.

Measurement and Payment

The quantity of *25' Clear Span Guardrail Sections* shall be measured and paid in units of each which have been completed and accepted.

GUARDRAIL ANCHOR UNITS, TYPE 350 TL-2:

(10-21-08) (Rev. 7-21-15) 862 SP08 R064

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2012 Standard Specifications*, and at locations shown in the plans.

Materials

Furnish guardrail anchor units listed on the NCDOT Approved Products List at https://apps.dot.state.nc.us/vendor/approvedproducts/ or approved equal.

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 2 in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2012 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail Anchor Units, Type 350 TL-2	Each

GUARDRAIL ANCHOR UNITS, TYPE 350 (TL-3):

(4-20-04) (Rev. 7-21-15) 862 SP08 R065

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2012 Standard Specifications*, and at locations shown in the plans.

Materials

Furnish guardrail anchor units listed on the NCDOT Approved Products List at https://apps.dot.state.nc.us/vendor/approvedproducts/ or approved equal.

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2012 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail Anchor Units, Type 350	Each

IMPACT ATTENUATOR UNITS, TYPE 350:

(4-20-04) (Rev. 7-21-15) SP08 R075

Description

Furnish and install impact attenuator units and any components necessary to connect the impact attenuator units in accordance with the manufacturer's requirement, the details in the plans and at locations shown in the plans.

Materials

Furnish impact attenuator units listed on the Approved Products List at https://apps.dot.state.nc.us/vendor/approvedproducts/ or approved equal. Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each impact attenuator unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the impact attenuator unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans and details and assembling instructions furnished by the manufacturer.

Construction Methods

If the median width is 40 feet or less, the Contractor shall supply NON-GATING Impact Attenuator Units.

If the median width is greater than 40 feet, the Contractor may use GATING or NON-GATING Impact Attenuator Units.

Measurement and Payment

Impact Attenuator Unit, Type 350 will be measured and paid at the contract unit price per each. Such prices and payment will be full compensation for all work covered by this provision including, but not limited to, furnishing, installing and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Impact Attenuator Units, Type 350	Each

EARLY FENCING:

(Rev 11-7-08) SPI 8-18 (REV.)

As part of the first operation, install barbed wire fence prior to removing the existing fence at the locations shown in the Fencing Summary table to constrain livestock in the appropriate area.

TEMPORARY 4 STRAND BARBED WIRE FENCE WITH POSTS:

Description

Construct temporary barbed wire fence with posts at locations indicated in the plans and as directed by the Engineer. After the fence has served its purpose and is no longer needed, as determined by the Engineer, it shall be removed. The temporary fence becomes the property of the Contractor.

Materials

Refer to Section 866 of the *Standard Specifications*.

Construction Methods

Barbed wire fence shall be installed in accordance with Section 866 of the *Standard Specifications*, *Roadway Standard Drawing* 866.04, and as directed by the Engineer. The fence shall be maintained as directed by the Engineer.

Measurement and Payment

Temporary 4 Strand Barbed Wire Fence With Posts will be measured and paid for as the actual number of linear feet of fence constructed and accepted, measured in place from center of end post to center of end post. All posts used for the barbed wire fence are included in the price of the barbed wire fence and will not be paid for separately. Such price and payment will be full compensation for all materials, labor, fence maintenance, removal, and incidentals, necessary to satisfactorily complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary 4 Strand Barbed Wire Fence With Posts	Linear Foot

PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:

(10-15-02) (Rev. 10-20-09) 410 SP8 R105

Description

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

Materials

Item	**Section**
Plain Rip Rap	1042
Filter Fabric	1056

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three dimensional structure. The mat shall have the following minimum physical properties:

Property	**Test Method**	**Value Unit**
Light Penetration	ASTM D6567	9 %
Thickness	ASTM D6525	0.40 in
Mass Per Unit Area	ASTM D6566	0.55 lb/sy
Tensile Strength	ASTM D6818	385 lb/ft
Elongation (Maximum)	ASTM D6818	49 %
Resiliency	ASTM D1777	>70 %
UV Stability *	ASTM 4355	≥80 %
Porosity (Permanent Net)	ECTC Guidelines	≥85 %
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0 lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0 ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1,000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) The chemical and physical properties of the mat used, and
(B) Conformance of the mat with this specification.

Construction Methods

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *2012 Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Preformed Scour Holes with Level Spreader Aprons will be measured and paid as the actual number incorporated into the completed and accepted work. Such price and payment will be full compensation for all work covered by this provision.

Payment will be made under:

Pay Item	**Pay Unit**
Preformed Scour Hole with Level Spreader Aprons	Each

MEDIAN HAZARD PROTECTION:

Description

Construct Median Hazard Protection at the concrete barrier transition sections as shown in the detail in the plans, in accordance with the detail in the plans and as directed by the Engineer.

Measurement and Payment

Median Hazard Protection will be measured and paid for per each that are completed and accepted. Such price and payment will be full compensation for all labor, materials (including, but not limited to concrete barrier, earth material, #57 stone, concrete cover, galvanized bar and grout) and all incidentals necessary construct the Median Hazard Protection.

Concrete barrier transition sections will be measured and paid for as provided elsewhere in the contract. No separate measurement or payment will be made for concrete cover at barrier transition sections as the cost of such shall be included in the unit price bid per each for *Concrete Barrier Transition Section*.

Payment will be made under:

Pay Item	**Pay Unit**
Median Hazard Protection	Each

STREET SIGNS AND MARKERS AND ROUTE MARKERS:

(7-1-95) 900 SP9 R02

Move any existing street signs, markers, and route markers out of the construction limits of the project and install the street signs and markers and route markers so that they will be visible to the traveling public if there is sufficient right of way for these signs and markers outside of the construction limits.

Near the completion of the project and when so directed by the Engineer, move the signs and markers and install them in their proper location in regard to the finished pavement of the project.

Stockpile any signs or markers that cannot be relocated due to lack of right of way, or any signs and markers that will no longer be applicable after the construction of the project, at locations directed by the Engineer for removal by others.

The Contractor shall be responsible to the owners for any damage to any street signs and markers or route markers during the above described operations.

No direct payment will be made for relocating, reinstalling, and/or stockpiling the street signs and markers and route markers as such work shall be considered incidental to other work being paid for by the various items in the contract.

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 5-19-15) 9, 14, 17 SP9 R05

Description

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

Materials

Refer to the *2012 Standard Specifications*.

Item	**Section**
Conduit	1091-3
Grout, Type 2	1003
Polymer Slurry	411-2(B)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the *2012 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Provide anchor rod assemblies in accordance with the contract consisting of the following:

(A) Straight anchor rods,

(B) Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and

(C) Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2012 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

Construction Methods

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2012 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

(A) Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2012 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the

excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *2012 Standard Specifications* except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the *2012 Standard Specifications* except for the following:

(1) Inspections for tip resistance and bottom cleanliness are not required,
(2) Temporary casings may remain in place if approved, and
(3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
(4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete until a concrete placement procedure is approved. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated concrete from exposed Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved.

Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the *2012 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2012 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2012 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2012 Standard Specifications*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation is required in accordance with Article 411-6 of the *2012 Standard Specifications*. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

(B) Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans, accepted submittals and Section 410 of the *2012 Standard Specifications*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *2012 Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the *2012 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do not use forms for standard foundations for low level light standards.

(C) Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

(1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
(2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
(3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
(4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
(5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
(6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.
(7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.
(8) Repeat (7) for leveling nuts.
(9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).

(10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total turn that meets the following nut rotation requirements:

NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)	
Anchor Rod Diameter, inch	**Requirement**
≤ 1 1/2	1/3 turn (2 flats)
> 1 1/2	1/6 turn (1 flat)

Follow a star pattern cycling through each top nut at least twice.

(11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.

(12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	**Requirement, ft-lb**
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not overtighten top nuts.

(13) Do not grout under base plate.

Measurement and Payment

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

MATERIALS:

(2-21-12) (Rev. 5-19-15) 1000, 1002, 1005, 1018, 1024, 1050, 1056, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092 SP10 R01

Revise the *2012 Standard Specifications* as follows:

Page 10-1, Article 1000-1, DESCRIPTION, lines 9-10, replace the last sentence of the first paragraph with the following:

Type IL, IP, IS or IT blended cement may be used instead of Portland cement.

Page 10-1, Article 1000-1, DESCRIPTION, line 14, add the following:

If any change is made to the mix design, submit a new mix design (with the exception of an approved pozzolan source change).

If any major change is made to the mix design, also submit new test results showing the mix design conforms to the criteria. Define a major change to the mix design as:

(1) A source change in coarse aggregate, fine aggregate or cement.

(2) A pozzolan class or type change (e.g. Class F fly ash to Class C fly ash).

(3) A quantitative change in coarse aggregate (applies to an increase or decrease greater than 5%), fine aggregate (applies to an increase or decrease greater than 5%), water (applies to an increase only), cement (applies to a decrease only), or pozzolan (applies to an increase or decrease greater than 5%).

Use materials which do not produce a mottled appearance through rusting or other staining of the finished concrete surface.

Page 10-1, Article 1000-2, MATERIALS, line 16; Page 10-8, Subarticle 1000-7(A), Materials, line 8; and Page 10-18, Article 1002-2, MATERIALS, line 9, add the following to the table of item references:

Item	**Section**
Type IL Blended Cement	1024-1

Page 10-1, Subarticle 1000-3(A), Composition and Design, lines 25-27, replace the second paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced.

Page 10-2, Subarticle 1000-3(A), Composition and Design, lines 12-21, delete the third paragraph through the sixth paragraph beginning with "If any change is made to the mix design, submit…" through "…(applies to a decrease only)."

Page 10-5, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Comp. Strength at 28 days	Maximum Water-Cement Ratio				Consistency Max. Slump		Cement Content			
		Air-Entrained Concrete		Non Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non- Vibrated	
		Rounded Aggregate	Angular Aggre-gate	Rounded Aggregate	Angular Aggre-gate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4,500	0.381	0.426	-	-	3.5	-	639	715	-	-
AA Slip Form	4,500	0.381	0.426	-	-	1.5	-	639	715	-	-
Drilled Pier	4,500	-	-	0.450	0.450	-	5-7 dry 7-9 wet	-	-	640	800
A	3,000	0.488	0.532	0.550	0.594	3.5	4	564	-	602	-
B	2,500	0.488	0.567	0.559	0.630	1.5 machine-placed 2.5 hand-placed	4	508	-	545	-
Sand Light-weight	4,500	-	0.420	-	-	4	-	715	-	-	-
Latex Modified	3,000 7 day	0.400	0.400	-	-	6	-	658	-	-	-
Flowable Fill excavatable	150 max. at 56 days	as needed	as needed	as needed	as needed	-	Flow-able	-	-	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	-	Flow-able	-	-	100	as needed
Pavement	4,500 design, field 650 flexural, design only	0.559	0.559	-	-	1.5 slip form 3.0 hand place	-	526	-	-	-
Precast	See Table 1077-1	as needed	as needed	-	-	6	as needed	as needed	as needed	as needed	as needed
Prestress	per contract	See Table 1078-1	See Table 1078-1	-	-	8	-	564	as needed	-	-

Page 10-6, Subarticle 1000-4(I), Use of Fly Ash, lines 36-2, replace the first paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced. Use Table 1000-1 to determine the maximum allowable water-cementitious material (cement + fly ash) ratio for the classes of concrete listed.

Page 10-7, Table 1000-3, MAXIMUM WATER-CEMENTITIOUS MATERIAL RATIO, delete the table.

Page 10-7, Article 1000-5, HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE, lines 30-31, delete the second sentence of the third paragraph.

Page 10-19, Article 1002-3, SHOTCRETE FOR TEMPORARY SUPPORT OF EXCAVATIONS, line 30, add the following at the end of Section 1002:

(H) Handling and Storing Test Panels

Notify the Area Materials Engineer when preconstruction or production test panels are made within 24 hours of shooting the panels. Field cure and protect test panels from damage in accordance with ASTM C1140 until the Department transports panels to the Materials and Tests Regional Laboratory for coring.

Page 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE, replace with the following:

TABLE 1005-1
AGGREGATE GRADATION - COARSE AGGREGATE

Std. Size #	Percentage of Total by Weight Passing											Remarks
	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#40	#200	
4	100	90-100	20-55	0-15	-	0-5	-	-	-	-	-	A	Asphalt Plant Mix
467M	100	95-100	-	35-70	-	0-30	0-5	-	-	-	-	A	Asphalt Plant Mix
5	-	100	90-100	20-55	0-10	0-5	-	-	-	-	-	A	AST, Sediment Control Stone
57	-	100	95-100	-	25-60	-	0-10	0-5	-	-	-	A	AST, Str. Concrete, Shoulder Drain, Sediment Control Stone
57M	-	100	95-100	-	25-45	-	0-10	0-5	-	-	-	A	AST, Concrete Pavement
6M	-	-	100	90-100	20-55	0-20	0-8	-	-	-	-	A	AST
67	-	-	100	90-100	-	20-55	0-10	0-5	-	-	-	A	AST, Str. Concrete, Asphalt Plant Mix
78M	-	-	-	100	98-100	75-100	20-45	0-15	-	-	-	A	Asphalt Plant Mix, AST, Str. Conc, Weep Hole Drains
14M	-	-	-	-	-	100	35-70	5-20	-	0-8	-	A	Asphalt Plant Mix, AST, Weep Hole Drains, Str. Concrete
9	-	-	-	-	-	100	85-100	10-40	-	0-10	-	A	AST
ABC	-	100	75-97	-	55-80	-	35-55	-	25-45	-	14-30	4-12[B]	Aggregate Base Course, Aggregate Stabilization
ABC (M)	-	100	75-100	-	45-79	-	20-40	-	0-25	-	-	0-12[B]	Maintenance Stabilization
Light-weight[C]	-	-	-	-	100	80-100	5-40	0-20	-	0-10	-	0-2.5	AST

A. See Subarticle 1005-4(A).
B. See Subarticle 1005-4(B).
C. For Lightweight Aggregate used in Structural Concrete, see Subarticle 1014-2(E)(6).

Page 10-40, Tables 1018-1 and 1018-2, PIEDMONT, WESTERN AND COASTAL AREA CRITERIA FOR ACCEPTANCE OF BORROW MATERIAL, under second column in both tables, replace second row with the following:

Acceptable, but not to be used in the top 3 ft of embankment or backfill

Page 10-46, Article 1024-1, PORTLAND CEMENT, line 33, add the following as the ninth paragraph:

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

Page 10-46, Table 1024-1, POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE, replace with the following:

TABLE 1024-1
POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE

Pozzolan	Rate
Class F Fly Ash	20% - 30% by weight of required cement content with 1.0 lb Class F fly ash per lb of cement replaced
Ground Granulated Blast Furnace Slag	35%-50% by weight of required cement content with 1.0 lb slag per lb of cement replaced
Microsilica	4%-8% by weight of required cement content with 1.0 lb microsilica per lb of cement replaced

Page 10-47, Subarticle 1024-3(B), Approved Sources, lines 16-18, replace the second sentence of the second paragraph with the following:

Tests shall be performed by AASHTO's designated National Transportation Product Evaluation Program (NTPEP) laboratory for concrete admixture testing.

Page 10-65, Article 1050-1, GENERAL, line 41, replace the first sentence with the following:

All fencing material and accessories shall meet Section 106.

Page 10-73, Article 1056-1, DESCRIPTION, lines 7-8, delete the first sentence of the second paragraph and replace with the following:

Use geotextile fabrics that are on the NCDOT Approved Products List.

Page 10-73, Article 1056-2, HANDLING AND STORING, line 17, replace "mechanically stabilized earth (MSE) wall faces" with "temporary wall faces".

Page 10-73, Article 1056-4, GEOTEXTILES, line 33, add the following after the first sentence in the second paragraph:

Geotextiles will be identified by the product name printed directly on the geotextile. When geotextiles are not marked with a product name or marked with only a manufacturing plant identification code, geotextiles will be identified by product labels attached to the geotextile wrapping. When identification is based on labels instead of markings, unwrap geotextiles just before use in the presence of the Engineer to confirm that the product labels on both ends of the outside of the geotextile outer wrapping match the labels affixed to both ends of the inside of the geotextile roll core. Partial geotextile roles without the product name printed on the geotextile or product labels affixed to the geotextile roll core may not be used.

Page 10-74, Table 1056-1, GEOTEXTILE REQUIREMENTS, replace with the following:

TABLE 1056-1
GEOTEXTILE REQUIREMENTS

Property	**Requirement**					**Test Method**
	Type 1	**Type 2**	**Type 3[A]**	**Type 4**	**Type 5[B]**	
Typical Application	*Shoulder Drains*	*Under Rip Rap*	*Temporary Silt Fence*	*Soil Stabilization*	*Temporary Walls*	
Elongation (MD & CD)	≥ 50%	≥ 50%	≤ 25%	< 50%	< 50%	ASTM D4632
Grab Strength (MD & CD)	Table 1[D], Class 3	Table 1[D], Class 1	100 lb[C]	Table 1[D], Class 3	-	ASTM D4632
Tear Strength (MD & CD)			-			ASTM D4533
Puncture Strength			-			ASTM D6241
Ultimate Tensile Strength (MD & CD)	-	-	-	-	2,400 lb/ft[C] (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2[D], 15% to 50% *in Situ* Soil Passing No. 200[E]		Table 7[D]	Table 5[D]	0.20 sec^{-1}[C]	ASTM D4491
Apparent Opening Size					0.60 mm[F]	ASTM D4751
UV Stability (Retained Strength)					70%[C, G]	ASTM D4355

A. Minimum roll width of 36" required.
B. Minimum roll width of 13 ft required.
C. MARV per Article 1056-3.
D. AASHTO M 288.
E. US Sieve No. per AASHTO M 92.
F. Maximum average roll value.
G. After 500 hours of exposure.

Page 10-74, Article 1056-5, GEOCOMPOSITES, lines 7-8, replace the first sentence with the following:

Provide geocomposite drain strips with a width of at least 12" and Type 1 geotextiles attached to drainage cores that meet Table 1056-2.

Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11, replace the first two sentences with the following:

Supply gray iron castings meeting all facets of AASHTO M 306 excluding proof load. Proof load testing will only be required for new casting designs during the design process, and conformance to M306 loading (40,000 lbs.) will be required only when noted on the design documents.

Page 10-126, Table 1078-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1078-1
REQUIREMENTS FOR CONCRETE

Property	28 Day Design Compressive Strength 6,000 psi or less	28 Day Design Compressive Strength greater than 6,000 psi
Maximum Water/Cementitious Material Ratio	0.45	0.40
Maximum Slump without HRWR	3.5"	3.5"
Maximum Slump with HRWR	8"	8"
Air Content (upon discharge into forms)	5 + 2%	5 + 2%

Page 10-151, Article 1080-4, INSPECTION AND SAMPLING, lines 18-22, replace (B), (C) and (D) with the following:

(B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.

(C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.

(D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.

(E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

Page 10-161, Subarticle 1081-1(A), Classifications, lines 29-33, delete first 3 sentences of the description for Type 2 and replace with the following:

Type 2 - A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected.

Page 10-162, Subarticle 1081-1(A), Classifications, lines 4-7, delete the second and third sentences of the description for Type 3A. **Lines 16-22,** delete Types 6A, 6B and 6C.

Page 10-162, Subarticle 1081-1(B), Requirements, lines 26-30, replace the second paragraph with the following:

For epoxy resin systems used for embedding dowel bars, threaded rods, rebar, anchor bolts and other fixtures in hardened concrete, the manufacturer shall submit test results showing that the bonding system will obtain 125% of the specified required yield strength of the fixture. Furnish certification that, for the particular bolt grade, diameter and embedment depth required, the anchor system will not fail by adhesive failure and that there is no movement of the anchor bolt. For certification and anchorage, use 3,000 psi as the minimum Portland cement concrete compressive strength used in this test. Use adhesives that meet Section 1081.

List the properties of the adhesive on the container and include density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength.

Page 10-163, Table 1081-1, PROPERTIES OF MIXED EPOXY RESIN SYSTEMS, replace with the following:

TABLE 1081-1
PROPERTIES OF MIXED EPOXY RESIN SYSTEMS

Property	Type 1	Type 2	Type 3	Type 3A	Type 4A	Type 4B	Type 5
Viscosity-Poises at 77°F ± 2°F	Gel	10-30	25-75	Gel	40-150	40-150	1-6
Spindle No.	-	3	4	--	4	4	2
Speed (RPM)	-	20	20	--	10	10	50
Pot Life (Minutes)	20-50	30-60	20-50	5-50	40-80	40-80	20-60
Minimum Tensile Strength at 7 days (psi)	1,500	2,000	4,000	4,000	1,500	1,500	4,000
Tensile Elongation at 7 days (%)	30 min.	30 min.	2-5	2-5	5-15	5-15	2-5
Min. Compressive Strength of 2". mortar cubes at 24 hours	3,000 (Neat)	4,000-	6,000-	6,000 (Neat)	3,000	3,000	6,000
Min. Compressive Strength of 2" mortar cubes at 7 days	5,000 (Neat)	-	-	-	-	5,000	-
Maximum Water Absorption (%)	1.5	1.0	1.0	1.5	1.0	1.0	1.0
Min. Bond Strength Slant Shear Test at 14 days (psi)	1,500	1,500	2,000	2,000	1,500	1,500	1,500

Page 10-164, Subarticle 1081-1(E), Prequalification, lines 31-33, replace the second sentence of the first paragraph with the following:

Manufacturers choosing to supply material for Department jobs must submit an application through the Value Management Unit with the following information for each type and brand name:

Page 10-164, Subarticle 1081-1(E)(3), line 37, replace with the following:

(3) Type of the material in accordance with Articles 1081-1 and 1081-4,

Page 10-165, Subarticle 1081-1(E)(6), line 1, in the first sentence of the first paragraph replace "AASHTO M 237" with "the specifications".

Page 10-165, Subarticle 1081-1(E), Prequalification, line 9-10, delete the second sentence of the last paragraph.

Page 10-165, Subarticle 1081-1(F), Acceptance, line 14, in the first sentence of the first paragraph replace "Type 1" with "Type 3".

Page 10-169, Subarticle 1081-3(G), Anchor Bolt Adhesives, delete this subarticle.

Page 10-170, Article 1081-3, HOT BITUMEN, line 9, add the following at the end of Section 1081:

1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS

(A) General

This section covers epoxy resin adhesive for bonding traffic markers to pavement surfaces.

(B) Classification

The types of epoxies and their uses are as shown below:

Type I – Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence to traffic markers to the surface of pavement.

Type II – Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

Type III – Rapid Setting, Low Viscosity, Water Resistant, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers.

Type IV – Standard Set Epoxy for Blade Deflecting-Type Plowable Markers.

(C) Requirements

Epoxies shall conform to the requirements set forth in AASHTO M 237.

(D) Prequalification

Refer to Subarticle 1081-1(E).

(E) Acceptance

Refer to Subarticle 1081-1(F).

Page 10-173, Article 1084-2, STEEL SHEET PILES, lines 37-38, replace first paragraph with the following:

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required

by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076. Metallized sheet piles shall be metallized in accordance to the Project Special Provision "Thermal Sprayed Coatings (Metallization)" with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating. The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness. The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

Page 10-174, Subarticle 1086-1(B)(1), Epoxy, lines 18-24, replace with the following:

The epoxy shall meet Article 1081-4.

The 2 types of epoxy adhesive which may be used are Type I, Rapid Setting, and Type II, Standard Setting. Use Type II when the pavement temperature is above 60°F or per the manufacturer's recommendations whichever is more stringent. Use Type I when the pavement temperature is between 50°F and 60°F or per the manufacturer's recommendations whichever is more stringent. Epoxy adhesive Type I, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F or per the manufacturer's recommendations whichever is more stringent.

Page 10-175, Subarticle 1086-2(E), Epoxy Adhesives, line 27, replace "Section 1081" with "Article 1081-4".

Page 10-177, Subarticle 1086-3(E), Epoxy Adhesives, line 22, replace "Section 1081" with "Article 1081-4".

Page 10-179, Subarticle 1087-4(A), Composition, lines 39-41, replace the third paragraph with the following:

All intermixed and drop-on glass beads shall not contain more than 75 ppm arsenic or 200 ppm lead.

Page 10-180, Subarticle 1087-4(B), Physical Characteristics, line 8, replace the second paragraph with the following:

All intermixed and drop-on glass beads shall comply with NCGS § 136-30.2 and 23 USC § 109(r).

Page 10-181, Subarticle 1087-7(A), Intermixed and Drop-on Glass Beads, line 24, add the following after the first paragraph:

Use X-ray Fluorescence for the normal sampling procedure for intermixed and drop-on beads, without crushing, to check for any levels of arsenic and lead. If any arsenic or lead is detected, the sample shall be crushed and repeat the test using X-ray Fluorescence. If the X-ray Fluorescence test shows more than a LOD of 5 ppm, test the beads using United States Environmental Protection Agency Method 6010B, 6010C or 3052 for no more than 75 ppm arsenic or 200 ppm lead.

Page 10-204, Table 1092-3 MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A, replace with the following:

TABLE 1092-3
MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A
(Candelas Per Lux Per Square Meter)

Observation Angle, degrees	Entrance Angle, degrees	White	Yellow	Green	Red	Blue	Fluorescent Yellow Green	Fluorescent Yellow
0.2	-4.0	525	395	52	95	30	420	315
0.2	30.0	215	162	22	43	10	170	130
0.5	-4.0	310	230	31	56	18	245	185
0.5	30.0	135	100	14	27	6	110	81
1.0	-4.0	120	60	8	16	3.6	64	48
1.0	30.0	45	34	4.5	9	2	36	27

SELECT MATERIAL, CLASS III, TYPE 3:
(1-17-12) 1016, 1044 SP10 R05

Revise the *2012 Standard Specifications* as follows:

Page 10-39, Article 1016-3, CLASS III, add the following after line 14:

Type 3 Select Material

Type 3 select material is a natural or manufactured fine aggregate material meeting the following gradation requirements and as described in Sections 1005 and 1006:

Percentage of Total by Weight Passing							
3/8"	#4	#8	#16	#30	#50	#100	#200
100	95-100	65-100	35-95	15-75	5-35	0-25	0-8

Page 10-39, Article 1016-3, CLASS III, line 15, replace "either type" with "Type 1, Type 2 or Type 3".

Page 10-62, Article 1044-1, line 36, delete the sentence and replace with the following:

Subdrain fine aggregate shall meet Class III select material, Type 1 or Type 3.

Page 10-63, Article 1044-2, line 2, delete the sentence and replace with the following:

Subdrain coarse aggregate shall meet Class V select material.

SHOULDER AND SLOPE BORROW:

(3-19-13) 1019 SP10 R10

Use soil in accordance with Section 1019 of the *2012 Standard Specifications*. Use soil consisting of loose, friable, sandy material with a PI greater than 6 and less than 25 and a pH ranging from 5.5 to 7.0.

Soil with a pH ranging from 4.0 to 5.5 will be accepted without further testing if additional limestone is provided in accordance with the application rates shown in Table 1019-1A. Soil type is identified during the soil analysis. Soils with a pH above 7.0 require acidic amendments to be added. Submit proposed acidic amendments to the Engineer for review and approval. Soils with a pH below 4.0 or that do not meet the PI requirements shall not be used.

pH TEST RESULT	Sandy Soils Additional Rate (lbs. / Acre)	Silt Loam Soils Additional Rate (lbs. / Acre)	Clay Loam Soils Additional Rate (lbs. / Acre)
4.0 - 4.4	1,000	4,000	6,000
4.5 - 4.9	500	3,000	5,000
5.0 - 5.4	NA	2,000	4,000

Note: Limestone application rates shown in this table are in addition to the standard rate of 4000 lbs. / acre required for seeding and mulching.

No direct payment will be made for providing additional lime or acidic amendments for Ph adjustment.

GROUT PRODUCTION AND DELIVERY:

(3-17-15) 1003 SP10 R20

Revise the *2012 Standard Specifications* as follows:

Replace Section 1003 with the following:

SECTION 1003
GROUT PRODUCTION AND DELIVERY

1003-1 DESCRIPTION

This section addresses cement grout to be used for structures, foundations, retaining walls, concrete barriers, embankments, pavements and other applications in accordance with the contract. Produce non-metallic grout composed of Portland cement and water and at the Contractor's option or as required, aggregate and pozzolans. Include chemical admixtures as required or needed. Provide sand cement or neat cement grout as required. Define "sand cement grout" as grout with only fine aggregate and "neat cement grout" as grout without aggregate.

The types of grout with their typical uses are as shown below:

Type 1 – A cement grout with only a 3-day strength requirement and a fluid consistency that is typically used for filling subsurface voids.

Type 2 – A nonshrink grout with strength, height change and flow conforming to ASTM C1107 that is typically used for foundations, ground anchors and soil nails.

Type 3 – A nonshrink grout with high early strength and freeze-thaw durability requirements that is typically used in pile blockouts, grout pockets, shear keys, dowel holes and recesses for concrete barriers and structures.

Type 4 – A neat cement grout with low strength, a fluid consistency and high fly ash content that is typically used for slab jacking.

Type 5 – A low slump, low mobility sand cement grout with minimal strength that is typically used for compaction grouting.

1003-2 MATERIALS

Refer to Division 10.

Item	**Section**
Chemical Admixtures	1024-3
Fine Aggregate	1014-1
Fly Ash	1024-5
Ground Granulated Blast Furnace Slag	1024-6
Portland Cement	1024-1
Silica Fume	1024-7
Water	1024-4

Do not use grout that contains soluble chlorides or more than 1% soluble sulfate. At the Contractor's option, use an approved packaged grout instead of the materials above except for water. Use packaged grouts that are on the NCDOT Approved Products List.

Use admixtures for grout that are on the NCDOT Approved Products List or other admixtures in accordance with Subarticle 1024-3(E) except do not use concrete additives or unclassified or other admixtures in Type 4 or 5 grout. Use Class F fly ash for Type 4 grout and Type II Portland cement for Type 5 grout.

Use well graded rounded aggregate with a gradation, liquid limit (LL) and plasticity index (PI) that meet Table 1003-1 for Type 5 grout. Fly ash may be substituted for a portion of the fines in the aggregate. Do not use any other pozzolans in Type 5 grout.

TABLE 1003-1 AGGREGATE REQUIREMENTS FOR TYPE 5 GROUT			
Gradation		**Maximum Liquid Limit**	**Maximum Plasticity Index**
Sieve Designation per AASHTO M 92	**Percentage Passing (% by weight)**		
3/8"	100	N/A	N/A
No. 4	70 – 95		
No. 8	50 – 90		
No. 16	30 – 80		
No. 30	25 – 70		
No. 50	20 – 50		
No. 100	15 – 40		
No. 200	10 – 30	25	10

1003-3 COMPOSITION AND DESIGN

When using an approved packaged grout, a grout mix design submittal is not required. Otherwise, submit proposed grout mix designs for each grout mix to be used in the work. Mixes for all grout shall be designed by a Certified Concrete Mix Design Technician or an Engineer licensed by the State of North Carolina. Mix proportions shall be determined by a testing laboratory approved by the Department. Base grout mix designs on laboratory trial batches that meet Table 1003-2 and this section. With permission, the Contractor may use a quantity of chemical admixture within the range shown on the current list of approved admixtures maintained by the Materials and Tests Unit.

Submit grout mix designs in terms of saturated surface dry weights on Materials and Tests Form 312U at least 35 days before proposed use. Adjust batch proportions to compensate for surface moisture contained in the aggregates at the time of batching. Changes in the saturated surface dry mix proportions will not be permitted unless revised grout mix designs have been submitted to the Engineer and approved.

Accompany Materials and Tests Form 312U with a listing of laboratory test results of compressive strength, density and flow or slump and if applicable, aggregate gradation, durability and height change. List the compressive strength of at least three 2" cubes at the age of 3 and 28 days.

The Engineer will review the grout mix design for compliance with the contract and notify the Contractor as to its acceptability. Do not use a grout mix until written notice has been received. Acceptance of the grout mix design or use of approved packaged grouts does not relieve the Contractor of his responsibility to furnish a product that meets the contract. Upon written request from the Contractor, a grout mix design accepted and used satisfactorily on any Department project may be accepted for use on other projects.

Perform laboratory tests in accordance with the following test procedures:

Property	**Test Method**
Aggregate Gradation[A]	AASHTO T 27
Compressive Strength	AASHTO T 106
Density (Unit Weight)	AASHTO T 121, AASHTO T 133[B], ANSI/API RP[C] 13B-1[B] (Section 4, Mud Balance)
Durability	AASHTO T 161[D]
Flow	ASTM C939 (Flow Cone)
Height Change	ASTM C1090[E]
Slump	AASHTO T 119

A. Applicable to grout with aggregate.
B. Applicable to Neat Cement Grout.
C. American National Standards Institute/American Petroleum Institute Recommended Practice.
D. Procedure A (Rapid Freezing and Thawing in Water) required.
E. Moist room storage required.

1003-4 GROUT REQUIREMENTS

Provide grout types in accordance with the contract. Use grouts with properties that meet Table 1003-2. The compressive strength of the grout will be considered the average compressive strength test results of three 2" cubes at each age. Make cubes that meet AASHTO T 106 from the grout delivered for the work or mixed on-site. Make cubes at such frequencies as the Engineer may determine and cure them in accordance with AASHTO T 106.

TABLE 1003-2
GROUT REQUIREMENTS

Type of Grout	Minimum Compressive Strength at		Height Change at 28 days	Flow[A]/Slump[B]	Minimum Durability Factor
	3 days	28 days			
1	3,000 psi	–	–	10 – 30 sec	–
2	Table 1[C]			Fluid Consistency[C]	–
3	5,000 psi	–	0 – 0.2%	Per Accepted Grout Mix Design/ Approved Packaged Grout	80
4[D]	600 psi	1,500 psi	–	10 – 26 sec	–
5	–	500 psi	–	1 – 3"	–

A. Applicable to Type 1 through 4 grouts.
B. Applicable to Type 5 grout.
C. ASTM C1107.
D. Use Type 4 grout with proportions by volume of 1 part cement and 3 parts fly ash.

1003-5 TEMPERATURE REQUIREMENTS

When using an approved packaged grout, follow the manufacturer's instructions for grout and air temperature at the time of placement. Otherwise, the grout temperature at the time of placement shall be not less than 50°F nor more than 90°F. Do not place grout when the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 40°F.

1003-6 ELAPSED TIME FOR PLACING GROUT

Agitate grout continuously before placement. Regulate the delivery so the maximum interval between the placing of batches at the work site does not exceed 20 minutes. Place grout before exceeding the times in Table 1003-3. Measure the elapsed time as the time between adding the mixing water to the grout mix and placing the grout.

TABLE 1003-3
ELAPSED TIME FOR PLACING GROUT
(with continuous agitation)

Air or Grout Temperature, Whichever is Higher	Maximum Elapsed Time	
	No Retarding Admixture Used	Retarding Admixture Used
90°F or above	30 minutes	1 hr. 15 minutes
80°F through 89°F	45 minutes	1 hr. 30 minutes
79°F or below	60 minutes	1 hr. 45 minutes

1003-7 MIXING AND DELIVERY

Use grout free of any lumps and undispersed cement. When using an approved packaged grout, mix grout in accordance with the manufacturer's instructions. Otherwise, comply with Articles 1000-8 through 1000-12 to the extent applicable for grout instead of concrete.

TEMPORARY SHORING:

(2-20-07) (Rev. 3-17-15) SP11 R02

Description

Temporary shoring includes cantilever, braced and anchored shoring and temporary mechanically stabilized earth (MSE) walls. Temporary shoring does not include trench boxes. At the Contractor's option, use any type of temporary shoring unless noted otherwise in the plans or as directed. Design and construct temporary shoring based on actual elevations and shoring dimensions in accordance with the contract and accepted submittals. Construct temporary shoring at locations shown in the plans and as directed. Temporary shoring is required to maintain traffic when a 2:1 (H:V) slope from the top of an embankment or bottom of an excavation will intersect the existing ground line less than 5 ft from the edge of pavement of an open travelway. This provision does not apply to pipe, inlet or utility installation unless noted otherwise in the plans.

Positive protection includes concrete barrier and temporary guardrail. Provide positive protection for temporary shoring at locations shown in the plans and as directed. Positive protection is required if temporary shoring is located in the clear zone in accordance with the *AASHTO Roadside Design Guide.*

(A) Cantilever and Braced Shoring

Cantilever shoring consists of steel sheet piles or H-piles with timber lagging. Braced shoring consists of sheet piles or H-piles with timber lagging and bracing such as beams, plates, walers, struts, rakers, etc. Define "piles" as sheet piles or H-piles.

(B) Anchored Shoring

Anchored shoring consists of sheet piles with walers or H-piles with timber lagging anchored with ground or helical anchors. Driven anchors may be accepted at the discretion of the Engineer. A ground anchor consists of a grouted steel bar or multi-strand tendon with an anchorage. A helical anchor consists of a lead section with a central steel shaft and at least one helix steel plate followed by extensions with only central shafts (no helixes) and an anchorage. Anchorages consist of steel bearing plates with washers and hex nuts for bars or steel wedge plates and wedges for strands. Use a prequalified Anchored Wall Contractor to install ground anchors. Define "anchors" as ground, helical or driven anchors.

(C) Temporary MSE Walls

Temporary MSE walls include temporary geosynthetic and wire walls. Define "temporary wall" as a temporary MSE wall. Define "reinforcement" as geotextile, geogrid, welded wire grid or metallic strip reinforcement.

Temporary geosynthetic walls consist of geotextile or geogrid reinforcement wrapped behind welded wire facing. Define "temporary geotextile wall" as a temporary geosynthetic wall with geotextile reinforcement and "temporary geogrid wall" as a temporary geosynthetic wall with geogrid reinforcement.

Temporary wire walls consist of welded wire grid or metallic strip reinforcement connected to welded wire facing. Define "Wire Wall Vendor" as the vendor supplying the temporary wire wall.

(D) Embedment

Define "embedment" for cantilever, braced and anchored shoring as the pile depth below the grade in front of shoring. Define "embedment" for temporary walls as the wall height below the grade in front of walls.

(E) Positive Protection

Define "unanchored or anchored portable concrete barrier" as portable concrete barrier (PCB) that meets Standard Drawing No. 1170.01 of the *2012 Roadway Standard Drawings*. Define "concrete barrier" as unanchored or anchored PCB or an approved equal. Define "temporary guardrail" as temporary steel beam guardrail that meets Standard Drawing No. 862.02 of the *2012 Roadway Standard Drawings*.

Materials

Refer to the *2012 Standard Specifications*.

Item	**Section**
Anchor Pins	1056-2
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geotextiles	1056
Grout	1003
Portland Cement Concrete	1000
Select Material	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3

Item	Section
Wire Staples	1060-8(D)

Provide Type 6 material certifications for shoring materials in accordance with Article 106-3 of the *2012 Standard Specifications*. Use Class IV select material (standard size No. ABC) for temporary guardrail. Use neat cement grout for Type 2 grout for ground anchors. Use Class A concrete that meets Article 450-2 of the *2012 Standard Specifications* or Type 1 grout for drilled-in piles. Provide untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging. Provide steel bracing that meets ASTM A36.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use A-2-4 soil for backfill around culverts.

(B) Anchors

Store anchor materials on blocking a minimum of 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store anchor materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

(1) Ground Anchors

Use high-strength deformed steel bars that meet AASHTO M 275 or seven-wire strands that meet ASTM A886 or Article 1070-5 of the *2012 Standard Specifications*. Splice bars in accordance with Article 1070-9 of the *2012 Standard Specifications*. Do not splice strands. Use bondbreakers, spacers and centralizers that meet Article 6.3.5 of the *AASHTO LRFD Bridge Construction Specifications*.

(2) Helical Anchors

Use helical anchors with an ICC Evaluation Service, Inc. (ICC-ES) report. Helical anchors without an ICC-ES report may be approved at the discretion of the Engineer. Provide couplers, thread bar adapters and bolts recommended by the Anchor Manufacturer to connect helical anchors together and to piles.

(3) Anchorages

Provide steel plates for bearing plates and steel washers, hex nuts, wedge plates and wedges recommended by the Anchor Manufacturer.

(C) Temporary Walls

(1) Welded Wire Facing

Use welded wire reinforcement for welded wire facing, struts and wires. For temporary wire walls, provide welded wire facing supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. For temporary wire walls with separate reinforcement and facing components, provide connectors (e.g., bars, clamps, plates, etc.) and fasteners (e.g., bolts, nuts, washers, etc.) required by the Wire Wall Vendor.

(2) Geotextiles

Provide Type 2 geotextile for separation and retention geotextiles. Provide Type 5 geotextile for geotextile reinforcement with ultimate tensile strengths in accordance with the accepted submittals.

(3) Geogrid Reinforcement

Handle and store geogrids in accordance with Article 1056-2 of the *2012 Standard Specifications*. Define "machine direction" (MD) and "cross-machine direction" (CD) for geogrids in accordance with ASTM D4439.

Use geogrids with a roll width of at least 4 ft and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from: connect.ncdot.gov/resources/Materials/Pages/SoilsLaboratory.aspx

Provide geogrids for geogrid reinforcement with design strengths in accordance with the accepted submittals. Geogrids are typically approved for ultimate tensile strengths in the MD and CD or short-term design strengths for a 3-year design life in the MD based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	**Shoring Backfill**
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

(4) Welded Wire Grid and Metallic Strip Reinforcement

Provide welded wire grid and metallic strip reinforcement supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. Use welded wire grid reinforcement ("mesh", "mats" and "ladders") that meet Article 1070-3 of the *2012 Standard Specifications* and metallic strip reinforcement ("straps") that meet ASTM A572 or A1011.

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of temporary shoring except for barrier above temporary walls. Concrete barrier with the minimum required clear distance is required above temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and temporary shoring. At the Contractor's option or if clear distance for cantilever, braced and anchored shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above temporary walls.

(C) Temporary Shoring Designs

Before beginning temporary shoring design, survey existing ground elevations in the vicinity of shoring locations to determine actual design heights (H). Submit 8 copies of working drawings and 3 copies of design calculations and a PDF copy of each for temporary shoring designs in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, shoring profiles, typical sections and details of temporary shoring design and construction sequence. Do not begin shoring construction until a design submittal is accepted.

Have cantilever and braced shoring designed, detailed and sealed by an engineer licensed in the state of North Carolina. Use a prequalified Anchored Wall Design Consultant to design anchored shoring. Provide anchored shoring designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for an Anchored Wall Design Consultant. Include details in anchored shoring working drawings of anchor locations and lock-off loads, unit grout/ground bond strengths for ground anchors or minimum installation torque and torsional strength rating for helical anchors and if necessary, obstructions extending through shoring or interfering with anchors. Include details in the anchored shoring construction sequence of pile and anchor installation, excavation and anchor testing.

Use a prequalified MSE Wall Design Consultant to design temporary walls. Provide temporary wall designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Wall Design Consultant. Include details in temporary wall working drawings of geotextile and reinforcement types, locations and directions and obstructions extending through walls or interfering with reinforcement.

(1) Soil Parameters

Design temporary shoring for the assumed soil parameters and groundwater elevations shown in the plans. Assume the following soil parameters for shoring backfill:

(a) Unit weight (γ) = 120 lb/cf;

(b)

Friction Angle (ϕ)	**Shoring Backfill**
30°	A-2-4 Soil
34°	Class II, Type 1 or Class III Select Material
38°	Class V or VI Select Material

(c) Cohesion (c) = 0 lb/sf.

(2) Traffic Surcharge

Design temporary shoring for a traffic surcharge of 250 lb/sf if traffic will be above and within H of shoring. This traffic surcharge does not apply to construction traffic. Design temporary shoring for any construction surcharge if construction traffic will be above and within H of shoring. For LRFD shoring designs, apply traffic (live load) surcharge in accordance with Figure C11.5.5-3 of the *AASHTO LRFD Bridge Design Specifications*.

(3) Cantilever, Braced and Anchored Shoring Designs

Use shoring backfill for fill sections and voids between cantilever, braced and anchored shoring and the critical failure surface. Use concrete or grout for embedded portions of drilled-in H-piles. Do not use drilled-in sheet piles.

Define "top of shoring" for cantilever, braced and anchored shoring as where the grade intersects the back of sheet piles or H-piles and timber lagging. Design cantilever, braced and anchored shoring for a traffic impact load of 2,000 lb/ft applied 18" above top of shoring if concrete barrier is above and next to shoring or temporary guardrail is above and attached to shoring. For anchored shoring designs, apply traffic impact load as horizontal load (P_{H1}) in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications.

Extend cantilever, braced and anchored shoring at least 32" above top of shoring if shoring is designed for traffic impact. Otherwise, extend shoring at least 6" above top of shoring.

Design cantilever, braced and anchored shoring for a maximum deflection of 3" if the horizontal distance to the closest edge of pavement or structure is less than H. Otherwise, design shoring for a maximum deflection of 6". Design cantilever and braced shoring in accordance with the plans and *AASHTO Guide Design Specifications for Bridge Temporary Works*.

Design anchored shoring in accordance with the plans and Article 11.9 of the *AASHTO LRFD Bridge Design Specifications*. Use a resistance factor of 0.80 for tensile resistance of anchors with bars, strands or shafts. Extend the unbonded length for ground anchors and the shallowest helix for helical anchors at least 5 ft behind the critical failure surface. Do not extend anchors beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail posts, pavements, pipes, inlets or utilities will interfere with anchors, maintain a clearance of at least 6" between obstructions and anchors.

(4) Temporary Wall Designs

Use shoring backfill in the reinforced zone of temporary walls. Separation geotextiles are required between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, separation geotextiles are also required between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Design temporary walls in accordance with the plans and Article 11.10 of the *AASHTO LRFD Bridge Design Specifications*. Embed temporary walls at least 18" except for walls on structures or rock as determined by the Engineer. Use a uniform reinforcement length throughout the wall height of at least 0.7H or 6 ft, whichever is longer. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate the reinforced zone outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads in accordance with the AASHTO LRFD specifications. For geotextile reinforcement, use geotextile properties approved by the Department or default values in accordance with the AASHTO LRFD specifications. For geogrid reinforcement, use approved geogrid properties available from the website shown elsewhere in this provision. If the website does not list a short-term design strength for an approved geogrid, use a short-term design strength equal to the ultimate tensile strength divided by 3.5 for the geogrid reinforcement. Use geosynthetic properties for the direction reinforcement will be installed, a 3-year design life and shoring backfill to be used in the reinforced zone.

Do not use more than 4 different reinforcement strengths for each temporary geosynthetic wall. Design temporary geotextile walls for a reinforcement coverage ratio (R_c) of 1.0 and temporary geogrid walls for an R_c of at least 0.8. For geogrid reinforcement with an R_c of less than 1.0, use a maximum horizontal clearance between geogrids of 3 ft and stagger reinforcement so geogrids are centered over gaps in the reinforcement layer below.

For temporary geosynthetic walls, use “L” shaped welded wire facing with 18" to 24" long legs. Locate geotextile or geogrid reinforcement so reinforcement layers

are at the same level as the horizontal legs of welded wire facing. Use vertical reinforcement spacing equal to facing height. Wrap geotextile or geogrid reinforcement behind welded wire facing and extend reinforcement at least 3 ft back behind facing into shoring backfill.

For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing with a connection approved by the Department. For temporary geogrid and wire walls, retain shoring backfill at welded wire facing with retention geotextiles and extend geotextiles at least 3 ft back behind facing into backfill.

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction, inspection and testing of the temporary shoring. If required and if this meeting occurs before all shoring submittals have been accepted, additional preconstruction meetings may be required before beginning construction of temporary shoring without accepted submittals. The Resident, District or Bridge Maintenance Engineer, Bridge or Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend preconstruction meetings.

Construction Methods

Control drainage during construction in the vicinity of shoring. Direct run off away from shoring and shoring backfill. Contain and maintain backfill and protect material from erosion.

Install positive protection in accordance with the contract and accepted submittals. Use PCB in accordance with Section 1170 of the *2012 Standard Specifications* and Standard Drawing No. 1170.01 of the *2012 Roadway Standard Drawings*. Use temporary guardrail in accordance with Section 862 of the *2012 Standard Specifications* and Standard Drawing No. 862.01, 862.02 and 862.03 of the *2012 Roadway Standard Drawings*.

(A) Tolerances

Construct shoring with the following tolerances:

(1) Horizontal wires of welded wire facing are level in all directions,

(2) Shoring location is within 6" of horizontal and vertical alignment shown in the accepted submittals, and

(3) Shoring plumbness (batter) is not negative and within 2° of vertical.

(B) Cantilever, Braced and Anchored Shoring Installation

If overexcavation behind cantilever, braced or anchored shoring is shown in the accepted submittals, excavate before installing piles. Otherwise, install piles before excavating for shoring. Install cantilever, braced or anchored shoring in accordance with the construction sequence shown in the accepted submittals. Remove piles and if applicable, timber lagging when shoring is no longer needed.

(1) Pile Installation

Install piles with the minimum required embedment and extension in accordance with Subarticles 450-3(D) and 450-3(E) of the *2012 Standard Specifications* except that a pile driving equipment data form is not required. Piles may be installed with a vibratory hammer as approved by the Engineer.

Do not splice sheet piles. Use pile excavation to install drilled-in H-piles. After filling holes with concrete or grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least 7 days before excavating.

Notify the Engineer if refusal is reached before pile excavation or driven piles attain the minimum required embedment. When this occurs, a revised design submittal may be required.

(2) Excavation

Excavate in front of piles from the top down in accordance with the accepted submittals. For H-piles with timber lagging and braced and anchored shoring, excavate in staged horizontal lifts with a maximum height of 5 ft. Remove flowable fill and material in between H-piles as needed to install timber lagging. Position lagging with at least 3" of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until timber lagging for the current lift is installed and if applicable, bracing and anchors for the current lift are accepted. Backfill behind cantilever, braced or anchored shoring with shoring backfill.

(3) Anchor Installation

If applicable, install foundations located behind anchored shoring before installing anchors. Fabricate and install ground anchors in accordance with the accepted submittals, Articles 6.4 and 6.5 of the *AASHTO LRFD Bridge Construction Specifications* and the following unless otherwise approved:

(a) Materials in accordance with this provision are required instead of materials conforming to Articles 6.4 and 6.5.3 of the AASHTO LRFD Specifications,

(b) Encapsulation-protected ground anchors in accordance with Article 6.4.1.2 of the AASHTO LRFD specifications are not required, and

(c) Corrosion protection for unbonded lengths of ground anchors and anchorage covers are not required.

(d) Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute/American Petroleum Institute Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

Install helical anchors in accordance with the accepted submittals and Anchor Manufacturer's instructions. Measure torque during installation and do not exceed the torsional strength rating of the helical anchor. Attain the minimum required installation torque and penetration before terminating anchor installation. When replacing a helical anchor, embed last helix of the replacement anchor at least 3 helix plate diameters past the location of the first helix of the previous anchor.

(4) Anchor Testing

Proof test and lock-off anchors in accordance with the accepted submittals and Article 6.5.5 of the *AASHTO LRFD Bridge Construction Specifications* except for the acceptance criteria in Article 6.5.5.5. For the AASHTO LRFD specifications, "ground anchor" refers to a ground or helical anchor and "tendon" refers to a bar, strand or shaft.

(a) Anchor Acceptance

Anchor acceptance is based in part on the following criteria.

(i) For ground and helical anchors, total movement is less than 0.04" between the 1 and 10 minute readings or less than 0.08" between the 6 and 60 minute readings.
(ii) For ground anchors, total movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(b) Anchor Test Results

Submit 2 copies of anchor test records including movement versus load plots for each load increment within 24 hours of completing each row of anchors. The Engineer will review the test records to determine if the anchors are acceptable.

If the Engineer determines an anchor is unacceptable, revise the anchor design or installation methods. Submit a revised anchored shoring design for acceptance and provide an acceptable anchor with the revised design or installation methods. If required, replace the anchor or provide additional anchors with the revised design or installation methods.

(C) Temporary Wall Installation

Excavate as necessary for temporary walls in accordance with the plans and accepted submittals. If applicable, install foundations located in the reinforced zone before placing shoring backfill or reinforcement unless otherwise approved. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or reinforcement until excavation dimensions and foundation material are approved.

Erect welded wire facing so the wall position is as shown in the plans and accepted submittals. Set welded wire facing adjacent to each other in the horizontal and vertical direction to completely cover the wall face with facing. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap geotextile reinforcement and retention geotextiles behind welded wire facing as shown in the plans and accepted submittals and cover geotextiles with at least 3" of shoring backfill. Overlap adjacent geotextile reinforcement and retention and separation geotextiles at least 18" with seams oriented perpendicular to the wall face. Hold geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement within 3" of locations shown in the plans and accepted submittals and in slight tension free of kinks, folds, wrinkles or creases. Install reinforcement with the direction shown in the plans and accepted submittals. For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip

reinforcement to welded wire facing as shown in the accepted submittals. Do not splice or overlap reinforcement so seams are parallel to the wall face. Contact the Engineer when unanticipated existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement.

Place shoring backfill in the reinforced zone in 8" to 10" thick lifts. Compact A-2-4 soil and Class II, Type 1 and Class III select material in accordance with Subarticle 235-3(C) of the *2012 Standard Specifications*. Use only hand operated compaction equipment to compact backfill within 3 ft of welded wire facing. At a distance greater than 3 ft, compact shoring backfill with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting shoring backfill. End dumping directly on geotextile or geogrid reinforcement is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of shoring backfill. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for temporary walls outside the reinforced zone in accordance with Article 410-8 of the *2012 Standard Specifications*. Bench temporary walls into the sides of excavations where applicable. For temporary geosynthetic walls with top of wall within 5 ft of finished grade, remove top facing and incorporate top reinforcement layer into fill when placing fill in front of wall. Temporary walls remain in place permanently unless otherwise required.

Measurement and Payment

Temporary Shoring will be measured and paid in square feet. Temporary walls will be measured as the square feet of exposed wall face area. Cantilever, braced or anchored shoring will be measured as the square feet of exposed shoring face area with the shoring height equal to the difference between the top and bottom of shoring elevations. Define “top of shoring” as where the grade intersects the back of sheet piles or H-piles and timber lagging. Define “bottom of shoring” as where the grade intersects front of sheet piles or H-piles and timber lagging. No measurement will be made for any embedment, shoring extension above top of shoring or pavement thickness above temporary walls.

The contract unit price for *Temporary Shoring* will be full compensation for providing shoring designs, submittals and materials, excavating, backfilling, hauling and removing excavated materials and supplying all labor, tools, equipment and incidentals necessary to construct temporary shoring.

No payment will be made for temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor’s convenience. No value engineering proposals will be accepted based solely on revising or eliminating shoring locations shown in the plans or estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

PCB will be measured and paid in accordance with Section 1170 of the *2012 Standard Specifications*. No additional payment will be made for anchoring PCB for temporary shoring. Costs for anchoring PCB will be incidental to temporary shoring.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Shoring	Square Foot

TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS:

(8-21-12) 1101.02 SP11 R10

Revise the *2012 Roadway Standard Drawings* as follows:

Drawing No. 1101.02, Sheet 12, TEMPORARY LANE CLOSURES, replace General Note #11 with the following:

11- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

12- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

Drawing No. 1101.02, Sheet 13, TEMPORARY LANE CLOSURES, replace General Note #12 with the following:

12- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

13- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE

WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

GROUT REFERENCES FOR POSITIVE PROTECTION:

(5-19-15) 1170 SP11 R20

Revise the *2012 Standard Specifications* as follows:

Page 11-14, Article 1170-2, Materials, line 30, in the materials table, replace "Freeze-Thaw Durable Grout, Nonshrink" with "Grout, Type 3".

Page 11-14, Article 1170-2, Materials, lines 31-32, delete the first paragraph after the materials table.

PERMANENT SEEDING AND MULCHING:

(7-1-95) 1660 SP16 R02

The Department desires that permanent seeding and mulching be established on this project as soon as practical after slopes or portions of slopes have been graded. As an incentive to obtain an early stand of vegetation on this project, the Contractor's attention is called to the following:

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660 in the *2012 Standard Specifications* and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

Percentage of Elapsed Contract Time	Percentage Additive
0% - 30%	30%
30.01% - 50%	15%

Percentage of elapsed contract time is defined as the number of calendar days from the date of availability of the contract to the date the permanent seeding and mulching is acceptably completed divided by the total original contract time.

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08) Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(E) of the *2012 Standard Specifications*.

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

Restricted Noxious **Weed**	Limitations per Lb. Of Seed	Restricted Noxious **Weed**	Limitations per Lb. of Seed
Blessed Thistle	4 seeds	Cornflower (Ragged Robin)	27 seeds
Cocklebur	4 seeds	Texas Panicum	27 seeds
Spurred Anoda	4 seeds	Bracted Plantain	54 seeds
Velvetleaf	4 seeds	Buckhorn Plantain	54 seeds
Morning-glory	8 seeds	Broadleaf Dock	54 seeds
Corn Cockle	10 seeds	Curly Dock	54 seeds
Wild Radish	12 seeds	Dodder	54 seeds
Purple Nutsedge	27 seeds	Giant Foxtail	54 seeds
Yellow Nutsedge	27 seeds	Horsenettle	54 seeds
Canada Thistle	27 seeds	Quackgrass	54 seeds
Field Bindweed	27 seeds	Wild Mustard	54 seeds
Hedge Bindweed	27 seeds		

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed shall not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet – Strain R
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass
Crownvetch
Pensacola Bahiagrass
Creeping Red Fescue
Japanese Millet
Reed Canary Grass
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

STANDARD SPECIAL PROVISION

ERRATA

(1-17-12) (Rev. 04-21-15) Z-4

Revise the *2012 Standard Specifications* as follows:

Division 2

Page 2-7, line 31, Article 215-2 Construction Methods, replace "Article 107-26" with "Article 107-25".

Page 2-17, Article 226-3, Measurement and Payment, line 2, delete "pipe culverts,".

Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows: Line 1, replace "(4) Buffer Zone" with "(c) Buffer Zone"; **Line 12,** replace "(5) Evaluation for Potential Wetlands and Endangered Species" with "(d) Evaluation for Potential Wetlands and Endangered Species"; and **Line 33,** replace "(6) Approval" with "(4) Approval".

Division 3

Page 3-1, after line 15, Article 300-2 Materials, replace "1032-9(F)" with "1032-6(F)".

Division 4

Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping, replace "sheet pile" with "reinforcement".

Division 6

Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments, replace "30" with "45".

Page 6-10, line 42, Subarticle 609-6(C)(2), replace "Subarticle 609-6(E)" with "Subarticle 609-6(D)".

Page 6-11, Table 609-1 Control Limits, replace "Max. Spec. Limit" for the Target Source of $P_{0.075}/P_{be}$ Ratio with "1.0".

Page 6-40, Article 650-2 Materials, replace "Subarticle 1012-1(F)" with "Subarticle 1012-1(E)"

Division 7

Page 7-1, Article 700-3, CONCRETE HAULING EQUIPMENT, line 33, replace "competion" with "completion".

Division 8

Page 8-23, line 10, Article 838-2 Materials, replace "Portland Cement Concrete, Class B" with "Portland Cement Concrete, Class A".

Division 10

Page 10-166, Article 1081-3 Hot Bitumen, replace "Table 1081-16" with "Table 1081-2", replace "Table 1081-17" with "Table 1081-3", and replace "Table 1081-18" with "Table 1081-4".

Division 12

Page 12-7, Table 1205-3, add "FOR THERMOPLASTIC" to the end of the title.
Page 12-8, Subarticle 1205-5(B), line 13, replace "Table 1205-2" with "Table 1205-4".
Page 12-8, Table 1205-4 and 1205-5, replace "THERMOPLASTIC" in the title of these tables with "POLYUREA".
Page 12-9, Subarticle 1205-6(B), line 21, replace "Table 1205-4" with "Table 1205-6".
Page 12-11, Subarticle 1205-8(C), line 25, replace "Table 1205-5" with "Table 1205-7".

Division 15

Page 15-4, Subarticle 1505-3(F) Backfilling, line 26, replace "Subarticle 235-4(C)" with "Subarticle 235-3(C)".
Page 15-6, Subarticle 1510-3(B), after line 21, replace the allowable leakage formula with the following: $\mathbf{W=LD\sqrt{P} \div 148{,}000}$
Page 15-6, Subarticle 1510-3(B), line 32, delete "may be performed concurrently or" and replace with "shall be performed".
Page 15-17, Subarticle 1540-3(E), line 27, delete "Type 1".

Division 17

Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation, replace "1633.01" with "1631.01".

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES

(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)

(3-18-03) (Rev. 10-15-13) Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-733-6932, or *http://www.ncagr.gov/plantind/* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed or other noxious weeds.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

(10-16-07) (Rev. 4-21-15) Z-10

Description

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year.\

Training Classifications

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

Equipment Operators	Office Engineers
Truck Drivers	Estimators
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

Measurement and Payment

No compensation will be made for providing required training in accordance with these contract documents.

PROJECT SPECIAL PROVISIONS

GEOTECHNICAL

DocuSigned by:
Geotechnical Engineering Unit
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8/5/2015

GEOTEXTILE FOR PAVEMENT STABILIZATION: (1-21-14)

Description

Furnish and place geotextile for pavement stabilization in accordance with the contract. Geotextile for pavement stabilization may be required to prevent pavement cracking and provide separation between the subgrade and pavement section at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextiles	1056

Provide Type 5 geotextile for geotextile for pavement stabilization that meets the following requirements:

GEOTEXTILE FOR PAVEMENT STABILIZATION REQUIREMENTS		
Property	**Requirement (MARV[A])**	**Test Method**
Tensile Strength @ 5% Strain (MD & CD[A])	1,900 lb/ft	ASTM D4595
Ultimate Tensile Strength (MD & CD[A])	4,800 lb/ft	ASTM D4595
Melting Point	300° F	ASTM D276

A. Define "minimum average roll value" (MARV), "machine direction" (MD) and "cross-machine direction" (CD) in accordance with ASTM D4439.

Construction Methods

Notify the Engineer when the roadbed is completed within 2" of subgrade elevation. The Engineer will sample and test subgrade soils for quality to determine if geotextile for pavement stabilization is required at locations shown in the plans and other locations as directed. For subgrades without stabilization, allow 24 days to determine if geotextile for pavement stabilization is required. For stabilized subgrades with geotextile for pavement stabilization, stabilize subgrade soils to 12" beyond the base course as shown in the plans.

Place geotextile for pavement stabilization on subgrades immediately below pavement sections as shown in the plans and in slight tension free of kinks, folds, wrinkles or creases. Install geotextiles with the MD perpendicular to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextiles in the MD so splices or overlaps are parallel to the roadway centerline. Extend geotextile for pavement stabilization 12" beyond the base course as shown in the plans.

Completely cover subgrades with geotextile for pavement stabilization so geotextiles are adjacent to each other in the CD, i.e., perpendicular to the MD. The CD is the direction of the width or short dimension of the geotextile roll. Overlapping geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that base course will be placed to prevent lifting the edge of the top geotextile.

For asphalt base courses, asphalt mixture temperatures in the truck may not exceed 315° F at the time of placement. Do not damage geotextile for pavement stabilization when constructing base courses. Place and compact base courses in accordance with the *Standard Specifications*. Do not operate heavy equipment on geotextiles any more than necessary to construct pavement sections. Replace any damaged geotextiles to the satisfaction of the Engineer.

Measurement and Payment

Geotextile for Pavement Stabilization will be measured and paid in square yards. Geotextiles will be measured along subgrades as the square yards of exposed geotextiles before placing base courses. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Pavement Stabilization* will be full compensation for providing, transporting and placing geotextiles.

Payment will be made under:

Pay Item	**Pay Unit**
Geotextile for Pavement Stabilization	Square Yard

DocuSigned by:
Scott A. Hidden
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7/9/2015

STANDARD SHORING: **(3-17-15)**

Description

Standard shoring includes standard temporary shoring and standard temporary mechanically stabilized earth (MSE) walls. At the Contractor's option, use standard shoring as noted in the plans or as directed. When using standard shoring, a temporary shoring design submittal is not required. Construct standard shoring based on actual elevations and shoring dimensions in accordance with the contract and Standard Detail No. 1801.01 or 1801.02.

Define "standard temporary shoring" as cantilever shoring that meets the standard temporary shoring detail (Standard Detail No. 1801.01). Define "standard temporary wall" as a temporary MSE wall with geotextile or geogrid reinforcement that meets the standard temporary wall detail (Standard Detail No. 1801.02). Define "standard temporary geotextile wall" as a standard temporary wall with geotextile reinforcement and "standard temporary geogrid wall" as a standard temporary wall with geogrid reinforcement. Define "geosynthetics" as geotextiles or geogrids.

Provide positive protection for standard shoring at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geotextiles	1056
Grout, Type 1	1003
Portland Cement Concrete	1000
Select Material	1016
Steel Beam Guardrail Materials	862-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3
Wire Staples	1060-8(D)

Provide Type 6 material certifications for shoring materials. Use Class IV select material (standard size No. ABC) for temporary guardrail. Use Class A concrete that meets Article 450-2 of the *Standard Specifications* or grout for drilled-in piles.

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, use sheet piles with the minimum required section modulus or H-piles with the sizes shown in Standard Detail No. 1801.01. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets

AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use the following:

(1) A-2-4 soil for backfill around culverts,

(2) A-2-4 soil in the reinforced zone of standard temporary walls with a back slope and

(3) Class VI select material in the reinforced zone of standard temporary geotextile walls.

(B) Standard Temporary Walls

Use welded wire reinforcement for welded wire facing, struts and wires with the dimensions and minimum wire sizes shown in Standard Detail No. 1801.02. Provide Type 2 geotextile for separation and retention geotextiles. Define "machine direction" (MD) and "cross-machine direction" (CD) for geosynthetics in accordance with ASTM D4439. Do not use more than 4 different reinforcement strengths for each standard temporary wall.

(1) Geotextile Reinforcement

Provide Type 5 geotextile for geotextile reinforcement with a mass per unit area of at least 8 oz/sy in accordance with ASTM D5261. Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geotextile wall location, provide geotextiles with ultimate tensile strengths as shown in Standard Detail No. 1801.02.

(2) Geogrid Reinforcement

Handle and store geogrids in accordance with Article 1056-2 of the *Standard Specifications*. Use geogrids with a roll width of at least 4 ft and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from:
connect.ncdot.gov/resources/Materials/Pages/SoilsLaboratory.aspx

Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geogrid wall location, provide geogrids for geogrid reinforcement with short-term design strengths as shown in Standard Detail No. 1801.02. Geogrids are typically approved for ultimate tensile strengths in the MD and CD or short-term design strengths for a 3-year design life in the MD based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

If the website does not list a short-term design strength for an approved geogrid, use a short-term design strength equal to the ultimate tensile strength divided by

3.5 for the geogrid reinforcement.

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of standard shoring except for barrier above standard temporary walls. Concrete barrier with the minimum required clear distance is required above standard temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and standard shoring. At the Contractor's option or if clear distance for standard temporary shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above standard temporary walls.

(C) Standard Shoring Selection Forms

Before beginning standard shoring construction, survey existing ground elevations in the vicinity of standard shoring locations to determine actual shoring or wall heights (H). Submit a standard shoring selection form for each location at least 7 days before starting standard shoring construction. Standard shoring selection forms are available from: connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction and inspection of the standard shoring. If required, schedule this meeting after all standard shoring selection forms have been submitted. The Resident, District or Bridge Maintenance Engineer, Bridge or Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend this preconstruction meeting.

Construction Methods

Construct standard shoring in accordance with the *Temporary Shoring* provision.

(A) Standard Temporary Shoring Installation

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, install piles with the minimum required embedment and extension for each shoring section in accordance with Standard Detail No. 1801.01. For concrete barrier above and next to standard temporary shoring and temporary guardrail above and attached to standard temporary shoring, use "surcharge case with traffic impact" in accordance with Standard Detail No. 1801.01. Otherwise, use "slope or surcharge case with no traffic impact" in accordance with Standard Detail No. 1801.01. If refusal is reached before driven piles attain the minimum required embedment, use drilled-in H-piles with timber lagging for standard temporary shoring.

(B) Standard Temporary Walls Installation

Based on actual wall height, groundwater elevation, slope or surcharge case, geotextile or geogrid reinforcement and shoring backfill in the reinforced zone at each standard temporary wall location, construct walls with the minimum required reinforcement length and number of reinforcement layers for each wall section in accordance with Standard Detail No. 1801.02. For standard temporary walls with pile foundations in the reinforced zone, drive piles through reinforcement after constructing temporary walls.

For standard temporary walls with interior angles less than 90°, wrap geosynthetics at acute corners as directed by the Engineer. Place geosynthetics as shown in Standard Detail No. 1801.02. Place separation geotextiles between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, place separation geotextiles between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Measurement and Payment

Standard shoring will be measured and paid in accordance with the *Temporary Shoring* provision.

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7/9/2015

PILE DRIVING CRITERIA **(9-18-12)**

Revise the *2012 Standard Specifications* as follows:

Page 4-72, Subarticle 450-3(D)(3) Required Driving Resistance, lines 26-30, delete first paragraph and replace with the following:

The Engineer will determine if the proposed pile driving methods and equipment are acceptable and provide the blows/ft and equivalent set for the required driving resistance noted in the plans, i.e., "pile driving criteria" except for structures with pile driving analyzer (PDA) testing. For structures with PDA testing, provide pile driving criteria for any bents and end bents with piles in accordance with Subarticle 450-3(F)(4).

Page 4-73, Subarticle 450-3(F) Pile Driving Analyzer, lines 45-48, delete third paragraph and replace with the following:

The Engineer will complete the review of the proposed pile driving methods and equipment within 7 days of receiving PDA reports and pile driving criteria. Do not place concrete for caps or footings on piles until PDA reports and pile driving criteria have been accepted.

Page 4-75, Subarticle 450-3(F) Pile Driving Analyzer, add the following:

(4) Pile Driving Criteria

Analyze pile driving with the GRL Wave Equation Analysis Program (GRLWEAP) manufactured by Pile Dynamics, Inc. Use the same PDA Consultant that provides PDA reports to perform GRLWEAP analyses and develop pile driving criteria. Provide driving criteria sealed by an engineer approved as a Project Engineer (key person) for the same PDA Consultant.

Analyze pile driving so driving stresses, energy transfer, ram stroke and blows/ft from PDA testing and resistances from CAPWAP analyses correlate to GRLWEAP models. Provide pile driving criteria for each combination of required driving resistance and pile length installed for all pile types and sizes. Submit 2 copies of pile driving criteria with PDA reports. Include the following for driving criteria:

(a) Project information in accordance with Subarticle 450-3(F)(3)(a)
(b) Table showing blows/ft and equivalent set vs. either stroke for multiple strokes in increments of 6" or bounce chamber pressure for multiple pressures in increments of 1 psi
(c) Maximum stroke or blows/ft or pile cushion requirements to prevent overstressing piles as needed
(d) GRLWEAP software version information
(e) PDF copy of all pile driving criteria and executable GRLWEAP input and output files

Page 4-76, Article 450-4 MEASUREMENT AND PAYMENT, add the following:

The contract unit price for *PDA Testing* will also be full compensation for performing

GRLWEAP analysis and developing and providing pile driving criteria.

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8/3/2015

MECHANICALLY STABILIZED EARTH RETAINING WALLS (3-17-15)

1.0 GENERAL

Construct mechanically stabilized earth (MSE) retaining walls consisting of steel or geosynthetic reinforcement in the reinforced zone connected to vertical facing elements. Use precast concrete panels for vertical facing elements and coarse aggregate in the reinforced zone unless noted otherwise in the plans. Provide reinforced concrete coping as required. Design and construct MSE retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified MSE Wall Installer to construct MSE retaining walls.

Define "reinforcement" as steel or geosynthetic reinforcement and "geosynthetics" as geosynthetic grids (geogrids) or strips (geostrips). Define "aggregate" as coarse or fine aggregate. Define "panel" as a precast concrete panel and "coping" as precast or cast-in-place concrete coping.

Define "MSE wall" as a mechanically stabilized earth retaining wall and "MSE Wall Vendor" as the vendor supplying the chosen MSE wall system. Define "MSE panel wall" as an MSE wall with panels and "MSE segmental wall" as an MSE wall with segmental retaining wall (SRW) units. Define "abutment wall" as an MSE wall with bridge foundations in any portion of the reinforced zone or an MSE wall connected to an abutment wall. Even if bridge foundations only penetrate a small part of the reinforced zone, the entire MSE wall is considered an abutment wall.

Use an approved MSE wall system in accordance with the plans and any NCDOT restrictions or exceptions for the chosen system. Value engineering proposals for other MSE wall systems will not be considered. Do not use MSE wall systems with an "approved for provisional use" status for abutment walls or MSE walls subject to scour, walls with design heights greater than 35 ft or walls supporting or adjacent to railroads or interstate highways. The list of approved MSE wall systems with approval status is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Aggregate	1014
Anchor Pins	1056-2
Curing Agents	1026
Epoxy, Type 3A	1081
Geotextiles, Type 2	1056
Grout, Type 3	1003
Joint Materials	1028
Portland Cement Concrete, Class A	1000
Precast Retaining Wall Coping	1077

Reinforcing Steel	1070
Retaining Wall Panels	1077
Segmental Retaining Wall Units	1040-4
Shoulder Drain Materials	816-2
Wire Staples	1060-8(D)

Provide Type 2 geotextile for filtration and separation geotextiles. Use Class A concrete for cast-in-place coping, leveling concrete and pads.

Use panels and SRW units from producers approved by the Department and licensed by the MSE Wall Vendor. Unless required otherwise in the contract, produce panels with a smooth flat final finish that meets Article 1077-11 of the *Standard Specifications*. Accurately locate and secure reinforcement connectors in panels and maintain required concrete cover. Produce panels within 1/4" of the panel dimensions shown in the accepted submittals.

Damaged panels or SRW units with excessive discoloration, chips or cracks as determined by the Engineer will be rejected. Do not damage reinforcement connection devices or mechanisms in handling or storing panels and SRW units.

Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Handle and store geosynthetics in accordance with Article 1056-2 of the *Standard Specifications*. Load, transport, unload and store MSE wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

A. Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate except do not use No. 57 or 57M stone in the reinforced zone of MSE walls with geosynthetic reinforcement or connectors. Use the following for fine aggregate:

1. Standard size No. 1S, 2S, 2MS or 4S that meets Table 1005-2 of the *Standard Specifications* or
2. Gradation that meets Class III, Type 3 select material in accordance with Article 1016-3 of the *Standard Specifications*.

Fine aggregate is exempt from mortar strength in Subarticle 1014-1(E) of the *Standard Specifications*. Use fine aggregate with a maximum organic content of 1.0%. Provide aggregate with electrochemical properties that meet the following requirements:

AGGREGATE ELECTROCHEMICAL REQUIREMENTS					
Aggregate Type	**Reinforcement or Connector Material**	**pH**	**Resistivity**	**Chlorides**	**Sulfates**
Coarse	Steel	Not Required			

Fine	Steel	5 – 10	≥ 3,000 Ω · cm	≤ 100 ppm	≤ 200 ppm
Coarse or Fine	Polyester Type (PET) Geogrid	5 – 8	N/A*	N/A*	N/A*
Coarse or Fine	Geostrip or Polyolefin Geogrid	4.5 – 9	N/A*	N/A*	N/A*

* Resistivity, chlorides and sulfates are not applicable to geosynthetics.

Use aggregate from a source that meets the *Mechanically Stabilized Earth Wall Aggregate Sampling and Testing Procedures*. Perform pH tests for coarse aggregate in accordance with Materials and Tests (M&T) Unit Chemical Procedure C-Elec. Perform organic content tests for fine aggregate in accordance with AASHTO T 267 instead of Subarticle 1014-1(D) of the *Standard Specifications*. Perform electrochemical tests for fine aggregate in accordance with the following test procedures:

Property	**Test Method**
pH	AASHTO T 289
Resistivity	AASHTO T 288
Chlorides	AASHTO T 291
Sulfates	AASHTO T 290

B. Reinforcement

Provide steel or geosynthetic reinforcement supplied by the MSE Wall Vendor or a manufacturer approved or licensed by the vendor. Use reinforcement approved for the chosen MSE wall system. The list of approved reinforcement for each MSE wall system is available from the website shown elsewhere in this provision.

1. Steel Reinforcement

Provide Type 1 material certifications in accordance with Article 106-3 of the *Standard Specifications* for steel reinforcement. Use welded wire grid reinforcement ("mesh", "mats" and "ladders") that meet Article 1070-3 of the *Standard Specifications* and metallic strip reinforcement ("straps") that meet ASTM A572 or A1011. Galvanize steel reinforcement in accordance with Section 1076 of the *Standard Specifications*.

2. Geosynthetic Reinforcement

Define "machine direction" (MD) for geosynthetics in accordance with ASTM D4439. Provide Type 1 material certifications for geosynthetic strengths in the MD in accordance with Article 1056-3 of the *Standard Specifications*. Test geosynthetics in accordance with ASTM D6637.

C. Bearing Pads

For MSE panel walls, use bearing pads that meet Section 3.6.1.a of the *FHWA Design*

and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I (Publication No. FHWA-NHI-10-024). Provide bearing pads with thicknesses that meet the following:

BEARING PAD THICKNESS	
Facing Area per Panel (A)	**Minimum Pad Thickness After Compression (based on 2 times panel weight above pads)**
$A \leq 30$ sf	1/2"
30 sf $< A \leq 75$ sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide miscellaneous components approved for the chosen MSE wall system. The list of approved miscellaneous components for each MSE wall system is available from the website shown elsewhere in this provision.

3.0 PRECONSTRUCTION REQUIREMENTS

A. MSE Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each MSE wall. Before beginning MSE wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of MSE wall locations as needed. For proposed slopes above or below MSE walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual MSE wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. MSE Wall Designs

For MSE wall designs, submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on the working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Wall Design Consultant to design MSE walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Wall Design Consultant.

Design MSE walls in accordance with the plans, *AASHTO LRFD Bridge Design Specifications* and any NCDOT restrictions for the chosen MSE wall system unless

otherwise required. Design MSE walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*. Use a uniform reinforcement length throughout the wall height of at least 0.7H with H as shown in the plans or 6 ft, whichever is longer, unless noted otherwise in the plans. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate drains, the reinforced zone or leveling pads outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads and design parameters approved for the chosen MSE wall system or default values in accordance with the AASHTO LRFD specifications. Design steel components including reinforcement and connectors for the design life noted in the plans and aggregate type in the reinforced zone. Use corrosion loss rates for galvanizing in accordance with the AASHTO LRFD specifications for nonaggressive backfill and carbon steel corrosion rates in accordance with the following:

CARBON STEEL CORROSION RATES	
Aggregate Type (in reinforced zone)	**Corrosion Loss Rate (after zinc depletion)**
Coarse	0.47 mil/year
Fine (except abutment walls)	0.58 mil/year
Fine (abutment walls)	0.70 mil/year

For geosynthetic reinforcement and connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 lb/sf in accordance with Figure C11.5.6-3(b) of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts or concrete barrier rail above MSE walls, analyze top 2 reinforcement layers for traffic impact loads in accordance with Section 7.2 of the FHWA MSE wall manual shown elsewhere in this provision except use the following for geosynthetic reinforcement rupture:

$$\phi\, T_{al}\, R_c \geq T_{max} + (T_I / RF_{CR})$$

Where,

ϕ = resistance factor for tensile resistance in accordance with Section 7.2.1 of the FHWA MSE wall manual,

T_{al} = long-term geosynthetic design strength approved for chosen MSE wall system,

R_c = reinforcement coverage ratio = 1 for continuous geosynthetic reinforcement,

T_{max} = factored static load in accordance with Section 7.2 of the FHWA MSE wall manual,

T_I = factored impact load in accordance with Section 7.2 of the FHWA MSE wall manual and

RF_{CR} = creep reduction factor approved for chosen MSE wall system.

If existing or future obstructions such as foundations, guardrail, fence or handrail posts, moment slabs, pavements, pipes, inlets or utilities will interfere with reinforcement,

maintain a clearance of at least 3" between obstructions and reinforcement unless otherwise approved. Locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations.

Use 6" thick cast-in-place unreinforced concrete leveling pads beneath panels and SRW units that are continuous at steps and extend at least 6" in front of and behind bottom row of panels or SRW units. Unless required otherwise in the plans, embed top of leveling pads in accordance with the following requirements:

EMBEDMENT REQUIREMENTS		
Front Slope[1] (H:V)	**Minimum Embedment Depth[2] (whichever is greater)**	
6:1 or flatter (except abutment walls)	H/20	1 ft for H ≤ 10 ft 2 ft for H > 10 ft
6:1 or flatter (abutment walls)	H/10	2 ft
> 6:1 to < 3:1	H/10	2 ft
3:1 to 2:1	H/7	2 ft

1. Front slope is as shown in the plans.
2. Define "H" as the maximum design height plus embedment per wall with the design height and embedment as shown in the plans.

When noted in the plans, locate a continuous aggregate shoulder drain along the base of the reinforced zone behind the aggregate. Provide wall drainage systems consisting of drains and outlet components in accordance with Standard Drawing No. 816.02 of the *Roadway Standard Drawings*.

For MSE panel walls, cover joints at back of panels with filtration geotextiles at least 12" wide. If the approval of the chosen MSE wall system does not require a minimum number of bearing pads, provide the number of pads in accordance with the following:

NUMBER OF BEARING PADS		
Facing Area per Panel (A)	**Maximum Wall Height Above Horizontal Panel Joint**	**Minimum Number of Pads per Horizontal Panel Joint**
A ≤ 30 sf	25 ft	2
	35 ft[1]	3
30 sf < A ≤ 75 sf	25 ft	3
	35 ft[1]	4

1. Additional bearing pads per horizontal panel joint may be required for wall heights above joints greater than 35 ft.

For MSE segmental walls, coarse aggregate is required in any SRW unit core spaces and between and behind SRW units for a horizontal distance of at least 18". Separation geotextiles are required between the aggregate and overlying fill or pavement sections except when concrete pavement, full depth asphalt or cement treated base is placed

directly on aggregate. When noted in the plans, separation geotextiles are also required at the back of the reinforced zone between the aggregate and backfill or natural ground. Unless required otherwise in the plans, use reinforced concrete coping at top of walls that meets the following requirements:

1. Coping dimensions as shown in the plans,
2. At the Contractor's option, coping that is precast or cast-in-place concrete for MSE panel walls unless cast-in-place coping is required as shown in the plans,
3. Cast-in-place concrete coping for MSE segmental walls and
4. At the Contractor's option and when shown in the plans, cast-in-place concrete coping that extends down back of panels or SRW units or connects to panels or SRW units with dowels.

For MSE segmental walls with dowels, attach dowels to top courses of SRW units in accordance with the following:

1. Set dowels in core spaces of SRW units filled with grout instead of coarse aggregate or
2. Embed adhesively anchored dowels in holes of solid SRW units with epoxy.

For MSE panel walls with coping, connect cast-in-place concrete coping or leveling concrete for precast concrete coping to top row of panels with dowels cast into panels. When concrete barrier rail is required above MSE walls, use concrete barrier rail with moment slab as shown in the plans.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with foundation pressures, typical sections with reinforcement and connection details, aggregate locations and types, geotextile locations and details of leveling pads, panels or SRW units, coping, bin walls, slip joints, etc. If necessary, include details on working drawings for concrete barrier rail with moment slab, reinforcement splices if allowed for the chosen MSE wall system, reinforcement connected to end bent caps and obstructions extending through walls or interfering with reinforcement, leveling pads, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. At least one analysis is required for each wall section with different reinforcement lengths. When designing MSE walls with computer software other than MSEW, use MSEW, version 3.0 with update 14.93 or later, manufactured by ADAMA Engineering, Inc. to verify the design. At least one MSEW analysis is required per 100 ft of wall length with at least one analysis for the wall section with the longest reinforcement. Submit electronic MSEW input files and PDF output files with design calculations.

C. Preconstruction Meeting

Before starting MSE wall construction, hold a preconstruction meeting to discuss the construction and inspection of the MSE walls. If this meeting occurs before all MSE wall submittals have been accepted, additional preconstruction meetings may be

required before beginning construction of MSE walls without accepted submittals. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and MSE Wall Installer Superintendent will attend preconstruction meetings.

4.0 CORROSION MONITORING

Corrosion monitoring is required for MSE walls with steel reinforcement. The Engineer will determine the number of monitoring locations and where to install the instrumentation. Contact M&T before beginning wall construction. M&T will provide the corrosion monitoring instrumentation kits and if necessary, assistance with installation.

5.0 SITE ASSISTANCE

Unless otherwise approved, provide an MSE Wall Vendor representative to assist and guide the MSE Wall Installer on-site for at least 8 hours when the first panels or SRW units and reinforcement layer are placed. If problems are encountered during construction, the Engineer may require the vendor representative to return to the site for a time period determined by the Engineer.

6.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of MSE walls. Direct run off away from MSE walls, aggregate and backfill. Contain and maintain aggregate and backfill and protect material from erosion.

Excavate as necessary for MSE walls in accordance with the accepted submittals. If applicable and at the Contractor's option, use temporary shoring for wall construction instead of temporary slopes to construct MSE walls. Define "temporary shoring for wall construction" as temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience.

Unless required otherwise in the plans, install foundations located in the reinforced zone before placing aggregate or reinforcement. Brace piles in the reinforced zone to maintain alignment when placing and compacting aggregate. Secure piles together with steel members near top of piles. Clamp members to piles instead of welding if bracing is at or below pile cut-off elevations.

Notify the Engineer when foundation excavation is complete. Do not place leveling pad concrete, aggregate or reinforcement until excavation dimensions and foundation material are approved.

Construct cast-in-place concrete leveling pads at elevations and with dimensions shown in the accepted submittals and in accordance with Section 420 of the *Standard Specifications*. Cure leveling pads at least 24 hours before placing panels or SRW units.

Erect and support panels and stack SRW units so the final wall position is as shown in the accepted submittals. Stagger SRW units to create a running bond by centering SRW units

over joints in the row below as shown in the accepted submittals. Space bearing pads in horizontal panel joints as shown in the accepted submittals and cover all panel joints with filtration geotextiles as shown in the accepted submittals. Attach filtration geotextiles to back of panels with adhesives, tapes or other approved methods.

Construct MSE walls with the following tolerances:

A. SRW units are level from front to back and between units when checked with a 4 ft long level,

B. Vertical joint widths are 1/4" maximum for SRW units and 3/4", ±1/4" for panels,

C. Final wall face is within 3/4" of horizontal and vertical alignment shown in the accepted submittals when measured along a 10 ft straightedge and

D. Final wall plumbness (batter) is not negative (wall face leaning forward) and within 0.5° of vertical unless otherwise approved.

Place reinforcement at locations and elevations shown in the accepted submittals and within 3" of corresponding connection elevations. Install reinforcement with the direction shown in the accepted submittals. Place reinforcement in slight tension free of kinks, folds, wrinkles or creases. Reinforcement may be spliced once per reinforcement length if shown in the accepted submittals. Use reinforcement pieces at least 6 ft long. Contact the Engineer when unanticipated existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid obstructions, deflect, skew or modify reinforcement as shown in the accepted submittals.

Place aggregate in the reinforced zone in 8" to 10" thick lifts. Compact fine aggregate in accordance with Subarticle 235-3(C) of the *Standard Specifications*. Use only hand operated compaction equipment to compact aggregate within 3 ft of panels or SRW units. At a distance greater than 3 ft, compact aggregate with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting aggregate. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of aggregate. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. If a drain is required, install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*.

Install dowels as necessary for SRW units and place and construct coping and leveling concrete as shown in the accepted submittals. Construct leveling concrete in accordance with Section 420 of the *Standard Specifications*. Construct cast-in-place concrete coping in accordance with Subarticle 452-3(C) of the *Standard Specifications*. When single faced precast concrete barrier is required in front of and against MSE walls, stop coping just

above barrier so coping does not interfere with placing barrier up against wall faces.

When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed. Seal joints above and behind MSE walls between coping and concrete slope protection with silicone sealant.

7.0 MEASUREMENT AND PAYMENT

MSE Retaining Wall No. __ will be measured and paid in square feet. MSE walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of leveling pad elevations. Define "top of wall" as top of coping or top of panels or SRW units for MSE walls without coping.

The contract unit price for *MSE Retaining Wall No. __* will be full compensation for providing designs, submittals, labor, tools, equipment and MSE wall materials, excavating, backfilling, hauling and removing excavated materials and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, bearing pads, coping, miscellaneous components and any incidentals necessary to construct MSE walls. The contract unit price for *MSE Retaining Wall No. __* will also be full compensation for reinforcement connected to and aggregate behind end bent caps in the reinforced zone, if required.

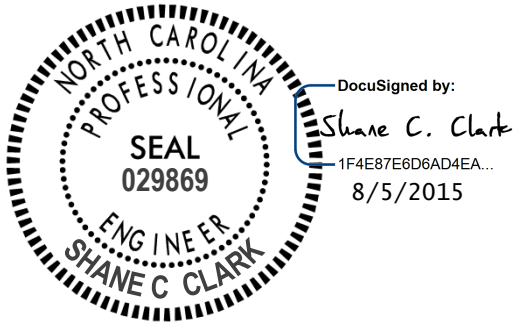
No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for *MSE Retaining Wall No. __*.

The contract unit price for *MSE Retaining Wall No. __* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind the reinforced zone from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

Payment will be made under:

Pay Item	**Pay Unit**
MSE Retaining Wall No. __	Square Foot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PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (7/13/2015)

The Contractor's attention is directed to the fact that soil contaminated with petroleum hydrocarbon compounds exist within the project area. The known areas of potential contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas and investigation reports will be available at the following web address by navigating to the correct letting year and month then selecting, "Plans and Proposals", "Watauga R-2915A", "GeoEnv Postings":

http://dotw-xfer01.dot.state.nc.us/dsplan/

Petroleum contaminated soil may be encountered during any earthwork activities on the project. The Contractor shall only excavate those soils that the Engineer designates necessary to complete a particular task. The Engineer shall determine if soil is contaminated based on petroleum odors and unusual soil staining. Contaminated soil not required to be excavated is to remain in place and undisturbed. Undisturbed soil shall remain in place, whether contaminated or not. The Contractor shall stockpile all contaminated soil excavated from the project in a location approved by the Engineer.

The stockpile shall be created within the property boundaries of the source material and in accordance with the Stockpile Detail found in the plans. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDENR UST Section's Regional Office for off-site temporary storage. The Engineer will notify the GeoEnvironmental Section of the stockpile and the GeoEnvironmental Section will arrange for the testing and disposal of the contaminated stockpile within two weeks of notification.

The quantity of contaminated soil excavated and stockpiled shall be the actual number of tons of material, which has been acceptably excavated, transported, and weighed with certified scales. The quantity of contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Stockpiling Contaminated Soil".

Pay Item	**Pay Unit**
Stockpiling Contaminated Soil	Ton

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Ronald W. King
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5/27/2015

OVERHEAD SIGN SUPPORTS

Description

Design, fabricate, furnish and erect various types of overhead sign assemblies. Fabricate supporting structures using tubular members of either aluminum or steel. The types of overhead sign assemblies included in this specification are span structures, cantilever structures and sign structures attached to bridges.

Materials

Structural Steel	Section 1072
Overhead Sign Structures	Section 1096
Signing Materials	Section 1092
Organic Zinc Repair Paint	Article 1080-9
Reinforcing Steel	Section 1070
Direct Tension Indicators	Sections 440 and 1072

Construction Methods

A. General

Fabricate overhead sign assemblies in accordance with the details shown in the approved working drawings and the requirements of these specifications.

No welding, cutting or drilling will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finished size, provided the diameter of the punched holes is at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots is not permitted.

Erect sign panels in accordance with the requirements for Type A or B signs as indicated in the plans or Roadway Standard Drawings. Field drill two holes per connection in the Z bars for attaching signs to overhead structures. Provide two U-bolts at each U-bolt connection such as each truss chord to sign hanger and each truss chord to walkway support or light support. Provide two U-bolts at each U-bolt connection where ends of truss chords are supported. The minimum diameter of all U-bolts is ½ inch.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials.

For high strength bolted connections, use direct tension indicators. Galvanize bolts, nuts and washers in accordance with the Standard Specifications.

B. Shop Drawings

Design the overhead sign supports, including foundations, prior to fabrication. Submit design calculations and working drawings of the designs to the Engineer for review and acceptance.

Have a professional engineer registered in the State of North Carolina perform the computations and render a set of sealed, signed and dated drawings detailing the construction of each structure.

Submit to the Engineer for review and acceptance complete design and fabrication details for each overhead sign assembly, including foundations and brackets for supporting the signs and maintenance walkways, if applicable, electrical control boxes, and lighting luminaires. Base design upon the revised structure line drawings, wind load area and the wind speed shown in the plans, and in accordance with the *Standard Specifications for Structural Structures for Highway Signs, Luminaires and Traffic Signals*.

Submit thirteen (13) copies of completely detailed working drawings and one copy of the design calculations including all design assumptions for each overhead sign assembly to the Engineer for approval prior to fabrication. Working drawings shall include complete design and fabrication details (including foundations); provisions for attaching signs, maintenance walkways (when applicable), lighting luminaires to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete overhead sign assembly.

Allow 40 days for initial working drawing review after the Engineer receives them. If revisions to working drawings are required, an additional 40 days shall be required for review and approval of the final working drawings.

Approval of working drawings by the Engineer shall not relieve the Contractor of responsibility for the correctness of the drawings, or for the fit of all shop and field connections and anchors.

C. Design and Fabrication

The following criteria govern the design of overhead sign assemblies:

Design shall be in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009* and the 2010 and 2011 Interim Revisions.

Within this Specification, there are several design criteria that are owner specified. They include:

- Overhead cantilever sign structures shall include galloping loads (exclude four-chord horizontal trusses).
- The natural wind gust speed in North Carolina shall be assumed to be 11.6 mph.
- The fatigue importance category used in the design, for each type of structure, shall be for:
- Cantilever structures with span greater than 50 feet – Fatigue Category I.
-
- Cantilever structures with span less than or equal to 50 feet – Fatigue Category II.
- Non-cantilever structures – Fatigue Category II

The following Specification interpretations or criteria shall be used in the design of overhead sign assemblies:

- For design of supporting upright posts or columns, the effective length factor for columns "K", as provided for in Appendix B, Section B.5, shall be taken as the following, unless otherwise approved by the Engineer:

  Case 1 For a single upright post of cantilever or span type overhead sign structure, the effective column length factor, "K", shall be taken as 2.0.

  Case 2 For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.

  Case 3 For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65

- For twin post truss-type uprights, the unbraced length of the post shall be from the chord to post connection to the top of base plate

- For twin post truss-type uprights when the post is subject to axial compression, bending moment, shear, and torsion, the post shall satisfy *Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* Equations 5-17, 5-18 and 5-19. To reduce the effects of secondary bending, in lieu of Equation 5-18, the following equation may be used:

$$\frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6 f_a}{F_{é}}\right) F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

Where fa = Computed axial compression stress at base of post

- The base plate thickness for all uprights and poles shall be a minimum of 2" but not less than that determined by the following criteria and design.

Case 1 Circular or rectangular solid base plates with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be calculated as $M = (P \times D_1) / 2$.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter
The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be calculated as $M = P \times D_2$.

- M - bending moment at the critical section of the base plate induced by one anchor bolt
- P - anchoring force of each anchor bolt
- D_1 - horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
- D_2 - horizontal distance between the face of the upright and the face of the anchor bolt nut

- The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.

- The thickness of Case 1 base plate shall not be less than that calculated based on formula for Case 2.

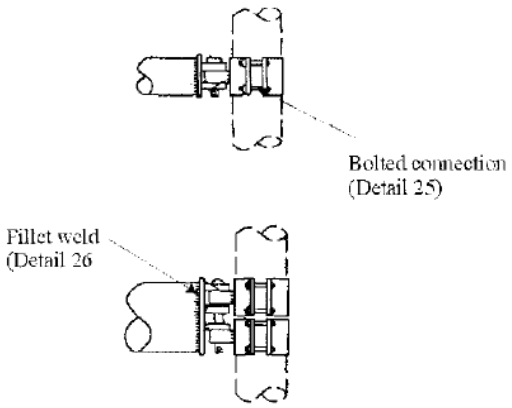
- Uprights, foundations, and trusses that support overhead signs shall be designed in accordance with the Overhead and Dynamic Message Sign Foundations Project Special Provision for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments such as walkways, supporting brackets, lights, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

- Uprights, foundations, and trusses that support overhead mounted signs shall be designed for the proposed sign wind area and future wind areas. The design shall consider the effect of torsion induced by the eccentric force location of the center of wind force above (or below) the center of the supporting truss. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

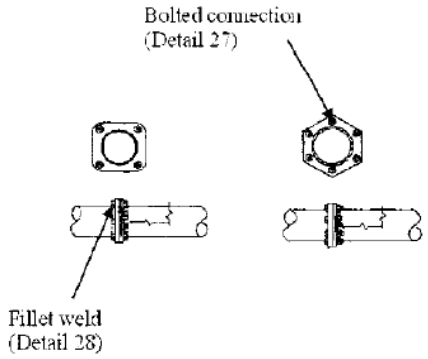
For non-cantilevered monotube sign support structures, the following table and figures are considered as a required addition to the Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009:

Construction	Detail	Stress Category	Application	Example
Mechanically Fastened Connections	25. Bolts in Tension	D	Beam column connection for monotube structures	16
Fillet Weld Connections	26. Fillet welded with one side normal to applied stress	E’	Beam column connection for monotube structures	17
Mechanically Fastened Connections	27. High strength bolts in tension	D	Monotube or truss-chord splice	17
Fillet Weld Connections	28. Fillet welded with one side normal to applied stress	E’	Monotube or truss-chord splice	17
Mechanically Fastened Connections	29. U-bolts tied to transverse truss column to keep chords in place	D	Horizontal truss connection with vertical truss	18
Mechanically Fastened Connections	30. Net section of full-tightened, high tension bolts in shear	B	Truss bolted joint	18

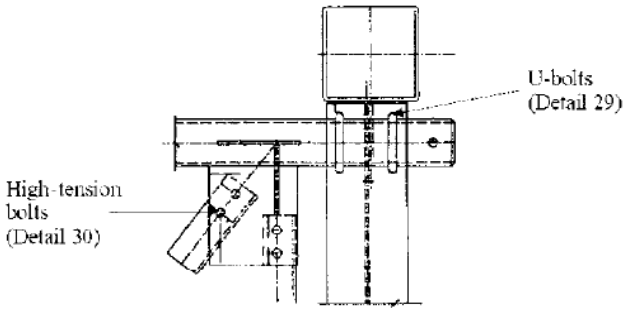
Add to the Specifications, Figure 11-1:



Beam-Column Connection for monotube structure
Example 16



Monotube beam splice
Example 17



Beam-Column Connection for Truss Structure
Example 18

Fabricate all overhead sign assemblies, including but not limited to foundations, in accordance with the details shown on the approved shop drawings and with the requirements of these Specifications.

Fabricate the span and cantilever supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project. Sign support structures that are to be attached to bridges shall be fabricated using other structural shapes.

Horizontal components of the supporting structures for overhead signs may be of a truss design or a design using singular (monotube) horizontal members to support the sign panels.

Truss or singular member centerline must coincide with the centerline of sign design area shown on the structure line drawing.

Provide permanent camber in addition to dead load camber in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and*

Traffic Signals. Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

Use cantilever sign structures that meet the following design criteria:

a. Do not exceed an L / 150 vertical dead load deflection at the end of the arm due to distortions in the arm and vertical support, where L is the length of the arm from the center of the vertical support to the outer edge of the sign.

b. Do not exceed an L / 40 horizontal deflection at the end of the arm due to distortions in the arm and vertical support, as a result of design wind load.

Fabricate attachment assemblies for mounting signs in a manner that allows easy removal of sign panels for repair.

Compensation

The work covered by this section will be paid for at the contract lump sum for each *Supports, Overhead Sign Structure @* _____. Such price will be full compensation for all work covered by this specification includes all design, fabrication, construction, transportation, and erection of the complete overhead sign structure, supporting structure, hardware, lighting support brackets, preparing and furnishing shop drawings, and attaching the signs to the overhead assembly.

Payment will be made under:

Supports, Overhead Sign Structure @ _____	Lump Sum

DocuSigned by:
Ronald W. King
0695D7A9577C4DC...

5/27/2015

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS

Description

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.*

Materials

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

(A) Unit weight (γ) = 120 lb/cf,

(B) Friction angle (ϕ) = 30°,

(C) Cohesion (c) = 0 lb/sf and

(D) Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 6th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Measurement and Payment

Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown on the accepted submittals. The contract unit price for *Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Overhead Footings	Cubic Yard

TC-1

(TIP R-2915A) Watauga and Ashe County

WORK ZONE TRAFFIC CONTROL
Project Special Provisions

Law Enforcement:
(05/14/2013)

Description

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to direct traffic in accordance with the contract.

Construction Methods

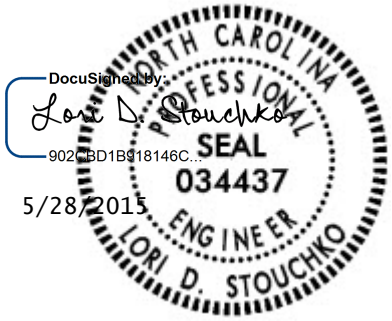
Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

Measurement and Payment

Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

Pay Item	Pay Unit
Law Enforcement	Hour



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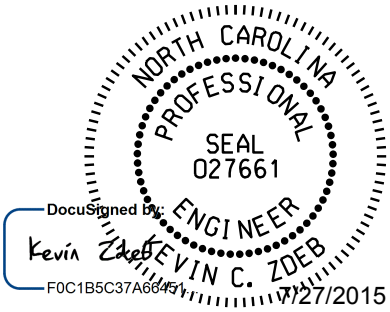
PROJECT SPECIAL PROVISIONS
Utility Construction

M A ENGINEERING CONSULTANTS, INC.
598 E. Chatham Street, Suite 137, Cary, NC 27511



Revise the 2012 Standard Specifications as follows:

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
Add the following sentences:

The utility owner is Frontier Natural Gas. The contact person is Gary Moore and he can be reached by phone at 336-526-2690.

NCDOT Roadway contractor and gas pipeline contractor shall not remove from service or demolish the existing Frontier Natural Gas launcher and receiver station until the relocated station is constructed and fully operational.

NCDOT Roadway contractor shall notify Frontier Natural Gas representative at least 48 hours in advance of conducting blasting for roadway excavation in the vicinity of any Frontier Natural Gas pipelines and facilities.

The date of availability is February 1, 2016 for the construction of the proposed launcher and receiver station site, subject to the actual acquisition date by NCDOT Right of Way Unit.

Page 15-2, Sub-article 1500-7 Submittals and Records
Replace the paragraph beginning "Provide as-built plans…" with the following:

Provide As-Built plans of the installed utility within 60 days of construction completion date. The plans shall include notations of the size and type of material installed, coordinates of utility controls, and horizontal and vertical locations of the piping. Provide an AutoCAD dwg file and two (2) paper copies *of surveyed As-Builts of the utility system constructed* to the Utility Owner and two (2) copies to the Engineer.

The gas pipeline contractor's attention is directed to the geotechnical data report compiled by S&ME, Inc. that was prepared for Frontier Natural Gas. The report provides geotechnical data along the proposed 10-inch HDD path and subgrade preparation requirements for the proposed Launcher/Receiver Station. This geotechnical data report can be found on the following NCDOT website for download: http://dotw-xfer01.dot.state.nc.us/dsplan.

All natural gas work is to be conducted as directed by the Frontier Natural Gas Representative in the field during construction and in accordance with the attached Frontier Natural Gas Specifications, Volume I - Chapter 3 and Volume II - Chapter 3, beginning with page **FNG-1**.

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The gas pipeline contractor that will be performing the actual natural gas pipeline relocation work will need to have the necessary Operator Qualification Certifications required to meet the standards established by the United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety, Sections 191 and 192, and as noted within the Frontier Natural Gas Specifications. Additionally, the gas pipeline contractor for the natural gas pipeline construction should show that they meet the O.S.H.A training qualifications as a Competent Person under Section 29 CFR 1926 Subpart P Standard.

Construction of the new gas facilities shall be provided by one of the following gas pipeline contractors and their subcontractors as approved by Frontier Natural Gas:

1. A & B Trenching Company, Inc.
2. Appalachian Pipeline Contractors, LLP
3. Benton-Georgia, LLC
4. Boothe & Greer Pipeline Company
5. Distribution Construction
6. G. Campbell Construction Company, Inc.
7. Mid-Ohio Pipeline Services
8. Miller Pipeline
9. NorthStar Energy Services, Inc.
10. Southeast Connections, LLC
11. Troy Construction

The awarded gas pipeline contractor shall be responsible for the scheduling and coordination of preferred products for the installation and removal of all Stopples and temporary bypass lines as required on the project to complete the work shown on the plans.

FRONTIER NATURAL GAS PREFERRED PRODUCT LIST

1. Stopple Fittings: T.D. WILLIAMSON; or approved equal.
2. 5R Elbows: TULSA TUBE BENDING; or approved equal.
3. Valves: MUELLER, BALON; or approved equal.

Third Party Inspection Services shall be provided by one of the following contractors as approved by Frontier Natural Gas:

1. Cleveland Inspection Services, Inc.
2. CR Inspection, Inc.
3. Cypress Energy Partners
4. Intergrity Inspection Services, LLC
5. Kestrel Engineering
6. Magonlia River
7. McDaniel Technical Services, Inc.
8. Meridian Construction Consultants

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Gas Launcher/Receiver Station:
Measurement and Payment:
Payment for launcher and receiver station shall be per each station, and paid for under the contract price for "Launcher and Receiver Station." Such price and payments will be full compensation for all labor, materials, pipeline testing, excavation, backfilling, and any incidentals necessary to complete the work as required. Such materials and labor shall include, but are not limited to: Installation and fabrication of 6-inch launchers and 10-inch receivers, 6-inch & 10-inch pipe, 6-inch & 10-inch 5R elbows, 6 & 10-inch blow offs, 6 & 10-inch valves, 6 & 10-inch tees; sediment and erosion control measures, drainage pipes, grading materials, and station fencing.

Pay Item:	**Pay Unit**
Gas Launcher/Receiver Station	Each

6" Gas Bypass:
Measurement and Payment:
Payment for 6-inch bypass shall be per each bypass, and paid for under the contract price for "6" Bypass." Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work as required. Such materials and labor shall include, but are not limited to: 6-inch pipe; 6-inch fittings; 6-inch piggable stopple fittings; installation and removal of temporary bypass piping, stopples, and thread-o-rings.

Pay Item:	**Pay Unit**
6" Gas Bypass	Each

10" Gas Bypass:
Measurement and Payment:
Payment for 10-inch bypass shall be per each bypass, and paid for under the contract price for "10" Bypass." Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work as required. Such materials and labor shall include, but are not limited to: 10-inch pipe; 10-inch fittings; 10-inch piggable stopple fittings; installation and removal of temporary bypass piping, stopples, and thread-o-rings.

Pay Item:	**Pay Unit**
10" Gas Bypass	Each

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Third Party Inspection Services:
Measurement and Payment:
Payment for third party inspection services shall be per lump sum and paid for under the contract price for Third Party Inspection Services. Such price and payment will be full compensation for all labor, materials, pipeline testing, visual inspection and any incidentals necessary to complete the work as required. Such materials, tasks and labor shall include but are not limited to those specified in Chapter 3, Section II, beginning with line II.0 of this Utility Construction Special Provisions.

Pay Item:	**Pay Unit**
Third Party Inspection Services	Lump Sum

6" Gas Line:
Measurement and Payment:
Furnish and install 6.625" x .280 wall API-5L X-52 steel line pipe with 16-18 mils FBE coating and furnish all materials, fittings, handling, welding, coating of joints, patching of coating, trenching, backfill, clean-up, clearing, testing, tie-in(s) to existing gas system, tamping, and other necessary work per linear foot of installed line pipe. This item is also payment to furnish and install any necessary rock shield and bedding required for the gas line project.

Pay Item:	**Pay Unit**
6" Gas Line	Linear Foot

10" Gas Line:
Measurement and Payment:
Furnish and install 10.75" x .219 wall API-5L X-52 steel line pipe with 16-18 mils FBE coating and furnish all materials, fittings, handling, welding, coating of joints, patching of coating, trenching, backfill, clean-up, clearing, testing, tie-in(s) to existing gas system, tamping, and other necessary work per linear foot of installed line pipe. This item is also payment to furnish and install any necessary rock shield and bedding required for the gas line project.

Pay Item:	**Pay Unit**
10" Gas Line	Linear Foot

Frontier Natural Gas NC's GREEN ENERGY CHOICE	Volume II Procedures Manual	[ ] New Date [X] Revised Date November 16, 2012 Revised by: A. Theriault
	Topic: CONSTRUCTION GENERAL	Chapter/Section 3 I

II.3.I. GENERAL

A. Scope (192.301, 192.303)

This chapter is for the expressed purpose of setting forth in accordance such techniques and methods as are required and necessary for the safe construction, installation, and inspection of natural gas pipelines and services. It is not intended that the requirements of this chapter be applied retroactively to existing installations insofar as design, fabrication, installation, established operating pressure, and testing are concerned. It is intended, however, that revisions of this chapter shall be applicable to the operation, maintenance, and uprating of existing installations.

All materials, equipment, and piping system components installed in this gas system shall be suitable and safe for the service for which they are intended. All pipe, valves, fittings, flanges, bolting and gaskets, and other pipeline appurtenances shall be qualified by conforming to the appropriate standards and specifications as set forth by the Minimum Federal Safety Standards for gas pipeline facilities. Materials and piping system components approved for use in this gas system are listed in Volume I, Chapter 3, Section VII, of the Operations and Maintenance Plan.

The Minimum Federal Safety Standards, as well as more restrictive State safety standards, were used as a basis for formulating the policies and procedures contained in this chapter. Therefore, some of the requirements contained herein exceed the minimum requirements, but only for good and proper reasons. The requirements and other information presented in this manual are set forth with high regard for the safety of construction personnel as well as the public.

The installation of new distribution mains and services and their appurtenances as well as alterations and changes to existing ones shall be carried out in accordance with the construction procedures. In general, steel piping thus installed will be operating at hoop stress levels below twenty (20%) percent of the specified minimum yield strength of the pipe material and will be

Frontier Natural Gas NC's GREEN ENERGY CHOICE	Volume II Procedures Manual	[ ] New Date [X] Revised Date November 16, 2012 Revised by: A. Theriault
	Topic: CONSTRUCTION GENERAL	Chapter/Section 3 I

qualified for Class 4 locations. Transmission mains and facilities will be installed wherever practical to qualify for Class 4 locations.

Construction work shall be inspected at its completion and the inspector will be responsible for making a record of the installation and certifying conformance of the installation with the provisions of the construction procedures. Gas system maps, valve books, service records, etc., shall be kept up to date.

No utility personnel shall be permitted to construct pipeline facilities until receiving adequate training and supervision. All work installed by outside contractors shall be performed by trained and competent personnel and fully conform to these construction procedures. Conformance with the policies and procedures described in this chapter shall be mandatory under conditions normally encountered in the gas industry. They are offered as a basis for safe, quality, and economic construction under normal conditions. They will not eliminate in all cases, however, the need for further engineering judgment or advice nor will they cover unusual conditions or special problems that may arise. Large-scale construction projects, transmission pipelines, and unusual construction will typically have detail plans and specifications prepared by personnel or consultants with a skilled technical background.

B. Routing/Right of Way (192.317)

A route for proposed pipeline facilities shall be selected to avoid conflicts with existing utilities and structures, provide for future protection of the facilities, and accommodate typical construction techniques. Each main or service shall be located to protect against washouts, floods, unstable soil, landslides, or other hazards that may cause the pipeline to move or to sustain abnormal loads. The route shall be selected to allow pipeline facilities to be installed underground whenever possible. Regulating and metering stations shall be installed above ground whenever possible.

Frontier Natural Gas NC's GREEN ENERGY CHOICE	Volume II Procedures Manual	[ ] New Date [X] Revised Date November 16, 2012 Revised by: A. Theriault
	Topic: CONSTRUCTION GENERAL	Chapter/Section 3 I

Each above ground facility must be protected from accidental damage by vehicular traffic or other similar causes by being placed at a safe distance from traffic or by installing barricades.

The probable pattern of future land use should be considered in selecting the route for new pipelines. To provide better control over future construction activities, consideration should be given to installing facilities in a private right-of-way.

When distribution facilities are to be installed in new areas, consideration should be given to developing a plan, in conjunction with other utilities, for assigning a standard location to each utility. Where practicable, facilities in a street should be installed at a constant distance from the property line. Diagonal installations or installations which "wander" in the street or right-of-way should be avoided. Where the street configuration permits, facilities should be installed in straight lines with right angle corners. Where practicable, services should run straight from the main to the meter location. The installation of facilities should be avoided in areas where storm sewer lines or catch basins are likely to be installed.

The route of the main should be staked at frequent intervals to ascertain its proper location and to provide a guide for construction personnel. Construction operations shall be confined to a reasonable width and due care shall be used in placing construction tools, equipment, excavated materials, and pipeline materials and supplies so as to cause the least possible damage to property and interference with traffic. All work should be scheduled to reduce to a minimum the blocking of street intersections, residential driveways, sidewalks, store entrances, parking lots, etc. Temporary bridges shall be provided where necessary.

Traffic control for the construction shall conform with the Manual on Uniform Traffic Control Devices for Streets and Highways. Suitable barricades, lights, flagmen, and watchmen shall be provided when required in all areas in which work is performed. Barricades, lights, flagmen and watchmen shall be in full compliance with all safety requirements.

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An encroachment permit or permission from the controlling authority shall be obtained for construction work involved on the right-of-way of railroads and highways. Such construction work shall be performed in accordance with requirements of the controlling authority. Where a hazardous condition exists, maintenance work necessary to remedy the situation shall be performed immediately and any necessary permit applied for later.

Prior to construction, adequate notice shall be given to utilities and others who own or operate underground facilities in the area of proposed construction as required by State law (72 hours). The local one-call system, NC811, shall be notified at 1-800-632-4949. Other utilities that do not participate in the local one-call system must also be notified (see Damage Prevention, Chapter 5 of Volume I, of the Operations and Maintenance Plan).

C. Weather

Precaution shall be taken to prevent weather from affecting the quality of pipeline construction. The inspector shall determine when the quality of welds/fusions or other factors will be negatively impacted by weather conditions and shall take precautions to prevent any undesirable effects. No welding shall be done when weather or any other factor will affect the quality of the finished weld. It is recommended that polyethylene pipe be fused when the ambient temperature is above 32^0F. When it is necessary to fuse polyethylene pipe at an ambient temperature below 32^0F, special procedures shall be taken to ensure that the heating plates can maintain the desired temperature.

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II.3.II. PIPELINE CONSTRUCTION

II.A. Handling and Storage of Pipe

When moving pipe by truck, the truck and load locking devices shall be padded to protect the coating and pipe from damage. Single lengths of pipe shall be lifted manually or by using padded tongs, a belt sling, or end hooks designed to prevent damage to beveled pipe ends. Rope, chain, or cable shall not be used as a sling for lifting pipe. When loading or unloading plastic pipe, it is preferable to use two personnel so that the pipe can be placed into position without damage. Since plastics are relatively soft, poor handling techniques may result in gouges, scratches, cuts or punctures.

The pipe shall be placed along the job site in a manner so as not to damage the coating or pipe. Pipe shall be strung in advance of the trenching operation only as needed to provide for orderly progress of the work. The pipe should not be thrown or dropped off the truck. Avoid dragging the pipe over rocks, pavement, or other abrasive materials. When possible, the pipe should be placed on a clean, flat surface away from any vehicular traffic and in locations not to block traffic lanes, roadways, or pedestrian passages. Plastic pipe should typically not be stored overnight on the job site unless it can be stored in an area that is protected from vandals.

During construction, steel pipe shall be placed on skids so that it is raised above the ground a sufficient height to properly accommodate the welding and field joint operations. The skids shall be padded as required to prevent damage to the pipe coating and should be spaced no more than twenty (20') feet apart.

Steel pipe may be stored on the ground in a fairly well drained area free of rocks, sticks, or other protrusions. For short term storage up to twelve months, two inch by eight inch (2" x 8") padded skids should be placed on the ground approximately ten (10') feet apart. A padded

wooden wedge should be tacked to the skid to prevent the bottom row from moving laterally. The nesting or pyramid method of stacking is suggested to be economical and simple. The maximum number of tiers in the pyramid shall be as follows.

Pipe Size	# of Tiers
< 2"	20
2"	15
3"	10
4"	8

Polyethylene pipe may be stored on the ground in a fairly well drained area free of rocks, sticks, or other protrusions, preferably on skids or pallets. Cover or shelter pipe as per manufacturer's recommendations. Coils should not be stacked over eight (8') feet in height or stored on edge. Other material should not be placed on top of the coils. Care must be exercised at all times to protect plastic pipe and tubing from fire, excessive heat, or harmful chemicals.

A policy of "first in -- first out" is necessary to prevent weathering damage to both steel and polyethylene pipe. New pipe shall not be stacked on top of pipe that has been in stock over one (1) year. Consult the pipe manufacturer's specifications and guidelines concerning the storage requirements, shelf life, and the effects of weathering.

II.B. Trenching and Cover (192.327)

Before trenching is begun, the existence and location of underground utilities and structures shall be investigated. Excavation in the vicinity of such obstructions shall be done by hand.
Road signs with proper instructions shall be used when appropriate to describe hazards and to control traffic.

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The trench shall be deep enough to provide thirty (30") inches minimum cover above the pipe for distribution mains. Each transmission line must be installed deep enough to provide thirty-six (36") inches minimum cover above the pipe. Each transmission line and distribution line shall be installed with at least 12 inches of clearance from any other underground structure not associated with the transmission line. If this clearance cannot be attained, the line must be protected from damage that might result from the proximity of the other structure. Each main must be installed with enough clearance from any other underground structure to allow proper maintenance and to protect against damage that might result from proximity to other structures. Where consolidated rock excavation is encountered, the minimum cover may be reduced to twenty-four (24") inches for transmission lines and mains. Where a main crosses drainage ditches, creeks, or land subjected to flood, consideration shall be given to installing the main with forty-eight (48") inches of cover. Where it is impractical to cover with the minimum cover requirements, the pipe shall be encased or designed to withstand any anticipated external loads.

The trench shall be graded so that the pipe shall have a substantially continuous and uniform bearing on native undisturbed or replaced compacted earth or imported sand. If the trench bottom is rocky or contains rocks, boulders, stones or similar hard material that cannot be readily removed, the trench bottom shall be padded.

Do not open more trench in advance of pipe laying than is necessary to expedite the work. Trenches, open excavations, and other dangerous places shall be marked and/or barricaded for protection during the progress of construction. Avoid trenching close to large trees and cutting tree roots. When trenching across lawns, remove and replace soil and sod carefully and protect lawn from loose dirt.

During excavations, if suspected contaminated soils and/or hazardous materials are encountered, the following steps shall be followed:

(1) The Field Supervisor shall be contacted immediately.

*In the event the Field Supervisor is not available, a designee shall assume the responsibility for personnel notifications and the forwarding of the Contaminated Soil or Liquid Check-Off Sheet.

(2) The Field Supervisor or designee shall complete the Contaminated Soil or Liquid Check-Off Sheet.

(3) If necessary, the Field Supervisor should contact a Consultant to provide support. The Field Supervisor shall refer to the completed Contaminated Soil or Liquid Check-Off Sheet to communicate the characteristics of the material encountered to the Consultant.

(4) Management or designee shall be notified by the Field Supervisor, when a Consultant is contacted.

(5) If it is determined that the material shall be removed, an authorized contractor shall be contacted to provide support and services by the Field Supervisor.

II.C. Installing (192.319, 192.321, 192.311, 192.309, 192.325)

Inspection of the trench shall be made prior to lowering in to see that no rocks or sharp objects are in the ditch that might damage the pipe or pipe coating. A continuous string of welded steel pipe or fused polyethylene pipe shall be lifted and lowered into the ditch in any approved manner which will not injure the pipe or the pipe coating and which will permit the maximum amount of slack to be secured to allow for contraction or movement of the pipe due to changes in temperature.

When polyethylene piping is laid in the trench, sufficient slack should be provided to allow for contraction. Snake the pipe within the ditch to obtain the greatest amount of slack possible. On an extremely hot, sunny day, the plastic pipe should be kept in the shade to minimize the expansion that will take place. When piping is lowered in the ditch, care should be exercised to

avoid any strains that may overstress or buckle the piping or impose excessive stress on the joints. Polyethylene pipe should not be laid directly on ledge rocks, gravel, or other abrasive objects.

An electrically conductive wire shall be installed with polyethylene mains and services to facilitate locating it with an electronic pipe locator. When necessary (e.g. boring) tracer wire may be taped to but not wrapped around polyethylene pipe. Typically this should not be performed on open trench installations. When tracer wire is installed by a HDD method two tracer wires should be installed. Polyethylene pipe installed in abandoned steel lines and in casings will not require tracer wire to be installed, provided that the wire is bonded to the ends of the metal pipe to maintain a continuous electrical circuit. The wire shall be as specified in the Materials Section VII, Chapter 3, of Volume I, Operations and Maintenance Plan.

All gas mains installed by the open trench method shall include warning tape, of color consistent with the APWA Uniform Color Code, located approximately 18" directly above and parallel to the entire installation.

When the transition from steel main to plastic main is made, it is recommended that this wire be brought up in a curb or valve box. It is also recommended for the wire to be brought to the surface in a valve or curb box at the terminal end of a polyethylene main that is not located close to a service line. Whenever a plastic system is extended or when a plastic service is installed, the wire shall be extended and spliced into the existing wire system by using the appropriate split bolt connector. Splicing tape and plastic electrical tape shall be used to waterproof the splice. At the service riser, the tracer wire shall be wrapped around the riser below the shut-off valve. It shall <u>not</u> be connected to the anodeless riser.

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This system of installing the locating wire with the installation of plastic mains and services provides a continuous electrically conductive circuit. This system also allows the pipe locator to be used normally or with a direct connection to the wire system.

Plastic pipe must be installed below ground unless the following conditions are met:

Uncased plastic pipe may be temporarily installed above ground level under the following conditions:

(1) The operator must be able to demonstrate that the cumulative above ground exposure of the pipe does not exceed the manufacturer's recommended maximum period of exposure or 3 years, whichever is less.

(2) The pipe either is located where damage by external forces is unlikely or is otherwise protected against such damage.

(3) The pipe adequately resists exposure to ultraviolet light and high and low temperatures.

Plastic pipe that is installed in a vault or any other below grade enclosure must be completely encased in gas-tight metal pipe with fittings that are adequately protected from corrosion.

During the lowering in operation, the pipe and pipe coating shall be inspected for flaws. A careful field inspection shall be made of the polyethylene pipe surface to detect gouges, grooves, and other defects. All defects or damage that could impair the serviceability of the plastic pipe or are deeper than 10% of the wall thickness shall be removed as a cylinder and replaced. A minimum of twelve (12") inches shall be removed when repairs are made.

A careful field inspection shall be made of the steel pipe surface to detect gouged, grooved, and dented pipe. A gouge or groove not exceeding one-eighth of the nominal wall thickness shall be removed by grinding provided that the remaining wall thickness must be at least equal to

the minimum thickness required by the tolerances in the specification to which the pipe was manufactured or the nominal wall thickness required for the design pressure of the pipeline. When gouges or grooves exceed this limitation, the damaged portion of the pipe shall be cut out as a cylinder and replaced.

Dents that are more than one-quarter inch deep, measured as the gap between the lowest point of the dent and a prolongation of the original contour of the pipe in any direction, or all dents which contain stress concentration such as scratches, gouges, grooves, or arc burns shall be removed by cutting out the faulty portion of the pipe as a cylinder.

The metallurgical notch caused by arc burns should be removed by grinding, provided the grinding does not reduce the pipe wall thickness by more than one-quarter of the nominal wall thickness and the remaining wall thickness is equal to the minimum wall thickness required by the tolerances in the specification to which the pipe was manufactured or the nominal wall thickness required for the design pressure of the pipeline. Otherwise, the portion of pipe containing the arc burn should be cut out as a cylinder and replaced.
If laminations, split ends, or other pipe defects are discovered, that length of pipe containing the defects shall be cropped, repaired, or removed and replaced.

During the lowering in operation, the pipe coating shall be inspected for flaws. All coated steel pipe shall be inspected with a holiday detector. The procedures and settings for utilizing a holiday detector are outlined in the manufacturer's operating instructions. All visible gouges in the coating shall be repaired. If a coating defect is deep enough to damage the pipe, a check shall be made of the pipe surface.

All pipe joints, line fittings, couplings, and other metal installed underground must be coated and/or wrapped with protective materials. The use of hot applied protective materials is recommended but any material approved by Frontier Natural Gas will be acceptable when

properly applied. Protective wraps to be used on joints and pipeline components shall be compatible with the coatings applied to the adjacent pipe. Practices to be followed in using these materials shall be done in the manner recommended by the manufacturer of the coating and wrapping materials.

In general, the coating materials must be installed on a clean, dry surface. All rust, slag, and dirt must be removed by wire brushing. Oil and grease shall be removed with a suitable solvent. All burrs or other sharp metal projections shall be removed with a chisel or file.

If the pipe is cold, a torch may be flashed lightly on the pipe to remove moisture from the pipe pores and to warm the surface. If the pipe is hot from a weld, it should be allowed to cool to such a degree that the hand can be comfortably rested on the metal.

It is recommended that tape wrap coatings be applied in a spiral fashion and have fifty (50%) percent overlap. Tapes and shrink sleeves that are applied with a cigarette wrap shall have adequate overlap onto existing coatings and shall be applied as per the manufacturer's recommended procedures.

In the vicinity of steam, hot water, power lines, or other sources of heat, additional clearance shall be allowed for polyethylene pipe. When this clearance is not attainable, casing or insulating material such as 1/4" fiberglass shoes or reinforced Bakelite, wood blocks dipped in hot coal tar enamel, rubber, or other non-metallic, water-proof materials shall be installed to prevent contact between the gas main and other underground metals such as water lines, sewer lines, cables, conduit, etc. Gas mains shall not be installed in the same trench with a sanitary sewer.

Before a temporary loose end is lowered into the trench when work is suspended at night or for any reason, it shall be securely plugged or closed to prevent the entrance of water and other foreign materials.

II.D. Bends and Elbows (192.313, 192.315)

All bends on steel pipe shall be free from buckling, cracks, excessive thinning of the pipe wall, or any other evidence of mechanical damage that would impair the serviceability of the pipe. The bends shall be made to conform to the profile of the bottom of the completed trench. All bends shall be made by a cold bending method that shall result in a smooth uniform bend. Such bends shall not have a difference between the maximum and minimum diameters in excess of 2.5 percent of the nominal diameter. The longitudinal weld of the pipe should be near the neutral axis of the bend.

The maximum distance between the bend section and the closest end of the pipe length measured along the longitudinal axis of the pipe shall be three (3) pipe diameters. In all cases, suitable precautions shall be taken to prevent out-of-roundness at the end of the pipe length due to the bending action. In no case shall a bend section contain a circumferential weld unless the weld is nondestructively tested by radiograph. Wrinkle bends are prohibited in all pipe. Factory-made steel welding elbows or transverse segments cut therefrom may be used for changes in the direction provided that the arc length measured along the crotch is at least one (1") inch on pipe two (2") inches nominal diameter or larger.

Field bends and fittings for transmission pipelines must be of a design that will permit the use of internal inspection devices. Specific instructions for field bends and the use of fittings for transmission pipelines shall be developed and identified on plans developed for each installation of transmission pipeline segments.

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Field bends in steel pipelines that damage the pipe coating shall be coated with a suitable coating.

All changes in direction for polyethylene pipe shall be smooth radii. It is recommended that the radius of curvature be greater than twenty-five (25) times the actual outside diameter of the pipe or tubing, however, in no case should the radius of curvature be less than ten (10) times the actual outside diameter of the pipe or twenty-four (24") inches, whichever is greater. If the radius of curvature is less than twenty-five (25) times the actual outside diameter of the pipe or tubing, soil shall be backfilled to provide the necessary restraining force. If field conditions require a bending radius of curvature of less then ten (10) times the actual outside diameter, an elbow-type fitting shall be used. In no case shall a joint or fitting be included in a bending radius of less than one hundred twenty-five (125) times the actual outside diameter of the pipe or tubing.

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The bending radius for plastic pipe shall not be less than the minimum recommended by the manufacturer for the kind, type, grade, wall thickness, and diameter of the particular plastic used as given in the following table.

R = Radius of Curvature

d = outside diameter

Pipe size	d (inches)	Minimum R = 10(d)* (No joints)	Recommended R = 25(d) (No joints)	Minimum R = 100(d) (With Joints)
3/8" (1/4" cts)	.375	2 ft.	2 ft.	4.0 ft.
1/2"	.840	2 ft.	2 ft.	8.8 ft.
5/8" (1/2" cts)	.625	2 ft.	2 ft.	6.5 ft.
3/4"	1.050	2 ft.	2.2 ft.	11.0 ft.
1"	1.315	2 ft.	2.7 ft.	13.7 ft.
1 1/8" (1" cts)	1.125	2 ft.	2.3 ft.	11.7 ft.
1 1/4"	1.660	2 ft.	3.5 ft.	17.3 ft.
2"	2.375	2 ft.	5.0 ft.	24.7 ft.
3"	3.500	3 ft.	7.3 ft.	36.5 ft.
4"	4.500	3.8 ft.	9.4 ft.	46.9 ft.
6"	6.625	5.5 ft.	13.8 ft.	69.0 ft.

*Only during temporary installation methods (i.e. insertion and plowing)

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II.E. Joining of Pipe (192.273)

All pipe, fittings, and flanges installed by welding under these specifications shall be butt-welded by the oxyacetylene or the shielded metal-arc process using a manual welding technique. Welding procedures for these two processes are given in the back of this chapter. If a qualified welder fails to pass any part of the welder qualification test, an immediate retest can be made after the welder has had further training or practice. If an apprentice welder fails to pass the test, he must wait at least six (6) weeks before a retest can be made. During this period, he is to have additional training and practice.

All polyethylene pipe and fittings installed by fusion shall be done in accordance to the manufacturer's fusion procedures for the type pipe being installed. When performing cross fusion between types and grades of polyethylene pipe the recommended manufactures procedures shall be followed. All personnel associated with the fusion of polyethylene pipe shall be qualified in accordance with the training and testing procedures listed in the back of this chapter.

It is recommended that pipe and fittings be joined by welding or fusion whenever practicable. Joining of pipe by mechanical fittings and couplings is permitted. The manufacturer's instructions and procedures are to be followed for the installation of such fittings. The pipeline must be designed and installed so that each joint will sustain the longitudinal pullout or thrust force caused by contraction or expansion of the piping or by anticipated external or internal loading.

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II.F. Valves (192.193, 192.181c)

Valves may be installed in the system using fusion, welding, flanges, or threaded-screw ends. The manufacturer's installation instructions should be followed to determine the position of the valve gate/plug when welding. Valves installed in plastic pipe must be designed to protect the plastic material against excessive torsional or shearing loads when the valve or shutoff is operated and from any other secondary stresses that might be exerted through the valve or its enclosure.

All flange surfaces shall be thoroughly cleaned before installation. All flange faces shall be parallel and correctly centered prior to final bolting. Force should not be used to attain alignment. After a gasket of proper size, or a flange insulating kit when required, is installed, bolts shall be tightened in diagonal sequence. Stud bolts should be centered with equal threads visible on both sides. Bolts should be uniformly tightened to produce a leak proof joint but shall not be tightened excessively so as to cause yield or permanent set. It is suggested that a torque wrench be used for bolt tightening.

Underground metal valves shall be coated with an approved coating to prevent corrosion.

A valve box shall be installed over each underground valve where ready access to the operating stem or mechanism is not otherwise provided. To avoid transmitting external loads to the main, valve boxes shall not be supported by the valve but by blocking under the valve box with brick, concrete block, or similar masonry material. The valve itself should be supported as necessary to prevent settlement or movement of the attached piping. Each valve box should have a top section adjustable for elevation and a cover with the word "GAS" cast on it. The installed valve box should be plumb and adjusted so the cover is flush with the surrounding ground level.

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The valve should be lubricated and turned during the installation to assure good working order. Plug valves shall be greased again after turning to aid the shutoff.

II.G. Backfilling

The trench shall be backfilled as soon as possible after the pipe has been lowered in so as to leave a minimum amount of trench open at any time. However, no trench shall be backfilled unless pipe has proper depth and fit. When the trench crosses driveways, roads, streets, or other places used for the travel of vehicles or pedestrians, proper care should be taken so as not to impede the flow of traffic unnecessarily. All passageways, including driveways, walks, streets, or alleys crossed by the trench shall be mechanically tamped during the backfilling operation to a density equal to that of adjacent original material.

When backfilling bellholes or trenches containing plastic pipe, take care that the bellhole or trench is backfilled and fully compacted below the pipe before any backfill is placed and compacted above the pipe. This is to ensure no uneven stresses are placed on the pipe during the backfill and compaction process.

Use appropriate equipment and technique to backfill excavations in public roadways to achieve a minimum 90% compaction. Each lift should be tamped thoroughly. In private property, achieve a minimum 80% compaction.

Backfilling shall be performed with care so that the steel coating or polyethylene pipe will not be damaged. Hand labor may be necessary in starting the backfill. No trash such as sticks, stumps, scrap pipe, fittings, buckets, cans, or refuse material of any kind shall be contained in the backfill material. The first six (6") inches above the pipe of backfill shall be free of rocks or foreign material that may damage the pipe coating or pipe. Where the pipe is laid in solid rock, a dirt or sand cushion at least six (6") inches thick shall be placed below and on the sides of the

pipe. After the first six (6") inches of backfill have been placed over the pipe, rocky material four (4") inches and smaller may be used in backfilling.

Each Municipal may have their own requirements for backfill material. Reference the street opening permit, or contact Engineering for any clarification on backfill materials.

It is recommended that rock shield be used to protect pipe and pipe coatings in rocky soil. Where rock shielding is used to prevent coating damage, it must be installed properly. One method of installing a wrap type rock shielding material is to secure the rock shielding entirely around the pipe using fiberglass tape and other suitable banding material. Rock shielding should not be draped over the pipe unless suitable backfill and padding is placed in the ditch to provide continuous and adequate support of the pipe in the trench. The use of rock shield does not relieve the requirement to obtain proper soil next to the pipe in the backfill.

II.H. Installing Mains and Services by Methods Other Than Trenching

II.H.1. Plowing and Directional Boring

Gas mains and service lines may be installed by plowing and by directional boring using the procedures and guidelines in this section.

Gas mains and service lines up to four (4") inches in nominal diameter may be installed by plowing when the integrity of the pipe and/or pipe coating will not be compromised. Plowing will only be allowed in terrain that is absent of significant rock, broken concrete, or other objects that may be detrimental to the pipe and pipe coating.

The specifications for the polyethylene and steel pipe to be installed must be consulted to establish maximum pulling force for the pipe used. No forces that will yield the pipe may be used in pulling and it is recommended that pulling forces be maintained below seventy-five (75%) percent of the pipe yield strength.

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Polyethylene pipe to be plowed-in must be installed in sections of five hundred (500') feet or less at a time. The pipe shall be inspected at sufficient intervals, by means of bellholes, and at all exit holes to determine the existence or lack thereof of signs of stretching, gouging, or cutting of the pipe a minimum of one (1) bellhole located midway in the segment to be plowed shall be required for inspection purposes. Stretched, gouged, or cut (other than fine scratches) pipe or pipe coating will not be accepted. If damage to the pipe or pipe coating is noted, the earth will be stripped away from the pipe in either direction until the full extent of the damage is exposed. The damaged pipe or pipe coating will then be cut out and replaced.

Polyethylene pipe shall be allowed to relax for a sufficient length of time (several hours) prior to joining sections of plowed-in pipe or making tie-ins to existing mains. Sections of plowed-in pipe to be joined or tied into existing mains shall be initially overlapped to tie-in bellholes to allow for shrinkage due to relaxation of the pipe. Fused joints shall be allowed to cool for a minimum of thirty to sixty (30-60) minutes prior to being installed by subsequent plowing.

Tracer wire is to be installed with polyethylene pipe as it is plowed-in. Wire is to be attached to plow blade a maximum of six (6") inches above the pipe attachment. Tracer wire shall not be mechanically fastened to the pipe or wrapped around the pipe during installation. In the event that tracer wire is lost or broken, a replacement wire shall be installed by trenching or plowing-in (minimum of 24" deep) to insure the continuity of tracer wire on mains and services.

Directional boring may be utilized as a method of installing pipe. Directional boring is defined as a special process where a pilot hole is drilled with great accuracy utilizing electronic heads at the bit of the drill string and the hole is back reamed with a larger diameter bit while simultaneously pulling the pipe into the hole. This hole is continuously being stabilized with a bentonite based drilling mud.

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Directional boring shall be done with the following specifications, except as provided in section II.R.1. Utility Accommodation Policy.

II.H.1.a. The terrain must be absent of significant rock, broken concrete, or other objects that may be detrimental to the pipe or pipe coating.

II.H.1.b. Maintain thirty-six inches (36") to fifty-four inches (54") depth unless need to go deeper than fifty-four inches (54") to obtain twelve inches (12") clearance from other utilities.

II.H.1.c. Length of directional bore shall not exceed five hundred feet (500') per interval without an inspection bellhole being dug to verify depth and condition of pipe installed.

II.H.1.d. Locating tool should be calibrated to a correct depth of two inches (2") at least one time per day.

II.H.1.e. In the event the tracer wire is lost or broken, a replacement wire shall be installed either by trenching or plowing-in with a minimum cover of twenty four inches (24"). The continuity of tracer wire in each section shall be verified upon the completion of the construction.

II.H.1.f. Back-reaming bit shall have a diameter of at least two inches (2") larger than pipe OD. **A weak link device between pipe and back reamer shall be used.**

II.H.1.g. A normal backthrust pressure shall be determined and any time this pressure must be exceeded to pull pipe through the bore hole, additional test pits should be excavated for further inspection to verify pipe condition.

II.H.1.h. At tie-in points, piping should be a minimum of thirty-six inches (36") deep.

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II.H.1.i. No toxic or hazardous chemical additive may be added to the drilling mud.

II.H.1.j. Installation of pipe using directional drilling or other trenchless technology techniques will be done in accordance with (Safety Standards for Natural Gas Facility Operators). Additional considerations are as follows:

1. Underground hazards such as utility locations and depths
2. Specific locations and depths of sewer and storm water lines, especially ROW and private property locations
3. HDD locating equipment is functioning properly

II.H.2. Insertion

Polyethylene mains and services may be inserted into steel, cast iron, or ductile iron pipe in accordance with the procedures and guidelines of this section. The capacity of the pipe to be inserted should be checked to ensure that whatever reduction in capacity is realized by the utilization of a smaller diameter pipe will not adversely affect the system.

When inserting plastic pipe, the existing main shall be utilized as a protective casing. Exposed polyethylene pipe is permitted at cutouts for fittings, service connection, tie-ins, and insertion locations. The location of all exposed polyethylene pipe shall be recorded on the installation sketch.

The following table shall be used to determine the maximum insert size of existing mains.

EXISTING MAIN SIZE	MAXIMUM INSERT
2" IPS	1 1/4" IPS
3" IPS	2" IPS
4" IPS	3" IPS

6" IPS	4" IPS
8" IPS	6" IPS
10" IPS	8" IPS

The guidelines below shall be followed for installing a plastic pipe insertion.

II.H.2.a. The main shall be cut out at the end of each section of the insertion, the service connections, and all bends. The casing or abandoned pipeline should be prepared to the extent necessary to remove any sharp edges, projections, dust, welding slag or abrasive material which could damage the plastic during or after insertion.

II.H.2.b. When necessary, the existing main shall be reamed.

II.H.2.c. Deposits in the pipe may require the use of a pipeline brush the same size as the existing pipe. Multiple pig runs may be required to insure the cleanliness of the pipe to be inserted.

II.H.2.d. A protective collar shall be installed on the end of the existing main to prevent scoring the plastic pipe during the insertion.

II.H.2.e. Install a tapered nose plug or plastic cap onto the leading end of the plastic pipe.

II.H.2.f. On butt fused pipe the external fusion bead may be removed with a bead cutter to facilitate insertion.

II.H.2.g. During the insertion process, the plastic pipe shall not be dragged along the ground. A piece of plastic pipe or rubber rollers shall be used to protect the plastic pipe as it enters the trench.

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II.H.2.h. When necessary, the pipe shall be inserted or pushed from the insert hole.

II.H.2.i. Suitable inserts shall be provided to permanently protect the polyethylene main from shearing damage by the steel casing.

II.H.2.j. That portion of the plastic pipe which spans disturbed earth shall be protected by bridging, by compaction of the soil under the plastic pipe or by other means to prevent the settling of the backfill from shearing the plastic pipe. The use of a support sleeve or plug can be used to prevent the plastic pipe from bearing on the end of the casing or abandoned pipeline.

II.H.2.k. Care should be taken to allow sufficient plastic main beyond the end of the steel main to allow expansion and contraction of the polyethylene main. Plastic expands and contracts one inch per 1,000 feet per degree (F.). Plastic main should extend a minimum of four feet per 1,000 feet beyond the end of the steel main before installing a fitting or branch connection. But, in no case shall it extend less than two feet. Protection from shear forces shall be provided.

II.H.2.l. The portion of the plastic pipe exposed due to the removal of a section of casing pipe or abandoned pipeline shall have sufficient strength or be protected with bridging or other means so as to withstand the anticipated external soil loadings.

II.H.2.m. When plastic main is inserted, tracer wire is not required to be installed when bonded to both sides of the steel main being inserted. If the bonding of tracer wire will connect the abandoned steel pipe to a cathodically protected pipeline, a test box with leads not connected may be set at the ends of the pipe being inserted or tracer wire may be installed.

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II.H.2.n. Where a gas leak migrating through the annular space between the plastic pipe and the casing or abandoned pipeline could result in a hazardous condition, consideration should be given to plugging the annular space at one or both ends. Plugs may also be provided at intermediate points such as where the casing or abandoned pipeline is cut to permit the installation of a service tee or a lateral main. Care should be used in the selection of the plugging material to avoid damage to the plastic pipe. Both urethane foam and grout have been found to be effective for this purpose.

II.H.2.o. If water which has accumulated between the casing or abandoned pipeline and the carrier pipe freezes, the carrier pipe can be constricted affecting the capacity, or damaged causing a leak. One or more of the following steps can be taken to minimize this possibility.

II.H.2.o.1. Sizing the pipe so that the formation of ice between the carrier and the casing or abandoned pipeline will not constrict the carrier pipe to the extent that service is affected.

II.H.2.o.2. Providing for drainage at the lower points in the casing or abandoned pipeline.

II.H.2.o.3. Inserting a filler such as a closed cell foam material in the annular space.

II.H.2.p. When the insertion process is complete, each service location should be checked to determine if there are any plastic joints that may interfere with a service connection.

II.I. Underboring and Casing Installation (192.323)

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Pipe under state highways, railroads, paved streets, certain highways, and walkways may be installed by underboring, with or without casing. The length and depth of bore shall be the minimum required by controlling authorities. The following procedures and guidelines govern the installation of pipe into casings and by underboring.

II.I.1. If pipe is installed by boring, driving, or other similar method, precautions must be taken to minimize damage to the steel pipe coating or polyethylene pipe during the installation.

II.I.2. The diameter of the auger used in boring shall not be greater than the maximum diameter permitted by controlling authorities and in no case greater than four (4") inches larger than the outside diameter of the casing or line pipe to be installed.

II.I.3. In instances such as crossings of interstate highways and railroads where the use of steel casing is required, casing pipe shall be capable of withstanding any superimposed loads.

II.I.4. Steel casing pipe shall be of the size and specification required by the authority requiring the installation of casings. It is recommended, however not required, that the casing size be two (2) standard pipe sizes larger than the carrier pipe (i.e., 8" casing for 4" carrier pipe).

II.I.5. Casing pipe shall be installed without significant bends and in a manner which will allow free and unrestricted movement of the carrier pipe. Where there is the possibility of water entering the casing, the ends of the casing shall be sealed. End seals may be deleted to allow flooding of the casing at river or creek crossings where additional weight is desired. Casing seals shall allow for independent movement of the carrier pipe and/or casing.

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II.I.6. Sealed casings shall have at least one 2" vent welded on the casing before the carrier pipe is inserted. Vents shall be coated with an approved coating below ground and painted above ground and provided with a gas line warning notice near the vent opening.

Vents shall be located to protect against accidental vehicular damage and other similar causes. The vent opening shall have a screened opening turned downward.

II.I.7. Casing insulators shall be set within 6" of each end of the casing and placed along the carrier pipe at a maximum spacing of ten (10') feet.

II.I.8. For a plastic piping system, the casing pipe shall be prepared to the extent necessary to remove any sharp edges, projections, or abrasive material which could damage the plastic during and after insertion. Plastic pipe shall be inserted into the casing pipe in such a manner so as to protect the plastic. The leading end of the plastic shall be closed before inserting.

II.I.9. After casing is loaded with the carrier pipe, the two metallic structures shall be checked to verify electrical isolation. If electrical isolation is not obtained, then the following actions shall be undertaken:

II.I.9.a. The carrier pipe and casing pipe will be rearranged to enable electrical isolation. This rearrangement may be the addition, replacement, or re-disposition of casing insulators or other such action in order to clear the short.

II.I.9.b. In the event the casing to carrier short cannot be cleared, the annular space between the two pipelines shall be filled with a high dielectric corrosion inhibiting material and the casing pipe will be cathodically protected.

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II.J. Internal Cleaning, Testing, and Purging (192.629)

II.J.1. Internal Cleaning

All gas lines shall be cleaned internally prior to being placed in service.

II.J.2. Testing

All mains and services shall be pressure tested for leaks and to establish a maximum allowable operating pressure. All pipe shall be tested in accordance to Section VIII, of Chapter 3 of Volume I, Operations and Maintenance Plan.

II.J.3. Purging

When a gas main containing air is to be placed into a service, the air can be safely displaced with natural gas introduced at one end at a moderately rapid and continuous flow rate (flow velocity above 200 linear feet per minute) and the air vented out the other end. Higher flow rates create greater turbulence and reduce the chance of producing a long section of a gas air mixture. For larger diameter pipe and long runs of small diameter pipe, consideration should be given to using a slug of nitrogen gas to separate the natural gas from the air.

Vent stacks shall be located in a manner that will allow gas to be safely discharged taking into account nearby buildings, overhead powerlines and other sources of ignition. Smoking and open flames shall be prohibited during a purging operation.

To minimize the risk of static electricity discharges, the utility can use a metallic vent stack that is properly braced to prevent blowoff and extends at least 8 feet above the ground.

The vent stack should be properly grounded to prevent static electricity buildup and should be equipped with valving where necessary for safe control.

The gas flow should be continued without interruption until the vented gas is free from air. The vent should then be closed. In using either gas or air to clear a main, the inlet valve should be controlled. The vent outlet should not be restricted or pressure will build up in the pipe creating a situation where gas and air can mix together. A combustible gas indicator shall be used at the terminal end of each purge to determine that a 100% gas or 0% gas reading is present prior to discontinuing purging operations.

To take a gas main out of service after it has been disconnected from all sources of gas, a procedure similar to, but the reverse of, that described above may be used to displace the gas in the main with air. A 125 CFM compressor can supply flows in excess of 200 linear feet per minute for pipelines up to 8" in nominal diameter. Before a main is severed or disconnected, a bond wire to control static electricity can be attached at two points that provide a connection across the proposed break. For polyethylene pipe, a rag wet with soap or a wetting solution should be wrapped over the main on each side of the cut. The rag should be in contact with the wet ground. In clearing from natural gas to air, especially with old piping, it should be kept in mind that clearing only removes gaseous materials and solid combustible materials may remain in the line after clearing is completed. Special care should be exercised after clearing such piping before piping is entered or disassembled.

A purge procedure should be developed for purging large sections of pipeline. The plan should include the following data:

1. Length of line to be purged.
2. Diameter(s) of line to be purged.
3. Diameter(s) of blowdown connection.
4. Calculation of time required to flow gas for positive displacement.

a. Purge time will be based on minimum gas velocity of 200 feet/minimum.

5. The establishment and maintenance of communications prior to and during purge.
6. A schematic sketch defining key valve locations, squeeze off location, and blowdown locations.
7. A directive to employees or contractors offering an explanation on valve operation.

With the above data obtained, the tables located at the back of this chapter can be used as a guide in determining purge time and gas loss. Two possible options are illustrated using different purging pressures. Additional reference material can be found in the AGA "Purging Principles and Practice" report, or in Volume I, Chapter 3, Section VIII "Testing" of the Operations and Maintenance Plan. At the conclusion of the purge, the gaseous product at the most downstream terminus of the purge shall be checked for being an explosive mixture. If the desired goal of the purge is not met, then the purge operation shall be continued until an acceptable gas reading is obtained. A reading of 100% cannot be obtained with the CGI unless it has been calibrated on line gas prior to purging. When using the CGI to obtain a percent gas reading, the operator shall take into account that the accuracy of the CGI is 2% volume plus (+/-) 2% of reading for 5 – 100% and (+/-) 2% volume plus (+/-) .25% of reading for 0 – 5% volume gas (see example below).

EXAMPLE:

% LEL RANGE

% VOLUME GAS (METHANE) 5-100%

READING * 2% VOLUME = X

X + 2% READING = +/- RANGE

.80 * .02 = .016

.016 +.02 = .036 = +/- 3.6%

80% LEL + 3.6% = 83.6% LEL UPPER RANGE

80% LEL – 3.6% = 76.4% LEL LOWER RANGE

II.K. Static Electricity

Static electricity can build up on both plastic and steel gas lines. Static electricity is generated by particles in the gas such as dirt and welding slag flowing against the pipe walls. This is especially true during times of high flow rates such as broken lines, leaks and squeeze offs. Static electricity charges must be grounded in order to prevent a static spark which can ignite a flammable mixture of natural gas.

When working with plastic and steel pipe the utility personnel should avoid a flammable gas-air mixture and should ensure that all static charges are properly grounded. To avoid a potential explosion it is essential that both of these conditions never occur at the same time.

Plastic pipe being a good insulator cannot be grounded in the same manner as steel pipe. Grounding can be performed by maintaining constant film of a soapy water solution on the pipe surface at all times. One method of grounding plastic pipe involves wrapping a soapy water saturated cloth around the pipe and in contact with the wet ground or a grounding rod.

When repairing plastic lines, purging and/or squeezing off it is recommended that the utility give consideration to the following:

II.K.1.a Personnel working in the area should have protective equipment such as flame retardant clothing, fresh air breathing apparatus, and confined entry rescue equipment.

II.K.1.b A fully charged and inspected fire extinguisher should be manned at all times near the bell hole or excavation. The position of the manned fire extinguisher depends on the direction of the blowing gas.

II.K.1.c Exposed ends of broken tracer wire should be grounded by sticking the exposed ends in the ground away from the plastic pipe.

II.K.1.d All plastic pipe exposed should be continuously sprayed with a soapy water solution.

II.K.1.e Working from the top of the excavation, the exposed plastic pipe should be wrapped with a wet burlap or cotton cloth saturated in a soapy water solution. The pipe should be wrapped from the ground to the break or area to be cut. Make sure the wet cloth is properly grounded and moist.

II.K.1.f When squeezing off broken or damage mains it is recommended to make the squeeze off in separate bell holes 20 feet back if possible. Tools should be grounded.

II.L. Squeeze Off and Cutting of Polyethylene Pipe

Pressure control is a basic requirement of gas systems. The toughness of polyethylene pipe permits the pipe to be squeezed closed for effective control and reopened without damage, provided the following precautions are followed.

II.L.1. In order to adequately control the gas flow, the pipe must be squeezed until the interfaces meet. A bubble tight seal may not always be obtained. To prevent damage, the squeeze gap should be limited. The recommended minimum gaps are as follows:

Size	SDR	Minimum Gap Between Squeeze Bars (inches)
½" CTS	7	.126
½" IPS	9.3	.126
¾" IPS	11	.133
1" CTS	11.5	.137
1" IPS	11	.167
1 1/4" IPS	10	.232
1 ½" IPS	11	.242
2" IPS	11	.302
3" IPS	11.5	.430
4" IPS	11.5	.553
6" IPS	11.5	.806

II.L.2. A squeeze unit must meet the requirements of ASTM F1041. This unit can be a mechanical or hydraulic device. In addition to considering the minimum gap between the squeeze bars, the diameter of the squeeze bars should not be less than:

Pipe Size	Minimum Bar Size
1/2"- 3/4"	1"
1" - 2"	1 1/4"
3" - 4"	1 1/2"
6" - 8"	2"
10" - 12"	3"
14" - 16"	3 1/2"

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II.L.3. Precautions to observe:

II.L.3.a. Do not squeeze closer than the recommended minimum gap.

II.L.3.b. Use only rounded squeeze bar surfaces.

II.L.3.c. Point of squeeze should be located at least three diameters of pipe or 12", whichever is greater, away from the nearest fusion fitting.

II.L.3.d. Care should be taken in positioning squeeze tool so that the pipe flattens freely (without jamming against tool tie rods or abutments).

II.L.3.e. When working with broken line, locate squeeze at least two feet back from break.

II.L.3.f. A release rate of .5 inches/minute or less should be maintained to minimize pipe material damage.

II.L.4. Polyethylene pipe should not be squeezed off at the same point more than one (1) time, although it may be allowed by a field supervisor if gas handling requirements and pipe condition permit it.

Polyethylene pipe can easily be cut using a plastic pipe cutter. One technique to prevent the pipe cutter from jumping off the pipe while cutting is to make a cut around the pipe by advancing the cutting wheel ahead of the roller. Then, reverse the wheel cutting direction and finish cutting through the pipe.

Cutting of the polyethylene pipe can also be accomplished by using an ordinary hacksaw with an eighteen tooth per inch blade. To ensure a straight cut, a cold ring of the proper size can be clamped around the pipe to use as a saw guide.

The appropriate precautions should be taken against static electrical discharge before cutting into existing gas filled piping system. The draping of a rag wetted with a soap

solution over the pipe or other similar methods can be employed to reduce the potential for static electrical discharges.

II.M. Tapping (192.627, 192.151a)

Each tap made on a pipeline under pressure must be performed by a crew qualified to make hot taps. Each fitting (weld-on or mechanical) used to make a hot tap must be designed for at least the operating pressure of the pipeline. It is recommended that these fittings be designed for the maximum allowable operating pressure when practical. Prior to tapping each completed hot tap weld on a steel line, the weld should be examined using a nondestructive test method (e.g., magnetic particle examination, or dye penetrant examination).

Tapping equipment can have a maximum working pressure rating less than the fitting and less than the actual operating pressure of the pipeline being tapped. In that event, the operating pressure must be temporarily reduced during the tapping operation. If, in an emergency, a fitting is not qualified for the maximum allowable operating pressure of the pipeline, the operating pressure must be lowered to the pressure rating of the fitting and must be maintained at or below this level until the fitting is removed.

Weld-on fittings are recommended for use on steel pipe; however, mechanical fittings are permitted. Lateral tie-ins that require reinforcement of branch connections should be discouraged. Split sleeve, full encirclement fittings and other fittings that require small fillet welds shall be used when possible.

All pressure testing shall be completed prior to performing the tap. All sources of ignition shall be removed from the work area before beginning the tapping operation and fire extinguishing equipment shall be placed in close proximity to the work area.

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All tapping procedures shall be in accordance with the tapping equipment manufacturer's recommended procedures.

Plastic service tees shall be heat fused to plastic mains to perform a service tap or main lateral. Manufacturer's specified temperatures and time periods for each pipe size and fitting shall be adhered to when performing the heat fusion operation. These service tees contain a cutter which shall be used to perforate the main.

When hot tapping a plastic insertion, two (2) circumferential cuts shall be made on the casing approximately twelve (12") inches apart. Care must be taken to prevent cutting the inserted plastic pipe. The loose section of the casing should then be blocked up so that the inserted plastic pipe rests on the bottom of the casing. The loose section of casing can then be split, using a hammer and chisel or a circular saw, depending on the material.

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II.N. Pipeline Markers (192.707)

Line markers shall be placed and maintained as close as practical over each buried gas main and transmission line at each crossing of a public road, railroad, navigable waterway, and where it is considered necessary to reduce the possibility of damage or interference. Markers are not required in Class 3 and 4 locations where a program for preventing interference with underground pipelines is established by law. Pipeline markers are not required on Transmission lines in Class 3 and 4 locations where placement of a line marker is impractical.

Line markers must be placed and maintained along each section of a main or transmission line located above ground in an area accessible to the public, except as provided in section II.R. Utility Accommodation Policy.

Line markers shall be worded as follows:

CAUTION, WARNING, or DANGER
"Type of Gas" Pipeline (i.e., Natural Gas Pipeline)
Operator
(Area Code) Phone Number

The above line marker message shall be in letters at least one (1") inch high with one-fourth (1/4") inch stroke on a background of sharply contrasting color.

Line markers at navigable waterways shall be worded as follows:

CAUTION, WARNING, or DANGER
DO NOT ANCHOR or DREDGE
"Type of Gas" Pipeline (i.e., Natural Gas Pipeline)
Operator
(Area Code) Phone Number

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II.O. Inspection (192.305, 192.287, 192.307)

II.O.1. No person shall perform the inspection of joints in plastic pipes required by Section 192.273(c) and 192.285(b), unless the person has been qualified by appropriate training or experience in evaluating the acceptability of plastic pipe joints made under the applicable joining procedure. The person shall have the authority to enforce compliance with the standards contained in this manual and all other applicable codes.

II.O.2. Inspection shall include but not be limited to the following:

II.O.2.a. Check the type and quantity of barricades, signs, warning lights, and other equipment used to protect the public from harm during construction.

II.O.2.b. Inspect the fit-up of the joints before the weld or fusion is made and ensure that line-up clamps are being used where applicable.

II.O.2.c. Visually inspect the stringer beads before subsequent beads are applied. Visually check the fusion procedures used in making joints.

II.O.2.d. Inspect the completed welds or fusions before they are covered with coating.

II.O.2.e. Inspect the condition of the trench bottom just before the pipe is lowered in.

II.O.2.f. Inspect the surface of the coated steel pipe or polyethylene pipe as it is lowered into the trench, looking for lacerations, gouges, or other defects that indicate the pipe might have been damaged. Witness the inspection of coated steel pipe with a holiday detector.

II.O.2.g. Inspect all pipeline components (flanges, insulators, valves, regulators, etc.) to insure compliance with specifications and any applicable codes.

II.O.2.h. Inspect the fit of the pipe to the trench before backfilling.

II.O.2.i. Inspect all repairs, replacements, or changes ordered before they are covered up.

II.O.2.j. Perform such special tests and inspections as are required by these standards and any applicable codes.

II.O.2.k. Electrical continuity pertaining to insulators, tracer wires, and casings shall be inspected and noted.

II.O.2.l. Document with appropriate forms and sketches the modifications or new installation of system facilities.

II.P. Permanent Pipe End Closures

II.P.1. Approved end closures for piping remaining under pressure are as follows. (See also Tables 1, 2 and 3)

II.P.1.a. Steel (See Figure 1)

II.P.1.a.1 Fish tail

II.P.1.a.2. Dead end plate

II.P.1.a.3. Weld caps

II.P.1.b. Plastic - use socket or butt fusion cap

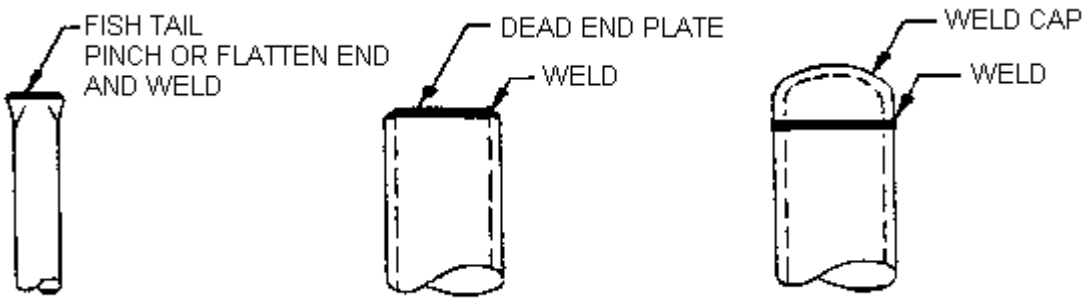

Figure 1. Steel Pipe End Closures.

II.P.2. Approved end closures for abandoned piping are as follows. (See also Tables 1, 2 and 3)

II.P.2.a Plastic plug or cap (cap lug)

II.P.2.b. Fish tail

II.P.2.c. Dead end or thin plate

II.P.2.d. Concrete or cold mix

Note: When abandoning pipelines, if there is leakage past a valve, stopper or pinch, do not use temporary end closures unless the source of leakage can be determined and safely vented. Never control pressure build up by using a temporary end closure such as a redwood plug, plastic cap, or plug.

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Table 1. Permanent Pipe End Closure Selection Guide for Steel, Cast Iron and Copper Pipe.

Nominal Pipe Size (in)	Steel and Wrought Iron		
	Aband.	MAOP	
		100 psig & Under	Over 100 psig
¾ 1 1-1/4 1-1/2 2 3 4 6 8 10 12 16 18+	Plug (1) or Fish Tail (2) or Plate (4)	Fish Tail (2) or Plate (4)	Weld Cap (9) or Blind Flange (6)
	Thin Plate (5) or Concrete/ Cold Mix (8)	Weld Cap (9) or Blind Flange (6)	

Table 2. Permanent Pipe End Closure Selection Guide for Plastic Pipe.

Nominal Pipe Size (in)	Plastic	
	Aband.	MAOP 60 psig & Under
All Sizes	Plug (1) or Concrete/ Cold Mix (8)	Cap (10)

Table 3. Descriptions for Items Listed in Tables 1 & 2.

Item No.	Item Description
1	Plastic plug or cap – caplug
2	Fish tail - pinch or flatten end and weld
3	Fish tail - pinch or flatten end and braze weld
4	Dead end plate
5	Thin plate - 10 gauge sheet steel to 1/4" flat steel plate
6	Blind flange – preferred where internal inspection may be required
7	Compression cap, Dresser Style 31 - securely blocked and anchored
8	Concrete or /cold mix - pack ends
9	Weld cap
10	Plastic cap - fusion type

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II.Q. Record Keeping (192.517)

Records shall be maintained for each new pipeline or service line installation. The inspector is responsible for completing appropriate Company Forms and supplementing these forms with sketches, maps, service cards, etc., in order to document the installation of new pipelines or the substantial modification of existing system facilities. Any unusual pipe configurations, all records of any strength or leak tests, and any other pertinent information that may affect the future operation and maintenance of the new installation should be noted on the record of installation. Installation of cathodic protection appurtenances shall be documented on appropriate Company Form(s).

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II.3.IV. WELDING REQUIREMENTS

IV.A. General (192.233, 192.225, 192.227, 192.229 192.231, 192.233, 192.235)

IV.A.1. All welding performed on steel pipe in this system shall conform to the standards outlined in this section. Each welding procedure shall be qualified by destructive testing. Shielded metal arc-welding is the preferred method and should be utilized whenever practical. Oxyacetylene welding is permitted on piping that has a diameter of two and three-eighths inches (2-3/8") and under, and will operate at less than one hundred (100) psig.

IV.A.2. Procedures for shielded metal arc-welding and oxyacetylene welding are outlined in this section. All welding performed on this system shall also adhere to API Standard 1104, "Welding of Pipelines and Related Facilities" and the Minimum Federal Safety Standards, Section 192, Subpart E: Welding of Steel in Pipelines. All personnel (including outside contractors) who weld steel pipe in this system must be qualified as outlined in this section. The ability of welders to make sound welds will be determined by test welds using the procedures outlined in this section. Test welds may be evaluated by qualified operating personnel or testing laboratories.

IV.A.3. Protection from weather: All welding shall be done in areas protected from weather conditions and that would impair the quality of the weld. Filler metals and fluxes shall be protected from deterioration and excessive moisture changes. Welding rods or other material that show signs of damage or deterioration shall not be used. During windy or rainy weather, suitable protection shall be provided to protect the work.

IV.A.4. Miter Joints: Miter joints should not be used other than for final alignments for tie-in purposes, but are allowed under the following conditions:

IV.A.4.a. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of thirty percent (30%) or more of SMYS may not deflect the pipe more than three degrees (3°).

IV.A.4.b. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of less than thirty percent (30%), but more than ten percent (10%), of SMYS may not deflect the pipe more than twelve and one-half degrees (12.5°) and must be a distance equal to one pipe diameter or more away from any other miter joint, as measure from the crotch of each joint.

IV.A.4.c. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of ten percent (10%) or less of SMYS may not deflect the pipe more than ninety degrees (90°).

IV.A.5. Each welding procedure shall be recorded in detail, including the results of the qualifying tests. This record shall be retained and followed whenever the procedure is used.

IV.A.6. Preparation for Welding: Before beginning any welding, the welding surfaces shall be clean and free of any material that may be detrimental to the weld, and the pipe or component must be aligned to provide the most favorable condition for depositing the root bead. This alignment shall be preserved while the root bead is being deposited.

IV.B. Inspection, Testing, and Repair of Welds (192.241, 193.243, 192.245)

All welds are visually inspected by the welder and, as needed, by a qualified person. Welds designed to operate at a SMYS of less then 20% can be further inspected by either radiographic or ultrasonic inspection, or by cutting out a cylindrical section of the pipe containing the weld for destructive testing.

Each weld will be visually inspected by a qualified welding inspector to ensure the joint design, fit up, and welding is performed and in compliance and in accordance with the welding procedures in this section and Section 9 of API Standard 1104.

IV.B.1. Nondestructive Testing: Welds designed to operate at 20% SMYS and over shall be nondestructively tested 100% (except as noted below) by radiographic or magnetic particle inspection in accordance with written procedures and by qualified persons who have experience and training with the equipment employed in testing and regarding the interpretation of weld acceptability.

The acceptability of a weld that is nondestructively tested or visually inspected is determined according to the standards in section 9 of API Standard 1104. However, if a girth weld is unacceptable under those standards for a reason other than a crack, and if the Appendix to API Standard 1104 applies to the weld, the acceptability of the weld may be further determined under that Appendix.

IV.B.2. Exceptions: The following are exceptions to the 100% rule for each day's field butt welds. Welds are selected at random and are nondestructively tested over the entire circumference. Exceptions must meet the following criteria and be approved by a qualified welding inspector:

IV.B.2.a. Pipe with a nominal diameter of less than six (6") inches.

IV.B.2.b. Pipelines operated with hoop stresses less than forty (40%) percent of SMYS having so few welds in number as to make nondestructive testing impractical need not be nondestructively tested if approved by a qualified welding person using the standards in Section 9 of API Standard 1104.

IV.B.2.c. In Class 1 locations, except offshore, sample at least ten (10%) percent.

IV.B.2.d. In Class 2 locations, sample at least fifteen (15%) percent.

IV.B.2.e. In Class 3 and Class 4 locations, at crossing of major or navigable rivers, offshore, and within railroad or public highway rights-of-way, including tunnels, bridges, and overhead road crossings, sample one hundred (100%) percent unless impracticable, in which case at least ninety (90%) percent shall be tested.

IV.B.2.f. At pipeline tie-ins including tie-ins of replacement sections, sample one hundred (100%) percent.

IV.B.2.g. Except for a welder whose work is isolated from the principal welding activity, a sample of each welder's work for each day must be nondestructively tested.

IV.B.3. Records: Records showing the milepost, engineering station, or by geographic feature, the number of girth welds made, the number nondestructively tested, the number rejected, and the disposition of the rejects shall be retained for the life of the pipeline.

IV.B.4. Defects: Unacceptable defects in welds shall be repaired or cut out. Repaired defects must be nondestructively tested again. Any defect in a previously repaired weld shall be removed from the pipeline. Except for offshore pipelines, a weld must be removed if it has a crack that is more than 8% of the weld length. Each weld that is repaired must have the defect removed down to sound metal and the segment to be repaired must be preheated if conditions exist which would adversely affect the quality of the weld repair.

IV.B.5. Standard Radiography Procedures: Only qualified technicians using approved procedures are allowed to produce and interpret radiographs that are in accordance with section 6 and 8 of API 1104.

IV.B.5.a All radiographic work should include the following information:

IV.B.5.a.1. Weld examination and procedure record reports of each day's activities that will include detail from section 8.1.2.2 API 1104.

IV.B.5.a.2. Each filmstrip is clearly identified. The identification includes as a minimum:

i. The company's name and job number

ii. The weld number and date

iii. Wraparound number belt with lead numbers spaced evenly around the circumference, to be used to orient the weld

iv. Penetrameters meeting requirements of section 8.1.4 and 8.1.5 that are spaced on the radiograph according to section 8.1.6 of API 1104.

IV.C. Welder Qualification Procedures (192.227, 192.229)

Only qualified welders are eligible to weld on Frontier Natural Gas pipelines. Qualification is done in accordance with part 192.227 of the DOT using the guidelines from section 6 of API 1104 or section IX of the ASME Boiler and Pressure Vessel Code. Two levels of welder qualification are available.

High Stress	Qualified to weld on all pipelines, including those with hoop stresses of twenty (20%) percent or more of SMYS.
Low Stress	Qualified for work on pipelines that operate at hoop stresses less than twenty (20%) percent of SMYS.

Butt-welding is used for initial qualification for either level of shielded metal arc-welding or oxyacetylene welding. Fabrication and fillet welding require additional qualification. A welder qualified for high stress welding is automatically qualified for low stress.

Successful completion of a Frontier Natural Gas welding test qualifies a welder for a six-month period in the process they tested in. After the initial test a welder stays qualified by engaging in that process within the preceding six calendar months and having a sample tested by radiography or destructively tested. No welder whose qualification is based on nondestructive testing may weld compressor station pipe and components.

IV.C.1. To qualify for High or Low Stress welding, the welder shall be qualified in accordance with this procedure and as listed in API Standard 1104, Section 6 or 9 and be tested every six (6) months.

IV.C.1.a The buttweld test for shielded metal arc welding shall be made on pipe of any diameter twelve (12") inches or smaller. The test weld shall be made with the pipe in a horizontal fixed position so that the test weld includes at least one (1) section of overhead position welding.

IV.C.1.b. To qualify for fabrication that includes branch and fillet welds, the welder makes a size for size branch connection, in the overhead position, that is equal to or larger than the pipe size he will be welding

IV.C.1.c. The test weld shall be acceptable if it meets the requirements of API 1104, 3.4 and either 3.5 or 3.6.

IV.C.2. To qualify for Low Stress, the welder must be qualified by the following procedures extracted from the Minimum Federal Safety Standards, Section 192, Appendix C.

IV.C.2.a. The butt-weld test shall be made on pipe of any diameter (6") inches or smaller. The test weld shall be made with the pipe in a horizontal fixed position so that the test weld includes at least one (1) section of overhead position welding.

IV.C.2.b. The beveling, root opening, and other details must conform to the procedure specification under which the welder is qualified.

IV.C.2.c. The test weld shall be cut into four (4) coupons and subjected to the root bend test. If, as a result of this test, a crack develops in the weld material or between the weld and base metal more than one-eighth (1/8") inch long in any direction, this shall be cause for rejection. Cracks occurring on the corner of the specimen during testing shall not be considered. If no more than one (1) coupon is rejected, the weld is to be considered as acceptable.

IV.C.3. Welders who are to make welded service line connections to mains should be required to satisfactorily pass the following tests:

IV.C.3.a. Weld a service line connection fitting to a pipe section having the same diameter as a typical main. This weld should be made in the same position as this type of weld is made in the field. The weld should be rejected if it shows a serious undercutting or if it has rolled edges.

IV.C.3.b. The weld should be tested by attempting to break the fitting off the run pipe by any available means (knocking off). A sample shall be rejected if the broken weld at the junction of the fitting and run pipe shows incomplete fusion, overlap, or poor penetration.

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IV.C.4. For the periodic checking of welders who work on small service lines only (2" or smaller in diameter), the following special field test may be employed. This test should not be used as a substitute for the original qualifying test.

IV.C.4.a. Two sample welds made by the welder under test should be taken from steel service line. Each sample should be cut eight (8") inches long with the weld located approximately in the center. One sample shall have the ends flattened and the entire joint subjected to the tensile strength test. Failure must be in the parent metal and not adjacent to or in the weld metal to be acceptable. The second sample shall be centered in the guided bend testing machine and bent to the contour of the die for a distance of two (2") inches on each side of the weld. The sample (to be acceptable) must show no breaks or cracks after removal from the bending machine.

IV.C.4.b. When a tensile strength testing machine is not available, two (2) bend test samples will be acceptable in lieu of one (1) tension and one (1) bending test.

IV.C.5 Records shall be kept of the original tests and all subsequent tests conducted on the work of each welder.

IV.D. Standard Welding Procedure Specification for Shielded Metal Arc-Welding

The standard procedure specification for metal arc-welding of carbon steel pipes, valves, fittings, and flanges is as follows:

IV.D.1. Process: Manual metal arc-welding.

IV.D.2. Base Metal: The base material shall conform to the specifications for API Standard 5L pipe and applicable ASTM specifications.

IV.D.3. Filler Metal: The filler metal shall conform to ASW-ASTM Class E-6010, E-7010-G, or E-8010-G.

IV.D.4. Position: As shown on the attached drawings and with longitudinal seams of adjacent pipe lengths offset one (1") inch or more.

IV.D.5. Preparation of Base Material: All surfaces to be welded shall be clean and free of material that may be detrimental to the weld. The ends of pipe at all welded joints shall be properly beveled, made by machine, or an appropriate oxygen cutting machine/guide.

IV.D.6. Electrical Characteristics: Direct current reverse polarity.

IV.D.7. Welding Layers: The welding current and manner of depositing the weld metal shall be such that the layers of welding as deposited shall have a neat appearance. Each completed weld shall be free of overlaps, undercuts, excessive convexity, scale, oxides, pin holes, non-metallic inclusions, air pockets, or any other defect. The size of electrode for each pass on each size of pipe shall be as shown on the attached

drawings. Each bead applied around the pipe shall be thoroughly cleaned of all scale, slag, or other foreign material before the next bead is started. The second pass (hot pass) shall be supplied immediately after the root pass is complete. The filler bead and final bead shall be applied as soon as practical behind the hot pass (within 72 hrs.). The completed weld shall project a minimum of one-sixteenth (1/16") inch above the surface of the pipe at all points and shall have a width of not less than one-sixteenth (1/16") inch over the shoulder of the pipe bevel.

IV.D.8. Cleaning: All slag or flux remaining on any bead of welding shall be removed before laying down the next successive bead. To increase weld quality, "high spots", and "start and stops" should be ground.

IV.D.9. Defects: Any cracks or blow holes that appear on the surface of any bead of welding shall be removed by chipping, grinding, or gouging before depositing the next successive bead of welding.

IV.D.10. Preheating: Preheating is not required above 32 degrees F. air temperature. If welding is done below 32 degrees F. air temperature, the pipe joint shall be heated to 250 degrees F. before welding is started.

IV.D.11. Cooling: Cooling of welds by any substance other than air shall not be permitted. Accelerated cooling by any method shall not be used until the weld is below 600 degrees F. The pipe shall not be moved until the weld is below 600 degrees F.

IV.D.12 Alignment: An internal line-up clamp is used for butt welds where possible. An external line-up clamp is used for all tie-in butt welds and other locations where it is impractical to use an internal clamp. Internal line-up clamps are held firmly in place until the root pass is 100% completed. External line-up clamps are held firmly until the

root pass has been placed uniformly around at 50% of the circumference. Tack welds are avoided.

IV.D.13 Pipe Movement: There shall be no movement of the weld joint until the hot pass is completed.

IV.E. Standard Welding Procedure Specification Oxyacetylene Welding

The standard procedure specification for oxyacetylene welding of carbon steel pipe, valve, fittings, and flanges is as follows:

IV.E.1. Process: Manual oxyacetylene.

IV.E.2. Base Metal: The base material shall conform to the specifications for API Standard 5L pipe and applicable ASTM specifications.

IV.E.3. Filler Metal: Airco No. 1 Alloy steel rod (or equal) ultimate tensile strength: 62,000 psi minimum ASW specification A5.2-46T, ASTM A251-46T, Classification GA-60.

IV.E.4. Preparation of Base Material: All surfaces to be welded shall be clean and free of material that may be detrimental to the weld. The ends of pipe at all welded joints shall be properly beveled.

IV.E.5. Size of Welding Tip: As shown on the attached drawings.

IV.E.6. Nature of Flame: The flame used for welding shall be neutral.

IV.E.7. Method of Welding: As shown on the attached drawings.

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IV.E.8. Size of Welding Rod: As shown on the attached drawings.

IV.E.9. Number of Layers of Welding: One (1).

IV.E.10. Defects: Any cracks or blow holes that appear on the surface of any layer of welding shall be removed by chipping or gas gouging or grinding. If the defect can be removed without grinding completely through the weld, repair may be made with the same welding process that was originally used.

IV.E.11. Line-up Clamp: External when necessary. Line-up clamp may be removed after tacking.

IV.E.12. Cooling: Cooling of welds by using any substance other than air shall not be permitted while the weld temperature is above 600 degrees F. The pipe shall not be moved until the weld is below 600 degrees F.

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V. PIPE DESIGN

A. General (192.103)

Pipe used for this system must be designed with sufficient wall thickness, or must be installed with adequate protection, to withstand anticipated external pressures and loads that will be imposed on the pipe after installation.

B. Design Formula for Steel Pipe (192.105, 192.107)

1. The design pressure for steel pipe is determined in accordance with the following formula as per 192.105:

$$P = \frac{2\,St}{D} \times F \times E \times T$$

P = Design pressure in pounds per square inch gauge.

S = Yield strength in pounds per square inch. For pipe that is manufactured in accordance with a specification listed in Section 192, Appendix B, I, the yield strength to be used is the SMYS stated in the listed specifications. For pipe manufactured by other specifications, see Section 192.107(b).

D = Nominal outside diameter of the pipe in inches.

t = Nominal wall thickness of the pipe in inches. If this is unknown, it is determined in accordance with 192.109. Additional wall thickness required for concurrent external loads in accordance with 192.103 may not be included in computing design pressure.

F = Design factor determined in accordance with (3) below.

E = Longitudinal joint factor determined in accordance with (4) below.

T = Temperature derating factor determined in accordance with (5) below.

2. If steel pipe that has been subjected to cold expansion to meet the SMYS is subsequently heated, other than by welding or stress relieving as a part of welding, the design pressure is limited to 75 percent of the pressure determined under paragraph 1 of this section if the temperature of the pipe exceeds 900 F (482 C) at any time or is held above 600 F (316 C) for more than one hour.

3. Design Factor (F) for Steel Pipe (192.111).

   a. Except as otherwise provided in paragraphs (2), (3), and (4) of this section, the design factor to be used in the design formula in 192.105 is determined in accordance with the following table:

Specific Condition	CL 1	CL 2	CL 3	CL 4
Within private right-of-way	0.72	0.60	0.50	0.40
Within unimproved private road	0.72	0.60	0.50	0.40
Within hard-surfaced public road	0.60	0.60	0.50	0.40
Within unimproved public road	0.72	0.60	0.50	0.40
Within public street or highway	0.60	0.60	0.50	0.40
Within railroad right-of-way	0.60	0.60	0.50	0.40
Uncased crossing of railroad right-of-way	0.72	0.60	0.50	0.40
Uncased crossing of unimproved private road	0.72	0.60	0.50	0.40
Uncased crossing of hard-surfaced private road	0.60	0.50	0.50	0.40
Uncased crossing of unimproved public road	0.60	0.60	0.50	0.40
Uncased crossing of public street or highway	0.60	0.50	0.50	0.40
Uncased crossing of railroad right-of-way	0.60	0.50	0.50	0.40
Cased crossing of all roads and railroads	0.72	0.60	0.50	0.40
Supported by a bridge of any kind	0.60	0.60	0.50	0.40
Fabricated assembly *	0.60	0.60	0.50	0.40
Pig launcher and receiver assembly	0.50	0.50	0.50	0.40
Compressor, regulating, and measuring stations	0.50	0.50	0.50	0.40
On a platform located offshore or in inland navigable waters	0.50	0.50	0.50	0.40

* Includes vessels (separators, odorizers, drip legs), mainline valve assemblies, cross-connections and river crossing headers, or is located within five pipe diameters in any direction from the last fitting of a fabricated assembly, other than a transition piece or an elbow used in place of a pipe bend which is not associated with a fabricated assembly.

4. Longitudinal Joint Factor (E) for Steel Pipe (192.113).

The longitudinal joint factor to be used in the design formula in 192.105 is determined in accordance with the following table:

Specification	Pipe Class	Longitudinal Joint Factor (E)
ASTM A 53	Seamless	1.00
	Electric resistance welded	1.00
	Furnace butt welded	0.60
ASTM A 106	Seamless	1.00
ASTM A 333	Seamless	1.00
ASTM A 333M	Electric welded	1.00
ASTM A 381	Double submerged arc welded	1.00
ASTM A 671	Electric-fusion-welded	1.00
ASTM A 672	Electric-fusion-welded	1.00
ASTM A 691	Electric-fusion-welded	1.00
API 5L	Seamless	1.00
	Electric resistance welded	1.00
	Electric flash welded	1.00
	Submerged arc welded	1.00
	Furnace butt welded	0.60
Other	Pipe over 4 inches	0.80
Other	Pipe 4 inches or less	0.60

If the type of longitudinal joint cannot be determined, the joint factor to be used must not exceed that designated for "Other".

5. Temperature Derating Factor (T) for Steel Pipe (192.115).

   The temperature derating factor to be used in the design formula in 192.105 is determined as follows:

Gas temperature in degrees Fahrenheit	Temperature derating factor (T)
250 or less	1.000
300	0.967
350	0.933
400	0.900
450	0.867

For intermediate gas temperatures, the derating factor is determined by interpolation.

C. Calculation of Hoop Stress and Percent of SMYS

Hoop stress may be calculated using the following equation:

$$\text{Hoop Stress (psi)} = \frac{pD}{2t}$$

Where p = internal pipe pressure psig

D = nominal outside diameter of pipe (inches)

t = nominal pipe wall thickness (inches)

Once hoop stress is calculated for a pipeline by the formula above under existing or proposed operating conditions, the percent (%) of specified minimum yield strength (SMYS) is obtained by dividing the hoop stress by the yield strength listed in the pipe manufacturer's specification. The material selection of this chapter lists yield strengths for common types of steel pipe.

$$\%\ \text{SMYS} = \frac{\text{Hoop Stress}}{\text{Yield Strength}} \times 100$$

Example: Calculate the % of SYMS for a 4.5" OD (4" nominal) steel pipe manufactured under API 5L X 42 specifications with a wall thickness of .188" operating at 300 psig.

As per 5L X42: yield strength = 42,000 psi

$$\text{Hoop stress} = \frac{PD}{2t} = \frac{(300)(4.5)}{(2)(0.188)} = 3590 \text{ psi}$$

$$\%\text{ SMYS} = \frac{\text{Hoop Stress}}{\text{Yield Strength}} \times 100 = \frac{3590}{42{,}000} \times 100 = 8.55\%$$

D. Design of Plastic Pipe (192.121, 192.123)

The design pressure for plastic pipe is determined in accordance with the following formula, subject to the limitations of 192.123:

$$P = 2S \frac{t}{(D-t)} \times 0.32$$

$$P = \frac{2S}{(SDR-1)} \times 0.32$$

P = Design pressure, gauge, kPa (psi).

S = For thermoplastic pipe the long-term hydrostatic strength determined in accordance with the listed specification at a temperature equal to 23°C (73°F), 38°C (100°F), 49°C (120°F), or 60°C (140°F); for reinforced thermosetting plastic pipe, 75,842 kPa (11,000 psi).

t = Specified wall thickness, mm (in.).

D = Specified outside diameter, mm (in.).

SDR = Standard dimension ratio, the ratio of the average specified outside diameter to the minimum specified wall thickness, corresponding to a value from a common numbering

system that was derived from the American National Standards Institute preferred number series 10.

Design limitations for the plastic pipe formula above are as follows:

1. The design pressure may not exceed a gauge pressure of 689 kPa (100 psig) for plastic pipe used in:

   a. Distribution systems; or
   b. Classes 3 and 4 locations.

2. Plastic pipe may not be used where operating temperatures of the pipe will be:

   a. Below minus –29°C (-20°F); or –40°C (-40°F) if all pipe and pipeline components whose operating temperature will be below –29°C (-20°F) have a temperature rating by the manufacturer consistent with that operating temperature or
   b. In the case of thermoplastic pipe, above the temperature at which the long-term hydrostatic strength used in the design formula under 192.121 is determined. However, if the pipe was manufactured before May 18, 1978 and its long-term hydrostatic strength was determined at 23°C (73°F), it may be used at temperatures up to 38°C or (100°F). In the case of reinforced thermosetting plastic pipe, above 66°C (150°F).

3. The wall thickness for thermoplastic pipe may not be less than 1.57 millimeters (0.062 in.).

4. The wall thickness for reinforced thermosetting plastic pipe may not be less than that listed in the following table:

Nominal size in inches	Minimum wall thickness in millimeters	(inches)
2	1.52	(0.060)
3	1.52	(0.060)
4	1.78	(0.070)
6	2.54	(0.100)

Additional factors to consider when designing plastic pipe:

1. Impact and Ductility.

The impact and ductility properties of plastics should be evaluated when the material is intended for use in facilities subjected to low temperatures.

2. Petroleum Gases.

The pressure-temperature relationship with petroleum gases should be such that condensation will not occur.

3. Hot Taps.

To minimize the possibility of a blowout when making a saddle type hot tap connection by heat fusion on pipe with a wall thickness of 0.216 inches or less, operating at higher pressures, it may be necessary to require heavier wall thickness than determined by the pressure design formula. The manufacturer of the pipe should be contacted for recommendations.

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VI. MISCELLANEOUS DESIGN

A. Structural and Stresses

1. General (192.143, 192.155, 192.153)

Each component of a pipeline must be able to withstand operating pressures and other anticipated loadings without impairment of its serviceability with unit stresses equivalent to those allowed for comparable material in pipe in the same location and kind of service. However, if design based upon unit stresses is impractical for a particular component, design may be based upon a pressure rating established by the manufacturer by pressure testing that component or a prototype of the component.

The designer should select components that will withstand the field test pressure to which they will be subjected without failure or leakage and without impairment to their serviceability. Consideration should also be given to pulsation-induced vibrations that could produce excessive cyclic stresses.

Each welded branch connection made to pipe in the form of a single connection, or in a header or manifold as a series of connections, must be designed to ensure that the strength of the pipeline system is not reduced, taking into account the stresses in the remaining pipe wall due to the opening in the pipe or header, the shear stresses produced by the pressure acting on the area of the branch opening, and any external loadings due to thermal movement, weight, and vibration.

Except for branch connections and assemblies of standard pipe and fittings joined by circumferential welds, the design pressure of each component fabricated by welding, whose strength cannot be determined, must be established in accordance with paragraph UG-101 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.

Orange-peel bull plugs and orange-peel swages may not be used in pipelines that are to operate at a hoop stress of 20 percent or more of the SMYS of the pipe.

Except for flat closures designed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code, flat closures and fish tails may not be used on pipe that either operates at 100 psig, or more, or is more than 3 inches in nominal diameter.

2. Supports and Anchors (192.161)

   a. Each pipeline and its associated equipment must have enough anchors or supports to -

      1. Prevent undue strain on connected equipment;
      2. Resist longitudinal forces caused by a bend or offset in the pipe; and
      3. Prevent or damp out excessive vibration.

   b. Each exposed pipeline must have enough supports or anchors to protect the exposed pipe joints from the maximum end force caused by internal pressure and any additional forces caused by temperature expansion or contraction or by the weight of the pipe and its contents.

   c. Each support or anchor on an exposed pipeline must be made of durable, non-combustible material and must be designed and installed as follows:

      1. Free expansion and contraction of the pipeline between supports or anchors may not be restricted.
      2. Provision must be made for the service conditions involved.
      3. Movement of the pipeline may not cause disengagement of the support equipment.

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d. Each support of an exposed pipeline operated at a stress level of 50 percent or more of SMYS must comply with the following:

1. A structural support may not be welded directly to the pipe.
2. The support must be provided by a member that completely encircles the pipe.
3. If an encircling member is welded to a pipe, the weld must be continuous and cover the entire circumference.

e. Each underground pipeline that is connected to a relatively unyielding line or other fixed object must have enough flexibility to provide for possible movement, or it must have an anchor that will limit the movement of the pipeline.

f. Except for offshore pipelines, each underground pipeline that is being connected to new branches must have a firm foundation for both the header and the branch to prevent detrimental lateral and vertical movement.

g. Unsupported spans are limited to the following design guidelines:

1. The maximum unsupported span length of a pipeline is limited by bending stress and deflection. To obtain this maximum distance between supports, take the lowest of the span length based on stress (Section g.3) and the span length based on deflection (Section g.4) values.

2. Restrictions

The existence of acetylene welds in a span does not limit span length providing that the quality of weld is known to be acceptable. If the quality of acetylene welds is not known, the following is required:

- The Company radiographically inspects the weld for defects in the weld. If the weld appears to have significant defects, a band or sleeve can be installed over the weld.

- The Company installs a band or sleeve over all welds without radiographic inspection.

3. Maximum Span Based on Stress

- General Formula

The limits for unsupported pipe spans based on bending stress are directly influenced by the forces due to the pipe's weight. Use the following formula for calculating the maximum unsupported span length:

$$L_S = \sqrt{\frac{S \times Z}{1.5 \times W}}$$

where:

L_S	=	Maximum Unsupported Span Length based on stress (ft)
S	=	Pipe Pressure Parameter per next bullet (psi)
Z	=	Section Modulus of pipe per next section (in^3)
W	=	Weight of pipe, wrap, and water (if used) per linear foot - (lb/ft)

- Pipe Pressure Parameter

i. For pipe containing gas, and designed to be supported for the lifetime of the pipeline, use the following formula for calculating the Pipe Pressure Parameter used in the formula in:

$$S_G = (0.75 \times Y \times F) - \left[\frac{0.25 \times P \times D}{t}\right]$$

where:

S_G	=	Pipe Parameter for gas filled pipe in service (psi)
Y	=	SMYS - Specified Minimum Yield Strength of pipe (psi)
F	=	Design Factor for pipeline segment
P	=	MAOP of pipeline (psig)
D	=	Outside Diameter of pipe (in)
t	=	Wall Thickness of pipe (in)

ii. For pipe containing water during a hydrostatic test of the pipeline, use the formula for calculating the Pipe Pressure Parameter used in the formula in Section g.3, 1st bullet:

$$S_W = Y - \left[\frac{0.25 \times H \times D}{t}\right]$$

where:

S_W	=	Pipe Parameter for water filled pipe during test (psi)

Y	=	SMYS - Specified Minimum Yield Strength of pipe (psi)
H	=	Hydrostatic Test Pressure (psig)
D	=	Outside Diameter of pipe (in)
t	=	Wall Thickness of pipe (in)

- Section Modulus

Calculate the pipe's section modulus using the following formula:

$$Z = \frac{\left(D^4 - d^4\right)}{10.2 \times D}$$

where:

Z	=	Section Modulus of pipe (in^3)
D	=	Outside Diameter of pipe (in)
d	=	Inside Diameter of pipe (in)

- Maximum Span Based on Deflection

The limits for unsupported pipe spans based on deflection are determined by a maximum deflection allowed by the pipeline between supports. See Table 1 for maximum spans for different pipe sizes.

Table 1. Maximum Unsupported Span Based on Deflection.

Nominal Pipe Size (in)	Maximum Span for Gas Filled Pipe (ft)	Maximum Span for Water Filled Pipe (ft)
2	21	19
3	29	25
4	33	28
6	44	35
8	53	41
10	61	45
12	69	51
16	81	58
18	88	61
20	94	64
22	101	67
24	107	72
26	113	72
30	125	79
34	137	89
36	142	92

- Example Calculation

  Six-inch grade X-42 wrapped pipe with wall thickness of 0.188 inches will be strength tested to 2380 psig using water as the medium. What is the maximum span length of pipe that can go unsupported?

  Given:

  D = 6.625 in d = 6.249 in t = 0.188 in H = 2380 psig Y = 42,000 psi

  Maximum Span Based on Stress:

  $Z = 5.94\ in^3$ $S_W = 21{,}032$ psi

  $W_{PIPE} = 12.94$ lb/ft $W_{WATER} = 13.29$ lb/ft $W_{WRAP} = 2.03$ lb/ft

  W = 28.26 lb/ft

  $L_S = 54$ ft

  Maximum Span Based on Deflection:

  $L_D = 35$ ft

  Therefore, the **Maximum Unsupported Span Length** for this pipeline is **35 ft**.

3. Flexibility (192.159)

Each pipeline must be designed with enough flexibility to prevent thermal expansion or contraction from causing excessive stresses in the pipe or components, excessive bending or unusual loads at the joints, or undesirable forces or moments at points of connection to equipment, or at anchorage or guide points.

The thermal expansion of the more common materials used for piping should be determined from Tables below. The expansion to be considered is the difference between the expansion for the maximum expected operating temperature and that for the expected average erection temperature. For materials not included in these tables, or for precise calculations, reference should be made to authoritative source data, such as publications of the National Bureau of Standards.

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THERMAL EXPANSION OF PIPING MATERIALS
CARBON AND LOW ALLOY
HIGH TENSILE STEEL AND WROUGHT IRON

Temperature Degree F	Total expansion in Inches per 100 feet above 32NF.
32	0.0
60	0.2
100	0.5
125	0.7
150	0.9
175	1.1
200	1.3
225	1.5
250	1.7
300	2.2
350	2.6
400	3.0
450	3.5

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COEFFICIENTS OF THERMAL EXPANSION
FOR PLASTIC PIPE

Pipe material	Nominal Coefficients of thermal expansion (1) (x 10 E-5 in./in.deg.F)	Expansion inches 100' pipe, deg.F increase
PE 2306	9.0	0.108
PE 2406	9.0	0.108
PE 3306	9.0	0.108
PE 3406	9.0	0.108
PE 3408	9.0	0.108
PVC 1120	3.0	0.036
PVC 1220	3.5	0.042
PVC 2110	5.0	0.060
PVC 2112	4.5	0.054
PVC 2116	4.0	0.048
CAB MH08	8.0	0.096
CAB S004	9.5	0.114
PB 2110	7.2	0.086
ABS 1210	5.5	0.066

Individual compounds may differ from the values in this table as much as ∀10 percent. More exact values for specific commercial products may be obtained from the manufacturer.

PE = polyethylene
PVC = polyvinylchloride
CAB = cellulose acetate butyrate
PB = polybutylene
ABS = acrylonitrile-butadiene-styrene

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Specific procedures for installing plastic pipe to allow for thermal expansion are detailed in the construction chapter of the Procedures Manual (Volume II, Chapter 3). Considerations for the thermal contraction and expansion of polyethylene pipe shall be made immediately downstream of a pressure reducing device that creates a significant cooling of the gas temperature. Large (over 100 psig) reductions in gas pressure and variations in gas flow may create a constant expansion and contraction of polyethylene pipe close to a regulator station. Where these significant temperature effects are present, steel pipe should be utilized instead of polyethylene pipe.

Formal calculations should be required only where reasonable doubt exists as to the adequate flexibility of the system.

Flexibility should be provided by the use of bends, loops, or offsets, or provisions should be made to absorb thermal changes by use of expansion joints or couplings of the slip joint type or expansion joints of the bellows type. If expansion joints are used, anchors or ties of sufficient strength and rigidity should be installed to provide for end forces due to fluid pressure and other causes.

In calculating the flexibility of a piping system, the system should be treated as a whole. The significance of all parts of the line and all restraints (such as solid supports or guides) should be considered.

Calculations should take into account stress intensification factors found to exist in components other than plain straight pipe. Credit may be taken for the extra flexibility of such components.

Properties of pipe and fittings for these calculations should be based on nominal dimensions and the joint factor E should be taken as 1.00.

Whether piping is cold sprung or not, the total range in temperature should be used in all expansion calculations. In addition to the expansion of the line itself, the linear and angular movements of the equipment to which it is attached should be considered.

B. Valves

1. Distribution System Valves (192.181)

a. General

Each high-pressure distribution system must have valves spaced so as to reduce the time to shut down a section of main in an emergency. The valve spacing is determined by the operating pressure, the size of the mains, and the local physical conditions.

Each regulator station controlling the flow or pressure of gas in a distribution system must have a valve installed on the inlet piping at a distance from the regulator station sufficient to permit the operation of the valve during and emergency that might preclude access to the station.

Each valve on a main installed for operating or emergency purposes must comply with the following:

1. The valve must be placed in a readily accessible location so as to facilitate its operation in an emergency.

2. The operating stem or mechanism must be readily accessible.

3. If the valve is installed in a buried box or enclosure, the box or enclosure must be installed so as to avoid transmitting external loads to the main.

b. Factors to Consider in Designing Distribution System Valves

The following physical characteristics should be considered when establishing high pressure distribution system line valves locations:

1. Size of area to be isolated.

2. Topographical features (such as rivers, major highways and railroads).

3. Number of valves necessary to isolate the area.

The following operating characteristics should be considered when establishing locations for high pressure distribution system line valves:

1. Number of customers and customers such as hospitals, schools, and commercial and industrial users that would be affected.

2. Time required for available personnel to carry out isolation procedures.

3. Time required for controlling the pressure in the isolated area by means such as venting and transferring gas to adjacent systems.

4. Time required for available personnel to restore service to the customer.

When a distribution system is supplied by more than one regulator station, or when the system may reasonably be expected to create a significant backfeed, consideration should be given to isolating the stations from backfeed during an emergency. This may be accomplished by one of the following:

1. Installing a valve on the station outlet piping.

2. Utilizing valving in the distribution system to prevent a backfeed into the station.
3. Developing a procedure to shut down all stations supplying the system.

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2. Transmission System Valves (192.179)

Each transmission line, other than offshore segments, must have sectionalizing block valves spaced as follows, unless in a particular case the Administrator finds that alternative spacing would provide an equivalent level of safety.

a. Each point on the pipeline in a Class 4 location must be within 2 1/2 miles of a valve.

b. Each point on the pipeline in a Class 3 location must be within 4 miles of a valve.

c. Each point on the pipeline in a Class 2 location must be within 7 1/2 miles of a valve.

d. Each point on the pipeline in a Class 1 location must be within 10 miles of a valve.

Each sectionalizing block valve on a transmission line, other than offshore segments, must comply with the following:

a. The valve and the operating device to open or close the valve must be readily accessible and protected from tampering and damage.
b. The valve must be supported to prevent settling of the valve or movement of the pipe to which it is attached.

Each section of a transmission line, other than offshore segments, between main line valves must have a blowdown valve with enough capacity to allow the transmission line to be blown down as rapidly as practicable. Each blowdown discharge must be located so the gas can be blown to the atmosphere without hazard and, if the transmission line is adjacent to an overhead electric line, so that the gas is directed away from the electrical conductors.

C. Vaults (192.185, 192.183, 192.189, 192.187)

This system does not utilize underground vaults or pits for housing pressure relieving, pressure limiting, or pressure regulating stations. If the use of vaults or pits to house such equipment becomes necessary in the future, the design of such vaults shall be done in accordance with 192.183, 192.185, 192.187, 192.189.

D. Passage of Internal Inspection Devices (192.150)

Except as detailed below, each new transmission line and each line section of a transmission line where the line pipe, valve, fitting, or other line component is replaced must be designed and constructed to accommodate the passage of instrumented internal inspection devices.

1. This does not apply to:
   a. Manifolds.
   b. Station piping such as at compressor stations, meter stations, or regulator stations.
   c. Piping associated with storage facilities, other than a continuous run of transmission line between a compressor station and storage facilities.
   d. Cross-overs.
   e. Sizes of pipes for which an instrumented internal inspection device is not commercially available.
   f. Transmission lines, operated in conjunction with a distribution system which is installed in Class 4 locations.
   g. Offshore pipelines, other than transmission lines 10 inches or greater in diameter, that transports gas to onshore facilities.
   h. Other piping that, under Sec. 190.9, the Administrator finds in a particular case would be impracticable to design and construct to accommodate the passage of instrumented internal inspection devices.

2. An operator encountering emergencies, construction time constraints or other unforeseen construction problems need not construct a new or replacement segment of a transmission line to accommodate the passage of instrumented internal inspection devices, if the operator determines and documents why an impracticability prohibits compliance with the first paragraph of this section.

Within 30 days after discovering the emergency or construction problem the operator must petition, under 190.9 for approval that design or construction to accommodate passage of instrumented internal inspection devices would be impracticable. If the petition is denied, within 1 year after that date of the notice of the denial, the operator must modify that segment to allow passage of instrumented internal inspection devices.

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VII. TESTING

A. General (192.503, 192.505, 192.507, 192.509, 192.511, 192.513, 192.515, 192.517, 192.619, 192.725)

No pipeline, pipeline segment, or pipeline component shall be commissioned or reinstated until:

1. It has been tested in accordance with this section and Part 192.619 to substantiate the maximum allowable operating pressure; and
2. Each potentially hazardous leak has been located and eliminated.

All distribution and transmission pipelines, including services, operating below 30% of their SMYS are leak tested before being placed in service. All transmission pipelines that will operate at 30% or more of their SMYS are strength tested before being placed in service.

Service lines temporarily disconnected from the main must be tested from the disconnection point to the stopcock in the same manner as a new service line. However, if gas supply was uninterrupted, as through use of a bypass, the portion of the original service line used to maintain gas supply need not be tested.

The test medium shall be liquid, air, natural gas, or inert gas according to the criteria of this section. Mixtures of air and gas are prohibited. The test medium shall be:

1. Compatible with the material of which the pipeline is constructed;
2. Relatively free of sedimentary materials; and
3. Except for natural gas, nonflammable.

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B. Safety Considerations

1. Welding on steel lines or fusing on plastic lines is prohibited during testing
2. Locate personnel operating test equipment a safe distance from the lines under test.
3. Whenever the test pressure exerts a stress greater than 50% of the line's SMYS, take all practicable steps to keep persons not working on the testing operation outside the area of the test.
4. Visually inspect temporary piping, closures and other test equipment before and during the test in order to insure soundness.
5. If water is the test medium insure spans are adequately supported for the increased weight.
6. Locate blowdown devices away from electrical conductors.
7. Maintain adequate communication between all personnel involved in the test.
8. Take precautions against static electricity during purging by grounding, wetting etc.
9. Insure proper emergency equipment is available i.e. fire extinguishers, breathing apparatus, ear protection, combustible gas indicators, etc.

C. Steel Pipelines that will Operate below 100 psig.

Steel pipelines that will operate at an MAOP less than 100 psig are stand-up leak tested at no less than 100 psig for a minimum of 20 minutes.

D. Steel Pipelines that will operate at 100 psig and greater pressures but at less than 30% SMYS

Use the following table to determine stand-up leak test pressures for steel pipelines that will operate at 100 psig and greater pressures but at less than 30% of SMYS.

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Class Location	Minimum Test Pressure	Maximum Test Pressure			Minimum Duration
		Gas	Air/Nitrogen	Water	
1	110% MAOP	80% SMYS	80% SMYS	100% Yield Pressure	1 Hr.*
2	125% MAOP	30% SMYS	75% SMYS		
3	150% MAOP	30% SMYS	50% SMYS		
4	150% MAOP	30% SMYS	40% SMYS		

Note: Do not subject butt-weld pipe to more than 100% of mill test pressure

E. Steel pipelines that will operate at 30% SMYS or greater pressures

Use the following table and instructions to determine strength test pressures for steel pipelines that will operate at 30% SMYS or greater pressures:

Class Location	Minimum Test Pressure	Maximum Test Pressure			Minimum Duration
		Gas	Air/Nitrogen	Water	
1	110% MAOP(1)	80% SMYS	80% SMYS	100% Yield Pressure	8 Hr. for all*
2	125% MAOP(1)	30% SMYS	75% SMYS		
3	150% MAOP	30% SMYS	50% SMYS		
4	150% MAOP	30% SMYS	40% SMYS		

Note: Do not subject butt-weld pipe to more than 100% of mill test pressure
*time begins after test pressure has stabilized at or above the specified pressure

(1) In class 1 and 2 locations where a building intended for human occupancy is within 300' of the pipeline to be tested, the section within 300' of the building (the section must be at least 600' long unless the pipeline being tested is less than 600' long) must be tested to125% of maximum operating pressure. The test medium must be water unless the building(s) are evacuated while test pressure exceeds 50% of SMYS.

In class 1 and 2 locations, compressor stations, regulator stations and measuring stations must be tested to at least class 3 requirements.

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If a component other than pipe is the only item being replaced or added to a pipeline, a strength test after installation is not required if the manufacturer certifies that the component was tested to at least the pipeline's intended MAOP or that the component was manufactured under a quality control system that ensures the component is equal in strength to a prototype that was tested to a pressure at least equal to the intended pipeline's MAOP.

If it will be impractical to test a fabricated unit or short section of pipe as part of the pipeline to be tested, a preinstallation strength test must be conducted by maintaining a test pressure equal to that of the pipeline's for at least 4 hours.

F. Steel Service Lines

Steel service lines that will operate at 40 psig or less pressure are stand-up leak tested at a minimum of 50 psig for at least 5 minutes.

Steel service lines that will operate at a pressure greater than 40 psig but less than 100 psig are stand-up leak tested at a minimum of 100 psig for at least 5 minutes.

Steel service lines that will operate at 100 psig or greater pressures are tested according to the criteria for steel pipelines operating at 100 psig or greater pressure. (See D. above)

G. Plastic Pipelines

Each plastic pipeline segment (e.g., main line, service line, or pipeline component) shall be tested in accordance with this paragraph.

1. Each potentially hazardous leak shall be located and eliminated.

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2. The test pressure shall be at least 150% of the intended MAOP, except that the test pressure may not be more than three times the design pressure, from 192.121, calculated using a temperature not less than the actual pipeline temperature during the test.

3. During the test, the temperature of the plastic may not be more than 100°F (38°C), or the temperature at which the material's long-term hydrostatic strength has been determined, whichever is greater.

4. Mains must be pressure tested before being put into service or put back into service after repair.

5. Test time starts when pressure has stabilized.

6. Final tie-in joints shall be leak tested at the distribution operating pressure with leak solution or other approved leak detection devices.

7. For a combined strength and leak test all pressure tests must be lengthy enough to ensure the discovery of all leaks in the segment being tested, overnight if necessary for longer segments. The following equation or Table 1 (60 psig systems) can be used to for the appropriate test time for each segment. This equation is a composite derived based on operational experience and desired design of the system. Many of the variables are in common with GPTC subpart J section 192.513.

   a. Test duration (hrs) = 0.027 * ^P * V

      (i) ^P = acceptance criteria – pressure drop (psig)

      (ii) V = total internal volume of the piping being tested (cf)

Note:

- ✓ The formula above uses the table data below to calculate the test time.
- ✓ The acceptance criterion to develop the test duration uses an acceptable leakage rate of 2.5 cfh.
- ✓ The table outlines the recommended measurement data

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MAOP (psig)	Test Pressure (psig)	Gauge Range (psig)	Chart Size (inches)	Acceptance Criterion (psig)
60	90	0-100	8	2
230	345	0-500	12	10
600	900	0-1000	12	20
720	1080	0-1500	12	25

H. Purging

For procedures and precautions related to purging, refer to Volume II, Chapter 3, Section II "Internal Cleaning, Testing & Purging" and AGA Purging Principles and Practices.

I. Environmental Considerations

The test medium is disposed of in accordance with local, state and federal regulations and in a manner that minimizes damage to the environment. In addition, consider the following:

1. Selecting water from satisfactory sources
2. Eroding and/or flooding the area of the discharge
3. Using filter bags, impoundment facilities etc. to ensure the atmosphere and/or rivers, streams etc. are not unnecessarily contaminated by the test medium used.
4. Minimizing noise impact on local residents through use of silencers and/or scheduling the operation during minimal impact periods.

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J. Record Keeping

Test records must be retained for the life of pipelines operating at 100 psig or greater pressures. At a minimum, these records shall include:

1. The name "Frontier Natural Gas"
2. Reference to the line being tested i.e. Work Order number, location, length, etc.
3. The name of the supervising employee conducting the test
4. Date of the test
5. Description of the test medium
6. Maximum and minimum test pressures
7. Test duration (start time & ending time)
8. Pressure recording chart used during the test (or other equivalent record)
9. Record of elevation profiles for hydrostatic tests
10. Record of leaks and/or failures during the test.

PROJECT SPECIAL PROVISIONS
Utilities by Others

M A ENGINEERING CONSULTANTS, INC.
598 E. Chatham Street, Suite 137, Cary, NC 27511

General:

The following utility companies have facilities that will be in conflict with the construction of this project.

A) Blue Ridge EMC – Distribution Power
B) AT&T – Telephone
C) Skyline – Telephone

The utility conflicts will be adjusted prior to the date of availability, unless otherwise noted and are therefore listed in these special provisions for the benefit of the Contractor. All utility work listed herein will be performed by the utility owner. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105-8 of the 2012 Standard Specifications for Roads and Structures.

Utilities Requiring Adjustments:

A) Blue Ridge EMC – Distribution Power
Mr. Hoss Prestwood
(828) 493-3196
hoss.prestwood@blueridgeemc.com

1. See "Utilities By Others Plans" for utility conflicts
2. Blue Ridge EMC will begin their work on October 1, 2015 and will require seven months to complete their work. They will complete their relocation by May 1, 2016.

B) AT&T – Telephone
Steve Mode
(704) 617-6525
modejames@ymail.com

1. See "Utilities By Others Plans" for utility conflict
2. AT&T will begin their work on November 1, 2015 and will require four months to complete as they will attach to Blue Ridge EMC poles. They will complete their work on April 15, 2016.

B) Skyline Telephone – Telephone
Eric Holt
(336) 876-6591
eric.holt@skyline.org

1. See "Utilities By Others Plans" for utility conflict
2. Skyline will begin their work on February 1, 2016 and will require four months to complete as they will attach to Blue Ridge EMC poles. They will complete their work on May 30, 2016.

Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective August 3, 2011 issued by the North Carolina Department of Environment and Natural Resources Division of Water Quality. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING: (West)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

Shoulder and Median Areas

August 1 - June 1		**May 1 - September 1**	
20#	Kentucky Bluegrass	20#	Kentucky Bluegrass
75#	Hard Fescue	75#	Hard Fescue
25#	Rye Grain	10#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 - June 1		**May 1 - September 1**	
100#	Tall Fescue	100#	Tall Fescue
15#	Kentucky Bluegrass	15#	Kentucky Bluegrass
30#	Hard Fescue	30#	Hard Fescue
25#	Rye Grain	10#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Scorpion
2nd Millennium	Essential	Kalahari	Serengeti
3rd Millennium	Evergreen 2	Kentucky 31*	Shelby
Apache III	Falcon IV	Kitty Hawk 2000	Sheridan
Avenger	Falcon NG	Legitimate	Signia
Barlexas	Falcon V	Lexington	Silver Hawk
Barlexas II	Faith	LSD	Sliverstar
Bar Fa	Fat Cat	Magellan	Shenandoah Elite
Barrera	Festnova	Matador	Sidewinder
Barrington	Fidelity	Millennium SRP	Skyline
Barrobusto	Finelawn Elite	Monet	Solara
Barvado	Finelawn Xpress	Mustang 4	Southern Choice II
Biltmore	Finesse II	Ninja 2	Speedway
Bingo	Firebird	Ol' Glory	Spyder LS
Bizem	Firecracker LS	Olympic Gold	Sunset Gold
Blackwatch	Firenza	Padre	Taccoa
Blade Runner II	Five Point	Patagonia	Tanzania
Bonsai	Focus	Pedigree	Trio
Braveheart	Forte	Picasso	Tahoe II
Bravo	Garrison	Piedmont	Talladega
Bullseye	Gazelle II	Plantation	Tarheel
Cannavaro	Gold Medallion	Proseeds 5301	Terrano
Catalyst	Grande 3	Prospect	Titan ltd
Cayenne	Greenbrooks	Pure Gold	Titanium LS
Cessane Rz	Greenkeeper	Quest	Tracer
Chipper	Gremlin	Raptor II	Traverse SRP
Cochise IV	Greystone	Rebel Exeda	Tulsa Time
Constitution	Guardian 21	Rebel Sentry	Turbo
Corgi	Guardian 41	Rebel IV	Turbo RZ
Corona	Hemi	Regiment II	Tuxedo RZ
Coyote	Honky Tonk	Regenerate	Ultimate
Darlington	Hot Rod	Rendition	Venture
Davinci	Hunter	Rhambler 2 SRP	Umbrella
Desire	Inferno	Rembrandt	Van Gogh
Dominion	Innovator	Reunion	Watchdog
Dynamic	Integrity	Riverside	Wolfpack II
Dynasty	Jaguar 3	RNP	Xtremegreen
Endeavor	Jamboree	Rocket	

***Note: Kentucky 31 will no longer be an approved NCDOT Tall Fescue Cultivar after December 31, 2015.**

Approved Kentucky Bluegrass Cultivars:

4-Season	Blue Velvet	Gladstone	Quantum Leap
Alexa II	Blueberry	Granite	Rambo
America	Boomerang	Hampton	Rhapsody
Apollo	Brilliant	Harmonie	Rhythm
Arcadia	Cabernet	Impact	Rita
Aries	Champagne	Jefferson	Royce
Armada	Champlain	Juliet	Rubicon
Arrow	Chicago II	Jump Start	Rugby II
Arrowhead	Corsair	Keeneland	Shiraz
Aura	Courtyard	Langara	Showcase
Avid	Delight	Liberator	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mercury	Sonoma
Bandera	Eagleton	Midnight	Sorbonne
Barduke	Emblem	Midnight II	Starburst
Barnique	Empire	Moon Shadow	Sudden Impact
Baroness	Envicta	Moonlight SLT	Total Eclipse
Barrister	Everest	Mystere	Touche
Barvette HGT	Everglade	Nu Destiny	Tsunami
Bedazzled	Excursion	NuChicago	Unique
Belissimo	Freedom II	NuGlade	Valor
Bewitched	Freedom III	Odyssey	Voyager II
Beyond	Front Page	Perfection	Washington
Blacksburg II	Futurity	Pinot	Zinfandel
Blackstone	Gaelic	Princeton 105	
Blue Note	Ginney II	Prosperity	

Approved Hard Fescue Cultivars:

Aurora II	Eureka II	Oxford	Scaldis II
Aurora Gold	Firefly	Reliant II	Spartan II
Berkshire	Granite	Reliant IV	Stonehenge
Bighorn GT	Heron	Rescue 911	
Chariot	Nordic	Rhino	

On cut and fill slopes 2:1 or steeper add 20# Sericea Lespedeza January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding And Mulching (West)

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation and/or trout stream construction within a 50 foot zone on both sides of the stream or depression, measured from top of stream bank or center of depression. The stream bank of the stream relocation shall be seeded by a method that does not alter the typical cross section of the stream bank. Native Grass Seeding and Mulching shall also be performed in the permanent soil reinforcement mat section of preformed scour holes, and in other areas as directed.

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

August 1 - June 1		**May 1 – September 1**	
18#	Creeping Red Fescue	18#	Creeping Red Fescue
8#	Big Bluestem	8#	Big Bluestem
6#	Indiangrass	6#	Indiangrass
4#	Switchgrass	4#	Switchgrass
35#	Rye Grain	25#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Creeping Red Fescue Cultivars:

Aberdeen Boreal Epic Cindy Lou

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding and Mulching shall be performed in accordance with Section 1660 of the *Standard Specifications* and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Measurement and Payment

Native Grass *Seeding and Mulching* will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

TEMPORARY SEEDING:

Fertilizer shall be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. German Millet, or Browntop Millet shall be used in summer months and rye grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis and as directed.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, and the rate of application may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be six inches.

LAWN TYPE APPEARANCE:

All areas adjacent to lawns must be hand finished as directed to give a lawn type appearance. Remove all trash, debris, and stones ¾" and larger in diameter or other obstructions that could interfere with providing a smooth lawn type appearance. These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

REFORESTATION:

Description

Reforestation will be planted within interchanges and along the outside borders of the road, and in other areas as directed. *Reforestation* is not shown on the plan sheets. See the Reforestation Detail Sheet.

All non-maintained riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated with native woody species.

The entire *Reforestation* operation shall comply with the requirements of Section 1670 of the *Standard Specifications*.

Materials

Reforestation shall be bare root seedlings 12"-18" tall.

Construction Methods

Reforestation shall be shall be planted as soon as practical following permanent S*eeding and Mulching*. The seedlings shall be planted in a 16-foot wide swath adjacent to mowing pattern line, or as directed.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay (kaolin) or a superabsorbent that is designated as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval.

With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Seasonal Limitations: *Reforestation* shall be planted from November 15 through March 15.

Measurement and Payment

Reforestation will be measured and paid for in accordance with Article 1670-17 of the *Standard Specifications*.

RESPONSE FOR EROSION CONTROL:

Description

Furnish the labor, materials, tools and equipment necessary to move personnel, equipment, and supplies to the project necessary for the pursuit of any or all of the following work as shown herein, by an approved subcontractor.

Section	Erosion Control Item	Unit
1605	Temporary Silt Fence	LF
1606	Special Sediment Control Fence	LF/TON
1615	Temporary Mulching	ACR
1620	Seed - Temporary Seeding	LB
1620	Fertilizer - Temporary Seeding	TN
1631	Matting for Erosion Control	SY
SP	Coir Fiber Mat	SY
1640	Coir Fiber Baffles	LF
SP	Permanent Soil Reinforcement Mat	SY
1660	Seeding and Mulching	ACR

1661	Seed - Repair Seeding	LB
1661	Fertilizer - Repair Seeding	TON
1662	Seed - Supplemental Seeding	LB
1665	Fertilizer Topdressing	TON
SP	Safety/Highly Visible Fencing	LF
SP	Response for Erosion Control	EA

Construction Methods

Provide an approved subcontractor who performs an erosion control action as described in the NPDES Inspection Form SPPP30. Each erosion control action may include one or more of the above work items.

Measurement and Payment

Response for Erosion Control will be measured and paid for by counting the actual number of times the subcontractor moves onto the project, including borrow and waste sites, and satisfactorily completes an erosion control action described in Form 1675. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

Payment will be made under:

Pay Item	**Pay Unit**
Response for Erosion Control	Each

ENVIRONMENTALLY SENSITIVE AREAS:

Description

This project is located in an *Environmentally Sensitive Area*. This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading operations within the Environmentally Sensitive Areas identified on the plans and as designated by the Engineer. This also requires special procedures to be used for seeding and mulching and staged seeding within the project.

The Environmentally Sensitive Area shall be defined as a 50-foot buffer zone on both sides of the stream or depression measured from top of streambank or center of depression.

Construction Methods

(A) Clearing and Grubbing

In areas identified as Environmentally Sensitive Areas, the Contractor may perform clearing operations, but not grubbing operations until immediately prior to beginning grading operations as described in Article 200-1 of the *Standard Specifications*. Only clearing operations (not grubbing) shall be allowed in this buffer zone until immediately prior to beginning grading operations. Erosion control devices shall be installed immediately following the clearing operation.

(B) Grading

Once grading operations begin in identified Environmentally Sensitive Areas, work shall progress in a continuous manner until complete. All construction within these areas shall progress in a continuous manner such that each phase is complete and areas are permanently stabilized prior to beginning of next phase. Failure on the part of the Contractor to complete any phase of construction in a continuous manner in Environmentally Sensitive Areas will be just cause for the Engineer to direct the suspension of work in accordance with Article 108-7 of the *Standard Specifications*.

(C) Temporary Stream Crossings

Any crossing of streams within the limits of this project shall be accomplished in accordance with the requirements of Subarticle 107-12 of the *Standard Specifications*.

(D) Seeding and Mulching

Seeding and mulching shall be performed in accordance with Section 1660 of the *Standard Specifications* and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment. No appreciable time shall lapse into the contract time without stabilization of slopes, ditches and other areas within the Environmentally Sensitive Areas.

(E) Stage Seeding

The work covered by this section shall consist of the establishment of a vegetative cover on cut and fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 feet in height measured along the slope, or greater than 2 acres in area. Each stage shall not exceed the limits stated above.

Additional payments will not be made for the requirements of this section, as the cost for this work shall be included in the contract unit prices for the work involved.

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation within project limits to the maximum extent practicable. Vegetation along stream banks and adjacent to other jurisdictional resources outside the construction limits shall only be removed upon approval of Engineer. No additional payment will be made for this minimization work.

STOCKPILE AREAS:

The Contractor shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed.

ACCESS AND HAUL ROADS:

At the end of each working day, the Contractor shall install or re-establish temporary diversions or earth berms across access/haul roads to direct runoff into sediment devices. Silt fence sections that are temporarily removed shall be reinstalled across access/haul roads at the end of each working day.

WASTE AND BORROW SOURCES:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

All offsite Staging Areas, Borrow and Waste sites shall be in accordance with "Borrow and Waste Site Reclamation Procedures for Contracted Projects" located at:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/ContractedReclamationProcedures.pdf

All forms and documents referenced in the "Borrow and Waste Site Reclamation Procedures for Contracted Projects" shall be included with the reclamation plans for offsite staging areas, and borrow and waste sites.

TEMPORARY DIVERSION:

This work consists of installation, maintenance, and cleanout of *Temporary Diversions* in accordance with Section 1630 of the *Standard Specifications*. The quantity of excavation for installation and cleanout will be measured and paid for as *Silt Excavation* in accordance with Article 1630-3 of the *Standard Specifications*.

CLEAN WATER DIVERSION:

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of clean water diversions. The clean water diversions shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

The Contractor shall install the clean water diversions in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the excavated material shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Line clean water diversion with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Stabilization of the excavated material will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the clean water diversions.

SAFETY FENCE AND JURISDICTIONAL FLAGGING:

Description

Safety Fence shall consist of furnishing materials, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary, or other boundaries located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland, endangered vegetation, culturally sensitive areas or water. The fence shall be installed prior to any land disturbing activities.

Interior boundaries for jurisdictional areas noted above shall be delineated by stakes and highly visible flagging.

Jurisdictional boundaries at staging areas, waste sites, or borrow pits, whether considered outside or interior boundaries shall be delineated by stakes and highly visible flagging.

Materials

(A) Safety Fencing

Polyethylene or polypropylene fence shall be a highly visible preconstructed safety fence approved by the Engineer. The fence material shall have an ultraviolet coating.

Either wood posts or steel posts may be used. Wood posts shall be hardwood with a wedge or pencil tip at one end, and shall be at least 5 ft. in length with a minimum nominal 2" x 2" cross section. Steel posts shall be at least 5 ft. in length, and have a minimum weight of 0.85 lb/ft of length.

(B) Boundary Flagging

Wooden stakes shall be 4 feet in length with a minimum nominal 3/4" x 1-3/4" cross section. The flagging shall be at least 1" in width. The flagging material shall be vinyl and shall be orange in color and highly visible.

Construction Methods

No additional clearing and grubbing is anticipated for the installation of this fence. The fence shall be erected to conform to the general contour of the ground.

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. Posts shall be installed a minimum of 2 ft. into the ground. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final

acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence geotextile shall be attached to the wood posts with one 2" galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

Place construction stakes to establish the location of the safety fence in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications.* No direct pay will be made for the staking of the safety fence. All stakeouts for safety fence shall be considered incidental to the work being paid for as "Construction Surveying", except that where there is no pay item for construction surveying, all safety fence stakeout will be performed by state forces.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

Boundary flagging delineation of interior boundaries will be placed in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for delineation of the interior boundaries. This delineation will be considered incidental to the work being paid for as *Construction Surveying*, except that where there is no pay item or construction surveying the cost of boundary flagging delineation shall be included in the unit prices bid for the various items in the contract. Installation for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Additional flagging may be placed on overhanging vegetation to enhance visibility but does not substitute for installation of stakes.

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(5) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

The Contractor shall be required to maintain alternative stakes and highly visible flagging in a satisfactory condition for the duration of the project as determined by the Engineer.

Measurement and Payment

Safety Fence will be measured and paid as the actual number of linear feet of polyethylene or polypropylene fence installed in place and accepted. Such payment will be full compensation including but not limited to furnishing and installing fence geotextile with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Safety Fence	Linear Foot

PERMANENT SOIL REINFORCEMENT MAT:

Description

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three-dimensional structure. The mat shall have the following minimum physical properties:

Property	**Test Method**	**Value**	**Unit**
Light Penetration	ASTM D6567	9	%
Thickness	ASTM D6525	0.40	in
Mass Per Unit Area	ASTM D6566	0.55	lb/sy
Tensile Strength	ASTM D6818	385	lb/ft
Elongation (Maximum)	ASTM D6818	49	%
Resiliency	ASTM D1777	>70	%
UV Stability *	ASTM D4355	$\geq$80	%
Porosity (Permanent Net)	ECTC Guidelines	$\geq$85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	$\geq$8.0	lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	$\geq$16.0	ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) the chemical and physical properties of the mat used, and
(B) conformance of the mat with this specification.

Construction Methods

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item	Pay Unit
Permanent Soil Reinforcement Mat	Square Yard

SKIMMER BASIN WITH BAFFLES:

Description

Provide a skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Skimmer Basin with Baffles Detail sheet provided in the erosion control plans. Work includes constructing sediment basin, installation of temporary slope drain pipe and coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing a geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drain, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056

Fertilizer for Temporary Seeding	1060-2
Seed for Temporary Seeding	1060-4
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
Coir Fiber Mat	1060-14
Temporary Slope Drain	1622-2
Coir Fiber Baffle	1640

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4” diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basin according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drain pipe and construct the primary spillway according to the Skimmer Basin with Baffles Detail sheet in the erosion control plans. Temporary slope drain pipe at inlet of basin may be replaced by geotextile as directed.

Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. The coupling shall be rigid and non-buoyant and not exceed a diameter of 4" and 12" in length. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Line primary spillway with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for the primary spillway is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Skimmer Basin with Baffles detail. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

__" Skimmer will be measured in units of each. *__" Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of *__" Skimmer* is considered incidental to the measurement of the quantity of *__" Skimmer* and no separate payment will be made. No separate payment shall be made if *__" Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	**Pay Unit**
__" Skimmer	Each
Coir Fiber Mat	Square Yard

COIR FIBER WATTLES WITH POLYACRYLAMIDE (PAM):

Description

Coir Fiber Wattles are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting. Coir Fiber Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Coir Fiber Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of coir fiber wattles, matting installation, PAM application, and removing wattles.

Materials

Coir Fiber Wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12 in.
Minimum Density	3.5 lb/ft^3 +/- 10%
Net Material	Coir Fiber
Net Openings	2 in. x 2 in.
Net Strength	90 lbs.
Minimum Weight	2.6 lbs./ft. +/- 10%

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Coir Fiber Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install coir fiber wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.
Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the coir fiber wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the coir fiber wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications,* or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the coir fiber wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM).*

Payment will be made under:

Pay Item	**Pay Unit**
Polyacrylamide(PAM)	Pound
Coir Fiber Wattle	Linear Foot

TEMPORARY ROCK SILT CHECK TYPE A WITH EXCELSIOR MATTING AND POLYACRYLAMIDE (PAM):

Description

Temporary Rock Silt Checks Type A with Excelsior Matting and Polyacrylamide (PAM) are devices utilized in temporary and permanent ditches to reduce runoff velocity and incorporate PAM into the construction runoff to increase settling of sediment particles and reduce turbidity of runoff. Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of Temporary Rock Silt Checks Type A, matting installation, PAM application, and removing Temporary Rock Silt Checks Type A with Excelsior Matting and PAM.

Materials

Structural stone shall be class B stone that meets the requirements of Section 1042 of the *Standard Specifications* for Stone for Erosion Control, Class B.

Sediment control stone shall be #5 or #57 stone, which meets the requirements of Section 1005 of the *Standard Specifications* for these stone sizes.

Matting shall meet the requirements of Excelsior Matting in Subarticle 1060-8(B) of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each Temporary Rock Silt Check Type A. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Temporary Rock Silt Checks Type A shall be installed in accordance with Subarticle 1633-3(A) of the *Standard Specifications*, Roadway Standard Drawing No. 1633.01 and the detail provided in the plans.

Installation of matting shall be in accordance with the detail provided in the plans, and anchored by placing Class B stone on top of the matting at the upper and lower ends.

Apply PAM at a rate of 4 ounces over the center portion of the Temporary Rock Silt Checks Type A and matting where the water is going to flow over. PAM applications shall be done during construction activities and after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM until the project is accepted or until the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are removed, and shall remove and dispose of silt accumulations at the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Temporary Rock Silt Checks Type A will be measured and paid for in accordance with Article 1633-5 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.
Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the Temporary Rock Silt Checks Type A. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	**Pay Unit**
Polyacrylamide(PAM)	Pound

CULVERT DIVERSION CHANNEL:

Description

This work consists of providing a *Culvert Diversion Channel* to detour the existing stream around the culvert construction site at locations shown on the plans. Work includes constructing the diversion channel, disposing of excess materials, providing and placing geotextile liner, maintaining the diversion area in an acceptable condition, removing geotextile liner, backfilling diversion channel area with suitable material, and providing proper drainage when diversion channel area is abandoned.

Materials

Refer to Division 10

Item	**Section**
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

Grade channel according to the plans with channel surface free of obstructions, debris, and pockets of low-density material. Utilize suitable material and provide disposal area for unsuitable material.

Line channel with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Culvert Diversion Channel will be measured and paid for as the actual number of cubic yards excavated, as calculated from the typical section throughout the length of the diversion channel as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of *Culvert Diversion Channel*.

Payment will be made under:

Pay Item	**Pay Unit**
Culvert Diversion Channel	Cubic Yard

IMPERVIOUS DIKE:

Description

This work consists of furnishing, installing, maintaining, and removing an *Impervious Dike* for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed.

Materials

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious geotextile.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, and removal of the impervious dike.

Payment will be made under:

Pay Item	**Pay Unit**
Impervious Dike	Linear Foot

TEMPORARY PIPE FOR CULVERT CONSTRUCTION:

Description

This work consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction.

Construction Methods

The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passageway for the stream through the work-site. The minimum size requirements will be as stated on the erosion control plans.

Measurement and Payment

__" *Temporary Pipe* will be measured and paid for at the contract unit price per linear foot of temporary pipe approved by the Engineer and measured in place from end to end. Such price and payment will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Payment will be made under:

Pay Item	**Pay Unit**
__" Temporary Pipe	Linear Foot

COIR FIBER MAT:

Description

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat with stakes, steel reinforcement bars or staples as directed.

Materials

Item	**Section**
Coir Fiber Mat	1060-14

Anchors: Stakes, reinforcement bars, or staples shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Place the coir fiber mat immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the mat with the soil. Unroll the mat and apply without stretching such that it will lie smoothly but loosely on the soil surface.

For stream relocation applications, take care to preserve the required line, grade, and cross section of the area covered. Bury the top slope end of each piece of mat in a narrow trench at

least 6 in. deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. overlap. Construct check trenches at least 12 in. deep every 50 ft. longitudinally along the edges of the mat or as directed. Fold over and bury mat to the full depth of the trench, close and tamp firmly. Overlap mat at least 6 in. where 2 or more widths of mat are installed side by side.

Place anchors across the mat at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the mat 3 ft. apart.

Adjustments in the trenching or anchoring requirements to fit individual site conditions may be required.

Measurement and Payment

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

No measurement will be made for anchor items.

Payment will be made under:

Pay Item	**Pay Unit**
Coir Fiber Mat	Square Yard

CONCRETE WASHOUT STRUCTURE:

Description

Concrete washout structures are watertight enclosures constructed above or below grade to contain concrete waste on construction sites. Concrete waste can include concrete waste water from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete waste also includes concrete slurries from concrete saw cutting, coring, grinding, grooving operations, or hydro-concrete demolition. Concrete washouts must prevent the discharge of concrete waste materials to storm drainage systems, surface waters, wetlands, and buffers. Work for above grade washout structures includes gathering high cohesive and low infiltration soil to construct an above grade earthen berm basin. Work also includes preparing a rock and debris free soil base inside this earthen basin, installing a geomembrane liner in the basin, and then placing sandbags along the entire polypropylene liner basin perimeter. Work for below grade washout structures includes preparing a rock and debris free soil base, excavation of a basin with non-vertical side slopes, installing a geomembrane liner in the basin, and then placing sandbags along the entire polypropylene liner excavation perimeter. Construct a gravel pad with Class A stone and a geotextile under liner to provide a defined access path to the concrete washout structures. Install safety fence around the perimeter of the concrete washout structures.

Materials

Item	Section
Borrow Material	1018
Stone for Erosion Control, Class A	1042
Geotextile for Drainage, Type 2	1056

The geomembrane basin liner shall meet the following minimum physical properties for low permeability, polypropylene or polyethylene geomembranes:

Property	Test Method	Value	Unit
Thickness, nominal		10	mil
Weight		0.04	lbs./ft^2
*1" Tensile Strength	ASTM D-751	52	lbf.
Elongation at Break	ASTM D-751	600	%
*Grab Tensile	ASTM D-751	70	lbf.
*Trapezoid Tear	ASTM D-4533	55	lbf.
Hydrostatic Resistance	ASTM D-751	70	lb./in^2
Water Vapor Transmission Rate	ASTM E-96 Procedure B	0.03	gal/100in^2/day
Perm Rating	ASTM E-96 Procedure B	0.066	U.S. Perms

***Tests are an average of diagonal directions.**

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Construction Methods

Above Grade Structures
Assemble high cohesive and low infiltration soil to build an enclosed earthen berm for an above grade concrete washout basin in accordance with the details and as directed. Construct the height, length, and width of the earthen berm according to the detail. Slope the interior and exterior walls of the earthen berm at 1:1 and then compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

The geomembrane liner will be of sufficient width and length so there will be no seams. Install the geomembrane lining by overlaying it in the basin to completely cover any exposed soil to create a water tight concrete washout basin. Extend the geomembrane lining from inside the basin floor, up the earth slope of the basin and extend, overlay, and wrap outside the earthen berm. Trench the toe of the geomembrane lining into an eight inch depth trench and then backfill and tamper with soil.

Below Grade Structures
Excavate an area for concrete washout in accordance with the details and as directed. Excavate to a minimum depth of 3 feet. Slope the interior walls of the excavated area at 1:1 and then

compact to provide structural stability and contain concrete washout liquids and solid materials until evaporation, curing, extraction, or final removal.

The geomembrane liner will be of sufficient width and length so there will be no seams. Install the geomembrane lining by overlaying it in the excavated area to completely cover any exposed soil to create a watertight impoundment. Extend the geomembrane lining from the excavation floor, up the interior slope of the excavated basin and beyond the outside perimeter of the excavation.

Prepare the soil base to be free of rocks or other debris that may cause holes or tears in the geomembrane lining.

Install safety fence around the perimeter of the concrete washout structures in accordance with the *Safety Fence and Jurisdictional Flagging* special provision.

Construct a stone gravel pad with Class A stone (or other approved aggregate material) and a geotextile liner to provide a defined access path to the concrete washout structure. Construct the stone gravel pad according to *Roadway Standard Drawings* No. 1607.01 and Section 1607 of the *Standard Specifications*. Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/details/

Maintenance and Removal

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage (i.e. tears in geomembrane liner, missing sand bags) and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. If appropriate and possible, reuse the geomembrane liner, the sandbags, orange safety fence, the Class A stone, and the geotextile. Otherwise, properly dispose of items. Grade the earth material to match the existing contours and permanently seed and mulch area.

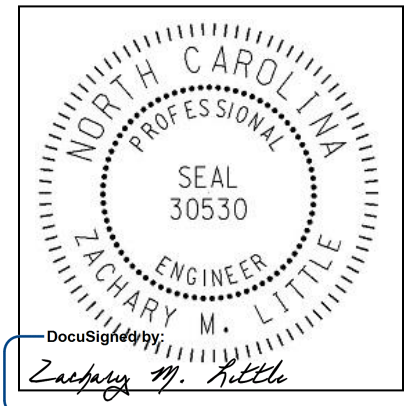
Measurement and Payment

Concrete Washout Structure will be measured and paid for by counting the actual number of washout structures installed and maintained on the project. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance and removal of concrete washout structures, grading and seeding and mulching

area. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Washout Structure	Each



Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 12.4)

Prepared By: __zml__
27-May-15

Contents

1. 2012 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2012 Standard Specifications are revised as follows:

1.1. Submittal Requirements (1098-1(B))

Page 10-208, replace paragraph on line 34 with the following:

Submit for approval catalog cuts and/or shop drawings for materials proposed for use on the project. Allow 40 days for review of each submittal. Do not fabricate or order material until receipt of Engineer's approval.

Submit 4 copies of each catalog cut and/or drawing and show for each component the material description, brand name, stock-number, size, rating, manufacturing specification and the intended use (identified by labeling all components with the corresponding contract line item number). Present the submittals neatly arranged in the same order as the contract bid items. Electronic submittals of catalog cuts and drawings may be accepted in lieu of hard copies.

One hard copy and an electronic (PDF) copy of reviewed submittals will be returned to the Engineer from the ITS and Signals Unit.

1.2. Controllers with Cabinets – Material (1751-2)

Page 17-37, Section 1751-2 Material

Add the following paragraph:

When the plans or specifications require a Type 2070L controller, contractor may provide a Type 2070E controller. Unless otherwise allowed by the Engineer, provide controllers of only one type.

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 12-inch and 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Fabricate 9-inch pedestrian signal head housings, end caps, and visors from virgin polycarbonate material. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel or corrosion resistant material.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538) a minimum of 2.5 to 3.5 mils thick. Do not apply paint to the latching hardware or rigid vehicle signal head mounting brackets for mast-arm attachments.

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

Where required, provide polycarbonate signal heads and visors that comply with the provisions pertaining to the aluminum signal heads listed on the QPL with the following exceptions:

Fabricate signal head housings, end caps, and visors from virgin polycarbonate material. Provide UV stabilized polycarbonate plastic with a minimum thickness of 0.1 ± 0.01 inches that is highway yellow (Federal Standard 595C, Color Chip 13538). Ensure the color is incorporated into the plastic material before molding the signal head housings and end caps. Ensure the plastic formulation provides the following physical properties in the assembly (tests may be performed on separately molded specimens):

Test	**Required**	**Method**
Specific Gravity	1.17 minimum	ASTM D 792
Flammability	Self-extinguishing	ASTM D 635
Tensile Strength, yield, PSI	8500 minimum	ASTM D 638
Izod impact strength, ft-lb/in [notched, 1/8 inch]	12 minimum	ASTM D 256

For pole mounting, provide side of pole mounting assemblies with framework and all other hardware necessary to make complete, watertight connections of the signal heads to the poles and pedestals. Fabricate the mounting assemblies and frames from aluminum with all necessary hardware, screws, washers, etc. to be stainless steel. Provide mounting fittings that match the positive locking device on the signal head with the serrations integrally cast into the brackets. Provide upper and lower pole plates that have a 1 ¼-inch vertical conduit entrance hubs with the hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions, and can accommodate a minimum of ten Number 14 AWG conductors.

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
   - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

   (Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,

3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 8 inches in length for 8-inch vehicle signal head sections. Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate mounting assemblies from malleable iron or steel and provide serrated rings made of aluminum. Provide messenger cable hangers and balance adjusters that are galvanized before being painted. Fabricate balance adjuster eyebolt and eyebolt nut from stainless steel or galvanized malleable iron. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, bolts, clevis pins, cotter pins, nuts, and U-bolt clamps from stainless steel.

For mast-arm mounting, provide rigid vehicle signal head mounting brackets and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the mast arms and to provide a means for vertically adjusting the vehicle signal heads to proper alignment. Fabricate the mounting assemblies from aluminum, and provide serrated rings made of aluminum.

Provide stainless steel cable attachment assemblies to secure the brackets to the mast arms. Ensure all fastening hardware and fasteners are fabricated from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections, and 8-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red circular	17	11
8-inch red circular	13	8
12-inch green circular	15	15
8-inch green circular	12	12

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module and 13 Watts or less for the 8-inch circular module.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red arrow	12	9
12-inch green arrow	11	11

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

3. LED U-Turn Arrow Signal Modules:

Provide modules in the following configurations: 12-inch left u-turn arrow signal modules and 12-inch right u-turn arrow signal modules.

Modules are not required to be listed on the ITS and Signals Qualified Products List. Provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that have minimum maintained luminous intensity values that are not less than 16% of the values calculated using the method described in section 4.1 of the VTCSH Circular Supplement.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red u-turn arrow	17	11
12-inch green u-turn arrow	15	15

For yellow u-turn arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to ensure power required at 77° F is 22 Watts or less.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

3. TRAFFIC SIGNAL SUPPORTS

3.1. METAL SIGNAL POLE REMOVALS

A. Description:

Remove and dispose of existing metal signal poles including mast arms, and remove and dispose of existing foundations, associated anchor bolts, electrical wires and connections.

B. Construction Methods:

1. Foundations:

Remove and promptly dispose of the metal signal pole foundations including reinforcing steel, electrical wires, and anchor bolts to a minimum depth of two feet below the finished ground elevation. At the Contractor’s option, remove the complete foundation.

2. Metal Poles:

Assume ownership of the metal signal poles, remove the metal signal poles, and promptly transport the metal signal poles from the project. Use methods to remove the metal signal poles and attached traffic signal equipment that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no additional cost to the Department.

Transport and properly dispose of the materials.

Backfill and compact disturbed areas to match the finished ground elevation. Seed unpaved areas.

Use methods to remove the foundations that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no cost to the Department.

3.2. MEASUREMENT AND PAYMENT

Actual number of metal signal pole foundations removed and disposed.

Actual number of metal signal poles removed and disposed.

Payment will be made under:

Metal Pole Foundation Removal .....Each
Metal Pole Removal.....Each

4. CONTROLLERS WITH CABINETS

4.1. MATERIALS – TYPE 2070L CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated August 16, 2002, plus Errata 1 dated October 27, 2003 and Errata 2 dated June 08, 2004) except as required herein.

Furnish Model 2070L controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide model 2070L controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070 1B, CPU Module, Single Board
- MODEL 2070-2A, Field I/O Module (FI/O)
    - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is “off”)
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4A, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

4.2. MATERIALS – GENERAL CABINETS

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

4.3. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 336S pole mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical

details. Provide 336S pole mounted cabinets that are 46" high with 40" high internal rack assemblies.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40º F to +185º F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A

Occurrences (8x20µs waveform)……..10 minimum @ 20,000A

Maximum Clamp Voltage…….395VAC

Operating Current……..15 amps

Response Time……..< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (6 times, 8x20µs)

(Differential Mode)…….400A

(Common Mode)……1,000A

Occurrences (8x20µs waveform)……..500 min @ 200A

Maximum Clamp Voltage

(Differential Mode @400A)……35V

(Common Mode @1,000A)…….35V

Response Time……..< 5 nanoseconds

Maximum Capacitance……..35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A

Occurrences (8x20µs waveform)……..100 min @ 2,000A

Maximum Clamp Voltage…….Rated for equipment protected

Response Time……..< 1 nanosecond

Maximum Capacitance…….1,500 pF

Maximum Series Resistance…….15Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A

Occurrences (8x20µs waveform)……..100 @ 2,000A

Maximum Clamp Voltage…….30V

Response Time……..< 1 nanosecond

Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A

Maximum Clamp Voltage……350VAC

Response Time……..< 200 nanoseconds

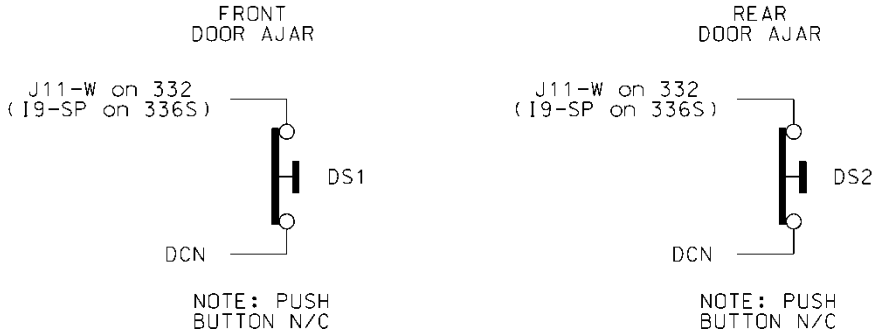
Discharge Voltage……<200 Volts @ 1,000A

Insulation Resistance……≥100 MΩ

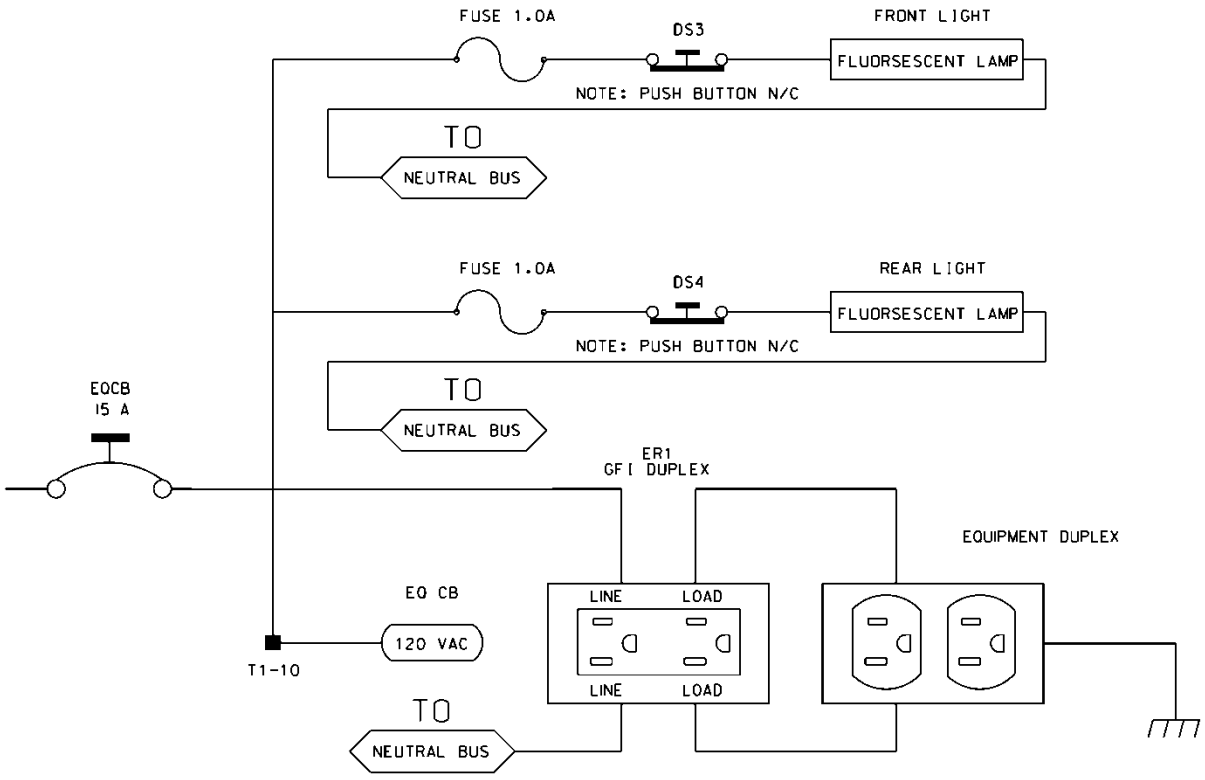
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. For model 336S cabinets, mount the police panel on the rear door. Ensure that the police panel door permits access to the police panel when the main door is closed. Ensure that no rainwater can enter the cabinet even with the police panel door open. Provide a police panel door hinged on the right side as viewed from the front. Provide a police panel door lock that is keyed to a standard police/fire call box key. In addition to the requirements of LA Specification No. 54-053-08, provide the police panel with a toggle switch connected to switch the intersection operation between normal stop-and-go operation (AUTO) and manual operation (MANUAL). Ensure that manual control can be implemented using inputs and software such that the controller provides full programmed clearance times for the yellow clearance and red clearance for each phase while under manual control.

Provide a 1/4-inch locking phone jack in the police panel for a hand control to manually control the intersection. Provide sufficient room in the police panel for storage of a hand control and cord.

Ensure the 336S cabinet Input File is wired as follows:

336S Cabinet **Port-Bit/C-1 Pin Assignment**														
Slot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
C-1 (Spares)	59	60	61	62	63	64	65	66	75	76	77	78	79	80
Port	3-2	1-1	3-4	1-3	3-1	1-2	3-3	1-4	2-5	5-5	5-6	5-1	5-2	6-7
C-1	56	39	58	41	55	40	57	42	51	71	72	67	68	81
Port	2-1	1-5	2-3	1-7	2-2	1-6	2-4	1-8	2-6	5-7	5-8	5-3	5-4	6-8
C-1	47	43	49	45	48	44	50	46	52	73	74	69	70	82

For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

Connect detector test switches for cabinets as follows:

336S Cabinet		**332 Cabinet**	
Detector Call Switches	**Terminals**	**Detector Call Switches**	**Terminals**
Phase 1	I1-F	Phase 1	I1-W
Phase 2	I2-F	Phase 2	I4-W
Phase 3	I3-F	Phase 3	I5-W
Phase 4	I4-F	Phase 4	I8-W
Phase 5	I5-F	Phase 5	J1-W
Phase 6	I6-F	Phase 6	J4-W
Phase 7	I7-F	Phase 7	J5-W
Phase 8	I8-F	Phase 8	J8-W

Provide the PCB 28/56 connector for the conflict monitor unit (CMU) with 28 independent contacts per side, dual-sided with 0.156 inch contact centers. Provide the PCB 28/56 connector contacts with solder eyelet terminations. Ensure all connections to the PCB 28/56 connector are soldered to the solder eyelet terminations.

Ensure that all cabinets have the CMU connector wired according to the 332 cabinet connector pin assignments (include all wires for auxiliary output file connection). Wire pins 13, 16, R, and U of the CMU connector to a separate 4 pin plug, P1, as shown below. Provide a second plug, P2, which will mate with P1 and is wired to the auxiliary output file as shown below. Provide an additional plug, P3, which will mate with P1 and is wired to the pedestrian yellow circuits as shown below. When no auxiliary output file is installed in the cabinet, provide wires for the green and yellow inputs for channels 11, 12, 17, and 18, the red inputs for channels 17 and 18, and the wires for the P2 plug. Terminate the two-foot wires with ring type lugs, insulated, and bundled for optional use.

	P1		P2		P3	
PIN	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

	P20 Connector				
PIN	**FUNCTION**	**CONN TO**	**PIN**	**FUNCTION**	**CONN TO**
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107

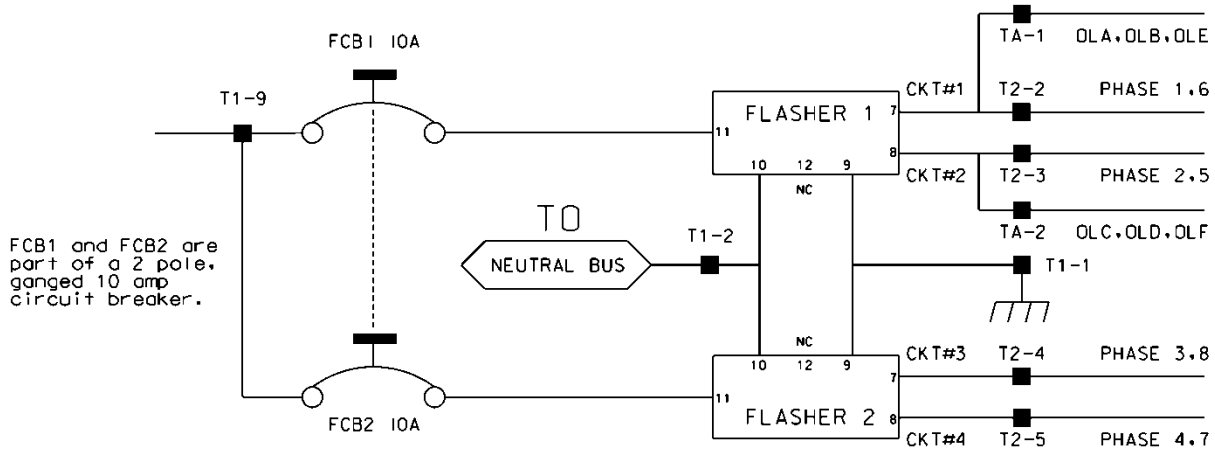
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	**FUNCTION**
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	**WATTAGE**
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' "*Transportation Electrical Equipment Specifications*" dated March 12, 2009 with Erratum 1.

C. Type 170 E Cabinet Physical Requirements:

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Furnish unpainted, natural, aluminum cabinet shells. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

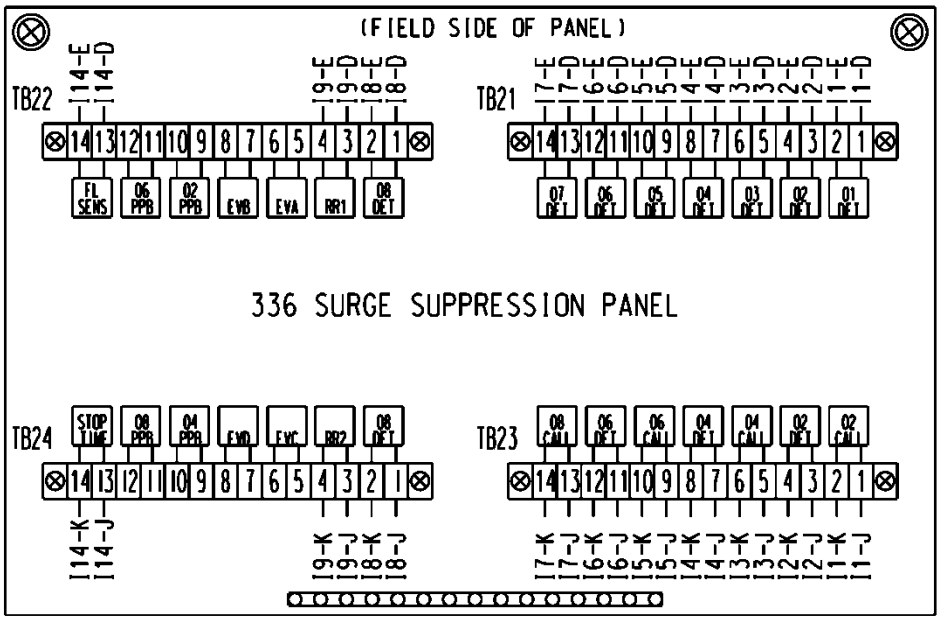
Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125 inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

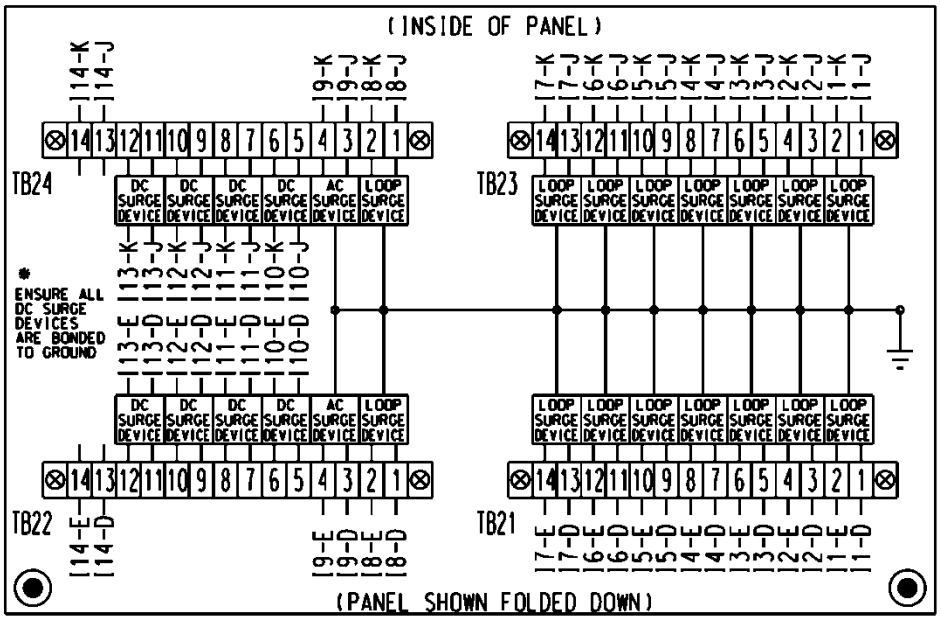
Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For pole mounted cabinets, mount surge protection devices for the AC+ interconnect inputs, inductive loop detector inputs, and low voltage DC inputs on a swing down panel assembly fabricated from sturdy aluminum. Attach the swing down panel to the bottom rear cabinet rack assembly using thumb screws. Ensure the swing down panel allows for easy removal of the input file without removing the surge protection panel assembly or its parts. Have the surge protection devices mounted horizontally on the panel and soldered to the feed through terminals of four 14 position terminal blocks with #8 screws mounted on the other side. Ensure the top row of terminals is connected to the upper slots and the bottom row of terminals is connected to the bottom slots. Provide a 15 position copper equipment ground bus attached to the field terminal side (outside) of the swing down panel for termination of loop lead-in shield grounds. Ensure that a Number 4 AWG green wire connects the surge protection panel assembly ground bus to the main cabinet equipment ground.





For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070L controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070L controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated March 12, 2009, with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)

- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150ms (210 mode).

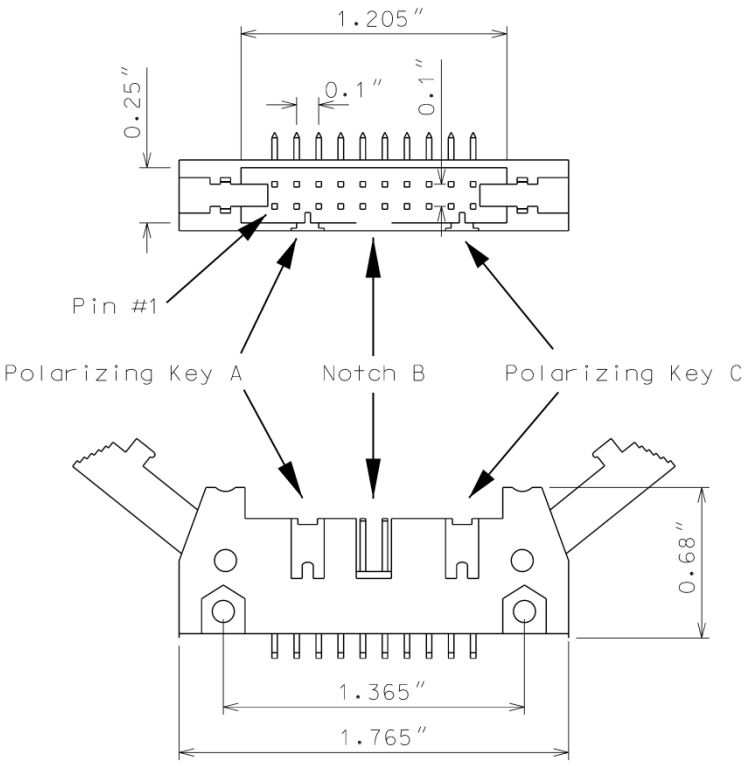
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1s (210 mode).

Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered ‘Active’ at a voltage greater than 70 Vrms and ‘Not Active’ at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered ‘Active’ at a voltage less than 50 Vrms and ‘Not Active’ at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS’ 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right angle solder tails are designed for a 0.062” thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10” and pitch is 0.10”. Ensure the mating length of the connector pins is 0.24”. Ensure the pins are finished with gold plating 30µ” thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less than 250 ms. A Special Function input is undefined by these specifications and may or may not be sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an "off" condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an "off" condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS' 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no "on" voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070L controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less that 750 ms when used with a 170 controller and 1200 ms when used with a 2070L controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:

    a) Red Enable input to monitor is active (Red Enable voltages are "on" at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and

    b) Neither Special Function 1 nor Special Function 2 inputs are active.

c) Pin #EE (output relay common) is not active

2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1-second accuracy). If a channel fails to detect an "on" signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an "on" signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.
3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as "on" at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.
4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 Hz ± 20% with a 50% duty cycle when the AC Line voltage falls below the "drop-out" level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the "restore" level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the "restore" level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 10 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 Hz ± 20% with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the "restore" level. If the watchdog input has not made

5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel for the following fault conditions: Conflict, Red Fail, Dual Indication, and Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 9 Red	Channel 10 Red	Channel 11 Red	Channel 12 Red
Yellow Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Flashing Yellow Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

FYAc mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
Flashing Yellow Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green
Green Arrow	Channel 9 Green	Channel 9 Yellow	Channel 10 Green	Channel 10 Yellow

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

For conflict monitors used within an Ethernet communications system, provide a conflict monitor with an Ethernet 10/100 Mbps, RJ-45 port for data communication access to the monitor by a local notebook computer and remotely via a workstation or notebook computer device connected to the signal system local area network. The Ethernet port shall be electrically isolated from the conflict monitor's electronics and shall provide a minimum of 1500 Vrms isolation. Integrate monitor with Ethernet network in cabinet. Provide software to retrieve the time and date from a network server in order to synchronize the on-board times between the conflict monitor and the controller. Furnish and install the following Windows based, graphic user interface software on workstations and notebook computers where the signal system client software is installed: 1) software to view and retrieve all event log information, 2) software that will search and display a list of conflict monitor IP addresses and IDs on the network, and 3) software to change the conflict monitor's network parameters such as IP address and subnet mask.

For non-Ethernet connected monitors, provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070L controller or to a Department-furnished laptop computer. Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070). Furnish and connect a serial cable from the conflict monitor's DB-9 connector to Comm Port 1 of the 2070 controller. Ensure conflict monitor communicates with the controller. Provide a Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	**Function**	**I/O**
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

MONITOR BOARD EDGE CONNECTOR

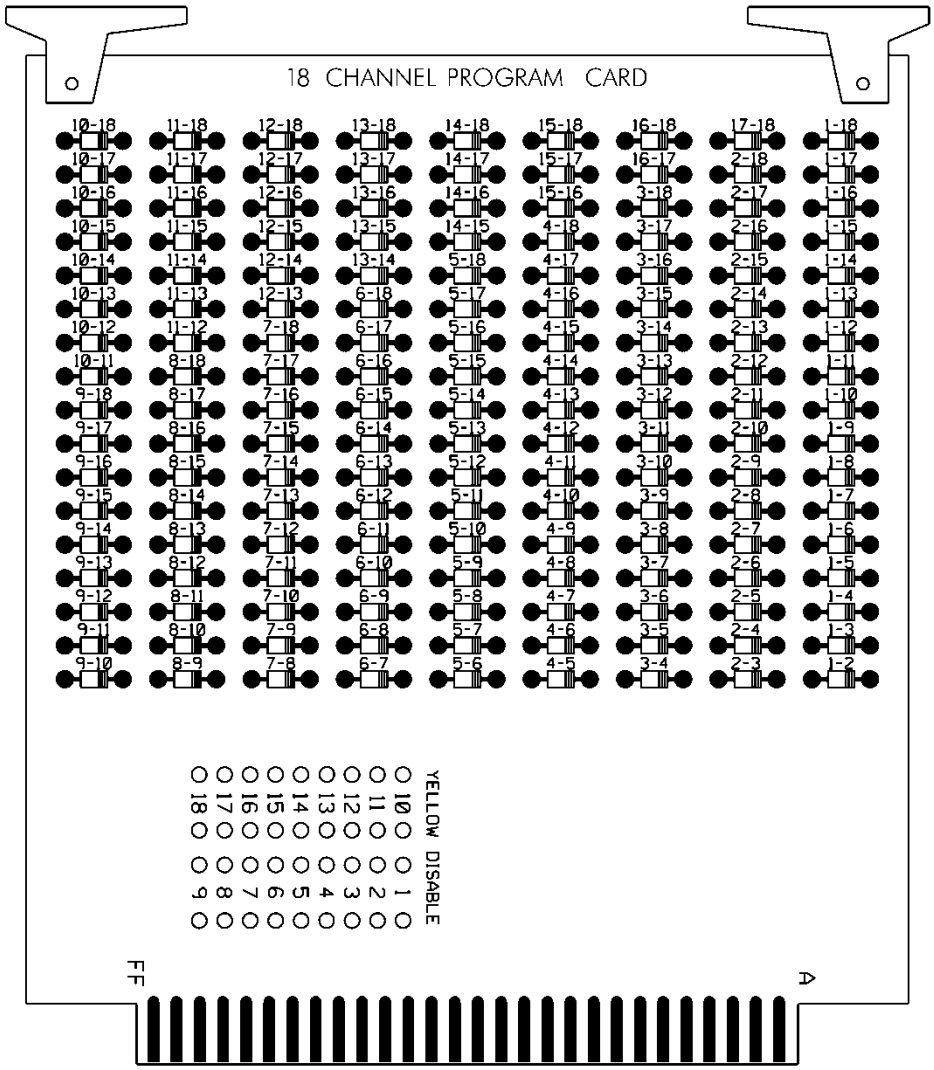
Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output,Side #2,Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



E. Preemption and Sign Control Box

Provide preemption and sign control box to operate in a Model 332 and Model 336S cabinet. Provide hardware to mount the box to the cage of the cabinet to ensure the front side is facing the opposite side of the cabinet. Furnish the material of the box from a durable finished metallic or thermoplastic case. Ensure the size of the box is not greater than 7(l) x 5(w) x 5(d) inches. Ensure that no modification is necessary to mount the box on the cabinet cage.

Provide the following components in the preemption and sign control box: relays, fuses, terminal blocks, MOVs, resistor, RC network, lamp, and push button switch.

Provide UL Listed or Recognized relay K1 as a DPDT enclosed relay (120 VAC, 60 Hz coil) with an 8-pin octal-style plug and associated octal base. Provide contact material made of AgCdO with a 10 amp, 240 VAC rating. Ensure the relay has a specified pickup voltage of 102 VAC.

Provide relay SSR1 as a Triac SPST normally open solid state relay that is rated for 120 VAC input and zero-crossing (resistive load) 25 amp @ 120 VAC output. Ensure the relay turns on at 90 Vrms within 10 ms and turns off at 10 Vrms within 40 ms. Ensure the relay has physical

characteristics as shown in the wiring detail in Figure 1. Provide 4 terminal screws with saddle clamps.

Provide fuses F1 and F2 as a UL Listed ¼″ x 1-1/4″ glass tube rated at 250 volts with a 10kA interrupting rating. Ensure F1 non-delay (fast-acting) and F2 slow-blow (time-delay) fuses have a maximum opening times of 60 minutes and 120 seconds for currents of 135 and 200 percent of the ampere rating, respectively. Ensure F2 slow-blow (time-delay) fuses have a minimum opening times of 12 seconds at 200 percent of the ampere rating. Provide fuse holders that are UL Recognized panel-mounted holders rated 250V, 15 ampere minimum with bayonet-type knobs which accept ¼″ x 1-1/4″ glass tube fuses.

Provide terminal blocks that are rated for 300V and are made of electrical grade thermoplastic or thermosetting plastic. Ensure each terminal block is of closed back design and has recessed-screw terminals with molded barriers between terminals. Ensure each terminal block is labeled with a block designation. Ensure each terminal is labeled with the function and a number.

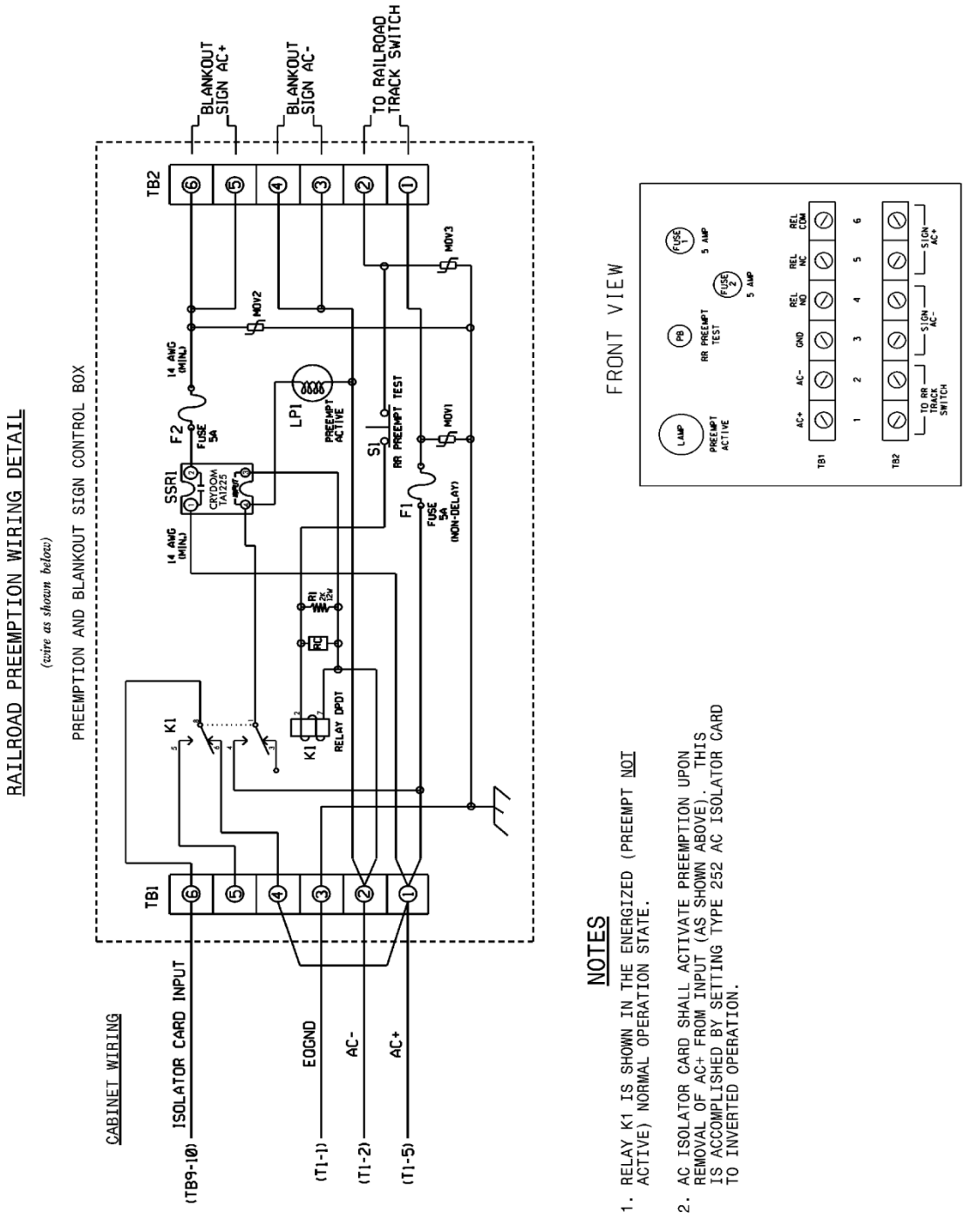
Provide 3/4-inch diameter radial lead UL-recognized metal oxide varistors (MOVs) that have electrical performance as outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide resistor R1 as a 2K ohm, 12 watt, wirewound resistor with tinned terminals and attaching leads. Ensure the resistor is spaced apart from surrounding wires.

Provide a LED or incandescent lamp that has a voltage rating of 120 VAC with a minimum life rating at 50,000 hours.

Wire the preemption and sign control box as shown in Figure 1.



NOTES

1. RELAY K1 IS SHOWN IN THE ENERGIZED (PREEMPT NOT ACTIVE) NORMAL OPERATION STATE.
2. AC ISOLATOR CARD SHALL ACTIVATE PREEMPTION UPON REMOVAL OF AC+ FROM INPUT (AS SHOWN ABOVE). THIS IS ACCOMPLISHED BY SETTING TYPE 252 AC ISOLATOR CARD TO INVERTED OPERATION.

Figure 1

4.4. MATERIALS – TYPE 170 DETECTOR SENSOR UNITS

Furnish detector sensor units that comply with Chapter 5 Section 1, "General Requirements," and Chapter 5 Section 2, "Model 222 & 224 Loop Detector Sensor Unit Requirements," of the CALTRANS "Transportation Electrical Equipment Specifications" dated March 12, 2009 with Erratum 1.

4.5. MATERIALS – TYPE 2070E CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010) except as required herein.

Furnish Model 2070E controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide Model 2070E controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1E, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2A or approved MODEL 2070-2E, Field I/O Module (FI/O)
  - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is "off")
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

ST-1

Project: R-2915A **Watauga/Ashe County**

Project Special Provisions
Structures and Culverts

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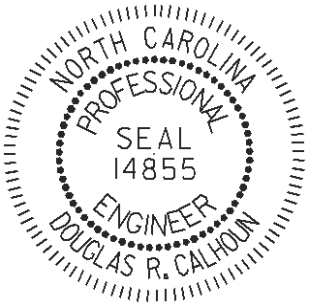
For Pile Driving Criteria and MSE Retaining Walls,
see Geotechnical special provisions.

8/4/2015



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PROJECT SPECIAL PROVISIONS
STRUCTURE AND CULVERTS

PROJECT R-2915A **WATAUGA / ASHE COUNTY**

MAINTENANCE AND PROTECTION OF TRAFFIC (8-13-04)
BENEATH PROPOSED STRUCTURE AT STATION 11+18.63 –L-

1.0 GENERAL

Maintain traffic on US-421 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 16'-11" at all times during construction.

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

2.0 PROTECTION OF TRAFFIC

Protect traffic from any operation that affords the opportunity for construction materials, equipment, tools, etc. to be dropped into the path of traffic beneath the structure. Based on Contractor means and methods determine and clearly define all dead and live loads for this system, which, at a minimum, shall be installed between beams or girders over any travelway or shoulder area where traffic is maintained. Install the protective system before beginning any construction operations over traffic. In addition, for these same areas, keep the overhang falsework in place until after the rails have been poured.

3.0 BRACING GIRDERS

Brace girders to resist wind forces, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the member during all stages of erection and construction. Before casting of intermediate diaphragms, decks, or connecting steel diaphragms do not allow the horizontal movement of girders to exceed ½ inch.

4.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

PLACING LOAD ON STRUCTURE MEMBERS (11-27-12)

The 2012 Standard Specifications shall be revised as follows:

In **Section 420-20 – Placing Load on Structure Members** replace the first sentence of the fifth paragraph with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 7 curing days.

STEEL REINFORCED ELASTOMERIC BEARINGS (11-27-12)

The 2012 Standard Specifications shall be revised as follows:
In **Section 1079-1 – Preformed Bearing Pads** add the following after the second paragraph:

Internal holding pins are required for all shim plates when the contract plans indicate the structure contains the necessary corrosion protection for a corrosive site.

Repair laminated (reinforced) bearing pads utilizing external holding pins via vulcanization. Submit product data for repair material and a detailed application procedure to the Materials and Tests Unit for approval before use and annually thereafter.

THERMAL SPRAYED COATINGS (METALLIZATION) (9-30-11)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces as specified herein when called for on the plans or by other Special Provisions, or when otherwise approved by the Engineer in accordance with the SSPC-CS 23.00/AWS C2.23/NACE No. 12 Specification. Only Arc Sprayed application methods are used to apply TSC coatings, the Engineer must approve other methods of application.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the following requirements:

1. The capability of blast cleaning steel surfaces to SSPC SP-5 and SP-10 Finishes.

2. Employ Spray Operator(s) qualified in accordance with AWS C.16/C2.16M2002 and Quality Control Inspector(s) who have documented training in the applicable test procedures of ASTM D-3276 and SSPC-CS 23.00.

A summary of the contractor's related work experience and the documents verifying each Spray Operator's and Quality Control Inspector's qualifications are submitted to the Engineer before any work is performed.

3.0 MATERIALS

Provide wire in accordance with the metallizing equipment manufacturer's recommendations. Use the wire alloy specified on the plans which meets the requirements in Annex **C** of the SSPC-CS 23.00 Specification. Have the contractor provide a certified analysis (NCDOT Type 2 Certification) for each lot of wire material.

Apply an approved sealer to all metallized surfaces in accordance with Section 9 of SSPC-CS 23. The sealer must either meet SSPC Paint 27 or is an alternate approved by the Engineer.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Grind flame cut edges to remove the carbonized surface prior to blasting. Bevel all flame cut edges in accordance with Article 442-10(D) regardless of included angle. Blast clean surfaces to be metallized with grit or mineral abrasive in accordance with Steel Structures Painting Council SSPC SP-5/10(as specified) to impart an angular surface profile of 2.5 - 4.0 mils. Surface preparation hold times are in accordance with Section 7.32 of SSPC-CS 23. If flash rusting occurs prior to metallizing, blast clean the metal surface again. Apply the thermal sprayed coating only when the surface temperature of the steel is at least 5°F above the dew point.

At the beginning of each work period or shift, conduct bend tests in accordance with Section 6.5 of SSPC-CS 23.00. Any disbonding or delamination of the coating that exposes the substrate requires corrective action, additional testing, and the Engineer's approval before resuming the metallizing process.

Apply TSC with the alloy to the thickness specified on the plans or as provided in the table below. All spot results (the average of 3 to 5 readings) must meet the minimum requirement. No additional tolerance (as allowed by SSPC PA-2) is permitted. (For Steel Beams: For pieces with less than 200 ft^2 measure 2 spots/surface per piece and for pieces greater than 200 ft^2 add 1 additional spots/surface for each 500 ft^2).

Application	Thickness	Alloy	Seal Coat
Pot Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Armored Joint Angles	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Modular Joints	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Expansion Joint Seals	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Optional Disc Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil

When noted on the plans or as specified in the above chart, apply the sealer to all metallized surfaces in accordance with the manufacturer's recommendations and these provisions. Apply the seal coat only when the air temperature is above 40°F and the surface temperature of the steel is at least 5°F above the dew point. If the sealer is not

applied within eight hours after the final application of TSC, the applicator verifies acceptable TSC surfaces and obtains approval from the Engineer before applying the sealer.

5.0 INSPECTION FREQUENCY

The TSC Contractor must conduct the following tests at the specified frequency and the results documented in a format approved by the Engineer.

Test/Standard	Location	Frequency	Specification
Ambient Conditions	Site	Each Process	5°F above the dew point
Abrasive Properties	Site	Each Day	Size, angularity, cleanliness
Surface Cleanliness SSPC Vis 1	All Surfaces	Visual All Surfaces	SSPC-SP-10 Atmospheric Service SSPC-SP - 5 Immersion Service
Surface Profile ASTM D-4417 Method C	Random Surfaces	3 per 500 ft^2	2.5 - 4.0 mils
Bend Test SSPC-CS 23.00	Site	5 per shift	Pass Visual
Thickness SSPC PA-2R SSPC-CS 23.00	Each Surface	Use the method in PA-2 Appendix 3 for Girders and Appendix 4 for frames and miscellaneous steel. See Note 1.	Zn - 8 mils minimum Al - 8 mils minimum Zn Al - 8 mils minimum Areas with more than twice the minimum thickness are inspected for compliance to the adhesion and cut testing requirements of this specification.
Adhesion ASTM 4541	Random Surfaces Splice Areas	1 set of 3 per 500 ft^2	Zn > 500 psi Al > 1000 psi Zn Al > 750 psi
Cut Test - SSPC-CS 23.00	Random Surfaces	3 sets of 3 per 500 ft^2	No peeling or delamination
Job Reference Std. SSPC-CS 23.00	Site	1 per job	Meets all the above requirements

6.0 REPAIRS

All Repairs are to be performed in accordance with the procedures below, depending on whether the repair surface is hidden or exposed. As an exception to the following, field welded splices on joint angles and field welding bearing plates to girders may be repaired in accordance with the procedures for hidden surfaces.

For hidden surfaces (including but not limited to interior girders, interior faces of exterior girders, and below-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallizing at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.

2. Minor areas less than or equal to 0.1 ft^2 exposing the substrate are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."

3. Large areas greater than 0.1 ft^2 exposing the substrate are metallized in accordance with SSPC CS 23.00.

4. Damaged (burnished) areas not exposing the substrate with less than the specified coating thickness are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."

5. Damaged (burnished) areas not exposing the substrate with more than the specified coating thickness are not repaired.

6. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

For Exposed Surfaces (including but not limited to exterior faces of exterior girders and above-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallization at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.

2. All areas exposing the substrate are metallized in accordance with SSPC CS 23.00

3. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

7.0 TWELVE MONTH OBSERVATION PERIOD

The contractor maintains responsibility for the coating system for a twelve (12) month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the engineer. The contractor must guarantee the coating system under the payment and performance bond (refer to Article 109-10). To successfully complete the observation period, the coating system must meet the following requirements after twelve(12) months service:

- No visible rust, contamination or application defect is observed in any coated area.
- Painted surfaces have a uniform color and gloss.

- Surfaces have an adhesion of no less than 500 psi when tested in accordance with ASTM D-4541.

8.0 BASIS OF PAYMENT

The contract price bid for the bridge component to which the coating is applied will be full compensation for the thermal sprayed coating.

EXPANSION JOINT SEALS (9-30-11)

1.0 GENERAL

The work covered by this Special Provision consists of furnishing and installing the expansion joint seals as shown on the contract drawings. All materials, labor, equipment and incidentals necessary for the proper installation of the expansion joint seals are included.

2.0 MATERIAL

Provide expansion joint seals capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans.

Provide an elastomeric component for each expansion joint seal that is a continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. The minimum length of an elastomeric component before shop splicing is 20 feet. However, one piece shorter than 20 feet is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Make sure the convolution of the gland does not project above the top of the hold-down plates when the joint opening is in the most compressed condition. Use either elastic polychloroprene (neoprene) or ethyl propylene diene monomer (EPDM) for the elastomer that meets the following minimum properties:

	ASTM TEST METHOD	REQUIREMENTS
Hardness, Durometer - Shore A	D2240	60 ± 5, Neoprene (upward corrugated shape - fabric reinforced) 75 ± 5, EPDM and Neoprene (upward non-corrugated shape) 80 ± 5, EPDM (upward corrugated shape-fabric reinforced)
Tensile Strength	D412	2000 psi (min.)
Elongation at Break	D412	250% (min.)
Width of Gland in Relaxed Condition	N/A	10" ± 0.25"

Thickness of Upturned portion of gland	N/A	0.25" non-corrugated shape, -0.032" to +0.032"
Thickness of Upturned portion of gland	N/A	0.1875" corrugated shape, -0.032" to +0.032"
Thickness of Flat portion of gland	N/A	0.1563", -0.032" to +0.032"

For fabric reinforced glands, submit one unreinforced sample per lot number, up to 500 feet of Expansion Joint Seal, to the Engineer for testing.

Only field splice hold-down plates at crown points, at abrupt changes in the deck slab cross slope, and on lane lines. Splicing within travel lanes is not permitted and splicing on edge lines is not required. Field splice hold-down plates between the edge line and gutter upturn and where necessary for proper installation and alignment is permitted. Show all splice locations on the working drawings for approval. For the location of lane markings at the expansion joint seal, see the Structure plans. At the splice locations, locate the hold-down bolts 3 inches from the end of the hold-down plate. At splice locations where changes in deck slab cross slope occur, cut the ends of hold-down plates parallel to the bridge centerline for skews less than 80° and greater than 100°.

Do not use welded shop splices in hold-down plates.

3.0 SHOP DRAWINGS

Submit nine sets of working drawings to the Engineer for review, comments and acceptance. Show complete details drawn to scale and include:

- The proposed template details including the makeup of the template

- The proposed method of holding the base angle assembly in place while concrete is cast around it
- The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening
- The proposed chronology of installation including the sequence and direction of the concrete casting
- The details of cross connectors between base angles, such as steel bars with slots bolted to angles, to maintain evenness between the adjacent base angles while accommodating movement that occurs when concrete is cast. Indicate when bolts are loosened to allow movement.
- The proposed method for removing the hold-down plate
- A section detail through the joint showing horizontal offset dimensions of the base angles from the centerline joint. This detail is required when the vertical face of the joint opening is not perpendicular to the roadway surface (e.g. when the roadway grade is significant).

Have someone other than the one who prepares the drawing check all detailed drawings and include the signatures of both the drafter and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor. Provide all completed drawings well in advance of the scheduled installation time for the expansion joint seal.

4.0 INSTALLATION

Provide supports for the base angle assembly at a maximum spacing of 9 feet. Place supports near field splices of base angles to ensure that field splices are straight and even. Provide base angles with ½" diameter weep holes at 12 inch centers to allow bleeding of trapped air and/or water. Do not obstruct the weep holes with falsework. Make the bottom of the trough parallel to grade and the sides parallel to the sides of the expansion joint seal.

For damaged areas, depressions, spalls, cracks, or irregularities of curbs or decks adjacent to the expansion joint, submit a proposed method of repair and repair material specifications for approval.

If the Engineer deems any aspects of the expansion joint seals unacceptable, make necessary corrections.

5.0 INSPECTION

When concrete is cast, use a non-aluminum, 10 foot, true to line straight edge to check and grade the top of the slab on each side of the joint to ensure smooth transition between spans.

Watertight Integrity Test

- Upon completion of an expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalks, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not a sign of leakage.
- If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.
- If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no extra cost to the Department.

6.0 BASIS OF PAYMENT

Basis of payment for all expansion joint seals will be at the lump sum contract price for "Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including any steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the expansion joint seal in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT AT STATION 66+11.00 –L- AND 9+89.00 –LPC- / 9+99.00 -RPC (12-12-13)

1.0 GENERAL

This Special Provision covers the design, fabrication and construction of precast reinforced concrete box culverts intended for the conveyance of storm water.

If the option is indicated on the plans, the submittal for a precast reinforced box culvert in lieu of a cast-in-place culvert is permitted. Design the precast culvert sections in

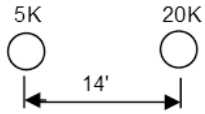
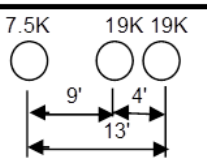
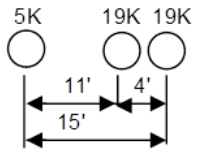
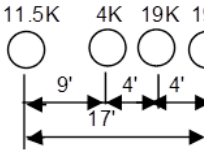
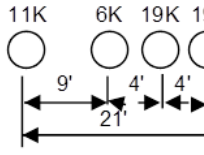
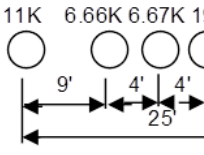
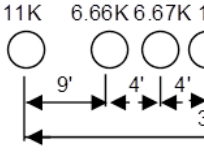
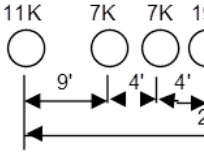
accordance with ASTM C1577 or the current edition of the AASHTO LRFD Bridge Design Specifications. Rate all sizes of precast reinforced concrete box culverts in accordance with the current edition of the AASHTO Manual for Bridge Evaluation. Ensure the culvert rates for the AASHTO design loads and North Carolina's legal loads (see Section 2.0 for North Carolina's legal loads). Provide the size and number of barrels as indicated on the plans. Detail the culvert with cast-in-place wings walls and footings. Precast wing walls and footings will not be allowed. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

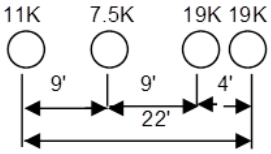
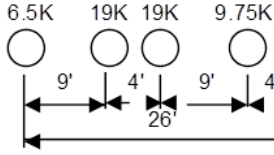
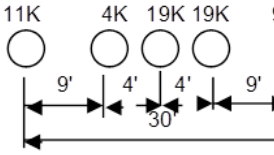
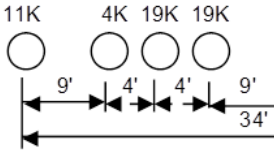
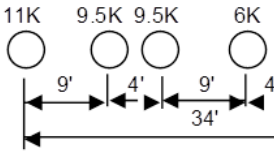
The design and rating of the precast and cast-in-place members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans and rating sheets for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box and cast-in-place members. Have a North Carolina Registered Professional Engineer check and seal the plans, rating sheets and design calculations. After the plans, rating sheets and design calculations are reviewed and, if necessary, the corrections made, submit one set of plans and rating sheets on 22" x 34" sheets to become part of the contract plans.

If the span, rise and design earth cover for the precast reinforced concrete box culvert are identical to a previously approved submittal, the Contractor may request the previously approved design calculations and plans be considered as the submittal for review and approval. However, a set of plans and rating sheets will need to be submitted to become part of the contract plans.

2.0 NORTH CAROLINA'S LEGAL LOADS

Apply the following legal loads to all structures carrying interstate traffic:

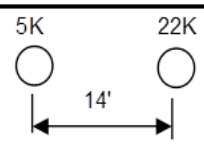
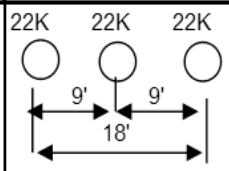
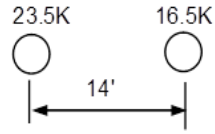
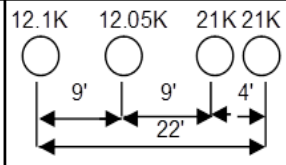
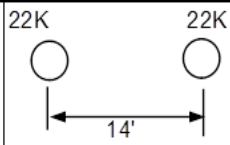
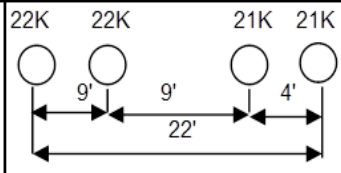
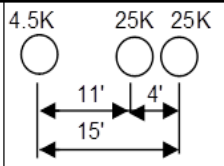
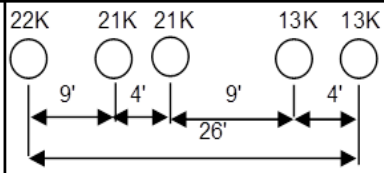
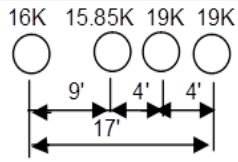
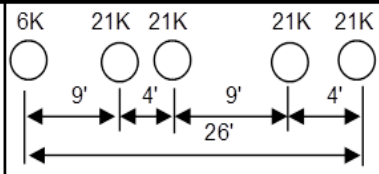
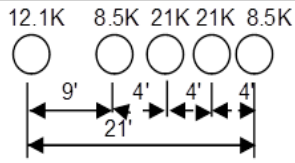
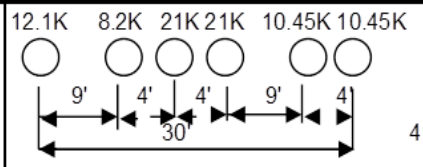
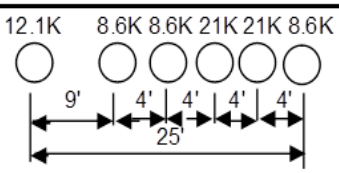
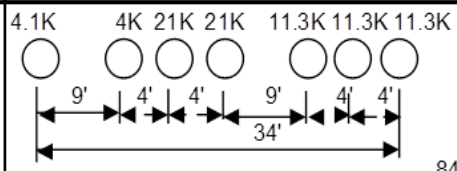
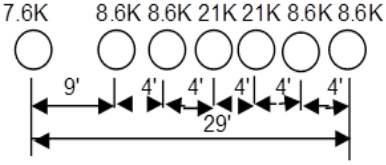
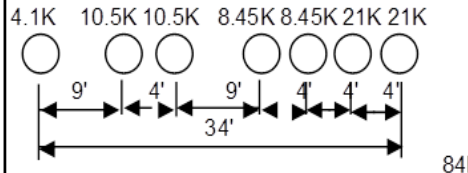
SINGLE VEHICLE(SV)	
REF. #	SCHEMATIC
SH	 25K 12.5 TON
S3A	 45.5K 22.75 TON
S3C	 43K 21.5 TON
S4A	 53.5K 26.75 TON
S5A	 61K 30.5 TON
S6A	 69K 34.5 TON
S7A	 80K 40 TON
S7B	 77K 38.5 TON

TRUCK TRACTOR SEMI-TRAILER(TTST)	
REF. #	SCHEMATIC
T4A	 56.5K 28.25 TON
T5B	 64K 32 TON
T6A	 72K 36 TON
T7A	 80K 40 TON
T7B	 80K 40 TON

ST-13

R-2915A Watauga / Ashe Co.

Apply the following legal loads to all structures carrying non-interstate traffic:

SINGLE VEHICLE (SV)			TRUCK TRACTOR SEMI-TRAILER (TTST)		
REF. #	SCHEMATIC		REF. #	SCHEMATIC	
SNSH		27K 13.5 TON	TNAGRIT3		66K 33 Ton
SNGARBS2		40K 20 TON	TNT4A		66.15K 33.075 TON
SNAGRIS2		44K 22 Ton	TNAGRIT4		86K 43 TON
SNCOTTS3		54.5K 27.25 TON	TNAGT5A		90K 45 TON
SNAGGRS4		69.85K 34.925 TON	TNAGT5B		90K 45 TON
SNS5A		71.1K 35.55 TON	TNT6A		83.2K 41.6 TON
SNS6A		79.9K 39.95 TON	TNT7A		84K 42 TON
SNS7B		84K 42 TON	TNT7B		84K 42 TON

3.0 PRECAST REINFORCED CONCRETE BOX SECTIONS

The precast reinforced concrete box culvert sections shall match the size and hydraulic opening indicated in the contract plans.

A. Design

1. Design Fill – The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the bottom of the top slab.

2. Placement of Reinforcement – Provide a 1 inch concrete cover over the reinforcement subject to the provisions of Section F. Extend the inside reinforcement into the tongue portion of the joint and the outside reinforcement into the groove portion of the joint. Detail the clear distance of the end wires so it is not less than 1/2 inch or more than 2 inches from the ends of the box section. Assemble reinforcement per the requirements of ASTM C1577 or the approved design. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.

3. Laps and Spacing – Use lap splices for the transverse reinforcement. Detail the transverse wires so that the center to center spacing is not less than 2 inches or more than 4 inches. Do not detail the longitudinal wires with a center to center spacing of more than 8 inches.

B. Joints

1. Produce the precast reinforced concrete box section with tongue and groove ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the tongue and groove ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.

2. Seal the external joint with an outside sealer wrap conforming to ASTM C877 that is at least 12 inches wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in pieces, as indicated on Figure 1 below:

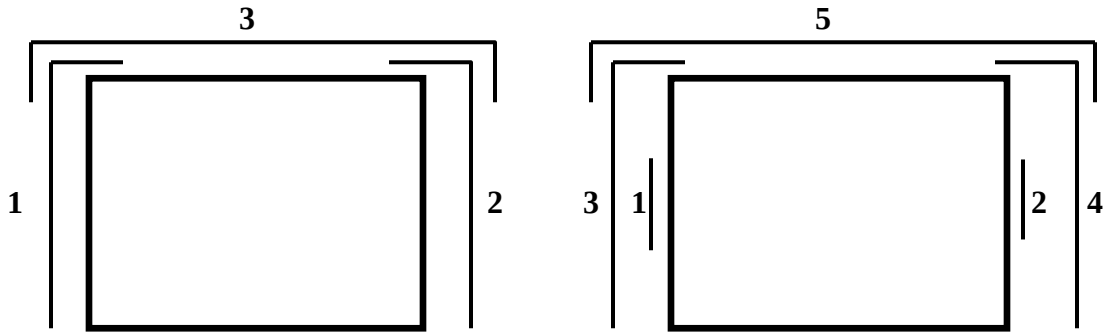


Figure 1

Cover the external joint sealer with a 3 foot strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications.

Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches. Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

C. Manufacture

Manufacture precast reinforced concrete box culvert sections by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd^3 of portland cement.

2. Strength – Concrete shall develop a minimum 28-day compressive strength of 5000 psi. Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.

3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.

4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).

5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and placing. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all handling devices flush with concrete surfaces as directed. Fill holes in a neat and

workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

D. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with ASTM C31 and ASTM C39.

E. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch in 8 feet.

2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch from the plan dimensions.

3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch.

4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches. The minimum length of the groove shall be 4 inches. The dimensions of the tongue and groove shall not vary more than 1/4 inch from the plan dimensions.

5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch, whichever is greater. A thickness more than that required on the plans is not a cause for rejection.

6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of ASTM C1577, Section 11.3.

7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch in any box section.

8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is ±3/8 inch for slab and wall thicknesses of 5 inches or less and ±1/2 inch for slab and wall thicknesses greater than 5 inches. Produce sections so that the concrete cover is never less than 5/8 inch as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.

9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

F. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, the Department will verify assembly of the first five adjacent sections or 20% of the total culvert length, whichever is greater, at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked. The producer shall document the GO-NO-GO dimensional measurements of each box culvert section produced through the post-pour inspection process.

2. Clearly mark each section of the box culvert in accordance with ASTM C1577, Section 15. The information requirements of Section 15.1 shall be clearly marked on the inner surface of each section.

G. Construction

1. Pre-installation Meeting – A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.

2. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet shall be provided between sections of fabric.

3. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.

4. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

4.0 BASIS OF PAYMENT

Any additional cost of redesigning will be paid for by the Contractor if Precast Reinforced Concrete Culvert is used in lieu of the cast-in-place culvert shown on the plans. Except for Foundation Conditioning Material and Culvert Excavation, payment for the Precast Box Culvert will be a lump sum amount equal to the payment that would be allowed for construction of a Cast-in-Place Box Culvert. Plan quantities and unit bid prices will be used to compute the lump sum amount. Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor, materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, leveling pad, end curtain walls, wings and wing footings.

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or

manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

   Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

   The following requirements replace those of Article 3.4.8.2.

   Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

   Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS (6-19-15)

1.0 GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required

submittals for the project. Submittals are only necessary for those items as required by the contract. Make submittals that are not specifically noted in this provision directly to the Engineer. Either the Structures Management Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Engineer, Structures Management Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

2.0 ADDRESSES AND CONTACTS

For submittals to the Structures Management Unit, use the following addresses:

Via US mail:

Mr. T. K. Koch, P. E.
State Structures Engineer
North Carolina Department of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Via other delivery service:

Mr. T. K. Koch, P. E.
State Structures Engineer
North Carolina Department of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

Submittals may also be made via email. Send submittals to:

plambert@ncdot.gov (Paul Lambert)

Send an additional e-copy of the submittal to the following addresses:

jgaither@ncdot.ov (James Gaither)

mrorie@ncdot.gov (Madonna Rorie)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:
Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit - Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:
Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit - Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:
Mr. Eric Williams, P. E.
Western Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit - Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via other delivery service:
Mr. Eric Williams, P. E.
Western Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit - Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's web site, via the "Drawing Submittal Status" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: Paul Lambert (919) 707–6407
(919) 250–4082 facsimile

Secondary Structures Contacts: James Gaither (919) 707–6409
Madonna Rorie (919) 707–6508

Eastern Regional Geotechnical Contact (Divisions 1-7):

K. J. Kim (919) 662–4710
(919) 662–3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):

Eric Williams (704) 455–8902
(704) 455–8912 facsimile
ewilliams3@ncdot.gov

3.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers "Geotechnical Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structures Management Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms [2] (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Disc Bearings [4]	8	0	"Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.

5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structures Management Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.
2. Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email) or by facsimile, US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.
3. The Pile Driving Equipment Data Form is available from:

   https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx

   See second page of form for submittal instructions.
4. Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY (8-15-05)

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

Submit all items listed below to the Engineer prior to beginning crane operations involving critical lifts. A critical lift is defined as any lift that exceeds 75 percent of the manufacturer's crane chart capacity for the radius at which the load will be lifted or requires the use of more than one crane. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.

C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.

D. **Certifications:** **By July 1, 2006**, crane operators performing critical lifts shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. All crane operators shall also have a current CDL medical card. Submit a list of anticipated critical lifts and corresponding crane operator(s). Include current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES 9-30-11

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in

accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance,

oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer's recommendations unless directed otherwise by the Engineer. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-13) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DENR State of North Carolina
Trout Buffer Zone Waiver	Division of Energy, Mineral, and Land Resources, DENR, State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by ***** are the responsibility of the Department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-13 of the *2012 Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the waters or wetlands provided that activities outside those areas is done in such a manner as to not affect the waters or wetlands.

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF

07 January 2015

RECEIVED
JAN 13 2014
OFFICE OF NATURAL ENVIRONMENT

RECEIVED
Division of Highways
JAN 13 2015
Preconstruction
Project Development and
Environmental Analysis Branch

Regulatory Division/1200A

Action ID: SAW-2012-00882

Mr. Richard Hancock, P.E.
Project Development and Environmental
Analysis Unit
NC Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina 27699-1598

Dear Mr. Hancock:

In accordance with the written request of July 22, 2014, and the ensuing administrative record, enclosed is a Department of the Army (DA) Permit to authorize the following: 1) Permanent placement of fill material into 7,886 linear feet of jurisdictional stream channel, 3.04 acres of adjacent riparian wetlands, and, 2) Temporary placement of fill material into 0.31 acres of waters of the US, associated with the proposed project (R-2915).

Any deviation in the authorized work will likely require modification of this permit. If a change in the authorized work is necessary, you should promptly submit revised plans to the Corps showing the proposed changes. You may not undertake the proposed changes until the Corps notified you that your permit has been modified.

Carefully read your permit. The general and special conditions are important. Your failure to comply with these conditions could result in a violation of Federal law. Certain significant general conditions require that:

a. You must complete construction before December 31, 2019.

b. You must notify this office in advance as to when you intend to commence and complete work.

c. You must allow representatives from this office to make periodic visits to your worksite as deemed necessary to assure compliance with permit plans and conditions.

You should address all questions regarding this authorization to Mrs. Jean B. Gibby in the Raleigh Regulatory Field Office, telephone number (919) 554-4884, extension 24.

Printed on Recycled Paper

Thank you in advance for completing our Customer Survey Form. This can be accomplished by visiting our web-site at http://regulatory.usacesurvey.com and completing the survey on-line. We value your comments and appreciate your taking the time to complete a survey each time you interact with our office.

Sincerely,

FOR Kevin P. Landers Sr.
Colonel, U.S. Army
District Commander

Enclosures

Copy Furnished (with enclosures):

Chief, Source Data Unit
NOAA/National Ocean Service
Attn: Sharon Tear N/CS261
1315 East-West Hwy., Rm 7316
Silver Spring, Maryland 20910-3282

Copies Furnished with special conditions and plans:

Mr. Pete Benjamin
U.S. Fish and Wildlife Service
Raleigh Ecological Service Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

Mr. Fritz Rohde
Habitat Conservation Division – Atlantic Branch
101 Pivers Island Road
Beaufort, North Carolina 28516

Mr. William Cox
Wetlands and Marine Regulatory Section
U.S. Environmental Protection Agency – Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-8931

Mr. Doug Huggett
Division Coastal Management
N.C. Department of Environment
And Natural Resources
400Commerce Avenue
Morehead City, North Carolina 28557

Dr. Pace Wilber
Habitat Conservation Division – Atlantic Branch
NOAA Fisheries Service
219 Fort Johnston Road
Charleston, South Carolina 29412

Mr. Tony Able
Wetlands Regulatory Section
U.S. Environmental Protection Agency – Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303

DEPARTMENT OF THE ARMY PERMIT

Permittee: NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ATTN: MR. RICHARD W. HANCOCK

Permit No: SAW-2012-00882

Issuing Office: USAED, WILMINGTON

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of the office acting under the authority of the commanding officer.

You are authorized to perform work in the accordance with the terms and conditions specified below.

Project Description: The project, identified as R-2915, consists of the widening of US 221 to a four-lane, median-divided facility from US 421 in the Deep Gap Community of Watauga County, North Carolina to the US 221 Business/NC88 intersection in the town of Jefferson, in Ashe County, North Carolina. R-2915 is divided into 5 sections for construction purposes, identified as Sections R-2915A, R-2915B, R-2915C, R-2915D, and R-2915E. Total permanent impacts for the construction of this project are 7,886 linear feet of jurisdictional stream channel and 3.04 acres of adjacent riparian wetlands. Temporary impacts total 0.31 acre of jurisdictional stream channel associated with the road's construction. All impacts are within the New River basin (Hydrologic Categorical Unit 05050001). THIS IS A PHASED PERMIT AUTHORIZATION: **This permit only authorizes work on Sections A, B, and D of TIP R-2915.** Construction on Sections C and E of TIP R-2915 shall not commence until final design has been completed for these sections, the permittee has minimized impacts to waters and wetlands to the maximum extent practicable, any modifications to the plans, and a compensatory mitigation plan, have been approved by the US Army Corps of Engineers (the Corps).

In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

Project Location: The project, identified as R-2915, involves 16.1 miles of widening US 221 from its intersection with US 421 in the Deep Gap Community, in Watauga County, North Carolina and extends to the US 221 Business/NC88 intersection in Jefferson, Ashe County, North Carolina. R-2915A begins at US 421 in Watauga County to SR 1003 (Idlewild Road) for 2.8 miles. The next section, R-2915B, runs 1.77 miles from SR 1003 (Idlewild Road) to the north of the South Fork New River. R-2915C extends from the South Fork New River 3.98 miles to south of NC 94. From south of NC 94, R-2915D extends 4.3 miles to US 211 Bypass. From US 221 Bypass, R-2915E extends 3.3 miles to the project's terminus at the US 221/NC88 intersection, in Jefferson, North Carolina. Coordinates (in latitude and longitude) for the site are 36.3475° N, -81.5320° W. The project will impact Gap Creek in twelve (12) different locations, along with impacting twenty-four (24) of its unnamed tributaries, South Fork of New River three (3) times, along with Old Field Creek and nine (9) of its unnamed tributaries, four (4) unnamed tributaries to South Beaver Creek, and Beaver Creek and fourteen (14) of its unnamed tributaries. The project also contains forty-six (46) adjacent riparian wetlands sites. All jurisdictional waters are located within the New River Basin (8-Digit Cataloging Unit 05050001).

Permit Conditions:

General Conditions:

1. The time Limit for completing the work authorized ends on December 31, 2019. **If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.**

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Conditions 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions (Appendix B).

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

*SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. C. 403).

(X) Section 404 of the clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United states in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was mad in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measure by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

12/29/2014

(PERMITTEE) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ATTN: RICHARD HANCOCK

(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Eric Alsey FOR

1/7/2015

(DISTRICT Engineer) KEVIN P. LANDERS SR., COLONEL

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee) (Date)

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

Failure to institute and carry out the details of the following special conditions below (listed as 1 - 27) will result in a directive to cease all ongoing and permitted work within waters of the United States, including wetlands, associated with the permitted project, or such other remedies and/or fines as the U.S. Army Corps of Engineers District Commander or his authorized representatives may seek.

WORK LIMITS

*1. **CONSTRUCTION PLANS:** All work authorized by this permit must be performed in strict compliance with the attached application and plans for R-2915, which were received on July 22, 2014. These plans are a part of this permit and identified as Exhibit A. Any modification to these plans must be approved by the US Army Corps of Engineers (USACE) prior to implementation.

2. PHASED PERMIT: This permit only authorizes work on Sections A, B, and D of TIP R-2915. Construction on Sections C and E shall not commence until final design has been completed for this section, the permittee has minimized impacts to waters and wetlands to the maximum extent practicable, any modifications to the plans, and a compensatory mitigation plan, have been approved by the U.S. Army Corps of Engineers (Corps). Preliminary plans for R-2915 C and E were provided with the July 22, 2014; application (sheets 1-33 and sheets 1-16, respectively). However, these plans are not to be used for construction purposes.

*3. **PLANS:** The permittee will ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers, Raleigh Regulatory Field Office prior to any active construction in waters or wetlands.

4. UNAUTHORIZED DREDGE OR FILL: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with this project.

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

5. MAINTAIN CIRCULATION AND FLOW OF WATERS: Except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within waters or wetlands or to reduce the reach of waters or wetlands.

6. DEVIATION FROM PERMITTED PLANS: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, or shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permits, including appropriate compensatory mitigation. This prohibition applies to all borrow and fill activities connected with this project. In addition, except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands or to reduce the reach of waters or wetlands..

* **7. PRECONSTRUCTION MEETING:** The permittee shall schedule a preconstruction meeting between its representatives, the contractor's representatives, and the Corps of Engineers, Raleigh Regulatory Field Office, NCDOT Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all of the terms and conditions contained within this Department of the Army Permit. The permittee shall provide the USACE, Raleigh Regulatory Field Office, NCDOT Regulatory Project Manager, with a copy of the final plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. The permittee shall schedule the preconstruction meeting for a time when the USACE and North Carolina Division of Water Resources (NCDWR) Project Managers can attend. The permittee shall invite the Corps and NCDWR Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedule and participate in the required meeting.

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

8. MORATORIA: To avoid adverse impacts to spawning populations of trout at this project site, no in-stream work and land disturbance within the 25-foot trout buffer from October 15 to April 15 for all streams supporting wild trout with the project area. This includes Cole Branch, Gap Creek, Old Field Creek, Beaver Creek and their unnamed tributaries. Little Buffalo Creek, South Beaver Creek and Naked Creek, along with their unnamed tributaries, are not subject to any construction moratoria.

RELATED LAWS

9. WATER CONTAMINATION: All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Resources at 1 (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

PROJECT MAINTENANCE

10. NOTIFICATION OF CONSTRUCTION COMMENCEMENT AND COMPLETION: The permittee shall advise the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

11. CLEAN FILL: Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used.

12. PERMIT DISTRIBUTION: The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, shall be available at the project site during construction and maintenance of this project

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

13. SILT-FENCING: The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

14. PERMIT REVOCATION: The permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

15. EROSION CONTROL MEASURES IN WETLANDS: The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

ENFORCEMENT

*__16. REPORTING ADDRESS:__ All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Raleigh Regulatory Field Office, c/o Mr. Andrew Williams, 3331 Heritage Trade Drive, Suite 105, Wake Forest, NC 27587, and by telephone at (919) 554-4884, Ext. 26. The Permittee shall reference the following permit number, SAW-2012-00882, on all submittals.

17. REPORTING VIOLATIONS OF THE CLEAN WATER ACT AND THE RIVERS AND HARBORS ACT: Violations of these conditions or violations of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act must be reported in writing to the Wilmington District U.S. Army Corps of Engineers within 24 hours of the permittee's discovery of the violation.

18. COMPLIANCE INSPECTION: A representative of the Corps of Engineers will periodically and randomly inspect the work for compliance with these conditions. Deviations from these procedures may result in an administrative financial penalty and/or directive to cease work until the problem is resolved to the satisfaction of the Corps.

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

19. CULVERTS

A. Unless otherwise requested in the applicant's application and depicted on the approved work plans, culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert must be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Destabilizing the stream channel and head cutting upstream should be considered in the placement of the culvert.

B. Measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening should be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

20. SEDIMENT EROSION CONTROL

A. During the clearing phase of the project, heavy equipment must not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

B. No fill or excavation for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless it is included on the plan drawings and specifically authorized by this permit.

C. The permittee shall remove all sedimentation and erosion control measures placed in wetlands or waters, and shall restore natural grades on those areas, prior to project completion.

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

D. The permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to assure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standards. This shall include, but it not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Adequate sedimentation and erosion control measures must be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures must be inspected and maintained regularly, especially following rainfall events. All fill material must be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands

21. TEMPORARY FILLS: Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated.

22. BORROW AND WASTE

A. To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall provide the USACE with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the permittee has that information. The permittee will coordinate with the USACE before approving any borrow or waste sites that are within 400 feet of any streams or wetlands.

B. All jurisdictional wetland delineations on borrow or waste areas shall be verified by the Corps of Engineers and shown on the approved reclamation plans. The permittee shall ensure that all such areas comply with Special Condition e of this permit. All information will be available to the Corps of Engineers upon request. The permittee shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

SPECIAL CONDITIONS
ACTION ID: SAW-2012-00882
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION R-2915 A, B AND D

* **23. MITIGATION:** In Lieu Fee: In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

* **24.** The final designs will be coordinated with the appropriate state and local officials and the Federal Emergency Management Agency (FEMA) to assure compliance with FEMA, state, and local floodway and floodplain regulations.

25. Geodetic survey control monuments will be located during the design, and the U.S. Coast and Geodetic Survey and North Carolina Geodetic Survey will be notified of their location.

26. NCDOT's "Best Management Practices for Protection of Surface Waters" will be implemented, where applicable, including hazardous spill catch basins in water supply watershed critical areas where the roadway crosses a water supply.

27. Any underground storage tanks discovered during construction will be reported to the North Carolina Division of Environmental Management.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL			
Applicant: **NCDOT-RICHARD W. HANCOCK, P.E. / R-2915**		File Number: **SAW-2012-0082**	Date: **12/29/2014**
Attached is:			See Section below
X	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at or http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or the Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: Jean B. Gibby** **3331 Heritiage Trade Drive, Suite 105** **Wake Forest, North Carolina 27587**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

District Engineer, Wilmington Regulatory Division, Attn: Mrs. Jean B. Gibby, Chief, Raleigh Regulatory Field Office, 3331 Heritage Trade Drive, Suite 105, Wake Forest, North Carolina, 27587
Phone: (919) 554-4884 ex.24

P-17 Exhibit B

NCDENR

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E Skvarla, III
Secretary

September 8, 2014

Mr. Richard W. Hancock, P.E., Manager
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for US 221 Widening from US 421 to US 221 Business/NC 88 in Jefferson located in Watauga and Ashe Counties. Federal Aid Project No. STP-0221(13), TIP No. R-2915. WBS 34518.1.1. NCDWR Project No. 20140762.

Dear Mr. Hancock:

Attached hereto is a copy of Certification No. 004001 issued to The North Carolina Department of Transportation (NCDOT) dated September 8, 2014.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

for Thomas A. Reeder, Director
Division of Water Resources

Attachments

cc: Andy Williams, US Army Corps of Engineers, Raleigh Field Office (electronic copy only)
Heath Slaughter, Division 11 Environmental Officer (electronic copy only)
Dr. Cynthia Van Der Wiele, Environmental Protection Agency (electronic copy only)
Marla Chambers, NC Wildlife Resources Commission (electronic copy only)
Beth Harmon, Ecosystem Enhancement Program (electronic copy only)
Dave Wanucha, NCDWR Winston Salem Regional Office (electronic copy only)
File Copy

Transportation and Permitting Unit
1617 Mail Service Center, Raleigh, North Carolina 27699-1617
Location 512 N Salisbury St. Raleigh, North Carolina 27604
Phone. 919-807-6300 \ FAX: 919-733-1290
Internet www.ncwaterquality.org

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Exhibit 3

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H. This certification authorizes the NCDOT to permanently impact 3.04 acres of jurisdictional wetlands and 7,886 linear feet of jurisdictional streams as described in Tables 1 and 2 below. The project shall be constructed pursuant to the application dated July 21, 2014. Stream and wetland impacts associated with Sections C and E are preliminary as shown in Tables 1 and 2 below. As such, details of the impacts will be forthcoming in a revision to this permit in the future. The authorized impacts for Sections A, B and D are as described below in Tables 4 through 8.

Table 1. Summary of Stream Impacts for all Sections of R-2915.

Section	Design Stage	Stream Impact Type	Impact Length (lf)	Temporary Impacts (ac)	Stream Impacts Requiring Mitigation (lf)
R-2915A	Final	Permanent Fill	1,119	--	1,119
		Bank Stabilization	402	--	
		Temporary	--	0.05	
R-2915B	Final	Permanent Fill	533	--	533
		Bank Stabilization	411	--	
		Temporary	--	0.15	
R-2915C	Preliminary	Permanent Fill	2,263	--	2,263
		Temporary	--	0.06	
R-2915D	Final	Permanent Fill	2,627	--	2,627
		Bank Stabilization	126	--	
		Temporary	--	0.05	
R-2915E	Preliminary	Permanent Fill	405	--	405
		Temporary	--	<0.01	
Total			**7,886**	**0.31**	**6,947**

Table 2. Summary of Wetland Impacts for all Sections of R-2915.

Section	Design Stage	Wetland Impact Type	Wetland Impact Area (ac)	Wetland Impacts Requiring Mitigation (ac)**
R-2915A	Final	Perm. Wetland Fill	0.48	0.57
		Excavation in Wetlands	0.01	
		Mechanized Clearing in Wetlands	0.08	
		Hand Clearing in Wetlands	0.05†	
R-2915B	Final	Perm. Wetland Fill	0.32	0.43
		Excavation in Wetlands	0.04	
		Mechanized Clearing in Wetlands	0.06	
R-2915C	Preliminary	Perm. Wetland Fill	0.16	0.20
		Excavation in Wetlands	--	
		Mechanized Clearing in Wetlands	0.04	
R-2915D	Final	Perm. Wetland Fill	1.01	1.32
		Excavation in Wetlands	0.01	
		Mechanized Clearing in Wetlands	0.30	
R-2915E	Preliminary	Perm. Wetland Fill	0.43	0.52
		Excavation in Wetlands	--	
		Mechanized Clearing in Wetlands	0.09	
Total				**3.04**

**Values are rounded.

Table 3. Stream Impacts in the New River Basin for Section R-2915A.

Site	Permanent Fill in Stream (linear ft.)	Temporary Fill in Stream (linear ft.)	Total Stream Impact (linear ft.)	Stream Impacts Requiring Mitigation (linear ft.)	
				USACE	NCDWR
1 n/a (wetland)	-	-	-	-	-
1A n/a (wetland)	-	-	-	-	-
1B n/a (wetland)	-	-	-	-	-
2	158	78	236	98	158
3	245	67	312	198	245
3A	57	10	67	57	57
4	19	-	19	-	19
5	9	10	19	-	9
6	15	-	15	-	15
7 *	250	10	260	250	250
8	12	-	12	-	12
9	10	-	10	-	10
10	90	10	100	74	-
11	140	20	160	80	-
12	65	20	85	55	-
12A	-	10	10	-	-
12B	-	10	10	-	-
13	79	25	104	66	-
13A	-	10	10	-	-
13B	-	10	10	-	-
14	13	-	13	-	13
15 *	110	20	130	84	-
16	9	-	9	-	9
17	47	20	67	26	-
18	-	-	-	-	-
19	136	20	156	113	-
20	9	-	9	-	-
21	-	-	-	-	-
22	-	-	-	-	-
23	27	10	37	18	-
23A	-	10	10	-	-
24	21	-	236	-	21
Totals	**1,521**	**370**	**2,106**	**1,119**	**818**

*Indicates that stream is intermittent.

Table 4. Riparian Wetland Impacts in the New River Basin for Section R-2915A.

Site	Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)**	
							USACE	NCDWR
1	0.25	-	-	-	0.03	0.28	0.25	-
1A	0.03	-	-	-	<0.01	0.03	0.03	-
1B	0.07	-	-	0.02	<0.01	0.09	0.10	-
5	<0.01	-	-	-	<0.01	0.01	<0.01	-
18	0.09	-	<0.01	0.05	-	0.15	0.15	-
21	0.01	-	<0.01	-	<0.01	0.01	0.02	-
22	0.03	-	-	-	<0.01	0.03	0.03	-
Total	**0.48**	**-**	**0.01**	**0.08**	**0.05**	**0.59**	**0.57**	**-**

**Values are rounded.

Table 5. Stream Impacts in the New River Basin for Section R-2915B.

Site	Permanent Fill in Stream (linear ft.)	Temporary Fill in Stream (linear ft.)	Total Stream Impact (linear ft.)	Stream Impacts Requiring Mitigation (linear ft.)	
				USACE	NCDWR
1A	214	21	235	170	214
1B	50	6	56	15	50
2	34	-	34	34	-
3	111	-	111	111	-
4 n/a (wetland)	-	-	-	-	-
5 n/a (wetland)	-	-	-	-	-
6 n/a (wetland)	-	-	-	-	-
7 n/a (wetland)	-	-	-	-	-
8 n/a (wetland)	-	-	-	-	-
9	147	-	147	124	-
10	154	57	211	-	154
11 n/a (wetland)	-	-	-	-	-
12 n/a (wetland)	-	-	-	-	-
13	52	8	60	52	-
14 n/a (wetland)	-	-	-	-	-
15 n/a (wetland)	-	-	-	-	-
16	36	-	36	27	-
17	54	-	54	-	54
18	53	-	53	-	53
19	-	115	115	-	-
20	19	-	19	-	-
21	20	-	20	-	-
Totals	**944**	**207**	**1,151**	**533**	**525**

Note: All sites are perennial streams except where indicated.

Table 6. Riparian Wetland Impacts in the New River Basin for Section R-2915B.

Site	Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)**	
							USACE	NCDWR
4	<0.01	-	-	<0.01	-	0.28	<0.01	-
5	<0.01	-	-	-	-	0.03	<0.01	-
6	<0.01	-	-	-	-	0.09	<0.01	-
7	0.05	-	0.03	-	-	0.01	0.08	-
8	<0.01	-	-	<0.01	-	0.15	<0.01	-
11	<0.01	-	-	<0.01	-	0.01	<0.01	-
12	0.12	-	-	<0.01	-	0.03	0.12	-
14	-	-	0.01	<0.01	-	-	0.02	-
15	0.14	-	-	0.05	-	-	0.19	-
Total	**0.32**	-	**0.04**	**0.06**	-	**0.59**	**0.43**	-

**Values are rounded.

Table 7. Stream Impacts in the New River Basin for Section R-2915D.

Site	Permanent Fill in Stream (linear ft.)	Temporary Fill in Stream (linear ft.)	Total Stream Impact (linear ft.)	Stream Impacts Requiring Mitigation (linear ft.)	
				USACE	NCDWR
1*	312	46	358	312	312
2 n/a (wetland)	-	-	-	-	-
3A	60	-	60	60	-
3B	56	73	129	56	-
4	-	19	19	-	-
5	76	-	76	57	-
6	168	25	193	120	168
7 n/a (wetland)	-	-	-	-	-
8	15	-	15	-	-
9	126	22	148	126	-
10	396	-	396	396	396
11	11	-	11	-	-
12	51	11	62	51	-
13 n/a (wetland)	-	-	-	-	-
14	162	14	176	162	162
15	12	-	12	12	12
16 n/a (wetland)	-	-	-	-	-
17A	28	23	51	28	-
17B	12	-	12	12	-
18	491	-	491	491	491
19	100	12	112	100	-
20A	55	18	73	55	-
20B	57	11	68	57	-
21	49	17	66	49	-
22	61	-	61	61	-
23A	19	-	19	19	-
23B	66	15	81	66	-
24*	22	10	32	22	-
25	12	-	12	12	-
26	108	48	156	75	-
27	134	-	134	134	134
28 n/a (wetland)	-	-	-	-	-
29	69	-	69	69	69
30 n/a (wetland)	-	-	-	-	-
31 n/a (wetland)	-	-	-	-	-
32	25	19	44	25	-
Totals	**2753**	**383**	**3136**	**2627**	**1744**

*Indicates that stream is intermittent.

Table 8. Riparian Wetland Impacts in the New River Basin for Section R-2915D.

Site	Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)**	
							USACE	NCDWR
2	<0.01	-	-	-	-	<0.01	<0.01	-
3B	<0.01	-	<0.01	0.02	-	0.03	0.03	-
4	0.10	-	-	0.04	-	0.14	0.14	-
7	0.25	-	-	0.05	-	0.30	0.30	-
13	<0.01	-	<0.01	-	-	<0.01	0.01	-
14	0.03	-	<0.01	0.01	-	0.05	0.05	-
15	<0.01	-	-	0.02	-	0.02	0.02	-
16	-	-		<0.01	-	<0.01	<0.01	-
17A	0.06	-	-	0.01	-	0.07	0.07	-
19	0.07	-	-	<0.01	-	0.07	0.07	-
20B	<0.01	-	-	<0.01	-	<0.01	0.01	-
21	0.17	-	<0.01	-	-	0.18	0.18	-
22	<0.01	-	-	<0.01	-	<0.01	<0.01	-
24	<0.01	-	-	0.01	-	0.02	0.02	-
25	0.11	-	-	0.05	-	0.15	0.15	-
27	0.04	-	-	<0.01	-	0.04	0.04	-
28	<0.01	-	-	0.02	-	0.02	0.02	-
30	0.04	-	-	0.06	-	0.10	0.10	-
31	0.06	-	-	<0.01	-	0.07	0.07	-
32	0.02	-	-	<0.01	-	0.02	0.02	-
Total	**1.01**	-	**<0.01**	**0.3**	-	**1.32**	**1.32**	-

**Values are rounded.

The application provides adequate assurance that the discharge of fill material into the waters of the New River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated July 21, 2014. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Condition(s) of Certification:

Project Specific Conditions

*1. When final design plans are completed for R-2915 Sections C and E, a modification to the 401 Water Quality Certification shall be submitted with five copies and fees to the NC Division of Water Resources. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters, and buffers. No construction activities that impact any wetlands, streams or surface waters located in R-2915 Sections C and E shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification from the NC Division of Water Resources.

2. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand permit conditions and avoidance and minimization measures. NCDWR staff shall be invited to the pre-construction meeting.

3. Where streams within the project area carry supplemental classifications as Trout (Tr), High Quality Waters (HQW) or Outstanding Resource Waters (ORW), stormwater shall be directed to vegetated buffer areas, grass-lined ditches or other means appropriate to the site for the purpose of pre-treating storm water runoff prior to discharging directly into streams. Mowing of existing vegetated buffers is strongly discouraged. Grassed swales should also be utilized throughout the project to reduce water velocity, promote infiltration and provide treatment for discharge before runoff enters streams. The permittee shall use Design Standards in Sensitive Watersheds per 15A NCAC 4B.0124(a)-(e) in areas draining to ORW, HQW waters. However, due to the size of the project, the NCDOT shall not be required to meet 15A NCAC 4B .0124(a) regarding the maximum amount of uncovered acres. Temporary cover (wheat, millet, or similar annual grain) or permanent herbaceous cover shall be planted on all bare soil within 15 business days of ground disturbing activities to provide erosion control.

4. Streams with Trout classifications require that in-stream work and land disturbance within the 25-foot buffer zone are prohibited during the trout-spawning season of October 15 through April 15 to protect the egg and fry stages of trout.

5. Where possible, hand clearing in wetlands should be used in Section R-2915A rather than mechanized clearing.

6. The relocated portion of a wetland at Permit Site 7 for Section R-2915B should be a grassed swale that has been designed to match the grade and shape of the existing wetland as much as possible.

7. Ensure that the planned installation of a cross vane structure at the downstream end of Old Field Creek at Permit Site 6 for Section R-2915D is constructed in such manner that alleviates scour and erosion to the maximum extent practical.

8. Channel relocations shall be completed and stabilized, and approved on site by NCDWR staff, prior to diverting water into the new channel. Stream banks shall be matted with coir-fiber matting. Vegetation used for bank stabilization shall be limited to native riparian vegetation, and should include establishment of a vegetated buffer on both sides of the relocated channel to the maximum extent practical. Also, additional rip-rap, above which was approved in final approved design drawings, may be allowed if it is necessary to maintain the physical integrity of the stream, but the applicant must provide written justification and any calculations used to determine the extent of rip-rap coverage requested. Once the stream has been turned into the new channel, it may be necessary to relocate stranded fish to the new channel to prevent fish kills.

9. All portions of the proposed project draining to 303(d) listed streams that are impaired due to biological criteria exceedances (i.e. Little Buffalo Creek) shall not discharge stormwater directly to surface waters. Stormwater shall be treated using appropriate best management practices (e.g., vegetated conveyances, constructed wetlands, detention ponds, etc.) prior to discharging to surface waters.

10. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.

11. Strict adherence to the most recent version of NCDOT's Best Management Practices For Bridge Demolition and Removal approved by the US Army Corps of Engineers is a condition of the 401 Water Quality Certification.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. To meet the requirements of NCDOT's NPDES permit NCS000250, please refer to the most recent version of the North Carolina Department of Transportation Stormwater Best Management Practices Toolbox manual for approved measures.

13. Bridge piles and bents shall be constructed using driven piles (hammer or vibratory) or drilled shaft construction methods. More specifically, jetting or other methods of pile driving are prohibited without prior written

approval from the NCDWR first.

14. No drill slurry or water that has been in contact with uncured concrete shall be allowed to enter surface waters. This water shall be captured, treated, and disposed of properly.

15. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.

16. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

17. Sites where streams are impacted due to site dewatering activities shall be graded to their preconstruction contours and revegetated with appropriate native species.

18. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species.

19. Due to site conditions at Permit Site 9 for Section R-2915B, NCDWR will not require the burial of the culvert inlet in this location. However, design and placement of the culvert and other structures shall be installed in such a manner that the original stream profiles are not altered (i.e., the depth of the channel must not be reduced by a widening of the streambed). Existing stream dimensions (including pattern and profile) are to be maintained above and below locations of each culvert. The structures shall be designed and installed to allow for fish and other wildlife movement as well as prevent headcutting of the stream. The applicant may be required to provide evidence that the equilibrium has been maintained if requested in writing by the NCDWR.

*20. Compensatory mitigation is required for stream impacts that include: 1,119 linear feet of impacts in Section R-2915A, 533 linear feet of impacts in Section R-2915B and 2,627 linear feet of impacts in Section R-2915D. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in letters dated July 7, 2014 for R-2915A; June 18, 2014 for R-2915B; and, June 3, 2014 for R-2915D that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the EEP Mitigation Banking Instrument signed July 28, 2010.

*21. Compensatory mitigation is required for impacts to riparian wetlands that include: 0.57 acres of impacts in Section R-2915A, 0.43 acres of impacts in Section R-2915B and 1.32 acres of impacts in Section R-2915D. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letters dated July 7, 2014 for R-2915A; June 18, 2014 for R-2915B; and, June 3, 2014 for R-2915D that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with EEP's Mitigation Banking Instrument signed July 28, 2010.

General Conditions

1. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and downstream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required.

2. NCDOT shall be in compliance with the NCS000250 issued to the NCDOT, including the applicable requirements of the NCG010000. Please note the extra protections for sensitive watersheds.

3. Tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian areas. For the establishment of permanent herbaceous cover, erosion control matting shall be used in conjunction with an appropriate native seed mix on disturbed soils within the riparian area and on disturbed steep slopes with the following exception. Erosion control matting is not necessary if the area is contained by perimeter erosion control devices such as silt fence, temporary sediment ditches, basins, etc. Matting should be secured in place with staples, stakes, or wherever possible, live stakes of native trees. Erosion control matting placed in riparian areas shall not contain a nylon mesh grid, which can impinge and entrap small animals. For the establishment of temporary groundcover within riparian areas, hydroseeding along with wood or cellulose based hydro mulch applied from a fertilizer- and limestone-free tank is allowable at the appropriate rate in conjunction with the erosion control measures. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

4. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

5. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

6. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.

7. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.

8. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

* 9. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

10. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

11. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.

12. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.

13. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

14. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If the NCDWR determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the NCDWR may reevaluate and modify this certification.

15. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.

16. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.

17. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.

18. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

19. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery.

* 20. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer or appointee shall complete and return the enclosed "Certification of Completion Form" to notify NCDWR when all work included in the 401 Certification has been completed.

21. Native riparian vegetation must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction.

22. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

23. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

    a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual.*
    b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual.* The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
    c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.*
    d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

24. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of

Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919)-431-3000, Facsimile: (919)-431-3100

A copy of the petition must also be served on DENR as follows:

Mr. John Evans, General Counsel
Department of Environment and Natural Resources
1601 Mail Service Center

This the 8th day of September 2014

DIVISION OF WATER RESOURCES

for Thomas A. Reeder, Director
Division of Water Resources

WQC No. 004001

TIP PROJECT: R-2915A

CONTRACT:

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2915A	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34518.1.2	STP-0221 (13)	P.E.
34518.2.2	STP-0221 (13)	R/W & UTILITY

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WATAUGA & ASHE COUNTIES

LOCATION: US 221 FROM US 421 IN WATAUGA COUNTY TO SR 1003 (IDLEWILD RD) IN ASHE COUNTY

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, AND RETAINING WALLS

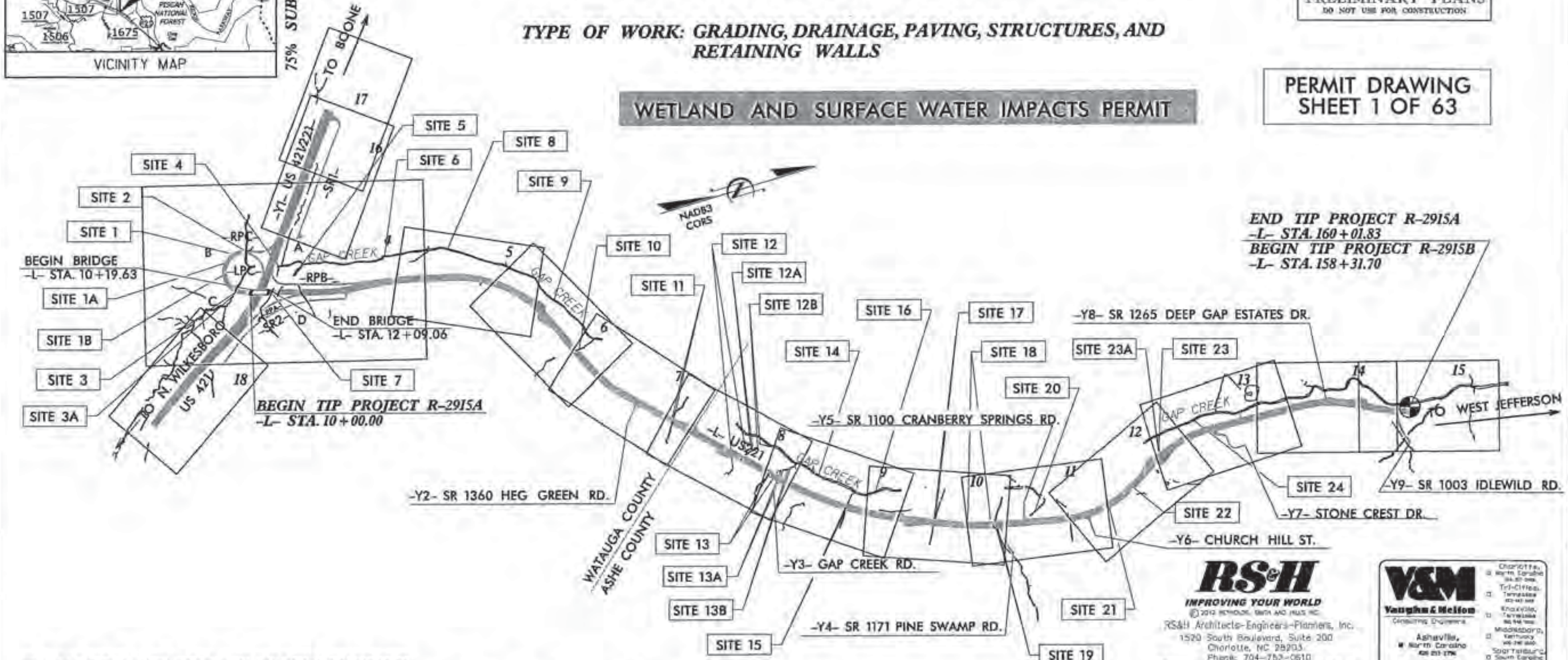
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWING
SHEET 1 OF 63

75% SUBMITTAL PLANS

VICINITY MAP

WETLAND AND SURFACE WATER IMPACTS PERMIT



RS&H
IMPROVING YOUR WORLD
RS&H Architects-Engineers-Planners, Inc.
1520 South Boulevard, Suite 200
Charlotte, NC 28203
Phone: 704-752-0610
NC License No. F-0493 www.rsandh.com

V&M
Vaughn & Melton
Consulting Engineers
Asheville, North Carolina

THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.
THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III

GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 50 25 0 50 100
PROFILE (VERTICAL): 10 5 0 10 20

DESIGN DATA

ADT 2015 = 11970
ADT 2035 = 20400
K = 10 %
D = 65 %
T = 9 %
V = 60 MPH
*(TTST 2% + DUALS 7%)
FUNC CLASS =
RURAL ARTERIAL
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2915A = 2.805 MI.
LENGTH STRUCTURES TIP PROJECT R-2915A = 0.036 MI.
TOTAL LENGTH OF TIP PROJECT R-2915A = 2.841 MI.

Prepared in the Office of:
VAUGHN & MELTON
1318-F PATTON AVE.
ASHEVILLE NC, 28806
FOR NCDOT DIVISION OF HIGHWAYS

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 30, 2013

LETTING DATE:
JUNE 16, 2015

REECE SCHULER, PE
PROJECT ENGINEER

AARON CARVER, PE
PROJECT DESIGN ENGINEER

NCDOT CONTACT:
BRENDA MOORE, PE

HYDRAULICS ENGINEER
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

7/14/2014
X:\P\1032850000 R-2915A\Project Production\Hydraulics\PERMITS_Environmental\Drawings\R-2915A_rdy_tsh.dgn
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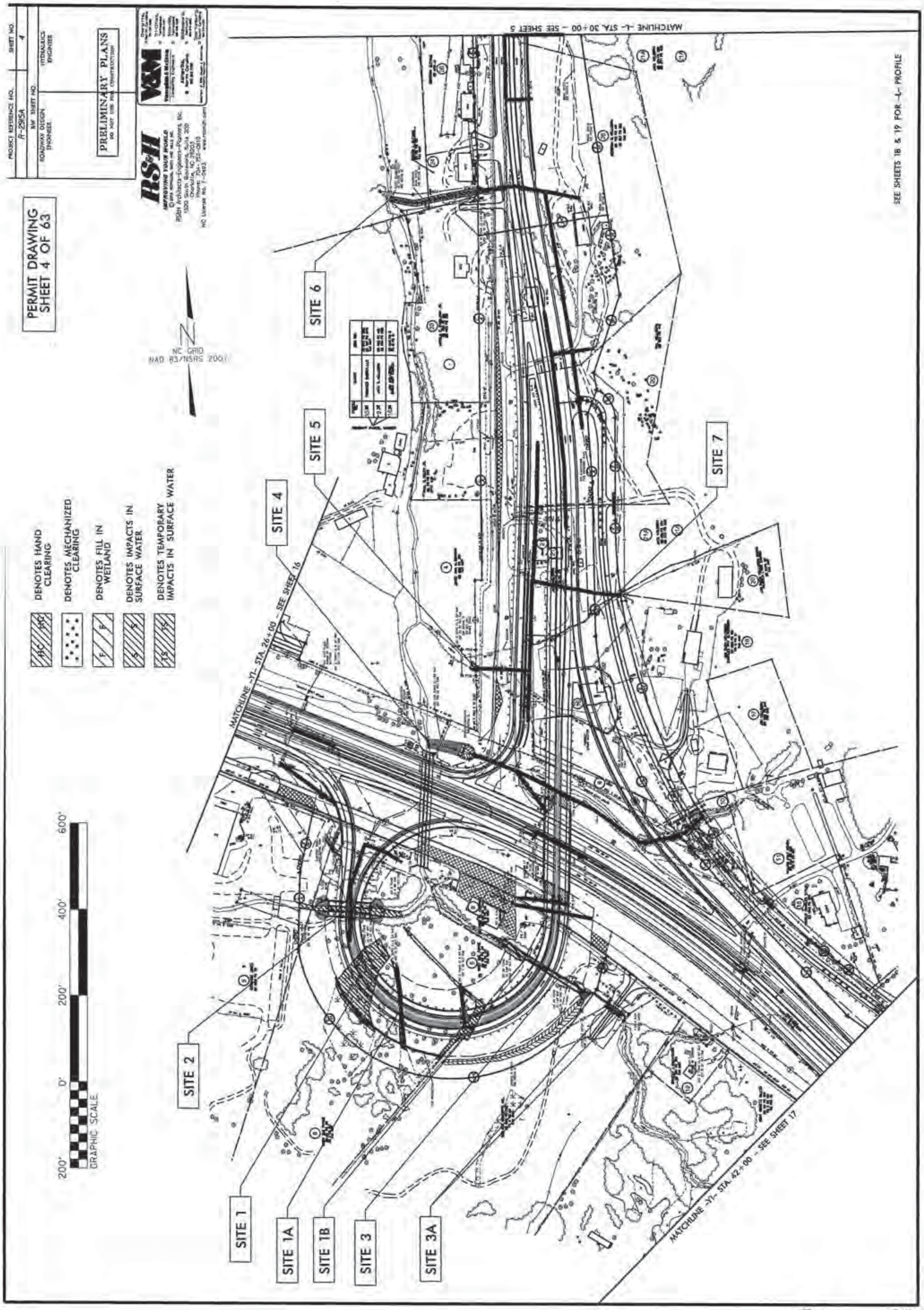
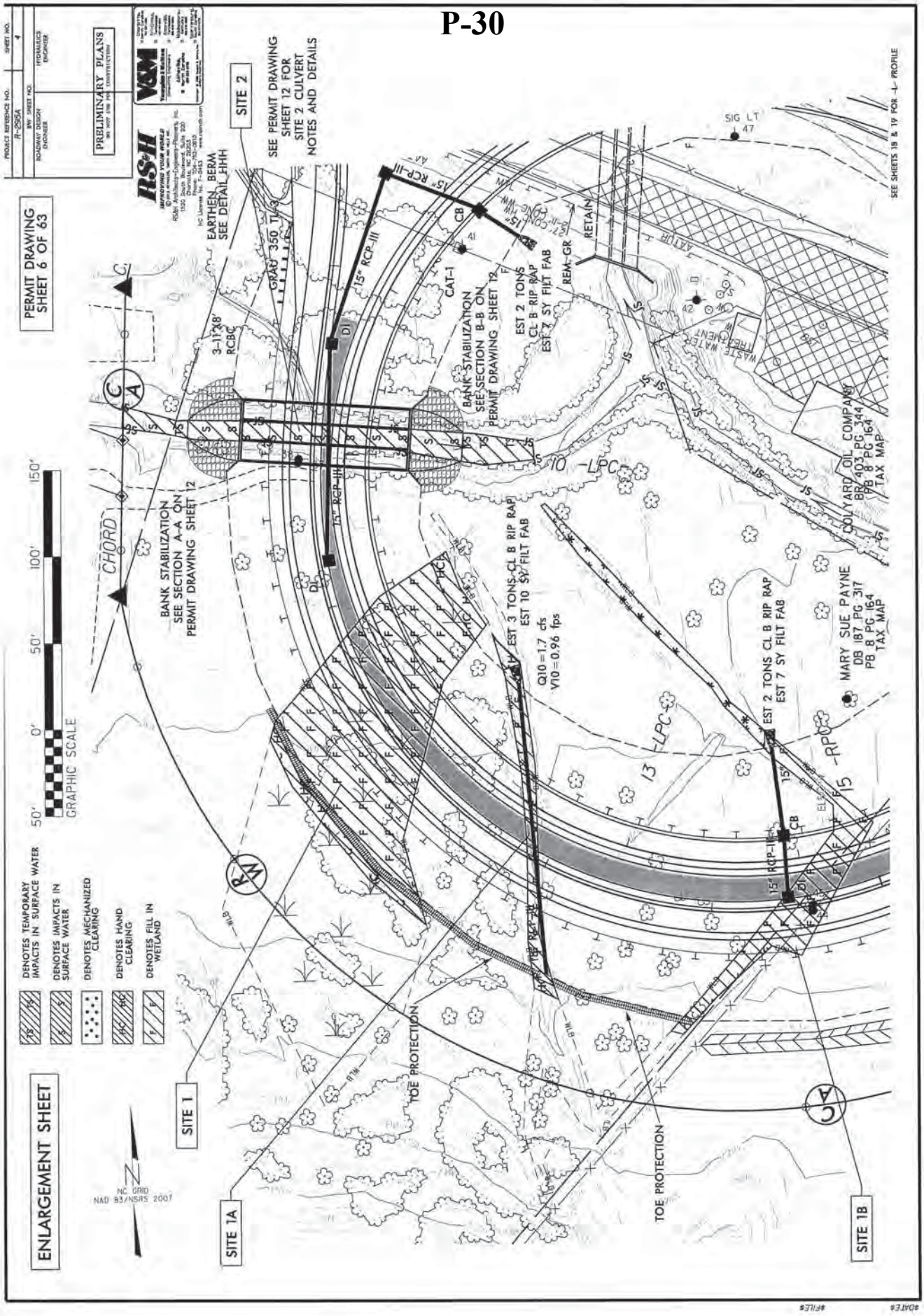

PERMIT DRAWING
SHEET 4 OF 63
PRELIMINARY PLANS
NC GRID
NAD 83/NSRS 2007
DENOTES HAND CLEARING
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
200'
0'
200'
400'
600'
GRAPHIC SCALE
MATCHLINE -L- STA. 30+00 - SEE SHEET 5
SEE SHEETS 18 & 19 FOR -L- PROFILE
MATCHLINE -Y1- STA. 26+00 - SEE SHEET 16
MATCHLINE -Y1- STA. 42+00 - SEE SHEET 17
SITE 6
SITE 5
SITE 4
SITE 7
SITE 2
SITE 1
SITE 1A
SITE 1B
SITE 3
SITE 3A


PROJECT REFERENCE NO.
R-2954
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
V&M
RS&H
PERMIT DRAWING SHEET 6 OF 63
ENLARGEMENT SHEET
SITE 1
SITE 1A
SITE 1B
SITE 2
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES HAND CLEARING
DENOTES FILL IN WETLAND
GRAPHIC SCALE
50' 0' 50' 100' 150'
NC GRID
NAD 83/NSRS 2007
CHORD
BANK STABILIZATION SEE SECTION A-A ON PERMIT DRAWING SHEET 12
BANK STABILIZATION SEE SECTION B-B ON PERMIT DRAWING SHEET 12
EARTHEN BERM SEE DETAIL HHH
SEE PERMIT DRAWING SHEET 12 FOR SITE 2 CULVERT NOTES AND DETAILS
3-11'X8' RCBC
GRAD 350 TIA3
15" RCP-III
CAT-1
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
REM-GR
RETAIN
EST 3 TONS CL B RIP RAP
EST 10 SY FILT FAB
Q10=1.7 cfs
V10=0.96 fps
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
TOE PROTECTION
TOE PROTECTION
COLYARD OIL COMPANY
DB 403 PG 344
PB 8 PG 164
TAX MAP
MARY SUE PAYNE
DB 187 PG 317
PB 8 PG 164
TAX MAP
SIG LT 47
SEE SHEETS 18 & 19 FOR -L- PROFILE
#DATE#
#FILE#

PERMIT DRAWING
SHEET 12 OF 63

SITE 2

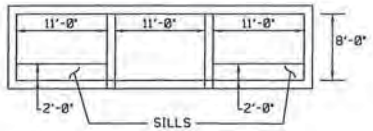
ADDITIONAL INFORMATION AND COMPUTATIONS

** NATIVE MATERIAL AND BACKFILL SPECIFICATION

NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. RIP RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. BACKFILL RIP RAP IN FLOODING BENCHES OF CHANNEL IMPROVEMENTS WITH NATIVE MATERIAL TO FILL VOIDS. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

NOTES: MAJORITY OF THE BANKS U/S AND D/S ARE WELL VEGETATED AND STABLE.

THIS PROJECT COMPLIES WITH LOCAL FLOODPLAIN REGULATIONS.



LOOKING DOWNSTREAM

BOX CULVERT SILL DETAIL AT INLET AND OUTLET

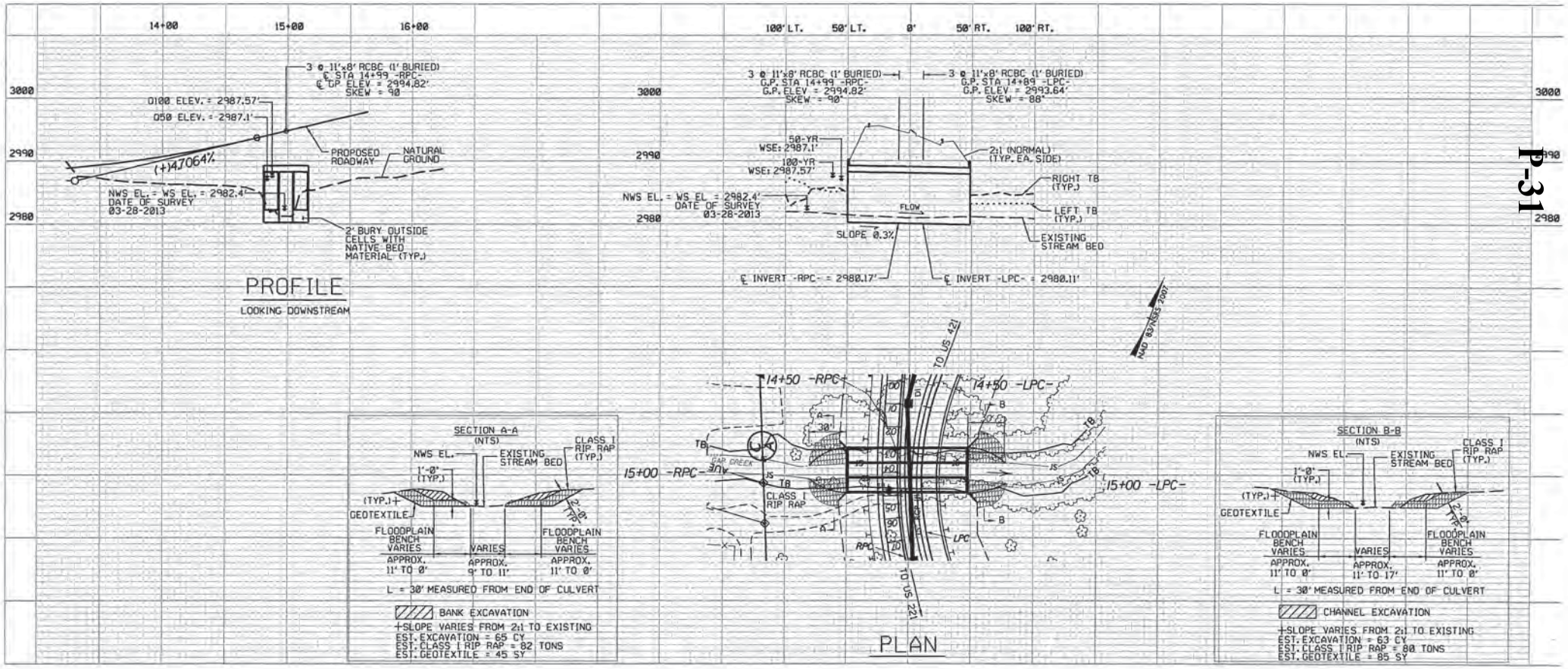
NOTES: SILLS TO BE CONSTRUCTED AT INLET AND OUTLET OF LEFT CELL AND RIGHT CELL.

SILLS TO BE 1' WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

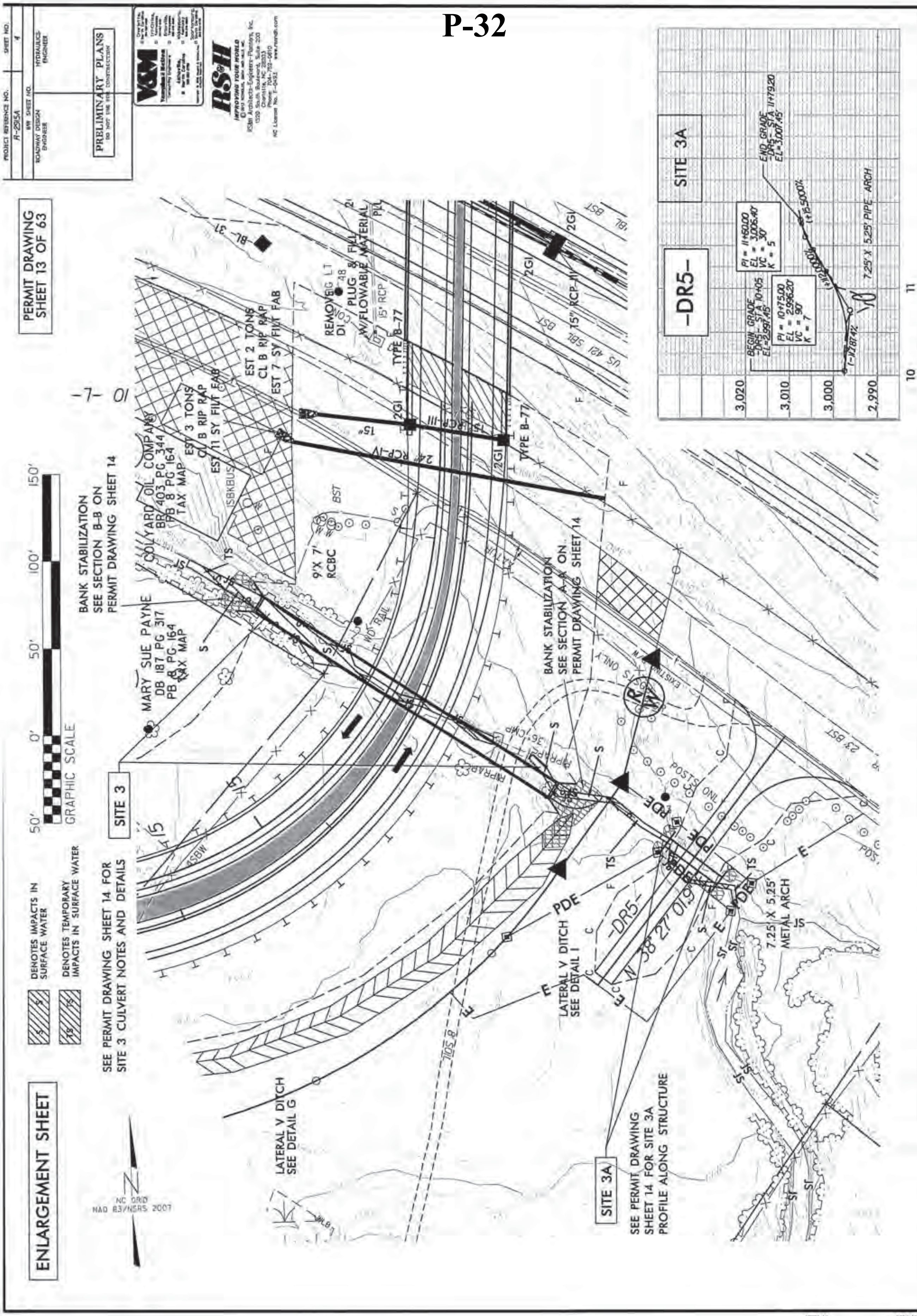
BED MATERIAL IS COMPOSED OF SAND, GRAVEL AND BOULDERS. RETAIN NATIVE MATERIAL AND PLACE BACK IN RCBC TO BURY 1".

BACK FILL LEFT AND RIGHT BARRELS UP TO THE FLOODPLAIN BENCH ELEVATION THAT EXISTS BOTH UPSTREAM AND DOWNSTREAM.

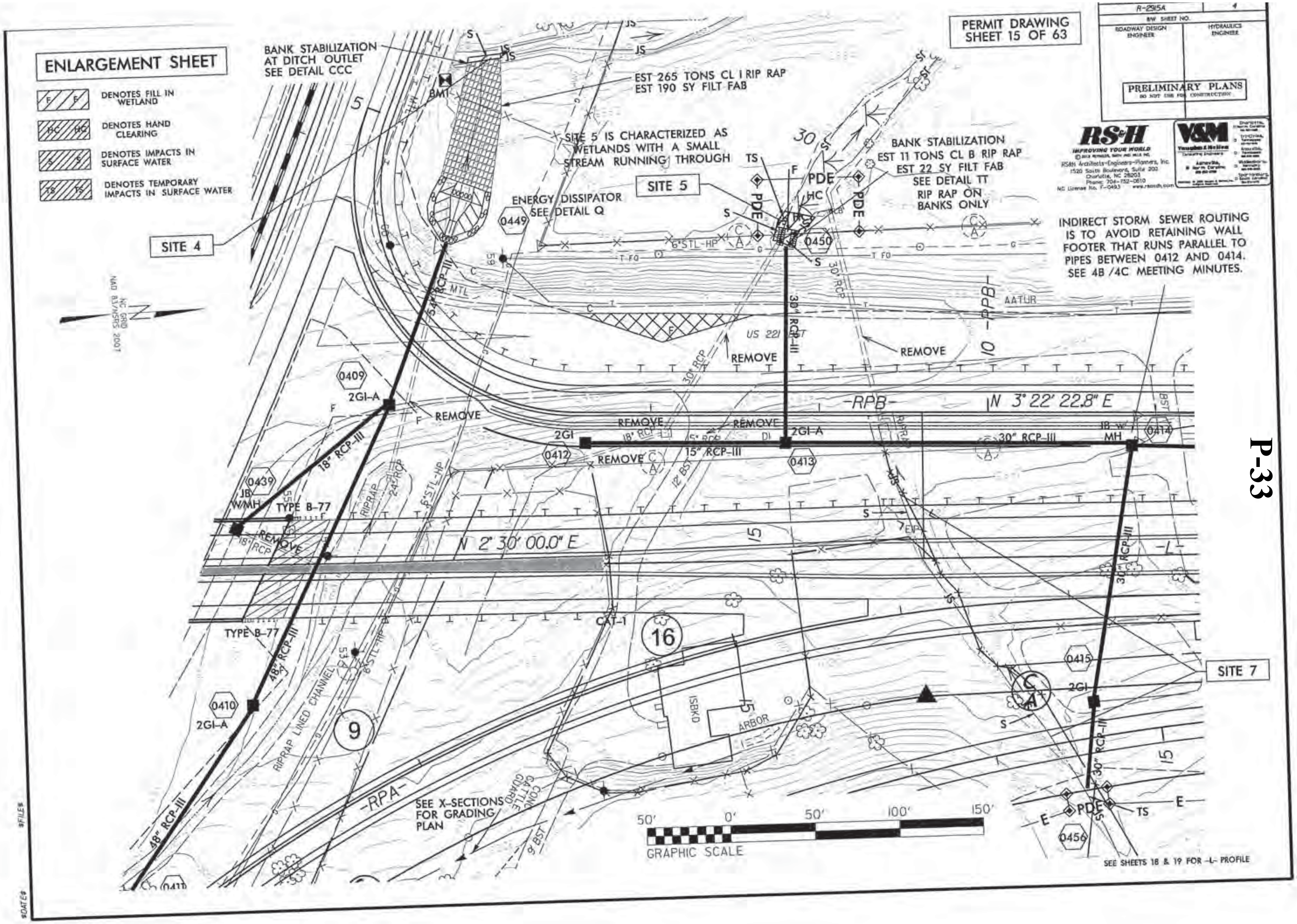
SEE NATIVE MATERIAL AND BACKFILL SPECIFICATION UNDER "ADDITIONAL INFORMATION AND COMPUTATIONS **

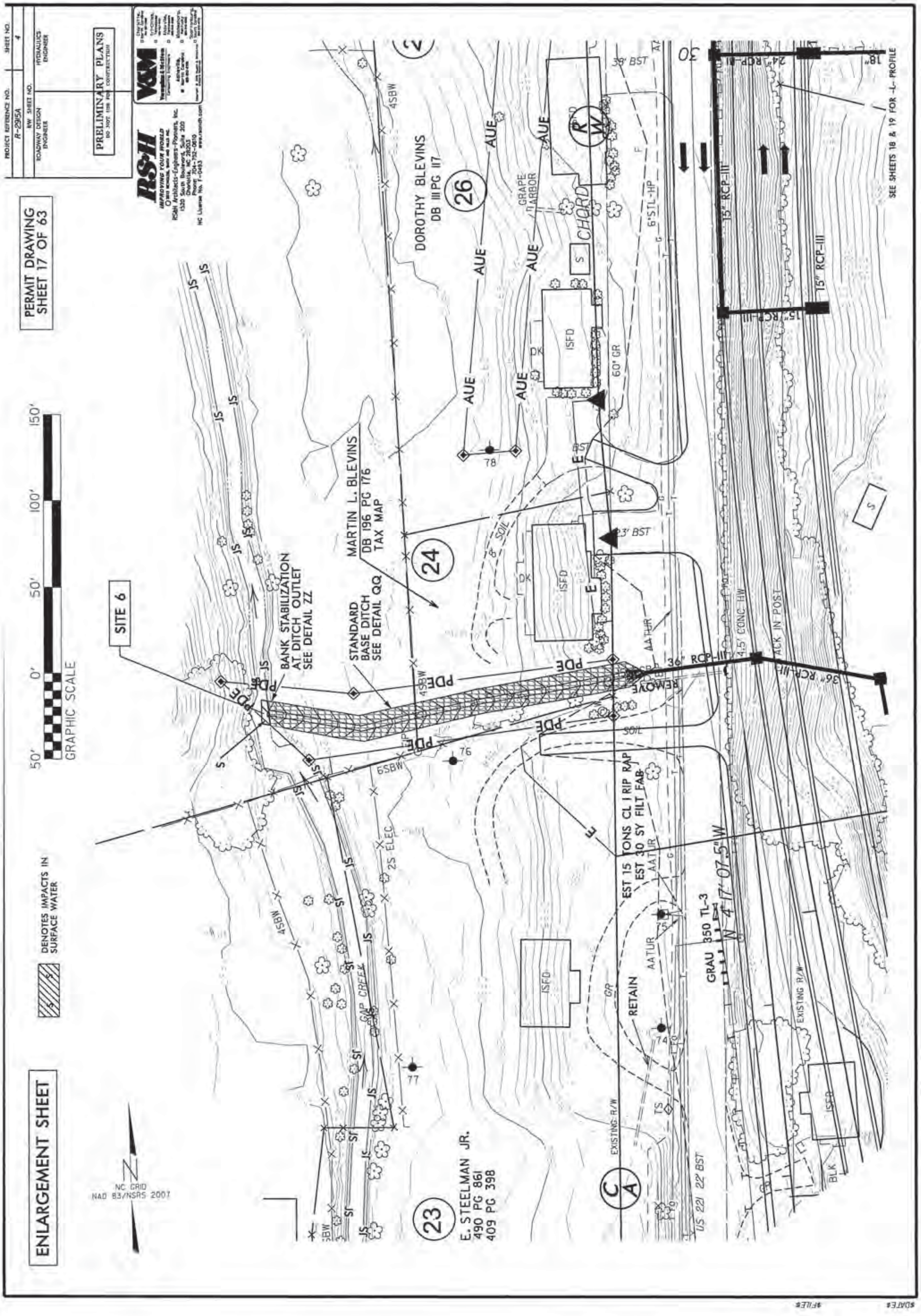


P-32

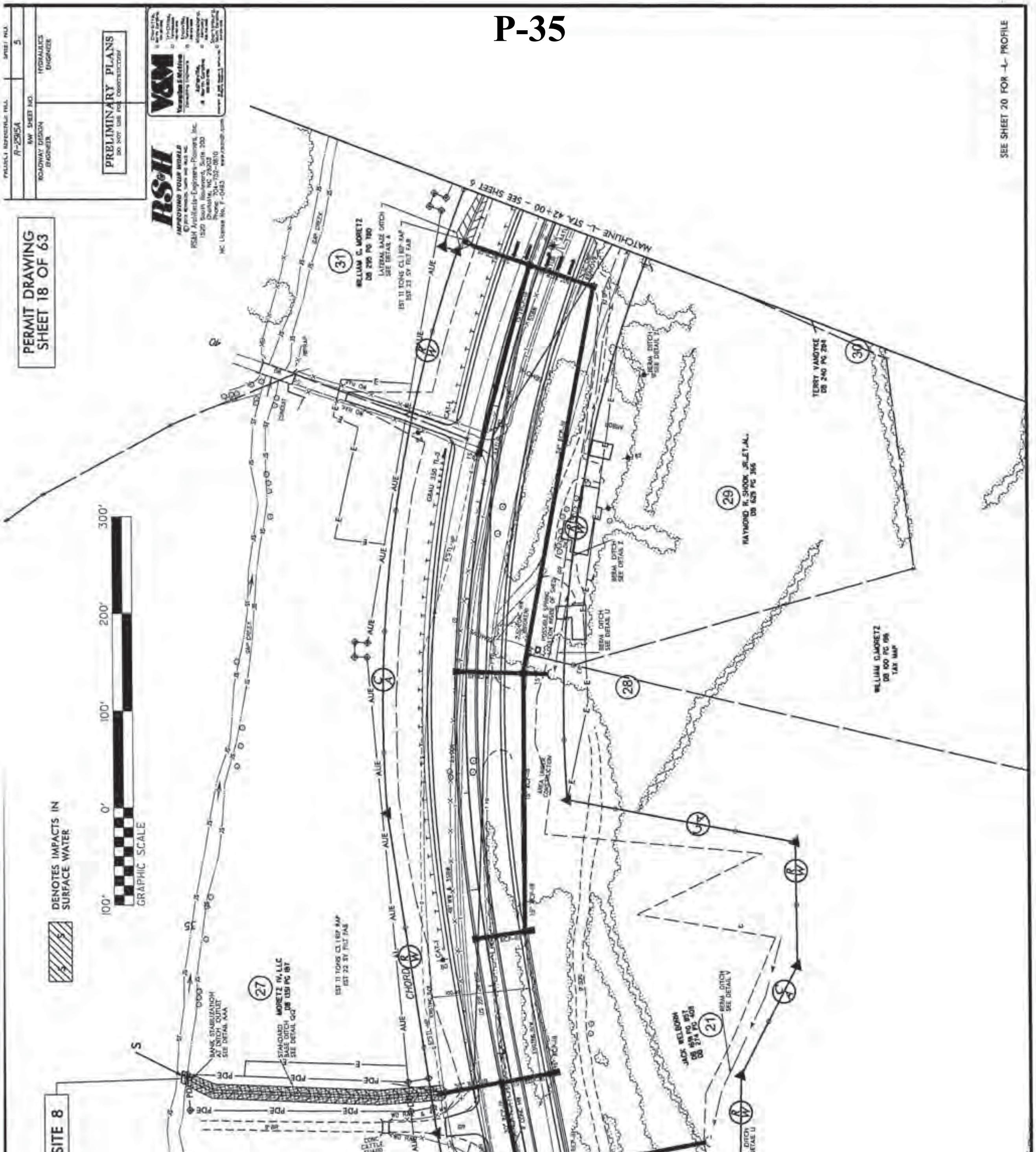

ENLARGEMENT SHEET
PERMIT DRAWING SHEET 13 OF 63
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
RS&H
IMPROVING YOUR WORLD
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SEE PERMIT DRAWING SHEET 14 FOR SITE 3 CULVERT NOTES AND DETAILS
GRAPHIC SCALE
50'
0'
50'
100'
150'
SITE 3
SITE 3A
BANK STABILIZATION SEE SECTION B-B ON PERMIT DRAWING SHEET 14
BANK STABILIZATION SEE SECTION A-A ON PERMIT DRAWING SHEET 14
MARY SUE PAYNE
DB 187 PG 317
PB 8 PG 164
TAX MAP
COLYARD OIL COMPANY
BR 403 PG 344
PB 8 PG 164
TAX MAP
EST 3 TONS CL B RIP RAP
EST 11 SY FILT FAB
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
REMOVE DI, PLUG & FILL W/FLOWABLE MATERIAL
9'X 7' RCBC
24" RCP-IV
15" RCP-III
15" RCP-II
TYPE B-77
2GI
US 421 SBL
-DR5-
N 58° 27' 01.9"
7.25' X 5.25' METAL ARCH
LATERAL V DITCH SEE DETAIL I
LATERAL V DITCH SEE DETAIL G
SEE PERMIT DRAWING SHEET 14 FOR SITE 3A PROFILE ALONG STRUCTURE
NC GRID NAD 83/NSRS 2007
PDE
-DR5-
BEGIN GRADE -DR5- STA 10+05 EL=2,997.45'
PI = 10+75.00 EL = 2,996.20' VC = 90' K = 7
PI = 11+60.00 EL = 3,006.40' VC = 30' K = 5
END GRADE -DR5- STA 11+79.20 EL=3,007.45'
7.25' X 5.25' PIPE ARCH
3,020
3,010
3,000
2,990
10
11

P-33


ENLARGEMENT SHEET
DENOTES FILL IN WETLAND
DENOTES HAND CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
BANK STABILIZATION AT DITCH OUTLET SEE DETAIL CCC
EST 265 TONS CL I RIP RAP
EST 190 SY FILT FAB
SITE 5 IS CHARACTERIZED AS WETLANDS WITH A SMALL STREAM RUNNING THROUGH
SITE 4
SITE 5
SITE 7
ENERGY DISSIPATOR SEE DETAIL Q
BANK STABILIZATION
EST 11 TONS CL B RIP RAP
EST 22 SY FILT FAB
SEE DETAIL TT
RIP RAP ON BANKS ONLY
PERMIT DRAWING SHEET 15 OF 63
R-2915A
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
RS&H
V&M
INDIRECT STORM SEWER ROUTING IS TO AVOID RETAINING WALL FOOTER THAT RUNS PARALLEL TO PIPES BETWEEN 0412 AND 0414. SEE 4B /4C MEETING MINUTES.
NC GRID NAD 83/NSRS 2007
54" RCP-III
30" RCP-III
18" RCP-III
48" RCP-III
15" RCP-III
2GI-A
2GI
JB W/MH
TYPE B-77
REMOVE
US 221
-RPB-
-RPA-
-L-
N 3° 22' 22.8" E
N 2° 30' 00.0" E
RIPRAP LINED CHANNEL
CAT-1
ISBKD
ARBOR
CONC CATTLE GUARD
SEE X-SECTIONS FOR GRADING PLAN
PDE
GRAPHIC SCALE
50' 0' 50' 100' 150'
SEE SHEETS 18 & 19 FOR -L- PROFILE

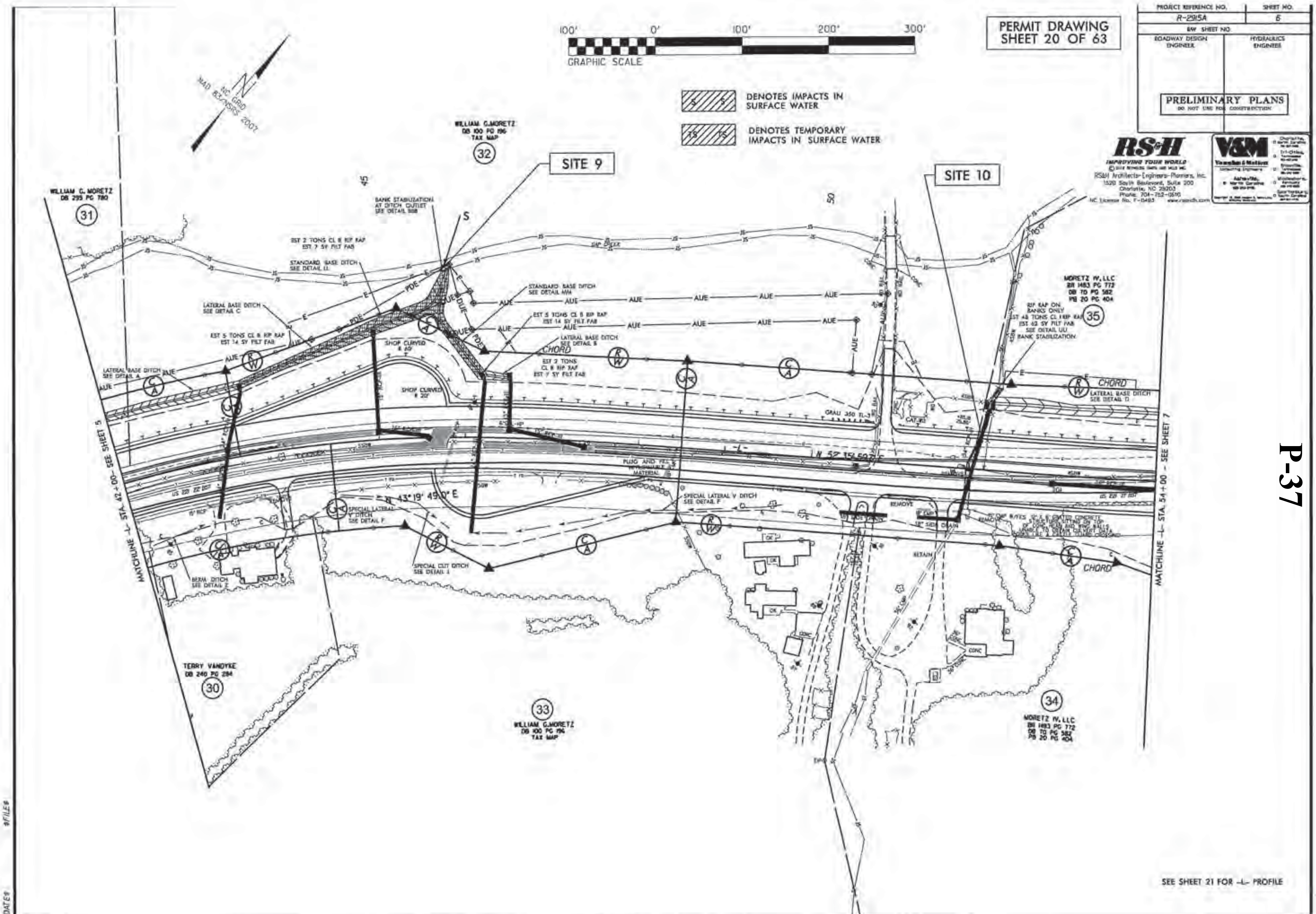

ENLARGEMENT SHEET
PERMIT DRAWING
SHEET 17 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
50'
0'
50'
100'
150'
SITE 6
BANK STABILIZATION
AT DITCH OUTLET
SEE DETAIL ZZ
STANDARD
BASE DITCH
SEE DETAIL QQ
MARTIN L. BLEVINS
DB 196 PG 176
TAX MAP
DOROTHY BLEVINS
DB III PG II7
E. STEELMAN JR.
490 PG 861
409 PG 398
NC GRID
NAD 83/NSRS 2007
GAP CREEK
EST 15 TONS CL I RIP RAP
EST 30 SY FILT FAB
RETAIN
REMOVE
GRAU 350 TL-3
N 4°17' 07.5" W
US 221 22' BST
EXISTING R/W
36" RCP-III
15" RCP-III
24" RCP-III
18"
4.5' CONC HW
60' GR
6"STL-HP
CHORD
GRAPE ARBOR
ISFD
SEE SHEETS 18 & 19 FOR -L- PROFILE

P-35

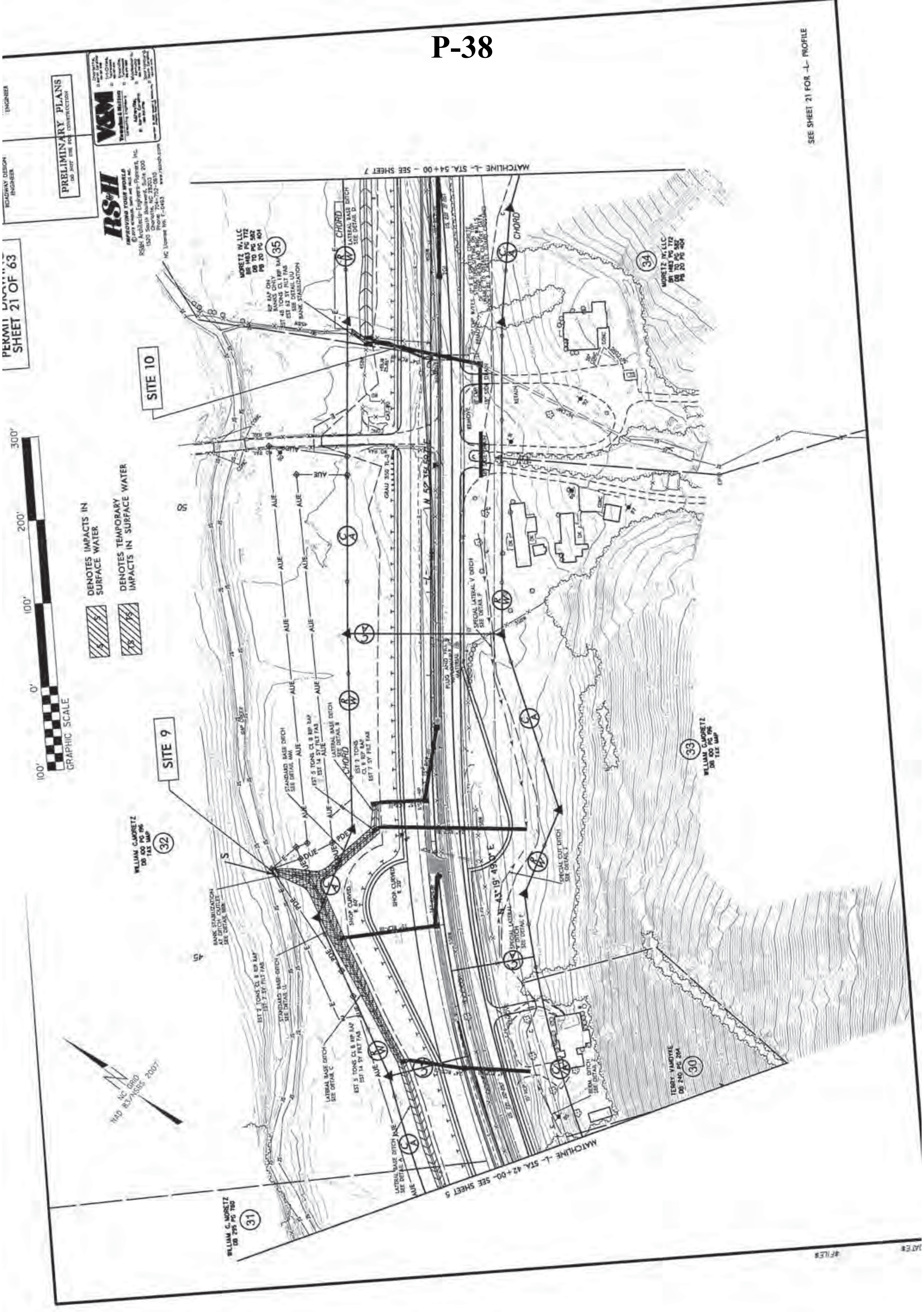

PERMIT DRAWING
SHEET 18 OF 63
SITE 8
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
100' 0' 100' 200' 300'
PRELIMINARY PLANS
R-2915A
NC GRID
NAD 83/NSRS 2007
MATCHLINE -L- STA. 42+00 - SEE SHEET 6
MATCHLINE -L- STA. 30+00 - SEE SHEET 4
SEE SHEET 20 FOR -L- PROFILE
WILLIAM G. MORETZ
TERRY VANDYKE
RAYMOND R. SHOOK JR.,ET.AL.
MORETZ IV, LLC
JACK WELBORN
DOROTHY BLEVINS
BERM DITCH
BANK STABILIZATION

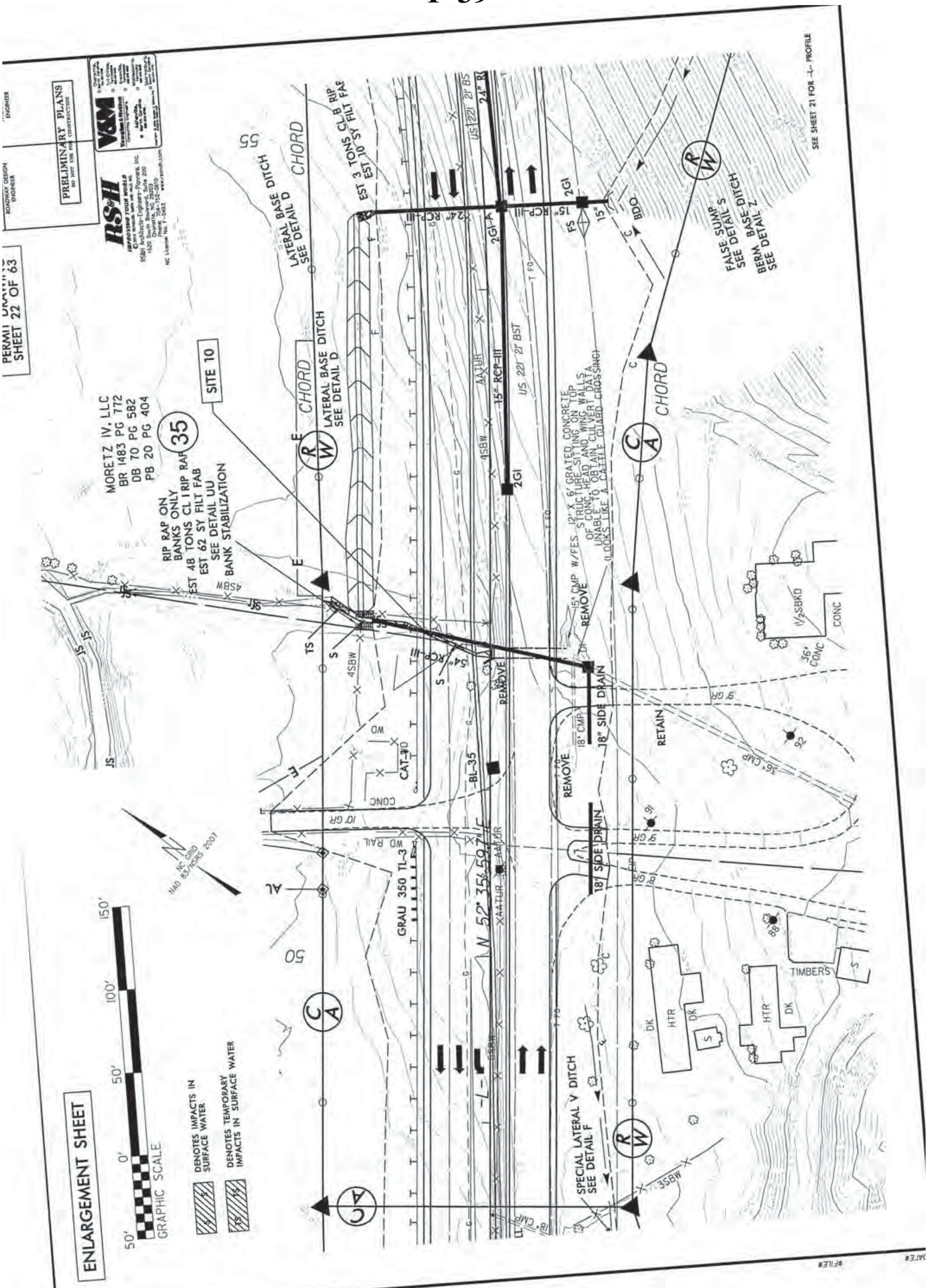
P-36

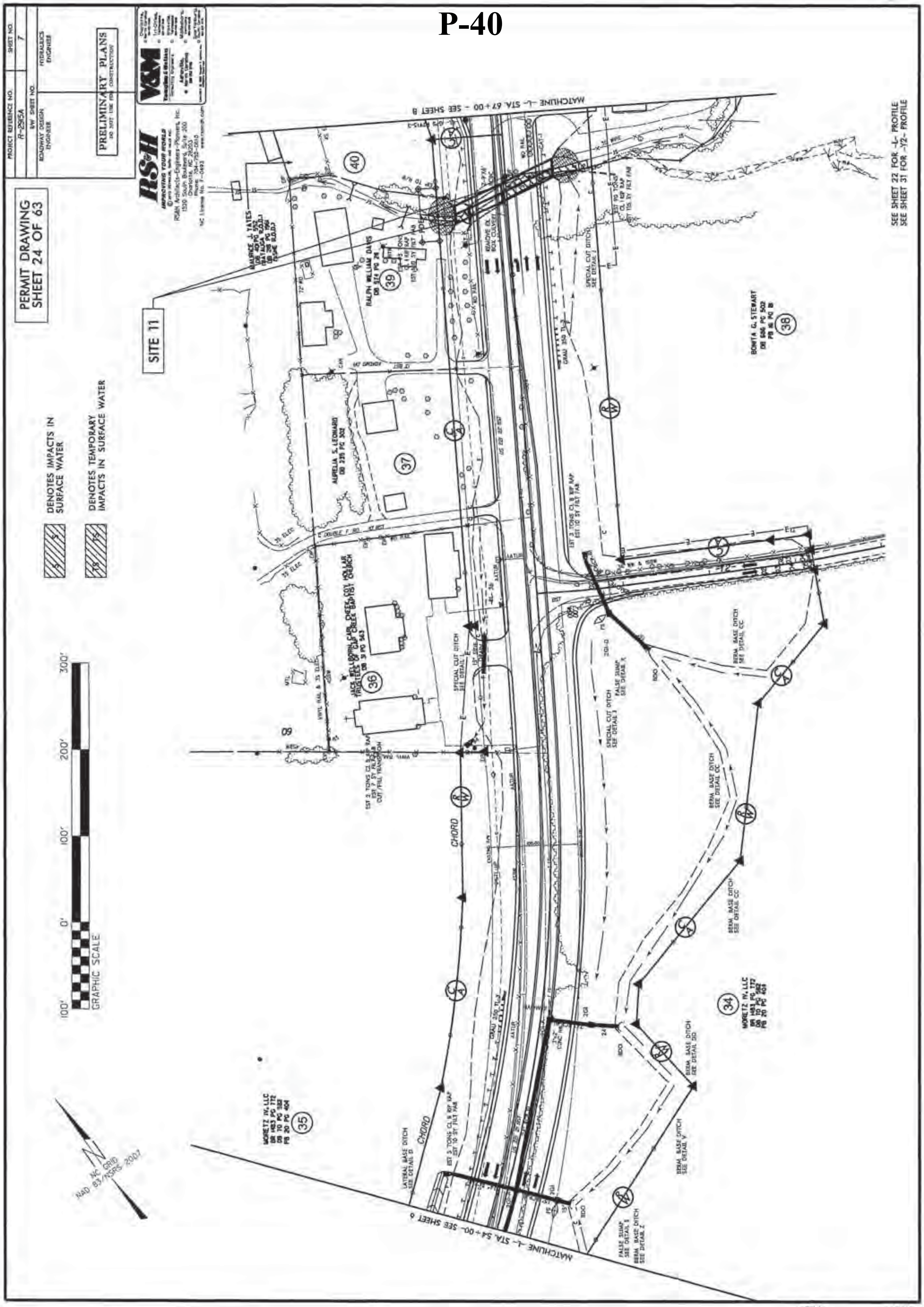

PERMIT DRAWING
SHEET 19 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
5
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
RS&H
V&M
SITE 8
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
100'
0'
100'
200'
300'
NC GRID
NAD 83/NSRS 2007
MATCHLINE -L- STA. 42+00 - SEE SHEET 6
MATCHLINE -L- STA. 30+00 - SEE SHEET 4
SEE SHEET 20 FOR -L- PROFILE
WILLIAM G. MORETZ
MORETZ IV, LLC
RAYMOND R. SHOOK JR. ET AL.
TERRY VANDYKE
WILLIAM G. MORETZ
DOROTHY BLEVINS
JACK WILBORN
SAP CREEK
BANK STABILIZATION
CHORD
AUE
PDE

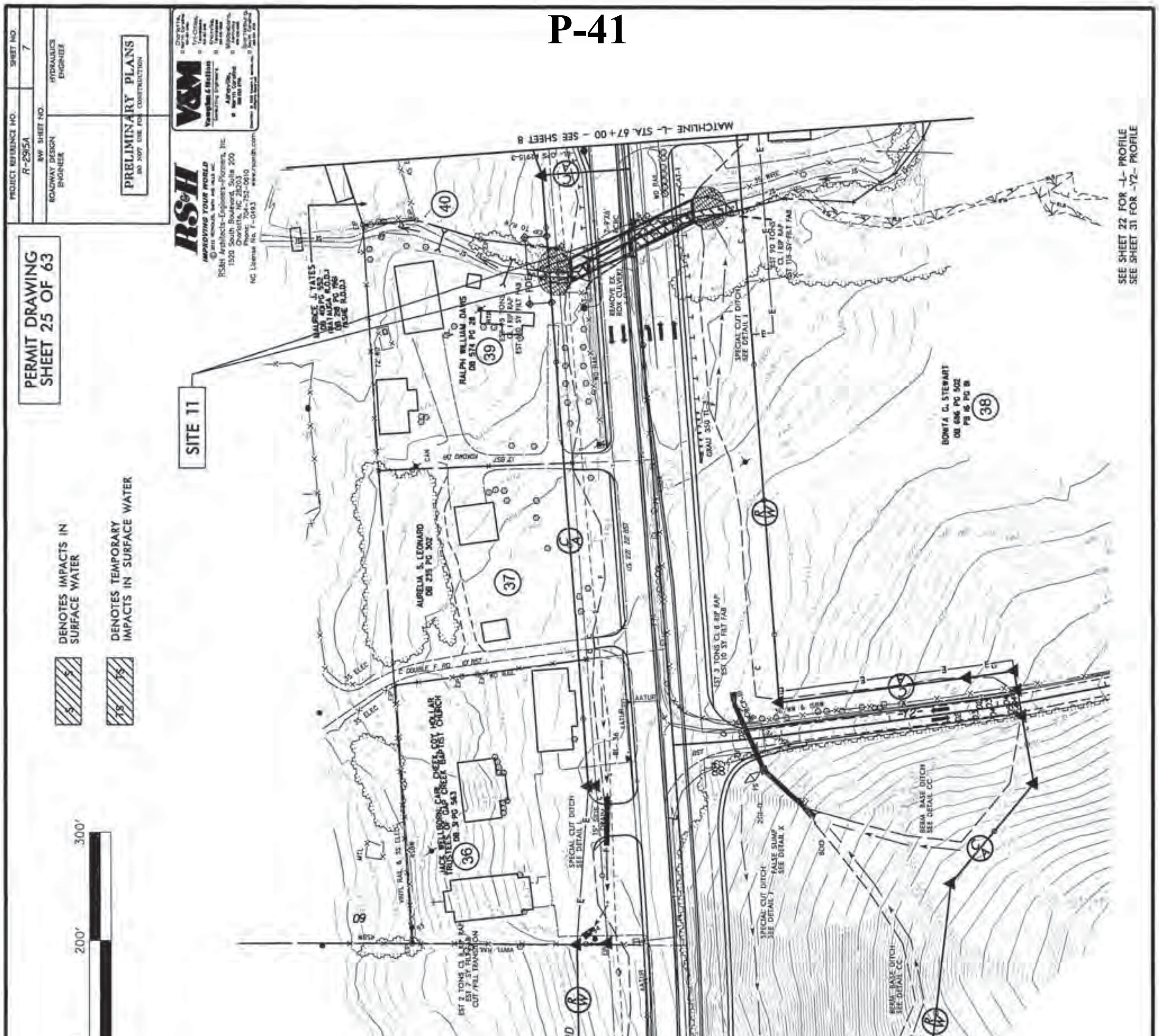

PROJECT REFERENCE NO. R-2915A
SHEET NO. 6
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWING
SHEET 20 OF 63
GRAPHIC SCALE
100' 0' 100' 200' 300'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
RS&H
IMPROVING YOUR WORLD
RS&H Architects-Engineers-Planners, Inc.
1520 South Boulevard, Suite 200
Charlotte, NC 28203
Phone: 704-752-0610
NC License No. F-0493
V&M
Vaughn & Melton
SITE 9
SITE 10
NC GRID NAD 83/NSRS 2007
WILLIAM G. MORETZ DB 295 PG 780
WILLIAM G.MORETZ DB 100 PG 196 TAX MAP
WILLIAM G.MORETZ DB 100 PG 196 TAX MAP
TERRY VANDYKE DB 240 PG 284
MORETZ IV, LLC BR 1483 PG 772 DB 70 PG 582 PB 20 PG 404
MORETZ IV, LLC BR 1483 PG 772 DB 70 PG 582 PB 20 PG 404
BANK STABILIZATION AT DITCH OUTLET SEE DETAIL BBB
EST 2 TONS CL B RIP RAP EST 7 SY FILT FAB
STANDARD BASE DITCH SEE DETAIL LL
LATERAL BASE DITCH SEE DETAIL C
EST 5 TONS CL B RIP RAP EST 14 SY FILT FAB
LATERAL BASE DITCH SEE DETAIL A
STANDARD BASE DITCH SEE DETAIL MM
EST 5 TONS CL B RIP RAP EST 14 SY FILT FAB
LATERAL BASE DITCH SEE DETAIL B
EST 2 TONS CL B RIP RAP EST 7 SY FILT FAB
SHOP CURVED
CHORD
RIP RAP ON BANKS ONLY
EST 48 TONS CL I RIP RAP EST 62 SY FILT FAB SEE DETAIL UU BANK STABILIZATION
LATERAL BASE DITCH SEE DETAIL D
PLUG AND FILL W/ SUITABLE MATERIAL
SPECIAL LATERAL V DITCH SEE DETAIL F
SPECIAL LATERAL V DITCH SEE DETAIL F
SPECIAL CUT DITCH SEE DETAIL I
BERM DITCH SEE DETAIL 2
43° 19' 49.0" E
REMOVE
RETAIN
MATCHLINE -L- STA. 42+00 - SEE SHEET 5
MATCHLINE -L- STA. 54+00 - SEE SHEET 7
SEE SHEET 21 FOR -L- PROFILE
#FILE#
#DATE#

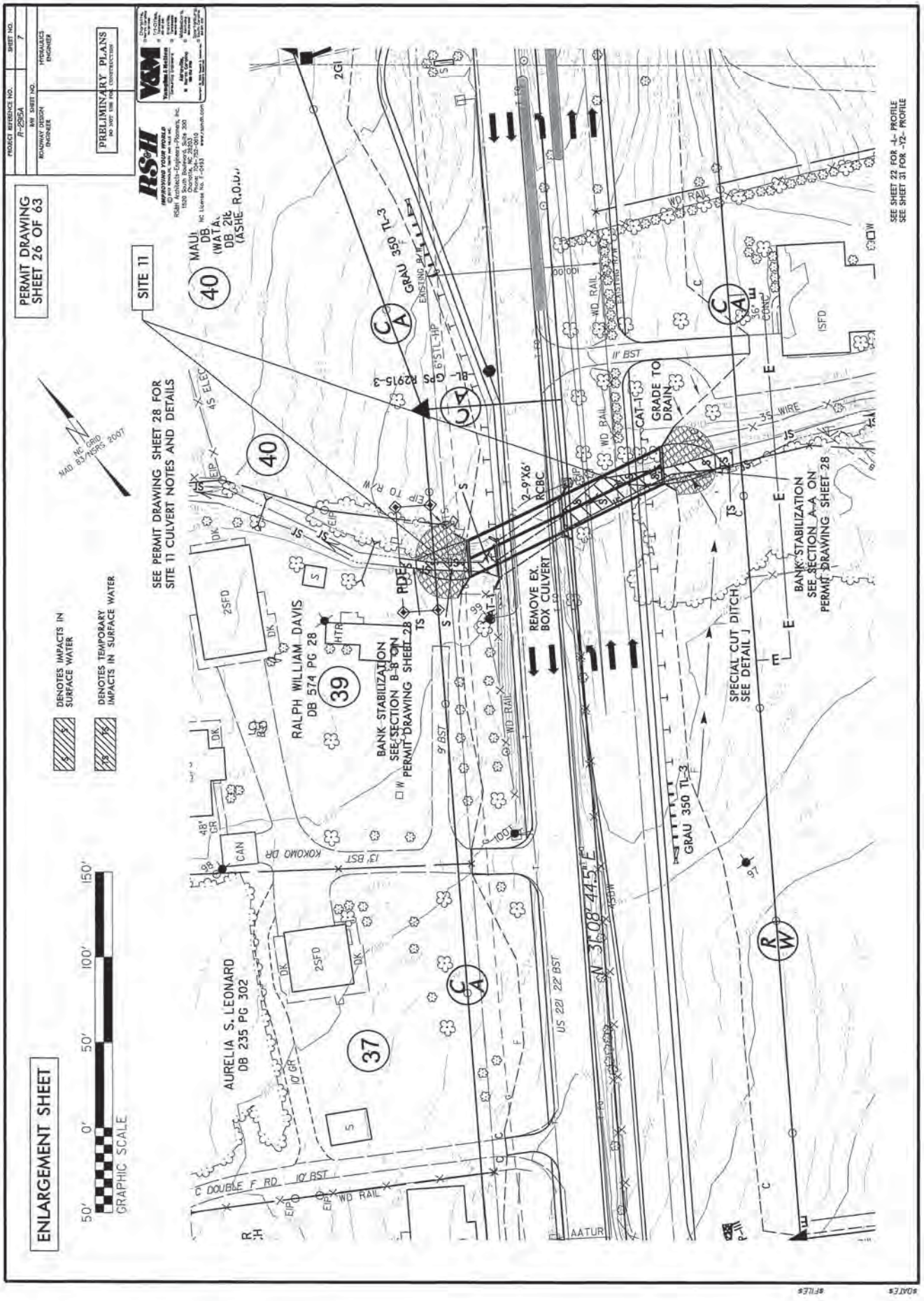
P-38

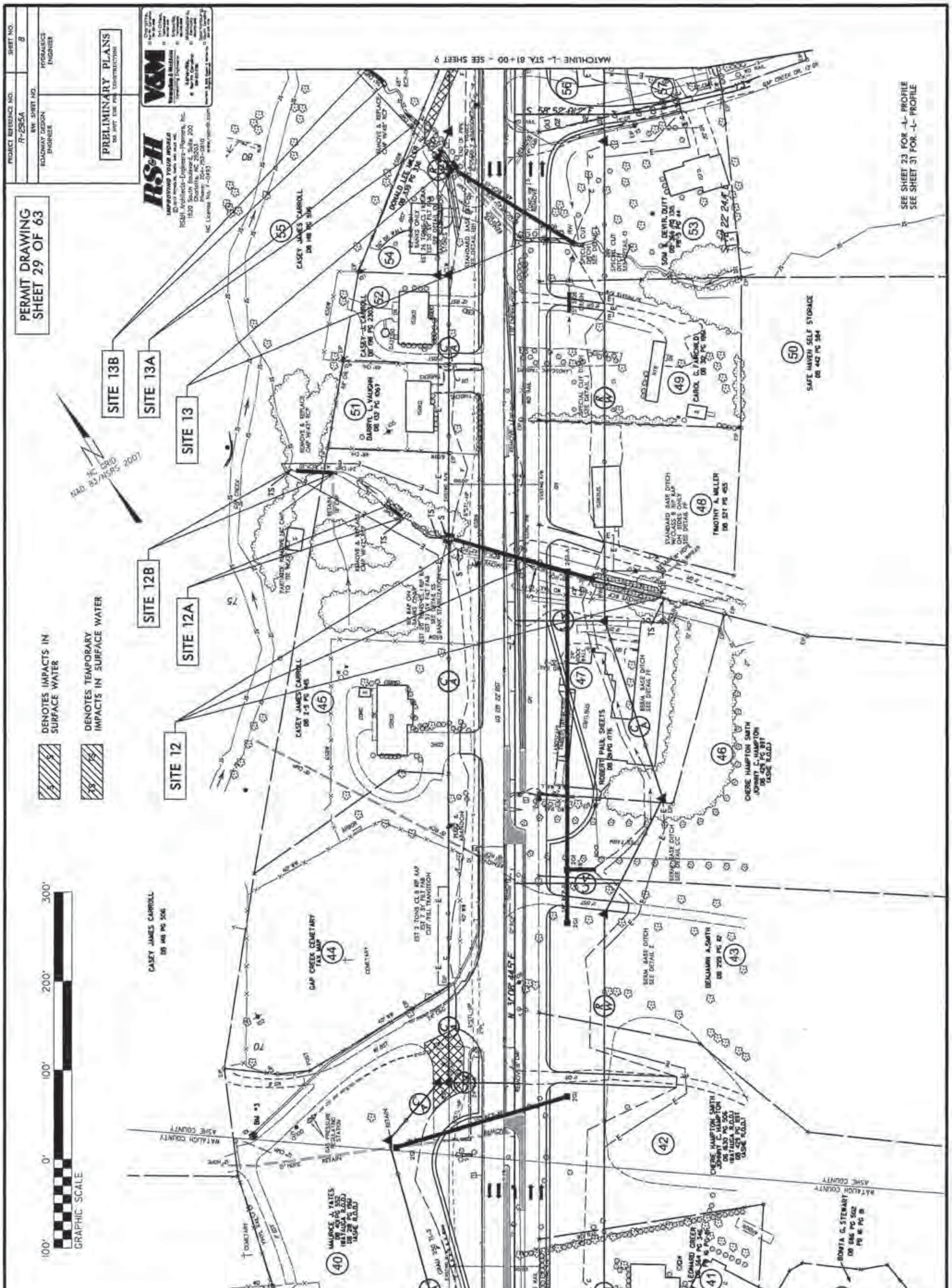

SHEET 21 OF 63
PRELIMINARY PLANS
SITE 9
SITE 10
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCHLINE -L- STA. 54+00 - SEE SHEET 7
MATCHLINE -L- STA. 42+00 SEE SHEET 5
SEE SHEET 21 FOR -L- PROFILE

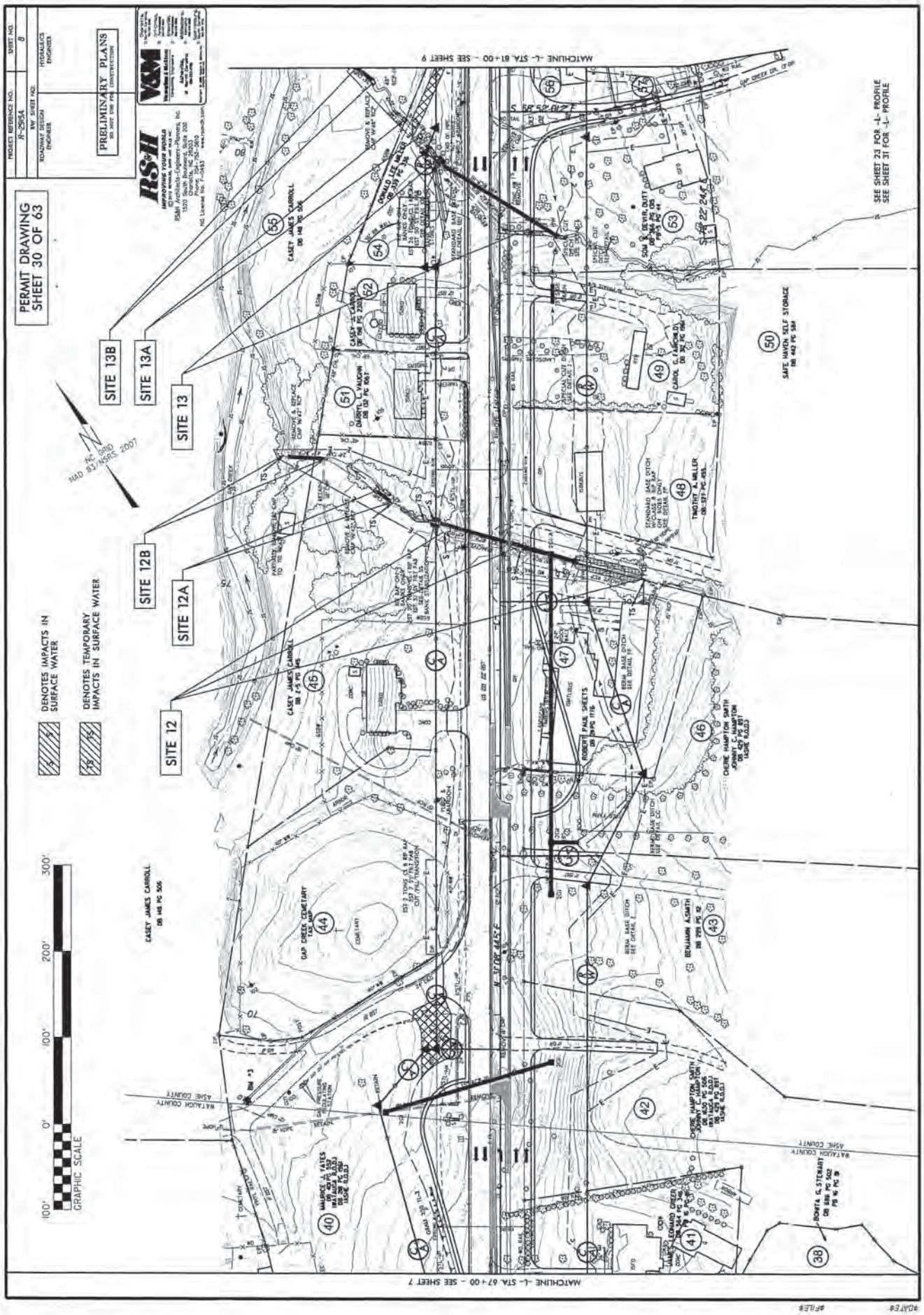

ENLARGEMENT SHEET
GRAPHIC SCALE
50' 0' 50' 100' 150'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PERMIT DRAWING SHEET 22 OF 63
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
ROADWAY DESIGN ENGINEER
ENGINEER
NC GRID NAD 83/NSRS 2007
MORETZ IV, LLC
BR 1483 PG 772
DB 70 PG 582
PB 20 PG 404
35
SITE 10
RIP RAP ON BANKS ONLY
EST 48 TONS CL I RIP RAP
EST 62 SY FILT FAB
SEE DETAIL UU
BANK STABILIZATION
LATERAL BASE DITCH SEE DETAIL D
LATERAL BASE DITCH SEE DETAIL D
EST 3 TONS CL B RIP
EST 10 SY FILT FAB
CHORD
15" CMP W/FES 12' X 6' GRATED CONCRETE STRUCTURE SITTING ON TOP OF CONC. HEAD AND WING WALLS UNABLE TO OBTAIN CULVERT DATA (LOOKS LIKE A CATTLE GUARD CROSSING)
REMOVE
18" SIDE DRAIN
RETAIN
GRAU 350 TL-3
N 52° 35' 59" E
-L-
-BL-35
CAT-WD
WD RAIL
CONC
15" RCP-III
54" RCP-III
24" RCP-III
2GI
2GI-A
FALSE SUMP SEE DETAIL S
BERM BASE DITCH SEE DETAIL Z
BDO
SPECIAL LATERAL V DITCH SEE DETAIL F
US 221 21' BST
HTR
DK
TIMBERS
1½SBKD
SEE SHEET 21 FOR -L- PROFILE


PERMIT DRAWING
SHEET 24 OF 63
SITE 11
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
100'
0'
100'
200'
300'
PRELIMINARY PLANS
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
7
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
MATCHLINE -L- STA. 67+00 - SEE SHEET 8
MATCHLINE -L- STA. 54+00 - SEE SHEET 6
SEE SHEET 22 FOR -L- PROFILE
SEE SHEET 31 FOR -Y2- PROFILE
RALPH WILLIAM DAVIS
AURELIA S. LEONARD
BONITA G. STEWART
MORETZ IV, LLC
CHORD
SPECIAL CUT DITCH
BERM BASE DITCH
FALSE SUMP

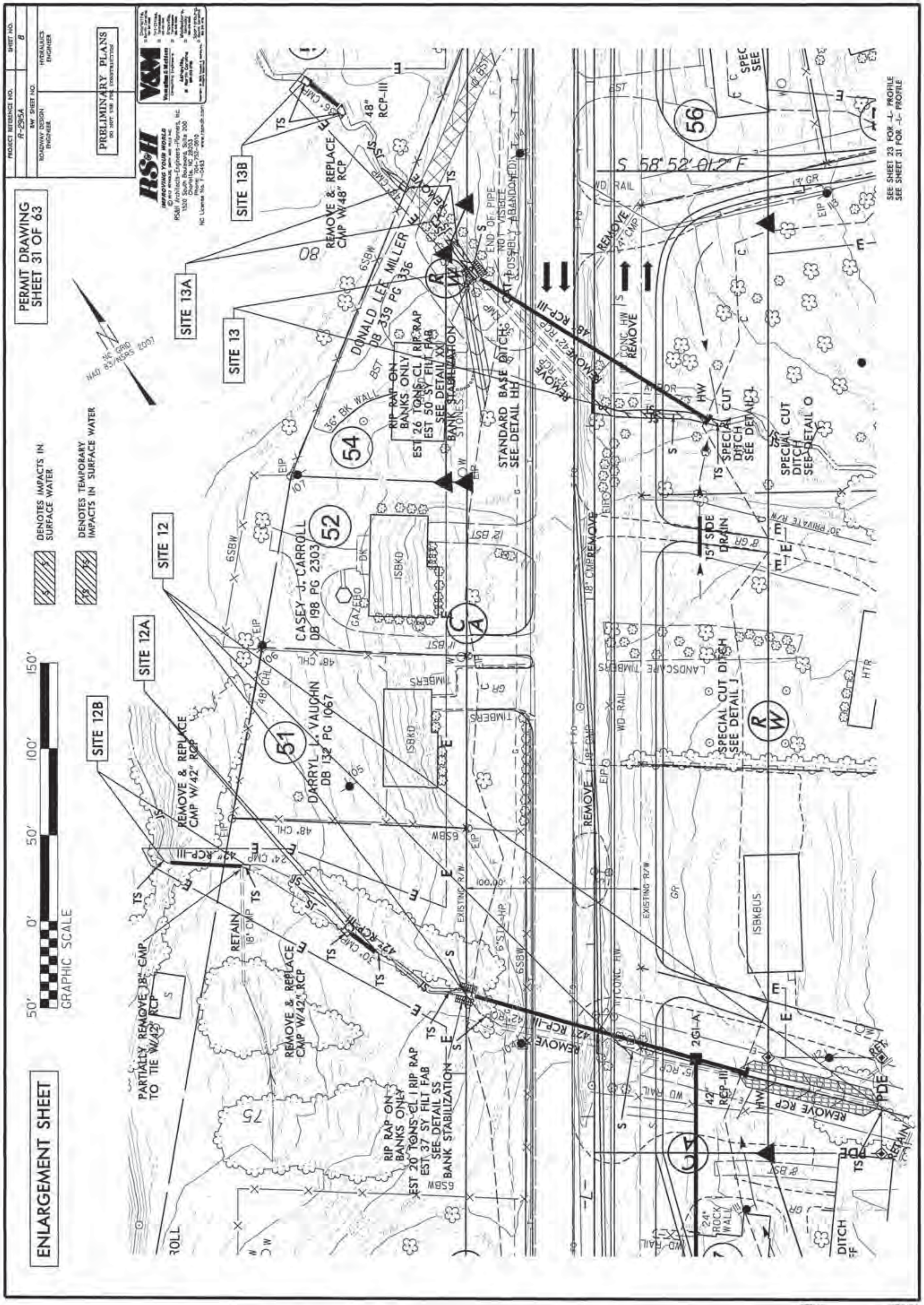

PERMIT DRAWING
SHEET 25 OF 63
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 11
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
7
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
GRAPHIC SCALE
100'
0'
100'
200'
300'
NC GRID
NAD 83/NSRS 2007
MATCHLINE -L- STA. 67+00 - SEE SHEET 8
MATCHLINE -L- STA. 54+00 - SEE SHEET 6
SEE SHEET 22 FOR -L- PROFILE
SEE SHEET 31 FOR -Y2- PROFILE
MAURICE E. YATES
RALPH WILLIAM DAVIS
DB 574 PG 28
AURELIA S. LEONARD
BONITA G. STEWART
MORETZ IV, LLC
CHORD
SPECIAL CUT DITCH
BERM BASE DITCH SEE DETAIL CC
LATERAL BASE DITCH SEE DETAIL D
40
39
38
37
36
35
34

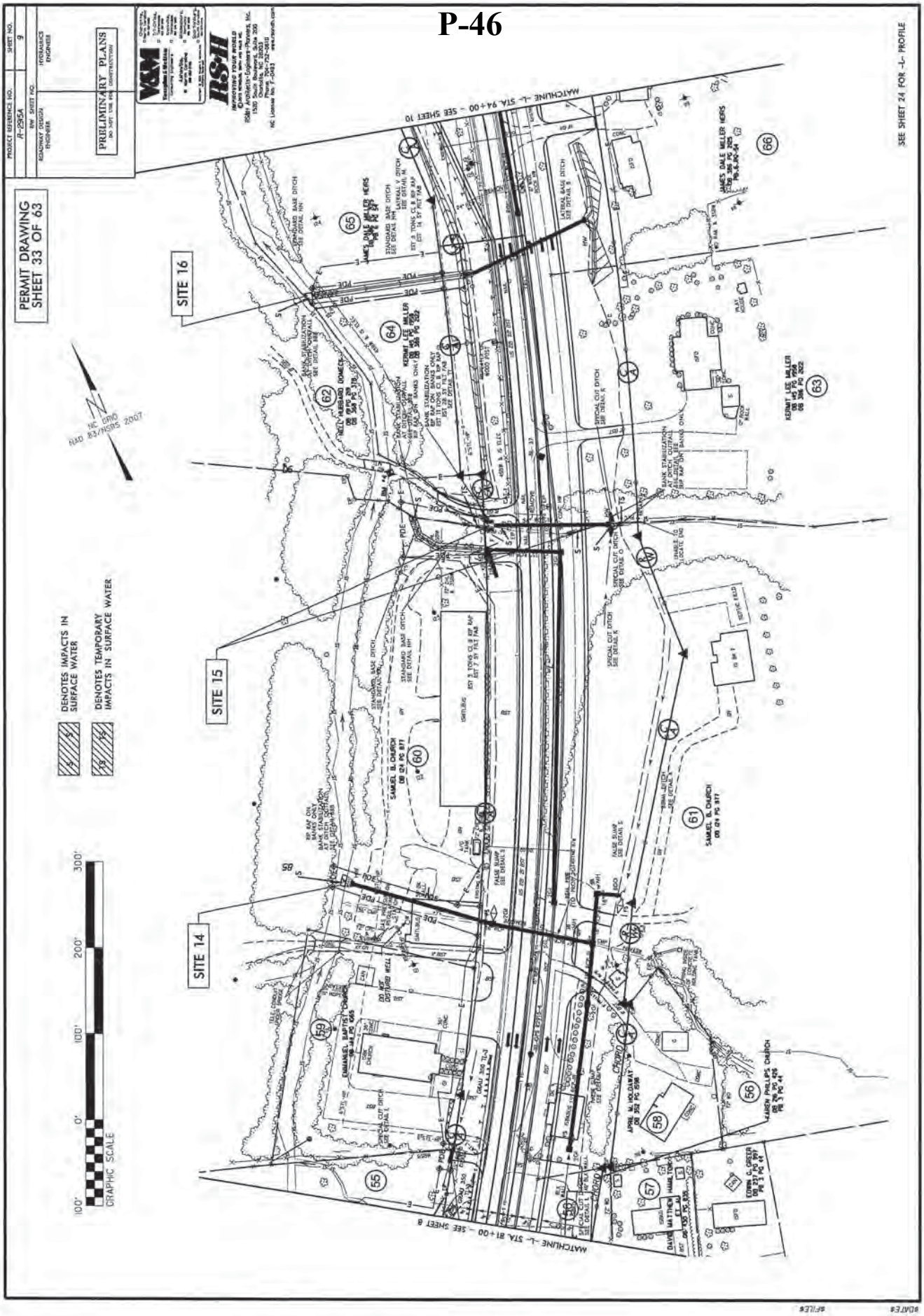

ENLARGEMENT SHEET
GRAPHIC SCALE
PERMIT DRAWING SHEET 26 OF 63
PRELIMINARY PLANS
SITE 11
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SEE PERMIT DRAWING SHEET 28 FOR SITE 11 CULVERT NOTES AND DETAILS
SEE SHEET 22 FOR -L- PROFILE
SEE SHEET 31 FOR -Y2- PROFILE
AURELIA S. LEONARD DB 235 PG 302
RALPH WILLIAM DAVIS DB 574 PG 28
MAUI DB (WATA. DB 216 (ASHE R.O.W.
REMOVE EX. BOX CULVERT
2-9'X6' RCBC
BANK STABILIZATION SEE SECTION B-B ON PERMIT DRAWING SHEET 28
BANK STABILIZATION SEE SECTION A-A ON PERMIT DRAWING SHEET 28
SPECIAL CUT DITCH SEE DETAIL J
GRADE TO DRAIN
GRAU 350 TL-3
US 221
N 36° 08' 44.5" E
C DOUBLE F RD
WD RAIL
36" CONC
CAT-1

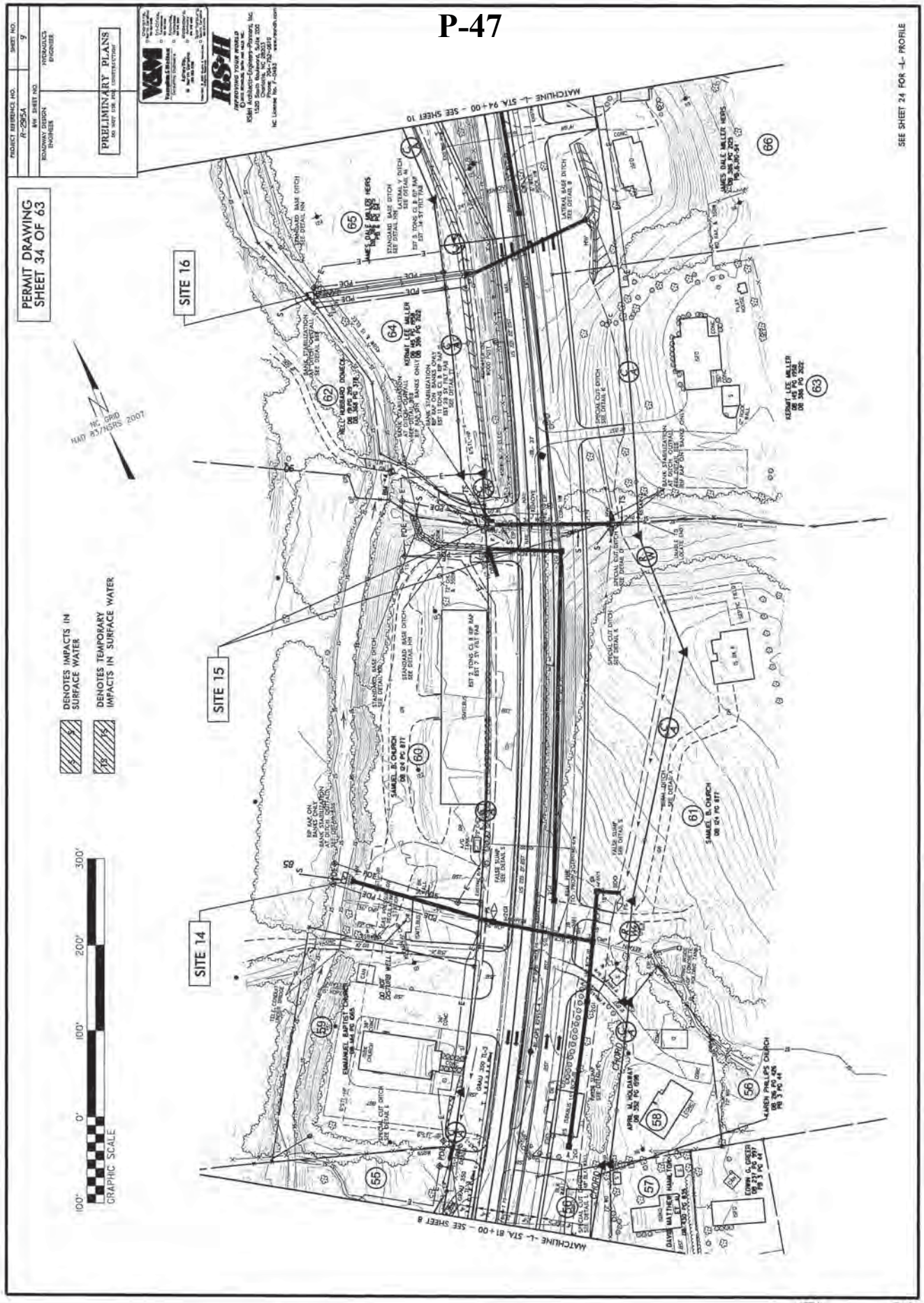

PERMIT DRAWING
SHEET 29 OF 63
SITE 13B
SITE 13A
SITE 13
SITE 12B
SITE 12A
SITE 12
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
NC GRID
NAD 83/NSRS 2007
GRAPHIC SCALE
100' 0' 100' 200' 300'
SAFE HAVEN SELF STORAGE
SEE SHEET 23 FOR -L- PROFILE
SEE SHEET 31 FOR -L- PROFILE

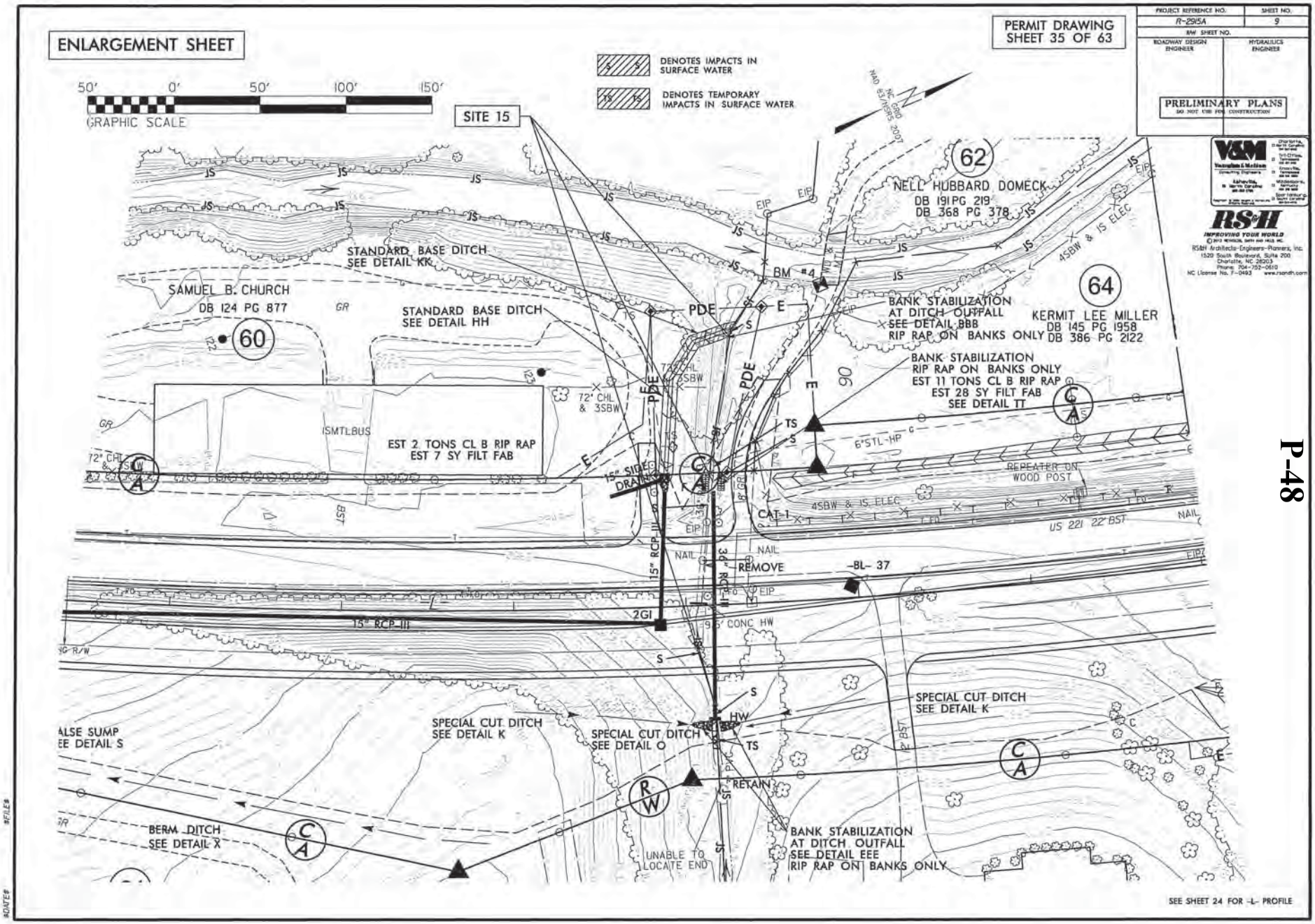

PERMIT DRAWING
SHEET 30 OF 63
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
PROJECT REFERENCE NO.
R-2958A
SHEET NO.
8
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
RS&H
V&M
SITE 13B
SITE 13A
SITE 13
SITE 12B
SITE 12A
SITE 12
NC GRID
NAD 83/NSRS 2007
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
100' 0' 100' 200' 300'
MATCHLINE -L- STA. 61+00 - SEE SHEET 9
MATCHLINE -L- STA. 67+00 - SEE SHEET 7
SEE SHEET 23 FOR -L- PROFILE
SEE SHEET 31 FOR -L- PROFILE
CASEY JAMES CARROLL
DB 148 PG 506
GAP CREEK CEMETERY
WATAUGA COUNTY
ASHE COUNTY
SAFE HAVEN SELF STORAGE
DB 442 PG 584
N 57°08'46"E

P-45


ENLARGEMENT SHEET
PERMIT DRAWING SHEET 31 OF 63
PRELIMINARY PLANS
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 12
SITE 12A
SITE 12B
SITE 13
SITE 13A
SITE 13B
DARRYL L. VAUGHN DB 132 PG 1067
CASEY J. CARROLL DB 198 PG 2303
DONALD LEE MILLER DB 339 PG 336
REMOVE & REPLACE CMP W/42" RCP
REMOVE & REPLACE CMP W/48" RCP
PARTIALLY REMOVE 18" CMP TO TIE W/42" RCP
STANDARD BASE DITCH; SEE DETAIL HH
SPECIAL CUT DITCH SEE DETAIL J


PROJECT REFERENCE NO.
A-2952A
SHEET NO.
9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NO RPT, USE FOR CONSTRUCTION
PERMIT DRAWING
SHEET 33 OF 63
SITE 14
SITE 15
SITE 16
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
NC GRID
NAD 83/NSRS 2007
MATCHLINE -L- STA. 81+00 - SEE SHEET 8
MATCHLINE -L- STA. 94+00 - SEE SHEET 10
SEE SHEET 24 FOR -L- PROFILE


PROJECT REFERENCE NO. R-2954A
SHEET NO. 9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
PERMIT DRAWING SHEET 34 OF 63
SITE 14
SITE 15
SITE 16
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
NC GRID NAD 83/HSRS 2007
MATCHLINE -L- STA. 81+00 - SEE SHEET 8
MATCHLINE -L- STA. 94+00 - SEE SHEET 10
SEE SHEET 24 FOR -L- PROFILE


ENLARGEMENT SHEET
PERMIT DRAWING
SHEET 35 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
50' 0' 50' 100' 150'
GRAPHIC SCALE
SITE 15
NAD 83/NSRS 2007
NC GRID
62
NELL HUBBARD DOMECK
DB 191 PG 219
DB 368 PG 378
64
KERMIT LEE MILLER
DB 145 PG 1958
DB 386 PG 2122
60
SAMUEL B. CHURCH
DB 124 PG 877
STANDARD BASE DITCH
SEE DETAIL KK
STANDARD BASE DITCH
SEE DETAIL HH
BANK STABILIZATION
AT DITCH OUTFALL
SEE DETAIL BBB
RIP RAP ON BANKS ONLY
BANK STABILIZATION
RIP RAP ON BANKS ONLY
EST 11 TONS CL B RIP RAP
EST 28 SY FILT FAB
SEE DETAIL TT
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
ISMTLBUS
72" CHL & 3SBW
4SBW & IS ELEC
6"STL-HP
REPEATER ON WOOD POST
CAT-1
US 221 22" BST
15" SIDE DRAIN
15" RCP-III
36" RCP-III
REMOVE
BL- 37
2GI
9'6" CONC HW
SPECIAL CUT DITCH
SEE DETAIL K
SPECIAL CUT DITCH
SEE DETAIL O
RETAIN
BERM DITCH
SEE DETAIL X
UNABLE TO LOCATE END
BANK STABILIZATION
AT DITCH OUTFALL
SEE DETAIL EEE
RIP RAP ON BANKS ONLY
SEE SHEET 24 FOR -L- PROFILE
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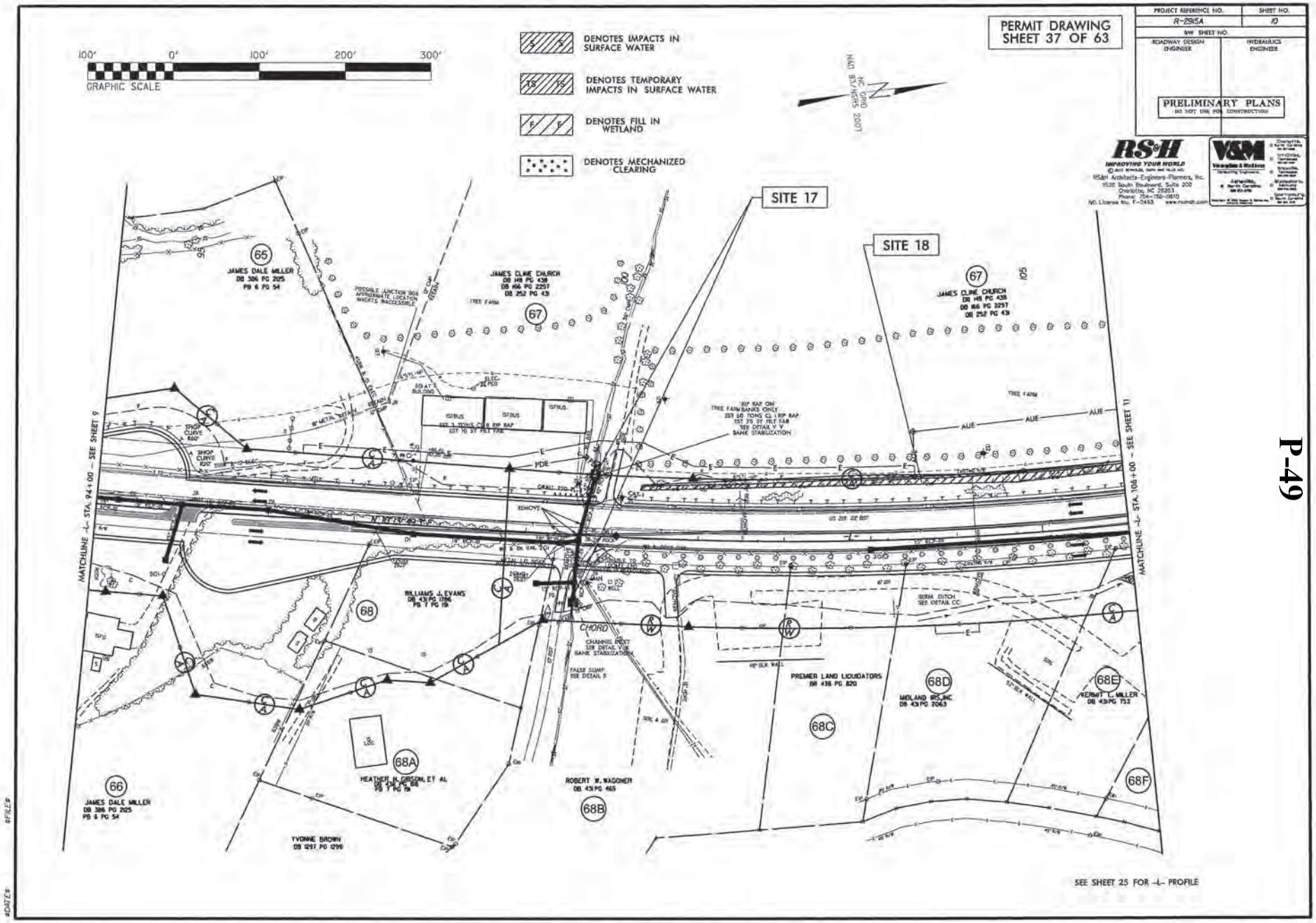
P-48


PERMIT DRAWING
SHEET 37 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
10
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
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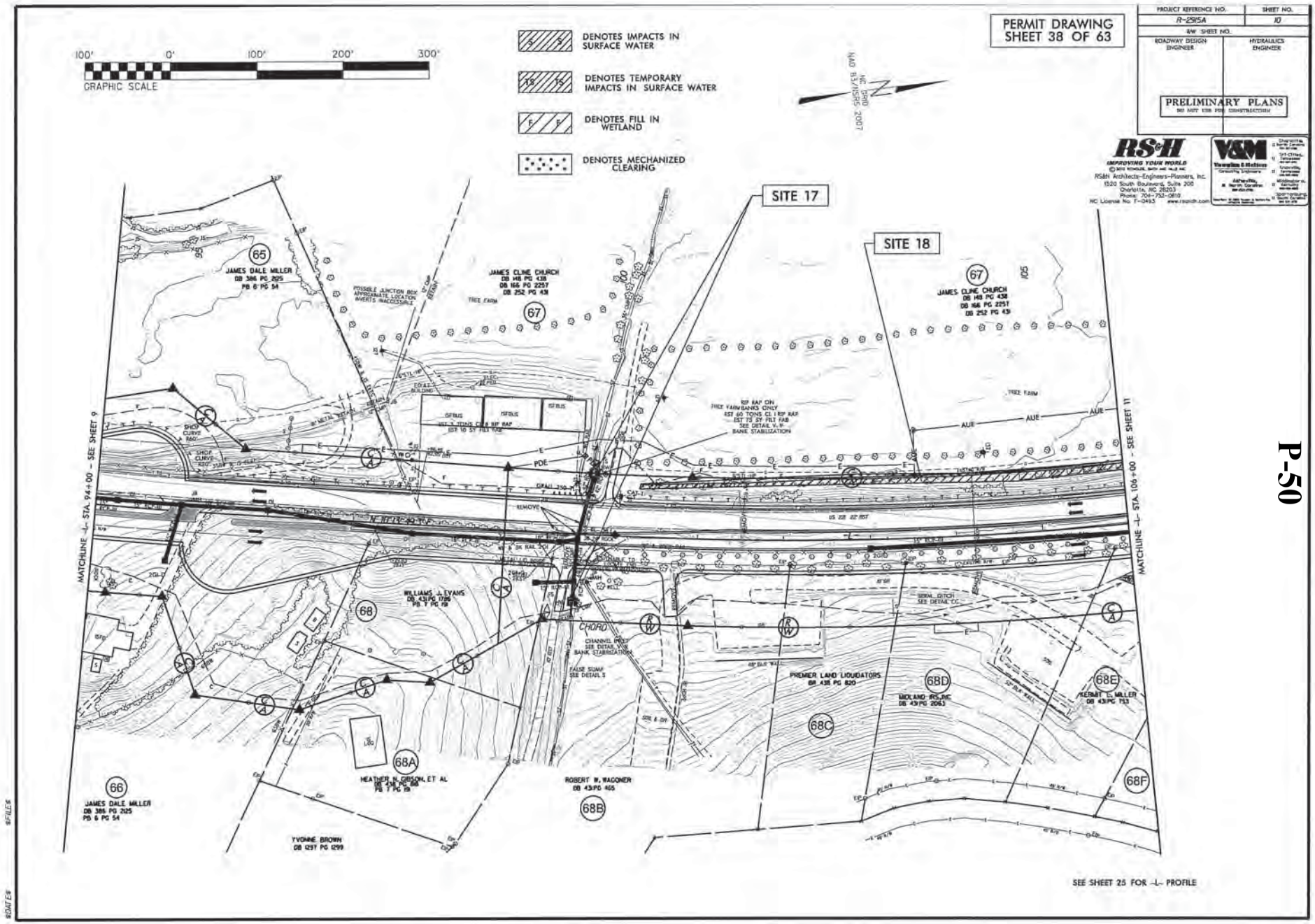
Charlotte, NC 28203
Phone: 704-752-0610
NC License No. F-0493
V&M
Vaughan & Melton
Consulting Engineers
100' 0' 100' 200' 300'
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
SITE 17
SITE 18
MATCHLINE -L- STA. 94+00 - SEE SHEET 9
MATCHLINE -L- STA. 106+00 - SEE SHEET 11
65
JAMES DALE MILLER
DB 386 PG 225
PB 6 PG 54
67
JAMES CLINE CHURCH
DB 148 PG 438
DB 166 PG 225?
DB 252 PG 43
68
WILLIAMS J. EVANS
DB 43 PG 1196
PB 7 PG 79
68A
HEATHER N. GIBSON, ET AL
68B
ROBERT W. WAGONER
DB 43 PG 465
68C
68D
MIDLAND IRS, INC
DB 43 PG 2063
68E
KERMIT L. MILLER
DB 43 PG 753
68F
66
JAMES DALE MILLER
DB 386 PG 225
PB 6 PG 54
YVONNE BROWN
DB 1297 PG 1296
PREMIER LAND LIQUIDATORS
BK 436 PG 820
RIP RAP ON TREE FARM BANKS ONLY
EST 60 TONS CL I RIP RAP
EST 75 SY FELT FAB
SEE DETAIL V V
BANK STABILIZATION
CHANNEL EXCT SEE DETAIL V W BANK STABILIZATION
FALSE SUMP SEE DETAIL S
BERM DITCH SEE DETAIL CC
SEE SHEET 25 FOR -L- PROFILE
P-49


PERMIT DRAWING
SHEET 38 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
10
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
100' 0' 100' 200' 300'
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
NC GRID
SITE 17
SITE 18
MATCHLINE -L- STA. 94+00 - SEE SHEET 9
MATCHLINE -L- STA. 106+00 - SEE SHEET 11
JAMES DALE MILLER DB 386 PG 225 PB 6 PG 54
JAMES CLINE CHURCH DB 148 PG 438 DB 166 PG 2257 DB 252 PG 43
WILLIAMS A EVANS DB 43 PG 1799 PB 7 PG 19
HEATHER N GIBSON, ET AL DB 438 PG 820 PB 7 PG 19
ROBERT W. WAGONER DB 43 PG 465
YVONNE BROWN DB 1257 PG 1299
PREMIER LAND LIQUIDATORS DB 438 PG 820
MIDLAND RS, INC DB 43 PG 2063
KERMIT L. MILLER DB 43 PG 753
SEE SHEET 25 FOR -L- PROFILE
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Phone: 704-752-0810
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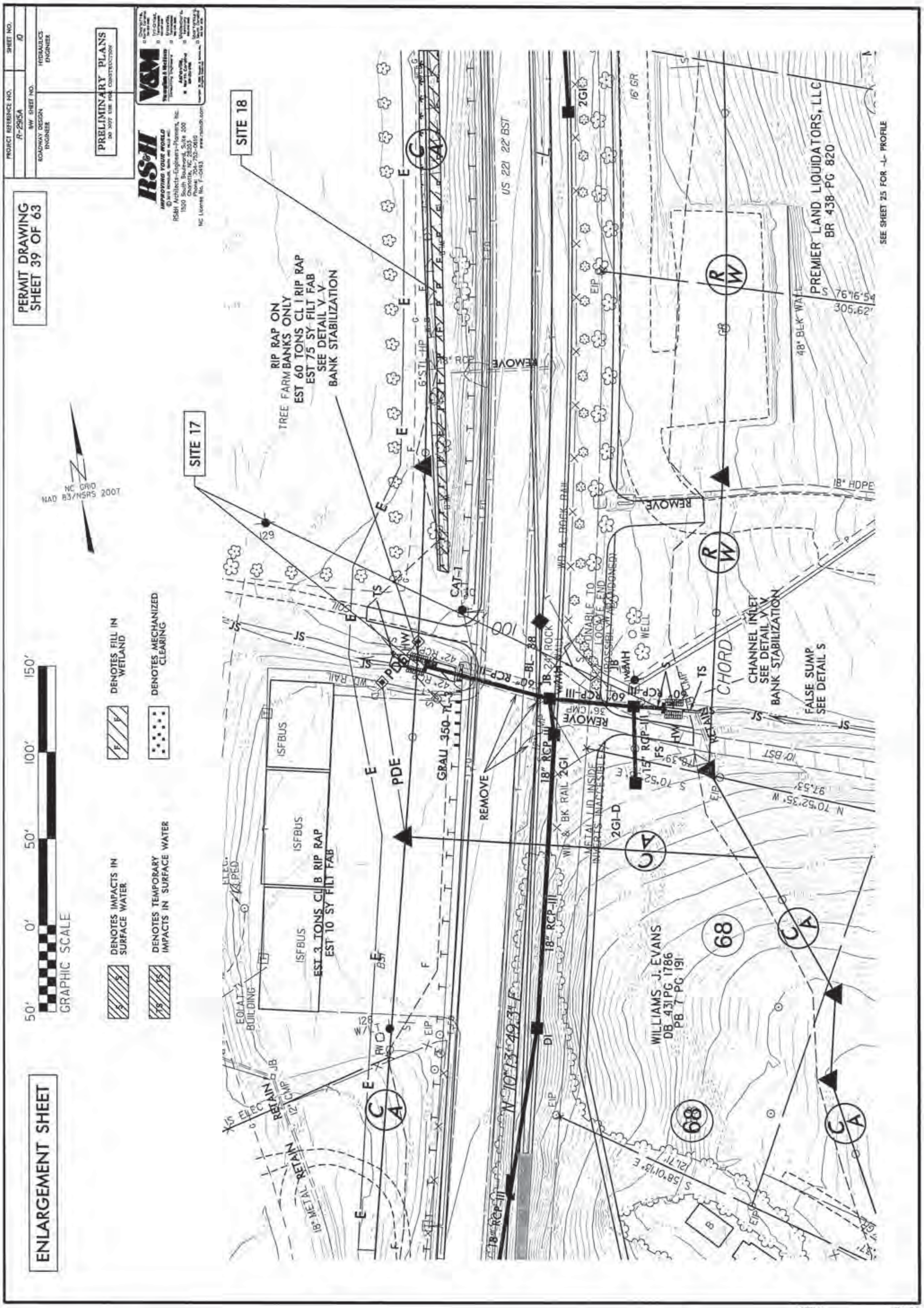
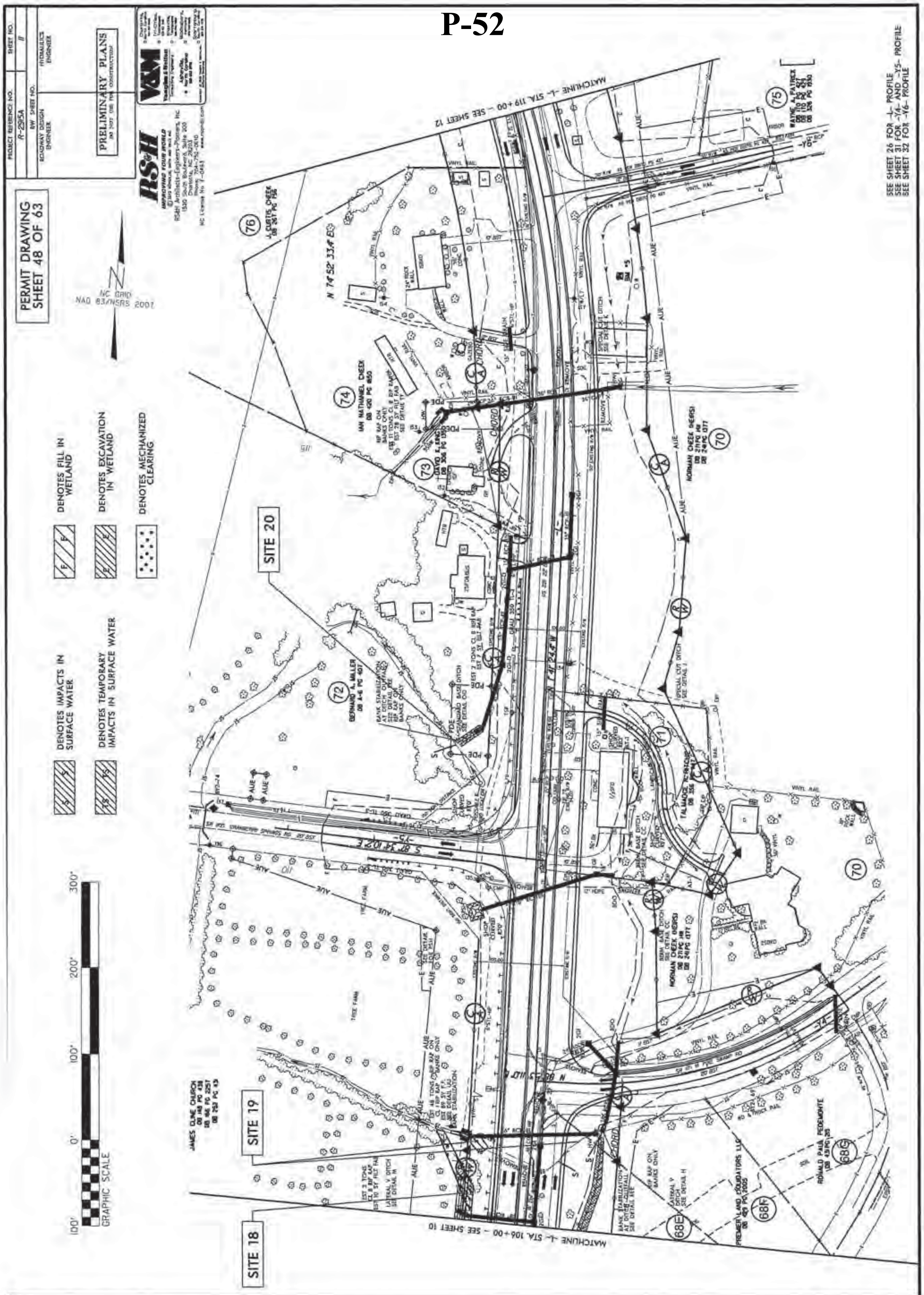
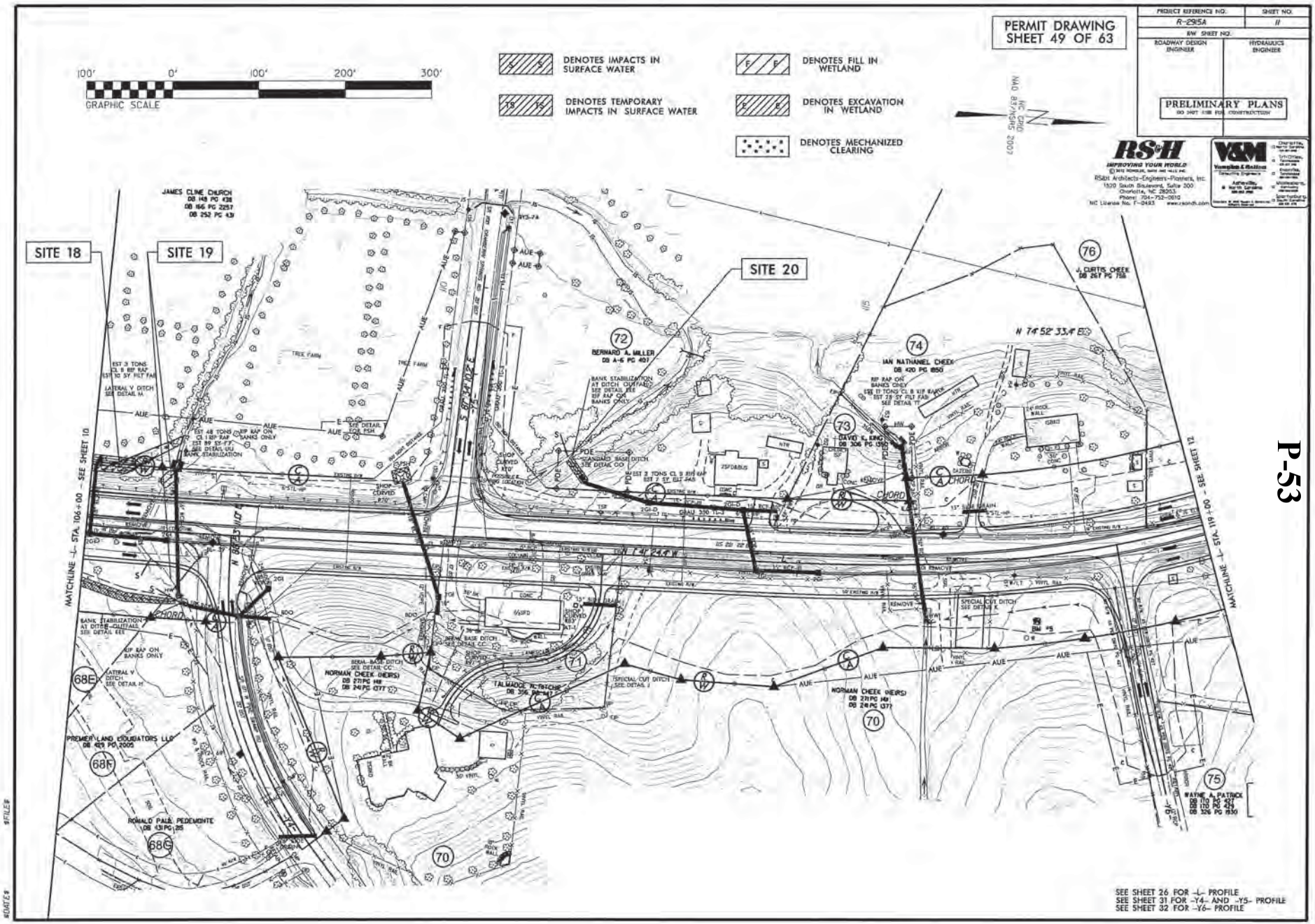
V&M
Vaughan & Melton
Consulting Engineers
#FILE#
#DATE#

P-50


ENLARGEMENT SHEET
PERMIT DRAWING
SHEET 39 OF 63
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
R-2915A
GRAPHIC SCALE
50' 0' 50' 100' 150'
NC GRID
NAD 83/NSRS 2007
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
SITE 17
SITE 18
RIP RAP ON
BANKS ONLY
EST 60 TONS CL I RIP RAP
EST 75 SY FILT FAB
SEE DETAIL V-V
BANK STABILIZATION
TREE FARM
EST 3 TONS CL B RIP RAP
EST 10 SY FILT FAB
CHANNEL INLET
SEE DETAIL Y-Y
BANK STABILIZATION
FALSE SUMP
SEE DETAIL S
REMOVE
US 221 22' BST
WILLIAMS J. EVANS
DB 431 PG 1786
PB 7 PG 191
PREMIER LAND LIQUIDATORS, LLC
BR 438-PG 820
SEE SHEET 25 FOR -L- PROFILE
48" BLK WALL
18" HDPE
ISFBUS
GRAU 350-TL-3
18" RCP-III
60" RCP-III
42" RCP
PDE
CHORD
WELL
S 76°6'54"
305.62'
N 70°52'35" W
97.53'
S 58°01'13" E
N 10°13'49.3" E

P-52


PERMIT DRAWING
SHEET 48 OF 63
NC GRID
NAD 83/NSRS 2007
PRELIMINARY PLANS
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
GRAPHIC SCALE
SITE 18
SITE 19
SITE 20
MATCHLINE -L- STA. 119+00 - SEE SHEET 12
MATCHLINE -L- STA. 106+00 - SEE SHEET 10
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -Y4- AND -Y5- PROFILE
SEE SHEET 32 FOR -Y6- PROFILE


PERMIT DRAWING
SHEET 49 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
11
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
100' 0' 100' 200' 300'
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83 (NSRS) 2007
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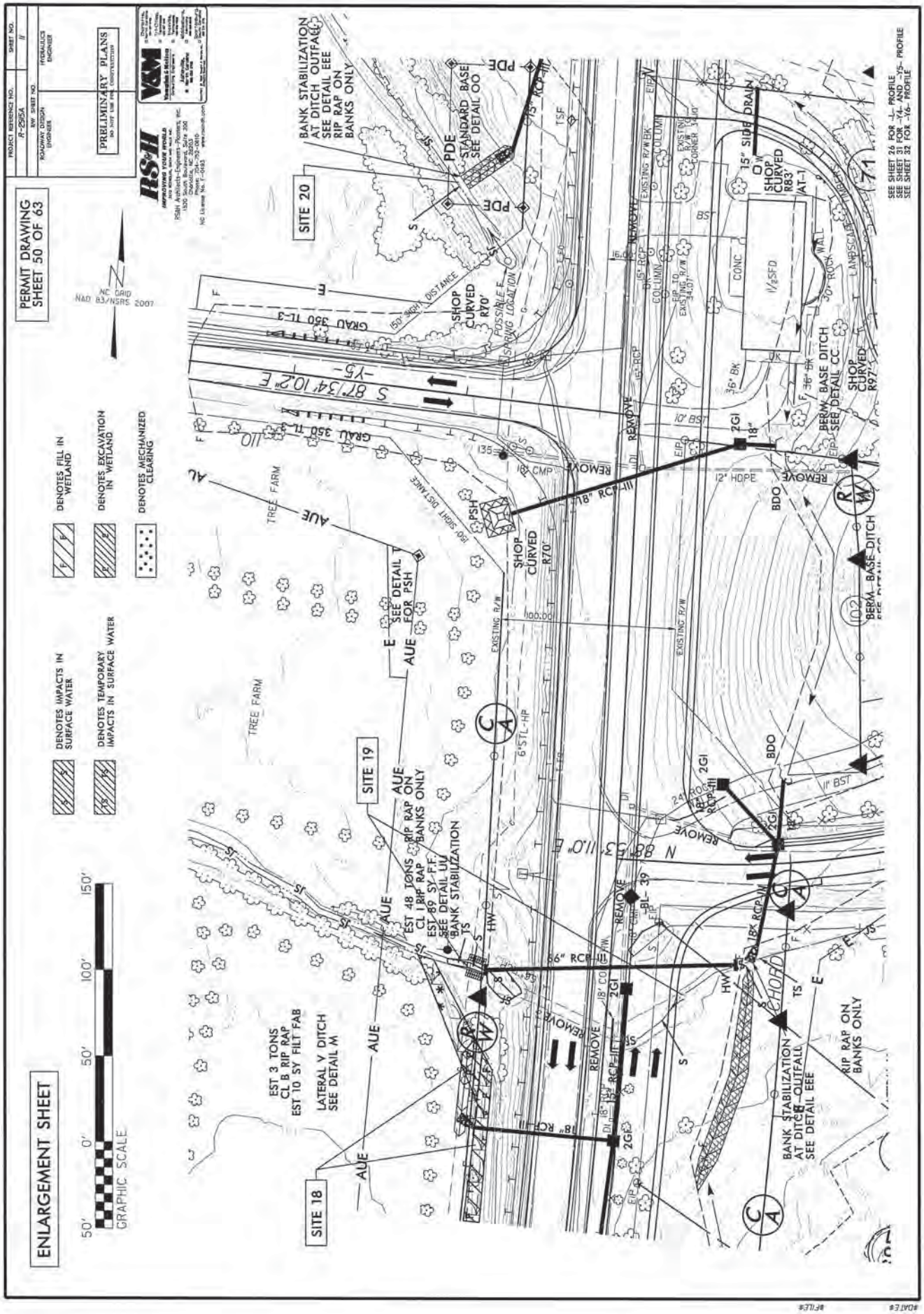
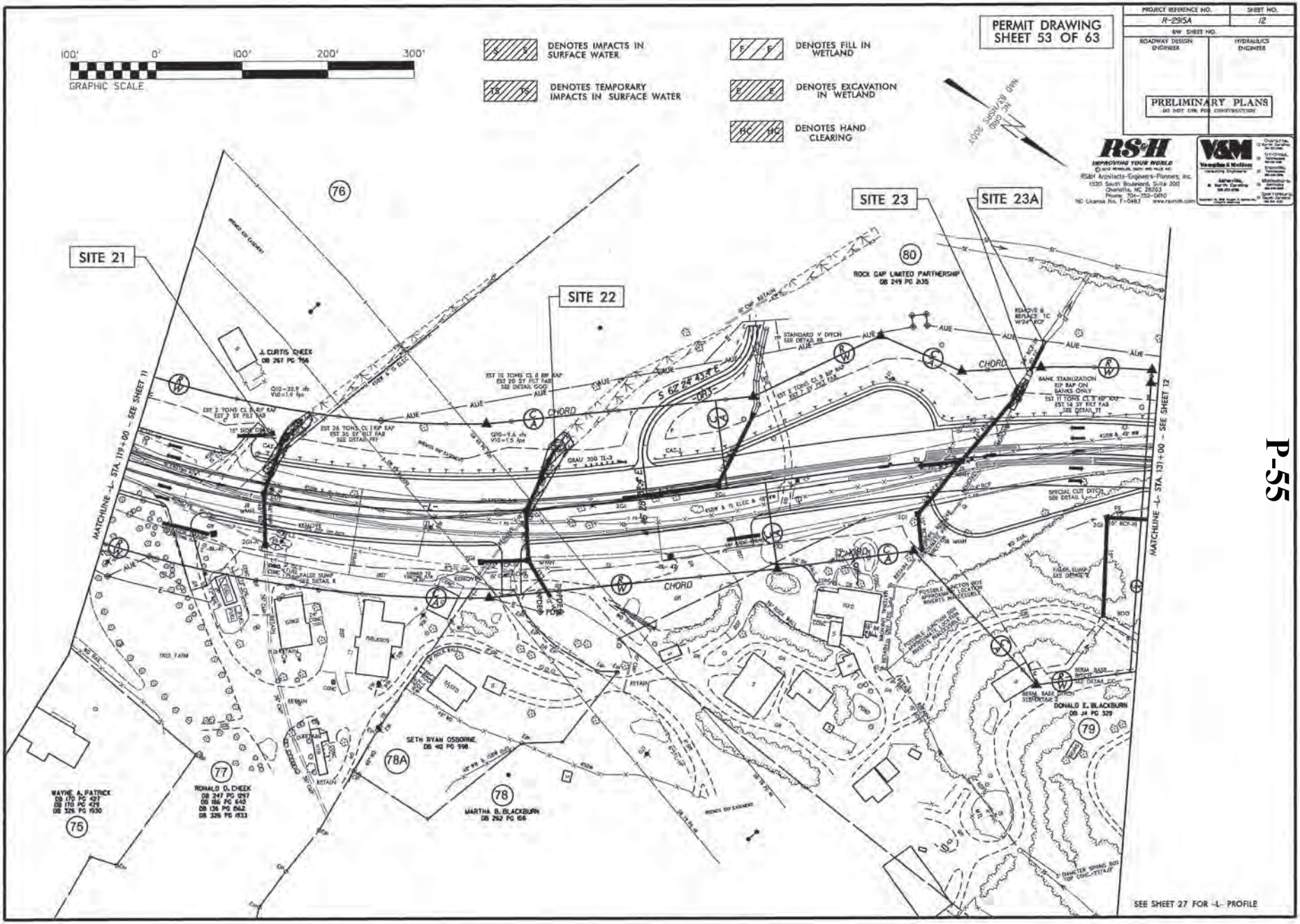
Vaughan & Melhorn
SITE 18
SITE 19
SITE 20
JAMES CLINE CHURCH
DB 149 PG 438
DB 166 PG 2251
DB 252 PG 43
BERNARD A. MILLER
DB A-6 PG 407
IAN NATHANIEL CHEEK
DB 420 PG 850
J. CURTIS CHEEK
DB 267 PG 758
DAVID K. KING
DB 306 PG 350
NORMAN CHEEK (HEIRS)
DB 271 PG 149
DB 24 PG 377
TALMADGE RITCHIE
DB 356 PG 147
PREMIER LAND LIQUIDATORS LLC
DB 429 PG 2005
RONALD PAUL PEDEMONTE
DB 431 PG 285
WAYNE A. PATRICK
DB 110 PG 427
DB 124 PG 424
DB 326 PG 1930
MATCHLINE -L- STA. 106+00 - SEE SHEET 10
MATCHLINE -L- STA. 119+00 - SEE SHEET 12
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -Y4- AND -Y5- PROFILE
SEE SHEET 32 FOR -Y6- PROFILE
P-53


ENLARGEMENT SHEET
GRAPHIC SCALE
50' 0' 50' 100' 150'
PERMIT DRAWING SHEET 50 OF 63
NC GRID NAD 83/NSRS 2007
PRELIMINARY PLANS
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 18
SITE 19
SITE 20
EST 3 TONS CL B RIP RAP EST 10 SY FILT FAB
LATERAL V DITCH SEE DETAIL M
EST 48 TONS CL I RIP RAP EST 89 SY F.F. SEE DETAIL UU
BANK STABILIZATION
RIP RAP ON BANKS ONLY
BANK STABILIZATION AT DITCH OUTFALL SEE DETAIL EEE
PDE STANDARD BASE SEE DETAIL OO
SHOP CURVED R70'
SHOP CURVED R83'
SHOP CURVED R97'
BERM BASE DITCH SEE DETAIL CC
TREE FARM
EXISTING R/W
REMOVE
SEE SHEET 26 FOR -L- PROFILE
SEE SHEET 31 FOR -14- AND -15- PROFILE
SEE SHEET 32 FOR -16- PROFILE


PERMIT DRAWING
SHEET 53 OF 63
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
12
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
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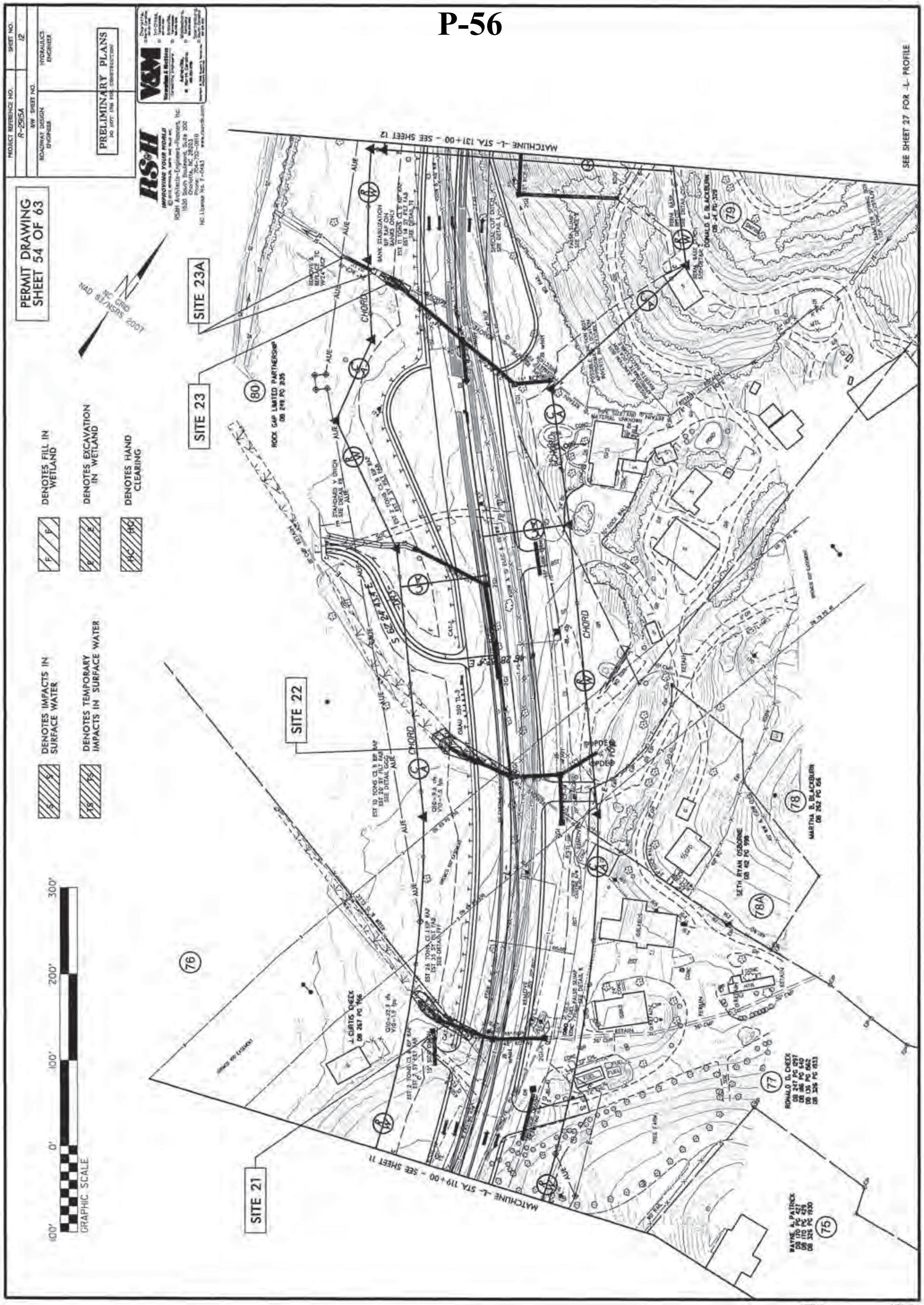
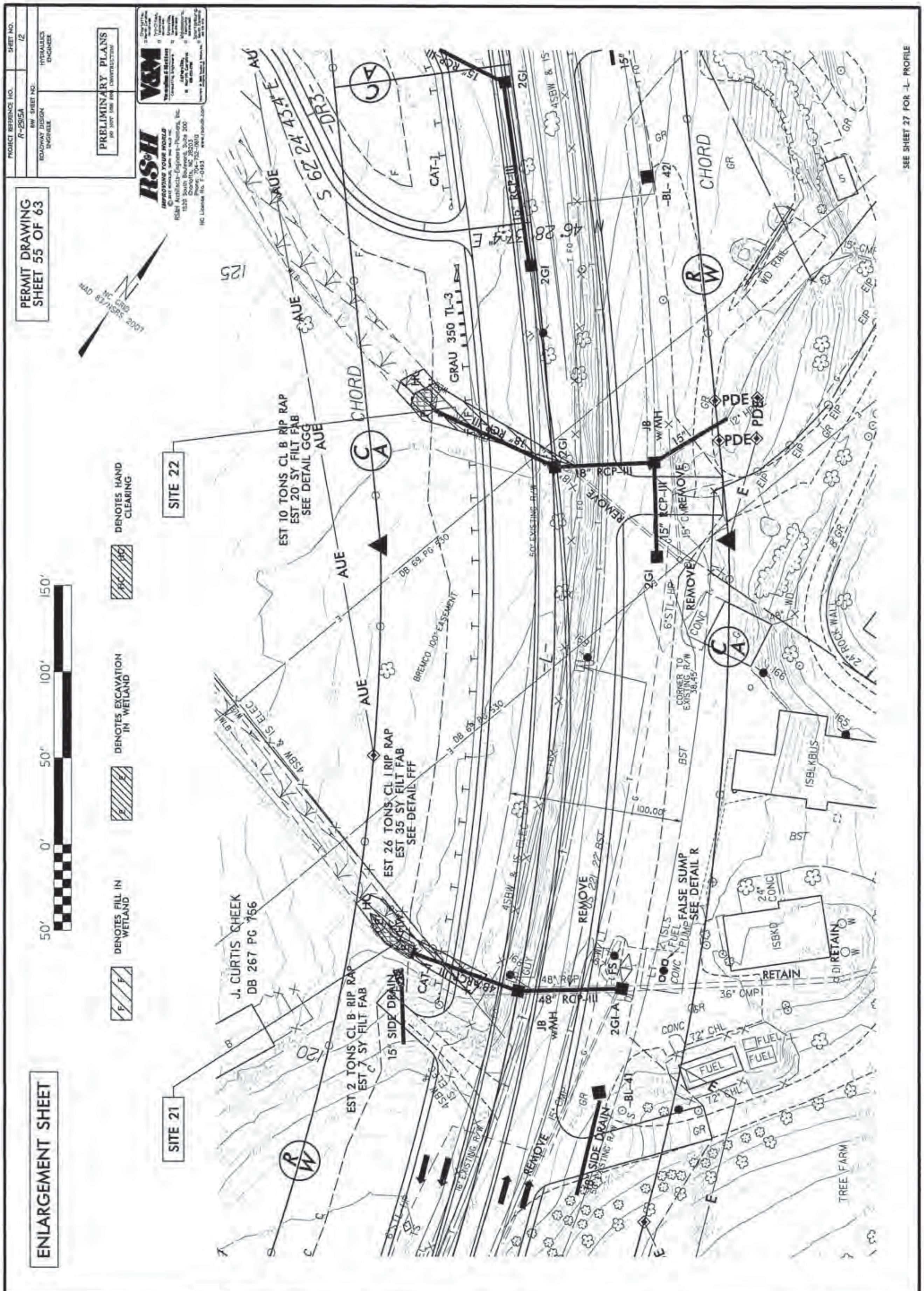
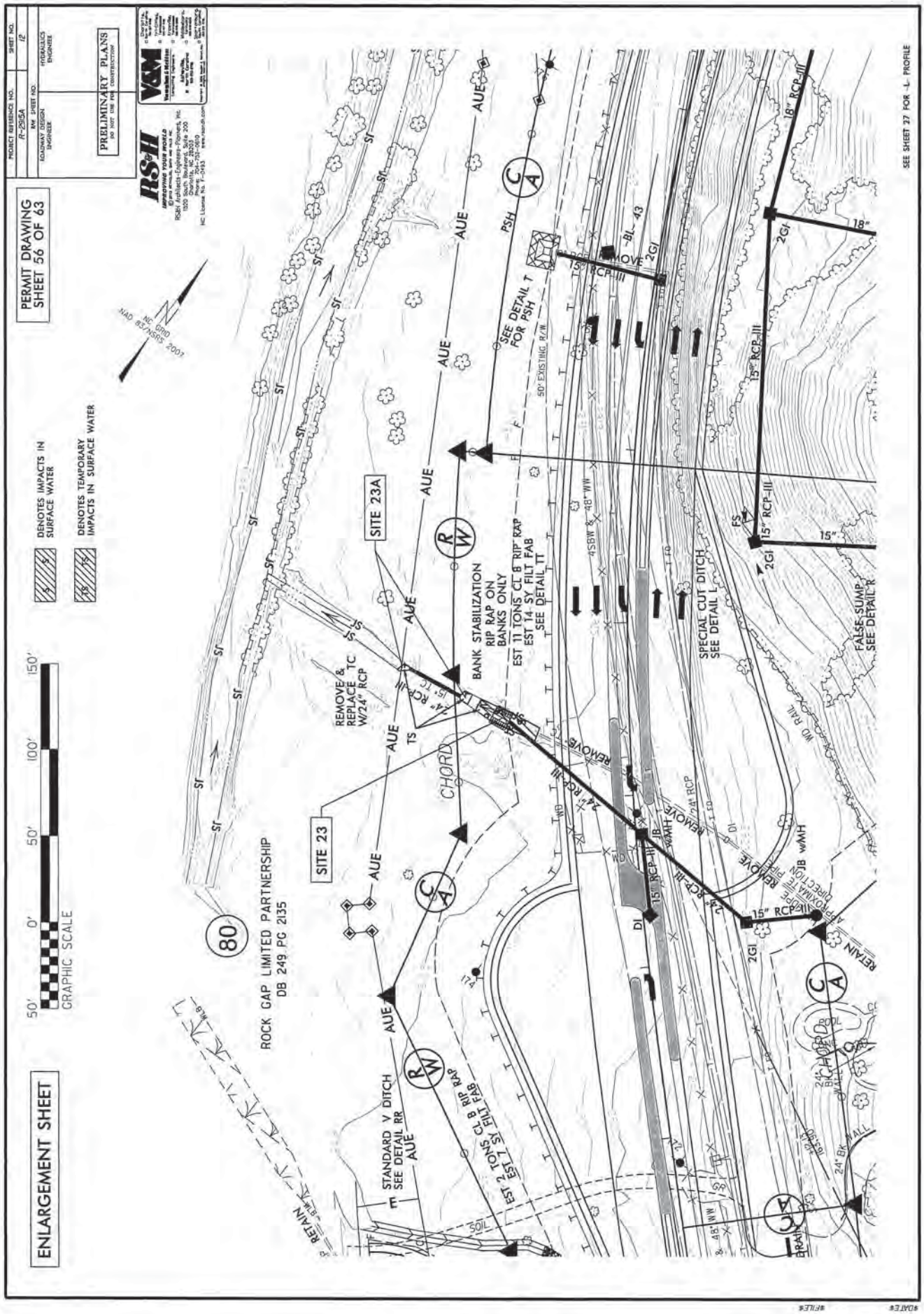
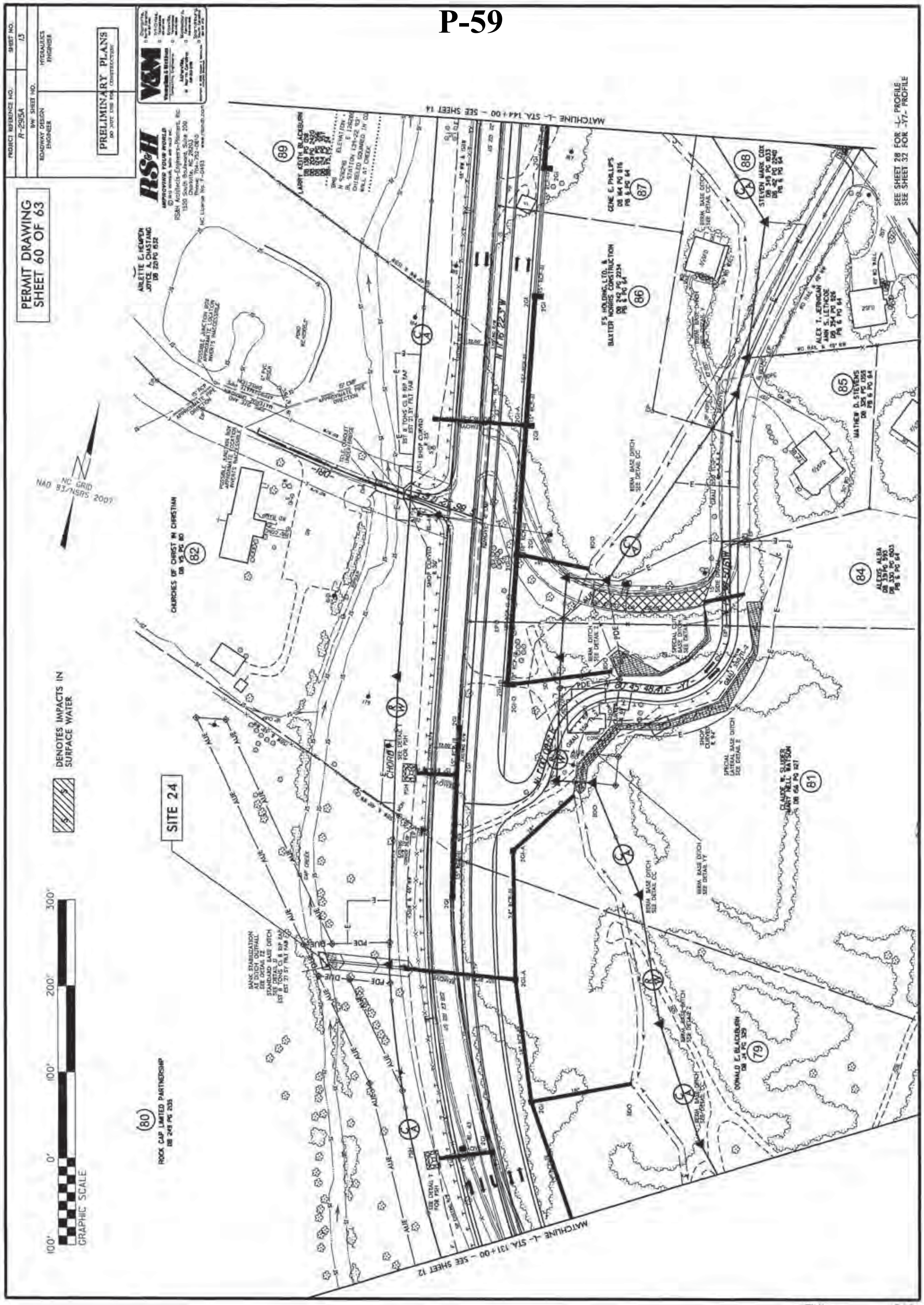
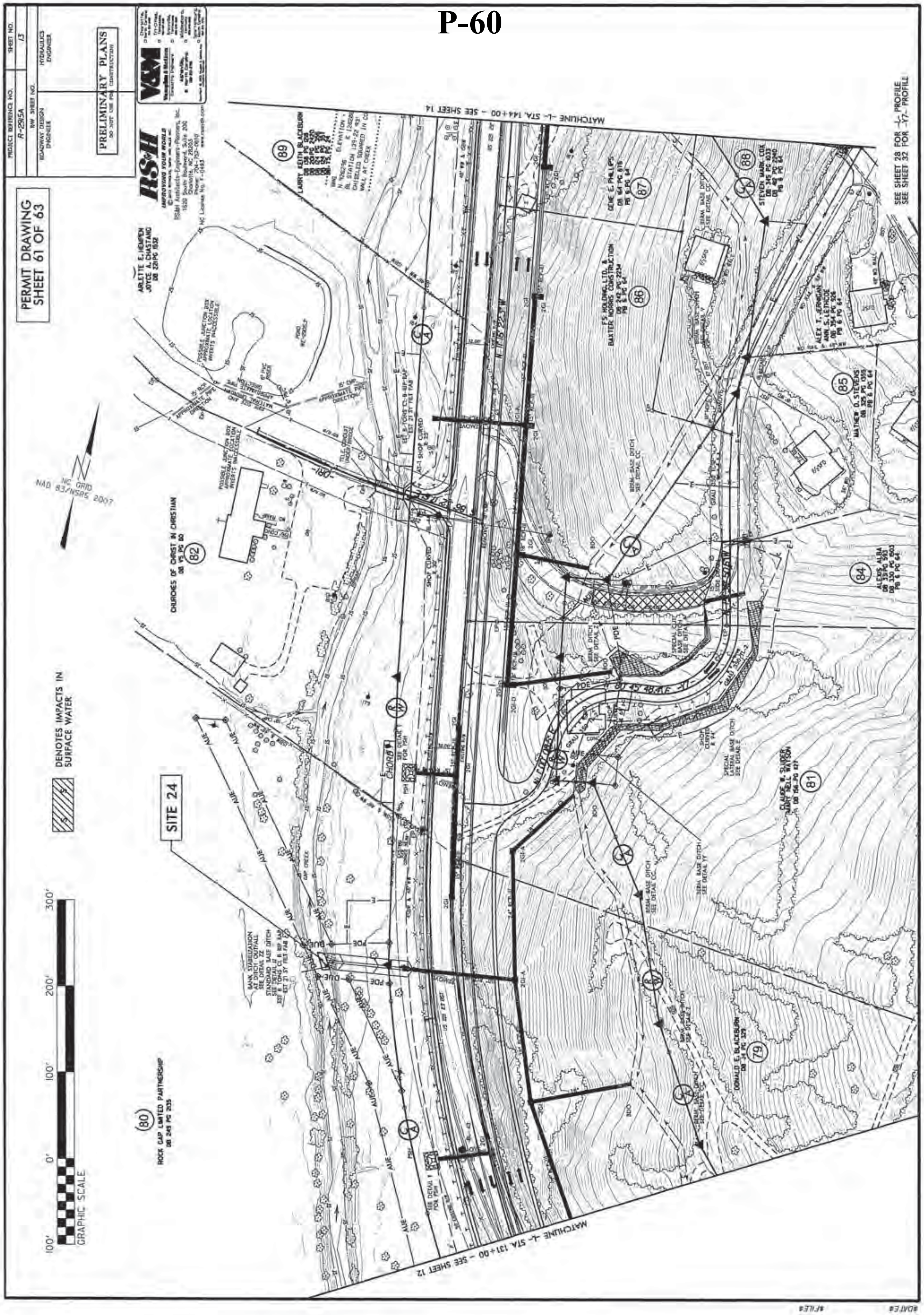
V&M
Vaughn & Melton
Consulting Engineers
Asheville, North Carolina
100' 0' 100' 200' 300'
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES HAND CLEARING
NAD 83/NSRS 2007
SITE 21
SITE 22
SITE 23
SITE 23A
MATCHLINE -L- STA. 119+60 - SEE SHEET 11
MATCHLINE -L- STA. 131+00 - SEE SHEET 12
76
77
78
78A
79
80
75
ROCK GAP LIMITED PARTNERSHIP
DB 249 PG 235
J. CURTIS CHEEK
DB 267 PG 766
RONALD D. CHEEK
DB 247 PG 1297
DB 186 PG 640
DB 136 PG 862
DB 326 PG 1933
WAYNE A. PATRICK
DB 170 PG 427
DB 170 PG 429
DB 326 PG 1930
SETH RYAN OSBORNE
DB 412 PG 998
MARTHA B. BLACKBURN
DB 262 PG 156
DONALD E. BLACKBURN
DB 34 PG 529
SEE SHEET 27 FOR -L- PROFILE
#FILE#
#DATE#


PERMIT DRAWING
SHEET 54 OF 63
PRELIMINARY PLANS
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES HAND CLEARING
GRAPHIC SCALE
SITE 21
SITE 22
SITE 23
SITE 23A
MATCHLINE -L- STA. 119+00 - SEE SHEET 11
MATCHLINE -L- STA. 131+00 - SEE SHEET 12
SEE SHEET 27 FOR -L- PROFILE


PERMIT DRAWING
SHEET 55 OF 63
ENLARGEMENT SHEET
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PROJECT REFERENCE NO.
R-2915A
SHEET NO.
12
SITE 21
SITE 22
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES HAND CLEARING
EST 10 TONS CL B RIP RAP
EST 20 SY FILT FAB
SEE DETAIL GGG
EST 26 TONS CL I RIP RAP
EST 35 SY FILT FAB
SEE DETAIL FFF
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
J. CURTIS CHEEK
DB 267 PG 766
BREMCO 100' EASEMENT
DB 69 PG 530
GRAU 350 TL-3
FALSE SUMP
SEE DETAIL R
TREE FARM
SEE SHEET 27 FOR -L- PROFILE


PERMIT DRAWING
SHEET 56 OF 63
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
ENLARGEMENT SHEET
GRAPHIC SCALE
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NC GRID NAD 83/NSRS 2007
ROCK GAP LIMITED PARTNERSHIP
DB 249 PG 2135
SITE 23
SITE 23A
STANDARD V DITCH
SEE DETAIL RR
EST 2 TONS CL B RIP RAP
EST 7 SY FILT FAB
REMOVE & REPLACE TC W/24" RCP
BANK STABILIZATION
RIP RAP ON
BANKS ONLY
EST 11 TONS CL B RIP RAP
EST 14 SY FILT FAB
SEE DETAIL TT
SPECIAL CUT DITCH
SEE DETAIL L
FALSE SUMP
SEE DETAIL R
SEE DETAIL T FOR PSH
50' EXISTING R/W
MOVE 2GI
REMOVE
RETAIN
SEE SHEET 27 FOR -L- PROFILE


PERMIT DRAWING
SHEET 60 OF 63
PRELIMINARY PLANS
SITE 24
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
MATCHLINE -L- STA. 144+00 — SEE SHEET 14
MATCHLINE -L- STA. 131+00 — SEE SHEET 12
SEE SHEET 28 FOR -L- PROFILE
SEE SHEET 32 FOR -Y7- PROFILE
CHURCHES OF CHRIST IN CHRISTIAN
ROCK CAP LIMITED PARTNERSHIP


PERMIT DRAWING
SHEET 61 OF 63
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
R-2915A
SITE 24
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
NC GRID
NAD 83/NSRS 2007
MATCHLINE -L- STA. 144+00 - SEE SHEET 14
MATCHLINE -L- STA. 131+00 - SEE SHEET 12
SEE SHEET 28 FOR -L- PROFILE
SEE SHEET 32 FOR -Y2- PROFILE
CHURCHES OF CHRIST IN CHRISTIAN
ROCK GAP LIMITED PARTNERSHIP
DONALD E. BLACKBURN

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
1	LPC 15+91 to 16+65	Roadway Fill	0.25	-	-	-	0.03	-	-	-	-	-
1A	LPC 17+34 to 17+43	18" RCP III	0.03	-	-	-	<0.01	-	-	-	-	-
1B	LPC 19+10 to 19+37	Roadway Fill	0.07	-	-	0.02	<0.01	-	-	-	-	-
2	LPC 14+83 to 14+95	3 @ 11'x8' RCBC	-	-	-	-	-	0.03	-	98	-	-
		Bank Stabilization	-	-	-	-	-	0.02	-	60	-	-
		Temporary Diversion	-	-	-	-	-	-	0.02	-	78	-
3	LPC 21+06 to 16+10	1 @ 9'x7' RCBC	-	-	-	-	-	0.03	-	198	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	-	47	-	-
		Temporary Diversion	-	-	-	-	-	-	<0.01	-	67	-
3A	DR5 10+90	7.25' x 5.25' Metal Arch	-	-	-	-	-	<0.01	<0.01	57	10	-
4	L 13+25 to 13+63	Bank Stabilization at outlet of Dissipator Basin	-	-	-	-	-	<0.01	-	19	-	-
5	L 15+13 to 15+36	Bank Stabilization	<0.01	-	-	-	<0.01	<0.01	<0.01	9	10	-
6	L 26+41 to 26+74	Bank Stabilization	-	-	-	-	-	<0.01	-	15	-	-
7	L 15+74 to 16+96	Roadway Fill	-	-	-	-	-	0.01	<0.01	250	10	-
8	L 33+45 to 33+72	Bank Stabilization	-	-	-	-	-	<0.01	-	12	-	-
9	L 45+63 to 45+91	Bank Stabilization	-	-	-	-	-	<0.01	-	10	-	-
10	L 51+79 to 52+12	54" RCP III	-	-	-	-	-	<0.01	-	74	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	16	10	-
11	L 65+75 to 66+44	2 @ 9'x6' RCBC	-	-	-	-	-	0.02	-	80	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	60	20	-
12	L 75+25 to 75+70	42" RCP III	-	-	-	-	-	<0.01	-	55	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	10	20	-
12A	L 75+93 to 76+10	42" RCP III	-	-	-	-	-	-	<0.01	-	10	-
12B	L 76+44 to 76+48	42" RCP III	-	-	-	-	-	-	<0.01	-	10	-
TOTALS:			0.35	-	-	0.02	0.04	0.13	0.04	1070	245	-

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WATAUGA & ASHE COUNTIES
WBS - 34518.1.2 (R-2915A)

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
13	L 79+03 to 79+85	Roadway Fill	-	-	-	-	-	<0.01	<0.01	66	10	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	13	15	-
13A	L 80+15 to 80+42	48" RCP III	-	-	-	-	-	-	<0.01	-	10	-
13B	L 80+79 to 90+03	48" RCP III	-	-	-	-	-	-	<0.01	-	10	-
14	L 84+80 to 84+90	Bank Stabilization	-	-	-	-	-	<0.01	-	13	-	-
15	L 89+14 to 89+19	36" RCP III	-	-	-	-	-	<0.01	-	84	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	26	20	-
16	L 91+98 to 92+24	Bank Stabilization	-	-	-	-	-	<0.01	-	9	-	-
17	L 99+59 to 99+76	60" RCP III	-	-	-	-	-	<0.01	-	26	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	21	20	-
18	L 100+31 to 106+67	Roadway Fill	0.09	-	<0.01	0.05	-	-	-	-	-	-
19	L 106+99 to 107+12	66" RCP III	-	-	-	-	-	<0.01	-	113	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	23	20	-
20	L 111+52 to 111+59	Bank Stabilization	-	-	-	-	-	<0.01	-	9	-	-
21	L 120+56 to 121+06	48" RCP III	0.01	-	<0.01	-	<0.01	-	-	-	-	-
22	L 123+67 to 124+35	18" RCP III	0.03	-	-	-	<0.01	-	-	-	-	-
23	L 129+34 to 129+58	24" RCP III	-	-	-	-	-	<0.01	-	18	-	-
		Bank Stabilization	-	-	-	-	-	<0.01	<0.01	9	10	-
23A	L 129+60 to 129+80	24" RCP III	-	-	-	-	-	-	<0.01	-	10	-
24	L 134+14 to 134+51	Bank Stabilization	-	-	-	-	-	<0.01	-	21	-	-
SHEET TOTALS (SITES 13 - 24)			0.13	-	0.01	0.05	0.01	0.03	0.01	451	125	-
SHEET TOTALS (SITES 1 - 12)			0.35	-	-	0.02	0.04	0.13	0.04	1070	245	-
TOTALS:			0.48	*0.01	0.01	0.08	0.05	0.17	0.05	1521	370	-

*0.01 acre of Temporary Fill in Wetlands in the Hand Clearing areas for erosion control measures.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

WATAUGA & ASHE COUNTIES
WBS - 34518.1.2 (R-2915A)

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

May 18, 2015

Mr. Barney Blackburn, PE
Soil & Water Engineering Supervisor
N C Department of Transportation
Roadside Environmental Unit
1557 Mail Service Center
Raleigh, NC 27699-1557

Subject: Trout Buffer Zone Waiver
TIP Project R-2915A, US 221 from US 421 in Watauga County to SR 1003 (Idlewild Rd) in Ashe County
TIP Project R-2915B, US 221 from SR 1003 (Idlewild Rd) in Ashe County to North of South Fork New River
TB-ASHE-2015-002
Ashe County and Watauga County

Dear Mr. Blackburn:

This office has received your plan for US 221 from US 421 in Watagua County to SR 1003 (Idlewild Rd) in Ashe County (R-2915A) and from 1003 (Idlewild Rd) in Ashe County to North of South Fork New River (R-2915B). Your plan was submitted to this office for approval because of the proposed encroachments into the buffer zone of designated trout waters. In accordance with NCGS 113A-57(1) and Title 15A NCAC 4B .0125(c) this letter will serve as written approval to encroach on the buffer zones of Gap Creek and unnamed tributaries to Gap Creek, Class C, Trout. This authority has been delegated to me by Tracy E. Davis, Director, Division of Energy, Mineral, and Land Resources, in accordance with NCGS 143B-10. The following conditions will apply to this approval:

1. This approval is based on the plans received on April 16, 2015.

2. This approval is conditional upon compliance with your 401 and 404 approvals. (G.S. 113A-54.1(a))

3. No instream work (in streams with trout classifications) or land disturbing activities within the 25 foot trout buffer zone may take place between October 15 and April 15 of each year. (G.S. 113A-54.1(a))

4. This approval does not absolve the permittee from compliance with the surface water quality turbidity standard. More protective erosion and sedimentation control measures may be required in order to comply with this water quality standard. (G.S. 113A-54.1(a))

Your cooperation in protecting our environment is most appreciated. If you have any questions about this approval, please contact me at ashley.rodgers@ncdenr.gov or (919) 707-9215.

Sincerely,

Ashley L. Rodgers, PE
State Sedimentation Specialist

cc: Matt Gantt, PE, Winston-Salem Regional Engineer via email

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum	L.S.	
0003	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	2 ACR		
0005	0015000000-N	205	SEALING ABANDONED WELLS	21 EA		
0006	0022000000-E	225	UNCLASSIFIED EXCAVATION	593,100 CY		
0007	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (11+15 -L-)	Lump Sum	L.S.	
0008	0036000000-E	225	UNDERCUT EXCAVATION	200 CY		
0009	0106000000-E	230	BORROW EXCAVATION	30,600 CY		
0010	0134000000-E	240	DRAINAGE DITCH EXCAVATION	2,340 CY		
0011	0141000000-E	240	BERM DITCH CONSTRUCTION	6,840 LF		
0012	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	34,750 SY		
0013	0192000000-N	260	PROOF ROLLING	20 HR		
0014	0195000000-E	265	SELECT GRANULAR MATERIAL	200 CY		
0015	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	4,300 SY		
0016	0199000000-E	SP	TEMPORARY SHORING	10,900 SF		
0017	0255000000-E	SP	GENERIC GRADING ITEM STOCKPILING CONTAMINATED SOIL	100 TON		
0018	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	2,772 TON		
0019	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	13,560 SY		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0020	0343000000-E	310	15" SIDE DRAIN PIPE	1,076 LF		
0021	0344000000-E	310	18" SIDE DRAIN PIPE	1,032 LF		
0022	0345000000-E	310	24" SIDE DRAIN PIPE	184 LF		
0023	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (15")	12 EA		
0024	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (18")	28 EA		
0025	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (24")	4 EA		
0026	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	7,500 LF		
0027	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	2,744 LF		
0028	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	2,844 LF		
0029	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	1,032 LF		
0030	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	708 LF		
0031	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	276 LF		
0032	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	704 LF		
0033	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	132 LF		
0034	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	144 LF		
0035	0420000000-E	310	66" RC PIPE CULVERTS, CLASS III	144 LF		
0036	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	204 LF		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0037	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	180 LF		
0038	0453000000-E	310	**" PIPE END SECTION (15")	7 EA		
0039	0453000000-E	310	**" PIPE END SECTION (18")	3 EA		
0040	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (36", 0.079")	168 LF		
0041	0654000000-E	310	***" X ***" CS PIPE ARCH CUL-VERTS, *****" THICK (87" X 63", 0.109")	37 LF		
0042	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (54", 0.75")	100 LF		
0043	0995000000-E	340	PIPE REMOVAL	5,175 LF		
0044	1000000000-E	462	6" SLOPE PROTECTION	175 SY		
0045	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0046	1044000000-E	501	LIME TREATED SOIL (SLURRY METHOD)	37,810 SY		
0047	1066000000-E	501	LIME FOR LIME TREATED SOIL	380 TON		
0048	1099500000-E	505	SHALLOW UNDERCUT	500 CY		
0049	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	200 TON		
0050	1110000000-E	510	STABILIZER AGGREGATE	250 TON		
0051	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STA-BILIZATION	9,716 SY		
0052	1121000000-E	520	AGGREGATE BASE COURSE	55,500 TON		
0053	1176000000-E	542	SOIL CEMENT BASE	56,710 SY		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0054	1187000000-E	542	PORTLAND CEMENT FOR SOIL CE-MENT BASE	1,560 TON		
0055	1209000000-E	543	ASPHALT CURING SEAL	14,180 GAL		
0056	1220000000-E	545	INCIDENTAL STONE BASE	2,000 TON		
0057	1275000000-E	600	PRIME COAT	4,041 GAL		
0058	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (1-1/2")	6,000 SY		
0059	1330000000-E	607	INCIDENTAL MILLING	600 SY		
0060	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	12,800 TON		
0061	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	6,900 TON		
0062	1498000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0B	26,850 TON		
0063	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	21,700 TON		
0064	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	8,500 TON		
0065	1525000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	2,450 TON		
0066	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	4,120 TON		
0067	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	1,000 TON		
0068	2022000000-E	815	SUBDRAIN EXCAVATION	336 CY		
0069	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	1,000 SY		
0070	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	168 CY		
0071	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	1,000 LF		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0072	2070000000-N	815	SUBDRAIN PIPE OUTLET	2 EA		
0073	2077000000-E	815	6" OUTLET PIPE	12 LF		
0074	2143000000-E	818	BLOTTING SAND	15 TON		
0075	2209000000-E	838	ENDWALLS	50 CY		
0076	2220000000-E	838	REINFORCED ENDWALLS	24 CY		
0077	2264000000-E	840	PIPE PLUGS	0.68 CY		
0078	2275000000-E	SP	FLOWABLE FILL	17 CY		
0079	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	161 EA		
0080	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	79 CY		
0081	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	185 LF		
0082	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	16 EA		
0083	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	62 EA		
0084	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	41 EA		
0085	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	19 EA		
0086	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	11 EA		
0087	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	1 EA		
0088	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	1 EA		
0089	2396000000-N	840	FRAME WITH COVER, STD 840.54	13 EA		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0090	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	16 EA		
0091	2474000000-N	SP	GENERIC DRAINAGE ITEM ENERGY DISSIPATOR BASIN	Lump Sum	L.S.	
0092	2538000000-E	846	**'-**" CONCRETE CURB & GUTTER (2'-9")	24,270 LF		
0093	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	1,140 LF		
0094	2556000000-E	846	SHOULDER BERM GUTTER	30 LF		
0095	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	2,810 LF		
0096	2619000000-E	850	4" CONCRETE PAVED DITCH	410 SY		
0097	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	2,670 SY		
0098	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T)	733.29 LF		
0099	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	1,775 LF		
0100	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	555 LF		
0101	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	2 EA		
0102	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	375 LF		
0103	2759000000-N	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	1 EA		
0104	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	4 EA		
0105	3030000000-E	862	STEEL BM GUARDRAIL	12,800 LF		
0106	3045000000-E	862	STEEL BM GUARDRAIL, SHOP CURVED	1,262.5 LF		

County : Ashe, Watauga

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0107	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	10 EA		
0108	3165000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (350, TL-2)	6 EA		
0109	3195000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE AT-1	5 EA		
0110	3210000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE CAT-1	16 EA		
0111	3270000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE 350	21 EA		
0112	3317000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE B-77	5 EA		
0113	3360000000-E	863	REMOVE EXISTING GUARDRAIL	691 LF		
0114	3389100000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE 350	2 EA		
0115	3435000000-N	SP	GENERIC GUARDRAIL ITEM 25'-0" CLEAR SPAN	2 EA		
0116	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	27,810 LF		
0117	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	1,575 EA		
0118	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	800 EA		
0119	3557000000-E	866	ADDITIONAL BARBED WIRE	1,000 LF		
0120	3575000000-E	SP	GENERIC FENCING ITEM TEMPORARY 4 STRAND BARBED WIRE FENCE WITH POSTS	5,600 LF		
0121	3628000000-E	876	RIP RAP, CLASS I	2,760 TON		
0122	3635000000-E	876	RIP RAP, CLASS II	140 TON		
0123	3649000000-E	876	RIP RAP, CLASS B	2,650 TON		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0124	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	13,525 SY		
0125	3659000000-N	SP	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	3 EA		
0126	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	19 CY		
0127	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	2 CY		
0128	4057000000-E	SP	OVERHEAD FOOTING	18 CY		
0129	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	9,033 LB		
0130	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	5,609 LB		
0131	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	3,571 LF		
0132	4079000000-N	903	SUPPORTS, BARRIER (SMALL)	7 EA		
0133	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (24+64 -L-)	Lump Sum	L.S.	
0134	4096000000-N	904	SIGN ERECTION, TYPE D	5 EA		
0135	4102000000-N	904	SIGN ERECTION, TYPE E	173 EA		
0136	4108000000-N	904	SIGN ERECTION, TYPE F	21 EA		
0137	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	4 EA		
0138	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	10 EA		
0139	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	2 EA		
0140	4116100000-N	904	SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (A)	2 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0141	4116100000-N	904	SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (B)	1 EA		
0142	4116100000-N	904	SIGN ERECTION, RELOCATE, TYPE **** (GROUND MOUNTED) (E)	5 EA		
0143	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	1 EA		
0144	4141000000-N	907	DISPOSAL OF SUPPORT, WOOD	2 EA		
0145	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	3 EA		
0146	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	50 EA		
0147	4192000000-N	907	DISPOSAL OF SUPPORT, U-CHANNEL	4 EA		
0148	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	769 SF		
0149	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	730 SF		
0150	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	680 SF		
0151	4415000000-N	1115	FLASHING ARROW BOARD	2 EA		
0152	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	3 EA		
0153	4430000000-N	1130	DRUMS	372 EA		
0154	4435000000-N	1135	CONES	372 EA		
0155	4445000000-E	1145	BARRICADES (TYPE III)	600 LF		
0156	4455000000-N	1150	FLAGGER	720 DAY		
0157	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	9 EA		
0158	4470000000-N	1160	RESET TEMPORARY CRASH CUSHION	6 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0159	4480000000-N	1165	TMA	2 EA		
0160	4485000000-E	1170	PORTABLE CONCRETE BARRIER	11,000 LF		
0161	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	500 LF		
0162	4500000000-E	1170	RESET PORTABLE CONCRETE BARRIER	7,600 LF		
0163	4510000000-N	SP	LAW ENFORCEMENT	40 HR		
0164	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	1,570 EA		
0165	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	430 LF		
0166	4710000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 120 MILS)	253 LF		
0167	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	54 EA		
0168	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (IV)	760 LF		
0169	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	539,813 LF		
0170	4815000000-E	1205	PAINT PAVEMENT MARKING LINES (6")	1,639 LF		
0171	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	15,909 LF		
0172	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	700 LF		
0173	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	740 LF		
0174	4840000000-N	1205	PAINT PAVEMENT MARKING CHARACTER	8 EA		
0175	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	139 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0176	4847000000-E	1205	POLYUREA PAVEMENT MARKING LINES (4", **********) (HIGHLY REFLECTIVE ELEMENTS)	118,875 LF		
0177	4847110000-E	1205	POLYUREA PAVEMENT MARKING LINES (8", **********) (HIGHLY REFLECTIVE ELEMENTS)	7,618 LF		
0178	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	40,324 LF		
0179	4905000000-N	1253	SNOWPLOWABLE PAVEMENT MARKERS	932 EA		
0180	4940000000-N	1267	FLEXIBLE DELINEATORS (YELLOW)	64 EA		
0181	4945000000-N	1267	FLEXIBLE DELINEATORS (CRYSTAL & RED)	35 EA		
0182	5800000000-E	1530	ABANDON 6" UTILITY PIPE	7,247 LF		
0183	5802000000-E	1530	ABANDON 10" UTILITY PIPE	393 LF		
0184	5871400000-E	1550	TRENCHLESS INSTALLATION OF 6" IN SOIL	24 LF		
0185	5871410000-E	1550	TRENCHLESS INSTALLATION OF 6" NOT IN SOIL	24 LF		
0186	5871600000-E	1550	TRENCHLESS INSTALLATION OF 10" IN SOIL	617 LF		
0187	5871610000-E	1550	TRENCHLESS INSTALLATION OF 10" NOT IN SOIL	617 LF		
0188	5879600000-E	SP	6" GAS LINE	5,832 LF		
0189	5879900000-E	SP	10" GAS LINE	1,340 LF		
0190	5882000000-N	SP	GENERIC UTILITY ITEM 10" GAS BYPASS	1 EA		
0191	5882000000-N	SP	GENERIC UTILITY ITEM 6" GAS BYPASS	14 EA		
0192	5882000000-N	SP	GENERIC UTILITY ITEM GAS LAUNCHER/RECEIVER STATION	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0193	5912000000-N	SP	GENERIC UTILITY ITEM THIRD PARTY INSPECTION SERVICES	Lump Sum	L.S.	
0194	6000000000-E	1605	TEMPORARY SILT FENCE	55,000 LF		
0195	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	3,500 TON		
0196	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	12,500 TON		
0197	6012000000-E	1610	SEDIMENT CONTROL STONE	8,000 TON		
0198	6015000000-E	1615	TEMPORARY MULCHING	65 ACR		
0199	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	4,000 LB		
0200	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	22.5 TON		
0201	6024000000-E	1622	TEMPORARY SLOPE DRAINS	6,100 LF		
0202	6029000000-E	SP	SAFETY FENCE	2,800 LF		
0203	6030000000-E	1630	SILT EXCAVATION	33,030 CY		
0204	6036000000-E	1631	MATTING FOR EROSION CONTROL	145,000 SY		
0205	6037000000-E	SP	COIR FIBER MAT	250 SY		
0206	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	1,460 SY		
0207	6042000000-E	1632	1/4" HARDWARE CLOTH	9,360 LF		
0208	6045000000-E	SP	**" TEMPORARY PIPE (15")	405 LF		
0209	6045000000-E	SP	**" TEMPORARY PIPE (18")	195 LF		
0210	6045000000-E	SP	**" TEMPORARY PIPE (24")	145 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0211	6069000000-E	1638	STILLING BASINS	300 CY		
0212	6071012000-E	SP	COIR FIBER WATTLE	3,500 LF		
0213	6071020000-E	SP	POLYACRYLAMIDE (PAM)	3,900 LB		
0214	6071030000-E	1640	COIR FIBER BAFFLE	7,100 LF		
0215	6071050000-E	SP	**" SKIMMER (1-1/2")	8 EA		
0216	6071050000-E	SP	**" SKIMMER (2")	8 EA		
0217	6071050000-E	SP	**" SKIMMER (2-1/2")	2 EA		
0218	6084000000-E	1660	SEEDING & MULCHING	65 ACR		
0219	6087000000-E	1660	MOWING	65 ACR		
0220	6090000000-E	1661	SEED FOR REPAIR SEEDING	1,000 LB		
0221	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	3.25 TON		
0222	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	1,800 LB		
0223	6108000000-E	1665	FERTILIZER TOPDRESSING	53.5 TON		
0224	6111000000-E	SP	IMPERVIOUS DIKE	510 LF		
0225	6114500000-N	1667	SPECIALIZED HAND MOWING	65 MHR		
0226	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	150 EA		
0227	6120000000-E	SP	CULVERT DIVERSION CHANNEL	950 CY		
0228	6123000000-E	1670	REFORESTATION	2.5 ACR		
0229	6132000000-N	SP	GENERIC EROSION CONTROL ITEM CONCRETE WASHOUT STRUCTURE	12 EA		
0230	7060000000-E	1705	SIGNAL CABLE	1,150 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0231	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	3 EA		
0232	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	1 EA		
0233	7264000000-E	1710	MESSENGER CABLE (3/8")	310 LF		
0234	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	80 LF		
0235	7300100000-E	1715	UNPAVED TRENCHING FOR TEMP-ORARY LEAD-IN	1,100 LF		
0236	7360000000-N	1720	WOOD POLE	1 EA		
0237	7372000000-N	1721	GUY ASSEMBLY	2 EA		
0238	7408000000-E	1722	1" RISER WITH WEATHERHEAD	1 EA		
0239	7420000000-E	1722	2" RISER WITH WEATHERHEAD	2 EA		
0240	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	870 LF		
0241	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	7,310 LF		
0242	7636000000-N	1745	SIGN FOR SIGNALS	2 EA		
0243	7768000000-N	1751	CONTROLLER WITH CABINET (TYPE 2070L, POLE MOUNTED)	1 EA		
0244	7780000000-N	1751	DETECTOR CARD (TYPE 2070L)	5 EA		
0245	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	1 EA		
0246	7960000000-N	SP	METAL POLE FOUNDATION REMOVAL	4 EA		
0247	7972000000-N	SP	METAL POLE REMOVAL	4 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			CULVERT ITEMS			
0248	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (66+11.00 -L-)	Lump Sum	L.S.	
0249	8126000000-N	414	CULVERT EXCAVATION, STA ****** (16+10.00 -LPC-)	Lump Sum	L.S.	
0250	8126000000-N	414	CULVERT EXCAVATION, STA ****** (66+11.00 -L-)	Lump Sum	L.S.	
0251	8126000000-N	414	CULVERT EXCAVATION, STA ****** (9+89.00 -LPC-)	Lump Sum	L.S.	
0252	8133000000-E	414	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	657 TON		
0253	8196000000-E	420	CLASS A CONCRETE (CULVERT)	888.1 CY		
0254	8245000000-E	425	REINFORCING STEEL (CULVERT)	100,483 LB		
			WALL ITEMS			
0255	8801000000-E	SP	MSE RETAINING WALL NO **** (1 @ 6+88.85 -RPB-)	4,000 SF		
0256	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	1,250 SF		
			STRUCTURE ITEMS			
0257	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 11+18.63 -L-)	Lump Sum	L.S.	
0258	8112730000-N	450	PDA TESTING	1 EA		
0259	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	10,974 SF		
0260	8161000000-E	420	GROOVING BRIDGE FLOORS	10,426 SF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0261	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	220.8 CY		
0262	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (11+18.63 -L-)	Lump Sum	L.S.	
0263	8217000000-E	425	REINFORCING STEEL (BRIDGE)	30,842 LB		
0264	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	2,309 LB		
0265	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	1,067.88 LF		
0266	8364000000-E	450	HP12X53 STEEL PILES	1,020 LF		
0267	8384000000-E	450	HP14X73 STEEL PILES	680 LF		
0268	8503000000-E	460	CONCRETE BARRIER RAIL	402.57 LF		
0269	8531000000-E	462	4" SLOPE PROTECTION	886 SY		
0270	8657000000-N	430	ELASTOMERIC BEARINGS (11+18.63 -L-)	Lump Sum	L.S.	
0271	8706000000-N	SP	EXPANSION JOINT SEALS (11+18.63 -L-)	Lump Sum	L.S.	