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

C204543

CONTRACT AND CONTRACT BONDS

FOR CONTRACT NO. C204543

WBS	47532.3.3 STATE FUNDED
T.I.P NO.	I-5986B, I-5878, I-5883
COUNTY OF	HARNETT, JOHNSTON
THIS IS THE	ROADWAY & STRUCTURE CONTRACT
ROUTE NUMBER	I 95 LENGTH 8.873 MILES
LOCATION	I-95 FROM SR-1002 (EXIT 71) TO I-40 (EXIT 81).
CONTRACTOR	FLATIRON-FRED SMITH COMPANY JV
ADDRESS	860 AVIATION PARKWAY SUITE 1000 MORRISVILLE, NC 27560
BIDS OPENED	JULY 20, 2021
CONTRACT EXECUTION	8/18/2021

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

PROPOSAL

INCLUDES ADDENDUM No. 2 DATED 07-14-2021

DATE AND TIME OF BID OPENING: **JULY 20, 2021 AT 2:00 PM**

CONTRACT ID	C204543
WBS	47532.3.3

FEDERAL-AID NO.	STATE FUNDED
COUNTY	HARNETT, JOHNSTON
T.I.P. NO.	I-5986B, I-5878, I-5883
MILES	8.873
ROUTE NO.	I 95
LOCATION	I-95 FROM SR-1002 (EXIT 71) TO I-40 (EXIT 81).

TYPE OF WORK GRADING, DRAINAGE, PAVING, SIGNALS, 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 <u>ROADWAY & STRUCTURE</u> PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C204543 IN HARNETT AND JOHNSTON 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. **C204543** 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 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 2018 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. **C204543** in **Harnett and Johnston 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 2018* 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:
Ronald E. Davenport, Jr.
F81B6038A47A442...

7/14/2021

TABLE OF CONTENTS

STANDARD SPECIAL PROVISIONS

UNIT PROJECT SPECIAL PROVISIONS

PROPOSAL ITEM SHEET

PROJECT SPECIAL PROVISIONS

GENERAL

CONTRACT TIME AND LIQUIDATED DAMAGES:

(8-15-00) (Rev. 12-18-07) 108 SP1 G07 A

The date of availability for this contract is **August 30, 2021**, 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 **October 28, 2026**.

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 **August 30, 2021**.

The completion date for this intermediate contract time is **May 1, 2026**.

The liquidated damages for this intermediate contract time are **Fifteen Thousand Dollars ($ 15,000.00)** 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 **I-95 (including associated Ramps and/or Loops)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Thursday, 7:00 A.M. to 7:00 P.M.
Friday thru Sunday, 7:00 A.M. to 9:00 P.M.

In addition, the Contractor shall not close or narrow a lane of traffic on **Any Road**, 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 **7:00 A.M.** December 31st and **9:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 P.M.** the following Tuesday.

3. For **Easter**, between the hours of **7:00 A.M.** Thursday and **9:00 P.M.** Monday.

4. For **Memorial Day**, between the hours of **7:00 A.M.** Friday and **9:00 P.M.** Tuesday.

5. For **Independence Day**, between the hours of **7:00 A.M.** the day before Independence Day and **9:00 P.M.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **7:00 A.M.** the Thursday before Independence Day and **9:00 P.M.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **7:00 A.M.** Friday and **9:00 P.M.** Tuesday.

7. For **Thanksgiving**, between the hours of **7:00 A.M.** Tuesday and **9:00 P.M.** Monday.

8. For **Christmas**, between the hours of **7:00 A.M.** the Friday before the week of Christmas Day and **9:00 P.M.** the following Tuesday after the week of Christmas Day.

9. For the **Town of Benson Mule Days event**, between the hours of **7:00 A.M.** the **day before the event** and **9:00 P.M.** the **day after the event**. **The 2021 Mule Days event is tentatively scheduled for September 23 - 26. The Contractor shall coordinate with the Town of Benson and the Engineer for exact dates for 2021 and any other year.**

10. For the **North Carolina State Annual Singing Convention**, between the hours of **7:00 A.M.** the **day before the event** and **9:00 P.M.** the **day after the event**. **This event is typically held during a weekend in June (Friday thru Sunday) at Singing Grove Park, 400 E. Main Street in Benson. The exact dates have not been scheduled yet for the 2022 North Carolina State Annual Singing Convention. The Contractor shall coordinate with the Engineer for exact dates for 2022 and any other year**.

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 **Two Thousand Five Hundred Dollars ($ 2,500.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 C

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 **NC 50 and/or US 421** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Friday
7:00 A.M. to 9:00 A.M. and 4:00 P.M. to 6:00 P.M.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for the lane closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the lane closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per hour.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 D

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **I-95 and/or US 421 for Overhead Girder Removal and/or Erection** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday, 6:00 A.M. to 11:00 P.M.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for road closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the road closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The Day and Time Restrictions, as well as liquidated damages, contained in this intermediate contract time shall apply to Intermediate Contract Time Number 11.

The liquidated damages are **Two Thousand Five Hundred Dollars ($ 2,500.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 10-15-13) 108 SP1 G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **I-95 (including associated Ramps and/or Loops)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Thursday, 5:00 A.M. to 11:00 P.M.
and from Friday at 5:00 A.M. to Sunday at Midnight

The maximum allowable time for **any of the following Construction Operations** is **thirty (30)** minutes for **I-95 (including associated Ramps and/or Loops)**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

Construction Operations:

- **Bridge Demolition**
- **Girder, Overhang and/or Falsework Installation and/or Removal**
- **Installation of Overhead Sign Assemblies and/or work on existing Overhead Sign Assembles over Travel Lanes**
- **Other Construction Operations directed by the Engineer**

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for the road closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the road closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The liquidated damages are **Two Thousand Five Hundred Dollars ($ 2,500.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 6 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase I (Spring Branch Road), Steps A thru F and Area I, Phase II (Spring Branch Road and US 421 Interchange Y14RPA/B/C/D) Steps #1 thru #4** as shown on Sheets **TMP-3A thru TMP-3C** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to **close -Y14- (Spring Branch Road)**.

The completion date for this intermediate contract time is the date which is **three hundred sixty-five (365)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Three Thousand Dollars ($ 3,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 7 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase I (US 421 Interchange - Jackson Road / Sampson Avenue (SR18)), Step #1 (1A thru 1D)** as shown on Sheets **TMP-3A** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **seventy (70)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 8 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase I (US 421 Interchange), Step #3 (3A thru 3C)** as shown on Sheets **TMP-3B** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **fourteen (14)** consecutive calendar days after and including the date of availability.

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

INTERMEDIATE CONTRACT TIME NUMBER 9 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase I (US 421 Interchange), Step #4 (4A thru 4C)** as shown on Sheets **TMP-3B** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **sixty (60)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 10 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase II (Spring Branch Road and US 421 Interchange Y14RPA/B/C/D), Steps #1 thru #4** as shown on Sheets **TMP-3C** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **one hundred twenty (120)** consecutive calendar days after and including the date of availability.

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

INTERMEDIATE CONTRACT TIME NUMBER 11 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 1, Phase IV, Step #2 (I-95 Work Areas)** as shown on Sheets **TMP-3C** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time will be the **Sunday at 11:00 P.M.** that the Contractor elects to begin this work.

The completion time for this intermediate contract time will be the **second Friday at 6:00 A.M.** after the time of availability.

The Contractor will be allowed ten (10) consecutive weeknights using lane and/or road closures of I-95 Southbound to complete this intermediate contract time. Each night shall begin at 11:00 P.M. and end the following morning at 6:00 A.M. The Contractor shall not conduct lane and/or road closures on Friday and/or Saturday nights to complete this intermediate contract time. The liquidated damages described in Intermediate Contract Time Number 4 will not apply to the number of consecutive nights required to complete this intermediate contract time.

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

INTERMEDIATE CONTRACT TIME NUMBER 12 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase I (Hodges Chapel Road Interchange), Steps A thru E, Area 2, Phase II (Hodges Chapel Road Interchange), Step #2 (2A thru 2C), and Area 2, Phase III (Hodges Chapel Road Interchange), Step #3 (3A thru 3C)** as shown on Sheets **TMP-3D thru TMP-3E** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to **close -Y17- (Hodges Chapel Road).**

The completion date for this intermediate contract time is the date which is **three hundred sixty-five (365)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Three Thousand Dollars ($ 3,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 13 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase II (Hodges Chapel Road Interchange), Step #2 (2A thru 2C)** as shown on Sheets **TMP-3E** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **sixty-five (65)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 14 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase III (Hodges Chapel Road Interchange), Step #3 (3A thru 3C)** as shown on Sheets **TMP-3E** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **eighty (80)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 15 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase IV (Jonesboro Road Interchange), Step #1 (1A thru 1C)** as shown on Sheets **TMP-3E** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **thirty (30)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Three Thousand Dollars ($ 3,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 16 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 2, Phase IV (Jonesboro Road Interchange), Step #3 (3A thru 3C)** as shown on Sheets **TMP-3F** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **forty-five (45)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Three Thousand Dollars ($ 3,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 17 AND LIQUIDATED DAMAGES:
(6-18-13) 108 SP1 G14 L

The Contractor shall complete the work required of **Area 3, Phase I thru Phase III** as shown on Sheet **TMP-3G** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is **August 30, 2021**.

The completion date for this intermediate contract time is **August 31, 2023**.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 18 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4, Phase II** as shown on Sheets **TMP-3H** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **forty-five (45)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Three Thousand Dollars ($ 3,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 19 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4, Phase II (Y18 Pipe Construction), Step #1** as shown on Sheets **TMP-3H** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **fourteen (14)** consecutive calendar days after and including the date of availability.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 20 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4, Phase II (Y18 Pipe Construction), Step #2** as shown on Sheets **TMP-3H** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **seven (7)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 21 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4, Phase III (Y18RPA / I-95 Southbound), Step #2 (2A thru 2C)** as shown on Sheets **TMP-3H** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **fourteen (14)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 22 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Area 4, Phase III (Y18RPD / I-95 Northbound), Step #3 (3A thru 3C)** as shown on Sheets **TMP-3H** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **ten (10)** consecutive calendar days after and including the date of availability.

The liquidated damages are **One Thousand Five Hundred Dollars ($ 1,500.00)** per calendar day.

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 *2018 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 *2018 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

DELAY IN RIGHT OF ENTRY (I-5878, I-5883, I-5986B):

(7-1-95) 108 SP1 G22 B

The Contractor will not be allowed right of entry to the following parcels prior to the listed dates unless otherwise permitted by the Engineer.

Parcel No.	Property Owner	Date
I-5878 046	Broadstone IT Portfolio, LLC	7-20-2021
I-5878 047	Sidney R. Dorman	9-15-2021
I-5878 048	Sidney R. Dorman	9-15-2021
I-5878 053	Dunn Hospitality Ventures	9-15-2021
I-5878 054	Baptist Church of Dunn	7-20-2021
I-5878 055	Circle Enterprises	9-15-2021
I-5878 056	Neelay, LLC	7-20-2021
I-5878 057	Premier Hospitality, LLC	9-15-2021
I-5878 058	Dylan Hotel, LLC	9-15-2021
I-5878 070	Jessie Casper, LLC	9-15-2021
I-5878 071	Susan E. Tart, Inc.	9-15-2021
I-5878 071A	Susan E. Tart, Inc.	9-15-2021
I-5878 075	Carolina Power & Light	9-15-2021
I-5878 078	I-Mart LLC	9-15-2021
I-5878 079	Mary E. Ratliff	7-20-2021
I-5878 080	ONH Properties, LLC	9-15-2021
I-5878 082	Wincor Properties, LLC	7-20-2021
I-5878 083	Randy B. Emanuel, Sr.	9-1-2021
I-5878 086	DVP Properties, LLC	9-15-2021
I-5878 087	DVP Properties, LLC	9-15-2021
I-5878 088	Haddock Family Properties	7-20-2021
I-5878 089	Annie Mae Tart	9-15-2021
I-5878 090	DAHIR Properties, LLC	9-15-2021
I-5878 091	Fidelity Bank	9-15-2021
I-5878 092	Circle Enterprise	9-15-2021
I-5878 093	Circle Enterprises	9-15-2021
I-5878 094	Granville Tilghman	9-15-2021
I-5878 094A	Granville Tilghman	9-15-2021
I-5878 094B	Granville Tilghman	9-15-2021
I-5878 097	Whole Armor Ministries, Inc.	9-15-2021
I-5878 099	Stoney Run Properties, LLC	9-15-2021
I-5878 200	Barbara B. Properties, LLC	9-15-2021
I-5878 201	Mary Angela Carr Fusco	9-15-2021
I-5878 205	Billy Tart	9-15-2021
I-5878 302	JA Dinkins Investments, LLC DB	9-1-2021
I-5878 303	Luihn Four Inc.	9-1-2021
I-5878 304	John Davis Sutton	9-15-2021
I-5878 305	Wayne Oil Company, Inc.	9-1-2021
I-5878 306	Johns Baptist Church	9-1-2021
I-5878 307	Johns Baptist Church	9-1-2021
I-5878 308	Wilcohess, LLC	9-1-2021
I-5878 309	Evening Star Holyness Church	9-1-2021
I-5878 310	Dunn ARDCGP LLC	9-1-2021
I-5878 311	Adnew Monds Heirs	9-1-2021
I-5878 313	Phillip C. Parker	9-1-2021
I-5878 314	Dunn Personal Storage, Inc.	9-15-2021

I-5878 315	Virginia Faison Heirs	9-1-2021
I-5878 316	St. Stephens Disciple	9-1-2021
I-5878 317	Caesar A. Brewington	9-1-2021
I-5878 318	MCRT3 Dunn LLC	9-1-2021
I-5878 319	Circle Enterprises	9-1-2021
I-5883 107	Marion Sadler	9-1-2021
I-5883 138	Loves Travel Stops, Inc	9-1-2021
I-5883 234	Donald Hobson	9-1-2021
I-5986B 240	Naegele Outdoor Advertising	11-15-2021
I-5986B 243	Doris Hodges	7-20-2021
I-5986B 246	Billy Parker	11-15-2021
I-5986B 247	Riley Barbour	9-15-2021
I-5986B 248	Reginald York	9-15-2021
I-5986B 251	P & M Properties, LLC	11-15-2021
I-5986B 252	Berry Global, Inc	9-15-2021
I-5986B 253	Yam Capital, LLC	9-15-2021
I-5986B 254	Denise House Mary Bush	11-15-2021
I-5986B 254A	Denise House Mary Bush	11-15-2021
I-5986B 255	Yam Capital, LLC	11-15-2021
I-5986B 260	Shirley W. McDaniel	6-15-2021
I-5986B 265	Ann Parker & James R. Parker	9-15-2021
I-5986B 266	James Lockamy Real Estate, LLC	6-15-2021
I-5986B 272	Shree Vinayak Inc	9-15-2021
I-5986B 275A	J. E. Wilson	7-20-2021
I-5986B 277	J. E. Wilson, Jr.	11-15-2021
I-5986B 280	James E. Wilson	11-15-2021
I-5986B 281	Carlie Sherrill & Shelby L. Hall	7-20-2021
I-5986B 282	Carlie Sherrill Hall	9-15-2021
I-5986B 283	George A. & Lois M. Grissom	7-20-2021
I-5986B 284	Shannon Stanley	7-20-2021
I-5986B 285	J. E. Wilson	11-15-2021
I-5986B 291	Thomas Hodges	9-15-2021

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 *2018 Standard Specifications*):

Line #	Description
14	Borrow Excavation
108	Asphalt Concrete Base Course, Type B25.0 C
109	Asphalt Concrete Intermediate Course, Type I19.0 C

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 *2018 Standard Specifications*).

Line #	Description
171-189	Guardrail
190-193	Fencing
199-240	Signing
266-272, 280-282, 288-293, 295-296	Long-Life Pavement Markings
294, 297	Permanent Pavement Markers
298-326, 328-343	Lighting
344-423	Utility Construction
424-464, 466-467	Erosion Control
465	Reforestation
468-531	Signals/ITS System
618-619	Bridge Painting
623, 626-627	Polymer Concrete

FUEL PRICE ADJUSTMENT:

(11-15-05) (Rev. 7-20-21) 109-8 SP1 G43

Revise the *2018 Standard Specifications* as follows:

Page 1-87, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is **$ 1.9310** 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	0.90 or 2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	0.90 or 2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	0.90 or 2.90
Open-Graded Asphalt Friction Course	Gal/Ton	0.90 or 2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	0.90 or 2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	0.90 or 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

For the asphalt items noted in the chart as eligible for fuel adjustments, the bidder may include the *Fuel Usage Factor Adjustment Form* with their bid submission if they elect to use the fuel usage factor. The *Fuel Usage Factor Adjustment Form* is found at the following link:

https://connect.ncdot.gov/letting/LetCentral/Fuel%20Usage%20Factor%20Adjustment%20Form.pdf

Select either 2.90 Gal/Ton fuel factor or 0.90 Gal/Ton fuel factor for each asphalt line item on the *Fuel Usage Factor Adjustment Form*. The selected fuel factor for each asphalt item will remain in effect for the duration of the contract.

Failure to complete the *Fuel Usage Factor Adjustment Form* will result in using 2.90 gallons per ton as the Fuel Usage Factor for Diesel for the asphalt items noted above. The contractor will not be permitted to change the Fuel Usage Factor after the bids are submitted.

PAYOUT SCHEDULE:

(1-19-10) (Rev. 1-17-12) 108 SP1 G57

Submit an Anticipated Monthly Payout Schedule prior to beginning construction. The Anticipated Monthly Payout Schedule will be used by the Department to monitor funding levels for this project. Include a monthly percentage breakdown (in terms of the total contract amount) of the work anticipated to be completed. The schedule should begin with the date the Contractor plans to begin construction and end with the anticipated completion date. Submit updates of the Anticipated Monthly Payout Schedule on March 15, June 15, September 15, and December 15 of each calendar year until project acceptance. Submit the original Anticipated Monthly Payout Schedule and all subsequent updates to the Resident Engineer with a copy to the State Construction Engineer at 1 South Wilmington Street, 1543 Mail Service Center, Raleigh, NC 27699-1543.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-13-19) 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:

	Fiscal Year	Progress (% of Dollar Value)
2022	(7/01/21 - 6/30/22)	**28**% of Total Amount Bid
2023	(7/01/22 - 6/30/23)	**28**% of Total Amount Bid
2024	(7/01/23 - 6/30/24)	**22**% of Total Amount Bid
2025	(7/01/24 - 6/30/25)	**15**% of Total Amount Bid
2026	(7/01/25 - 6/30/26)	**7**% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2018 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. 12-17-19) 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 the Combined MBE /WBE Goal. No submittal of a Letter of Intent is required.

Combined MBE/WBE Goal: A portion of the total contract, expressed as a percentage that is to be performed by committed MBE/WBE subcontractors.

Committed MBE/WBE Subcontractor - Any MBE/WBE submitted at the time of bid that is being used to meet the Combined MBE /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 Goal Requirement - The approved participation at time of award, but not greater than the advertised Combined MBE/WBE contract goal.

Goal Confirmation Letter - Written documentation from the Department to the bidder confirming the Contractor's approved, committed 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 Participation (Anticipated) - A portion of the total contract, expressed as a percentage that is anticipated 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.

Replacement / Substitution – A full or partial reduction in the amount of work subcontracted to a committed (or an approved substitute) MBE/WBE firm.

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 Participation (Anticipated) - A portion of the total contract, expressed as a percentage, that is anticipated 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. https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf

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 estimated amount (based on quantities and unit prices) 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 the Combined MBE/WBE goal. 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

Combined MBE/WBE Goal

The Combined MBE/WBE Goal for this project is **9.0 %**

The Combined Goal was established utilizing the following anticipated participation for Minority Business Enterprises and Women Business Enterprises:

(A) Minority Business Enterprises **4.0 %**

(1) *If the anticipated MBE participation 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.

(2) *If the anticipated MBE participation 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 **5.0 %**

(1) *If the anticipated WBE participation 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.

(2) *If the anticipated WBE participation 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.

The Bidder is required to submit only participation to meet the Combined MBE/WBE Goal. The Combined Goal may be met by submitting all MBE participation, all WBE participation, or a combination of MBE and WBE participation.

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 Combined MBE/WBE Goal. The Directory can be found at the following link.
https://www.ebs.nc.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 Combined MBE/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 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 the electronic submittal file.

(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 the electronic submittal file, 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 the Combined MBE/WBE goal.

(B) Paper Bids

(1) *If the Combined MBE/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 Combined MBE/WBE Goal.

(2) *If the Combined MBE/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 a Combined MBE/WBE goal, the firm is responsible for meeting the goal or making good faith efforts to meet the goal, just like any other bidder. In most cases, a MBE or WBE bidder on a contract will meet the Combined MBE/WBE Goal 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 goal.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE/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 Combined MBE/WBE Goal 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 10:00 a.m. 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 10:00 a.m. 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 Combined MBE/WBE Goal, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the Combined MBE/WBE Goal. If the lack of this participation drops the commitment below the Combined MBE/WBE

Goal, the Contractor shall submit evidence of good faith efforts for the goal, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 10:00 a.m. 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 10:00 a.m. on the next official state business day.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted exceeds the algebraic sum of the Combined MBE /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 and WBE firms to meet the advertised goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the Combined MBE/WBE Goal as long as there are adequate funds available from the bidder's MBE and WBE bank accounts.

Submission of Good Faith Effort

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

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 10:00 a.m. on 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 no later than 10:00 a.m. on the next official state business day. If the contractor cannot send the information electronically, then one complete set and 5 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 a Combined MBE/WBE Goal 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 that are also prequalified subcontractors. 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 Combined MBE/WBE Goal 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 advertised goal when the work to be sublet includes potential for MBE/WBE participation (2^{nd} and 3^{rd} tier subcontractors).

(C) Providing interested certified MBEs/WBEs that are also prequalified subcontractors 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 the advertised goal 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 goal, 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 Opportunity and Work Force Development Unit at BOWD@ncdot.gov 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 advertised 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 Combined MBE/WBE Goal.

(2) The bidders' past performance in meeting the contract goal.

(3) The performance of other bidders in meeting the advertised goal. For example, when the apparent successful bidder fails to meet the goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the advertised goal, 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 Combined MBE/WBE Goal can be met or that an adequate good faith effort has been made to meet the advertised goal.

Non-Good Faith Appeal

The State Prequalification 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 Prequalification 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 the Combined MBE/WBE Goal

(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 anticipated MBE participation. The same holds true for work that a WBE subcontracts to another WBE firm. Work that a MBE/WBE subcontracts to a non-MBE/WBE firm does <u>not</u> count toward the contract goal requirement. 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 MBE or WBE participation breakdown. 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 firms and there is no interest or availability, and they can get assistance from other certified firms, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE breakdown. 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.

(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/ 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/ 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. If it is determined that a MBE or WBE is not performing a Commercially Useful Function, the contractor may present evidence to rebut this presumption to the Department.

(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 Combined MBE/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 participation breakdown. 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 responsible for meeting the individual MBE or WBE participation breakdown.

(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.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE subcontractor (or an approved substitute MBE or WBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE subcontractor 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.

The Contractor must give notice in writing both by certified mail and email to the MBE/WBE subcontractor, with a copy to the Engineer of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the MBE/WBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the MBE/WBE subcontractor objects to the intended termination/substitution, the MBE/WBE, within five (5) business days must advise the Contractor and the Department of the reasons why the action should not be approved. The five-day notice period shall begin on the next business day after written notice is provided to the MBE/WBE subcontractor.

A committed MBE/WBE subcontractor may only be terminated after receiving the Department's written approval based upon a finding of good cause for the proposed termination and/or substitution. For purposes of this section, good cause shall include the following circumstances:

(a) The listed MBE/WBE subcontractor fails or refuses to execute a written contract;
(b) The listed MBE/WBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the MBE/WBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
(c) The listed MBE/WBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
(d) The listed MBE/WBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
(e) The listed MBE/WBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1,200 or applicable state law;
(f) The listed MBE/WBE subcontractor is not a responsible contractor;
(g) The listed MBE/WBE voluntarily withdraws from the project and provides written notice of withdrawal;
(h) The listed MBE/WBE is ineligible to receive MBE/WBE credit for the type of work required;

(i) A MBE/WBE owner dies or becomes disabled with the result that the listed MBE/WBE contractor is unable to complete its work on the contract;
(j) Other documented good cause that compels the termination of the MBE/WBE subcontractor. Provided, that good cause does not exist if the prime contractor seeks to terminate a MBE/WBE it relied upon to obtain the contract so that the prime contractor can self-perform the work for which the MBE/WBE contractor was engaged or so that the prime contractor can substitute another MBE/WBE or non-MBE/WBE contractor after contract award.

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

(A) Performance Related Replacement

When a committed MBE/WBE is terminated for good cause as stated above, an additional MBE/WBE that was submitted at the time of bid may be used to fulfill the MBE/WBE commitment to meet the Combined MBE/WBE Goal. A good faith effort will only be required for removing a committed MBE/WBE if there were no additional MBE/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 MBE/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 MBE/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBE/WBEs who were contacted.
(b) A description of the information provided to MBE/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 MBE/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 MBE/WBE subcontractor to perform at least the same amount of work to meet the Combined 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).

All requests for replacement of a committed MBE/WBE firm shall be submitted to the Engineer for approval on Form RF-1 *(DBE 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.

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/ 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.

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

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2018 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).

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:
(11-17-20) SP01 G090

All telecommunications, video or other ITS equipment or services installed or utilized on this project must be in conformance with UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS **2 CFR, § 200.216 Prohibition on certain telecommunications and video surveillance services or equipment.**

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):
(8-20-19) SP1 G092

The Contractor shall adhere to all Federal, State and Local regulations and guidelines for the use of Unmanned Aircraft Systems (UAS). This includes but is not limited to US 14 CFR Part 107 *Small UAS Rule*, NC GS 15A-300.2 *Regulation of launch and recovery sites,* NC GS 63-95 *Training required for the operation of unmanned aircraft systems*, NC GS 63-96 *Permit required for commercial operation of unmanned aircraft system,* and NCDOT UAS Policy. The required operator certifications include possessing a current Federal Aviation Administration (FAA) Remote Pilot Certificate, a NC UAS Operator Permit as well as operating a UAS registered with the FAA.

Prior to beginning operations, the Contractor shall complete the NCDOT UAS – Flight Operation Approval Form and submit it to the Engineer for approval. All UAS operations shall be approved by the Engineer prior to beginning the operations.

All contractors or subcontractors operating UAS shall have UAS specific general liability insurance to cover all operations under this contract.

The use of UAS is at the Contractor's discretion. No measurement or payment will be made for the use of UAS. In the event that the Department directs the Contractor to utilize UAS, payment will be in accordance with Article 104-7 Extra Work.

EQUIPMENT IDLING GUIDELINES:
(1-19-21) 107 SP1 G096

Exercise reduced fuel consumption and reduced equipment emissions during the construction of all work associated with this contract. Employees engaged in the construction of this project should turn off vehicles when stopped for more than thirty (30) minutes and off-highway equipment should idle no longer than fifteen (15) consecutive minutes.

These guidelines for turning off vehicles and equipment when idling do not apply to:

1. Idling when queuing.
2. Idling to verify the vehicle is in safe operating condition.
3. Idling for testing, servicing, repairing or diagnostic purposes.
4. Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane, mixing concrete, etc.).
5. Idling required to bring the machine system to operating temperature.
6. Emergency vehicles, utility company, construction, and maintenance vehicles where the engines must run to perform needed work.
7. Idling to ensure safe operation of the vehicle.
8. Idling when the propulsion engine is providing auxiliary power for other than heating or air conditioning. (such as hydraulic systems for pavers)
9. When specific traffic, safety, or emergency situations arise.
10. If the ambient temperature is less than 32 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants (e.g. to run the heater).
11. If the ambient temperature is greater than 90 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants of off-highway equipment (e.g. to run the air conditioning) no more than 30 minutes.
12. Diesel powered vehicles may idle for up to 30 minutes to minimize restart problems.

Any vehicle, truck, or equipment in which the primary source of fuel is natural gas or electricity is exempt from the idling limitations set forth in this special provision.

SUBSURFACE INFORMATION:

(7-1-95) 450 SP1 G112 C

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

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 *2018 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2018 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 *2018 Standard Specifications* as follows:

Page 1-39, 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 1-39, 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 1-39, 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 *2018 Standard Specifications*.

I-5986A / I-5877 (C204283) is located adjacent to this project. I-5986A / I-5877 is currently under construction and not anticipated to be complete prior to the letting of this project.

I-5986C (C204556 - I-95 Broadband Infrastructure Project from South Carolina State Line to Virginia State Line) is located throughout the project limits. I-5986C is currently under construction and not anticipated to be complete 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.

ELECTRONIC BIDDING:

(2-19-19) 101, 102, 103 SP1 G140

Revise the *2018 Standard Specifications* as follows:

Page 1-4, Article 101-3, DEFINITIONS, BID (OR PROPOSAL) ***Electronic Bid,*** **line 1,** replace "Bid Express®" with "the approved electronic bidding provider".

Page 1-15, Subarticle 102-8(B), Electronic Bids, lines 39-40, replace "to Bid Express®" with "via the approved electronic bidding provider".

Page 1-15, Subarticle 102-8(B)(1), Electronic Bids, line 41, delete "from Bid Express®"

Page 1-17, Subarticle 102-9(C)(2), Electronic Bids, line 21, replace "Bid Express® miscellaneous folder within the .ebs" with "electronic submittal".

Page 1-29, Subarticle 103-4(C)(2), Electronic Bids, line 32, replace ".ebs miscellaneous data file of Expedite" with "electronic submittal file"

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.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev 12-15-20) 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 and within 24 hours after a rainfall event equal to or greater than 1.0 inch that occurs within a 24

hour period. Additional monitoring may be required at the discretion of Division of Water Resources personnel if the receiving stream is 303(d) listed for turbidity and the project has had documented problems managing turbidity.

(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. 4-5-19) 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 *2018 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 https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/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.

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING:

(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 *2018 Roadway Standard Drawings,* except in those areas designated in the permits where Method "III" Clearing is prohibited. 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. In areas designated in the permits, where Method "III" is prohibited, perform clearing to the limits established by Method "II" shown on Standard Drawing No. 200.02 of the *2018 Roadway Standard Drawings.*

BURNING RESTRICTIONS:

(7-1-95) 200, 210, 215 SP2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in this county. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

TEMPORARY DETOURS:

(7-1-95) (Rev. 11-19-13) 1101 SP2 R30B(Rev)

Construct temporary detours required on this project in accordance with the typical sections in the plans or as directed.

After the detours have served their 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 detour in embankments or dispose of in waste areas furnished by the Contractor.

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.* Pipe culverts removed from the detours 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 detours will be made at the contract unit prices for the various items involved.

Such prices and payments will be full compensation for constructing the detours and for the work of removing earth material; 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 *2018 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 *2018 Standard Specifications*.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS:

(4-16-02) (Rev. 12-15-20) 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 Materials and Tests 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 in accordance with NCGS § 130A-309.219(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 Resource Conservation Program (RCP) Engineer at ResourceConservation@ncdot.gov for review. The Engineer and the RCP Engineer will coordinate the requirements of NCGS § 130A-309.219(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 *2018 Standard Specifications*.

MANUFACTURED QUARRY FINES IN EMBANKMENTS:

(01-17-17) 235 SP02 R72

Description

This specification addresses the use of manufactured quarry fines that are not classified as select materials. The specification allows the Contractor an option, with the approval of the Engineer, to use manufactured quarry fines (MQFs) in embankments as a substitute for conventional borrow material. Furnish and place geotextile for pavement stabilization in accordance with the Geotextile for Pavement Stabilization special provision and detail. Geotextile for pavement stabilization is required to prevent pavement cracking and provide separation between the subgrade and pavement section at embankment locations where manufactured quarry fines are utilized and as directed by the Engineer.

Materials

Manufactured Quarry Fines.

Site specific approval of MQFs material will be required prior to beginning construction as detailed in the preconstruction requirements of this provision.

The following MQFs are unacceptable:

(A) Frozen material,

(B) Material with a maximum dry unit weight of less than 90 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C.

(C) Material with greater than 80% by weight Passing the #200 sieve

Collect and transport MQFs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the MQFs as needed and transport in covered trucks to prevent dusting. If MQFs are blended with natural earth material, follow Borrow Criteria in Section 1018 of the *Standard Specifications.*

Geotextiles

Areas of embankment where MQFs are incorporated, Geotextile for Pavement Stabilization shall be used. If the Geotextile for Pavement Stabilization special provision is not included elsewhere in this contract, then it along with a detail will be incorporated as part of the contractors request to use. Notification of subgrade elevation, sampling and waiting period as required in the Construction Methods section of the Geotextile for Pavement Stabilization special provision are not required.

Preconstruction Requirements

When MQFs 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 MQFs and include the following details:

(A) Description, purpose and location of project.
(B) Estimated start and completion dates of project.
(C) Estimated volume of MQFs to be used on project with specific locations and construction details of the placement.
(D) The names, address, and contact information for the generator of the MQFs.
(E) Physical location of the site at which the MQFs were generated.

The Engineer will forward this information to the State Materials Engineer for review and material approval.

Construction Methods

Place MQFs in the core of the embankment section with at least 4 feet of earth cover to the outside limits of the embankments or subgrade.

Construct embankments by placing MQFs 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.

Areas of embankment where MQFs are incorporated, Geotextile for Pavement Stabilization shall be used. See Geotextile for Pavement Stabilization special provision for geotextile type and construction method.

Measurement and Payment

Borrow Excavation will be measured by truck volume and paid in cubic yards in accordance with Article 230-5 of the *2018 Standard Specifications*. As an alternate weigh tickets can be provided and payment made by converting weight to cubic yards based on the verifiable unit weight. Where the pay item of *Geotextile for Pavement Stabilization* is included in the original contract the material will be measured and paid in square yards (see Geotextile for Pavement Stabilization special provision). Where the pay item of *Geotextile for Pavement Stabilization* is not included in the original contract then no payment will be made for this item and will be considered incidental to the use of MQFs in embankment.

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12) 300, 340, 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 *2018 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

POLYPROPYLENE CULVERT PIPE:

(8-20-19) 305,310 SP3 R35

Revise the *2018 Standard Specifications* as follows:

Page 3-5, Article 305-1 DESCRIPTION, lines 12-14, replace with the following:

Where shown in the plans, the Contractor may use reinforced concrete pipe, aluminum alloy pipe, aluminized corrugated steel pipe, HDPE pipe, Polypropylene Pipe, or PVC pipe in accordance with the following requirements.

Page 3-5, Article 305-2 MATERIALS, add the following after line 16:

Item	**Section**
Polypropylene Pipe	1032-9

Page 3-6, Article 310-2 MATERIALS, add the following after line 9:

Item	**Section**
Polypropylene Pipe	1032-9

Page 3-6, Article 310-4 SIDE DRAIN PIPE, lines 24-25, replace the first sentence of the second paragraph with the following:

Where shown in the plans, side drain pipe may be Class II reinforced concrete pipe, aluminized corrugated steel pipe, corrugated aluminum alloy pipe, polypropylene pipe, HDPE pipe or PVC pipe.

Page 3-7, Article 310-5 PIPE END SECTIONS, lines 2-4, replace the second sentence with the following:

Both corrugated steel and concrete pipe end sections will work on concrete pipe, corrugated steel pipe, polypropylene pipe, and HDPE smooth lined corrugated plastic pipe.

Page 3-7, Article 310-6 MEASUREMENT AND PAYMENT, add the following after line 14:

Pay Item	**Pay Unit**
__" Polypropylene Pipe	Linear Foot

Page 10-60, add Article 1032-9:

(A) General

Use polypropylene pipe from sources participating in the Department's Polypropylene Pipe QA/QC Program. A list of participating sources is available from the Materials and Tests Unit. The Department will remove a manufacturer of polypropylene pipe from this program if the monitoring efforts indicated that non-specification material is being provided or test procedures are not being followed.

Use polypropylene culvert pipe that meets AASHTO M 330 for Type S or Type D, or ASTM F2881 or ASTM F2764 Double or Triple wall; and has been evaluated by NTPEP.

(B) End Treatments, Pipe Tees and Elbows

End treatments, pipe tees and elbows shall meet AASHTO M 330, Section 7.7, or ASTM F2764, Section 6.6.

(C) Marking

Clearly mark each section of pipe, end section, tee and elbow and other accessories according to the Department's Polypropylene Pipe QC/QA Program:

(1) AASHTO or ASTM Designation
(2) The date of manufacture
(3) Name or trademark of the manufacturer

When polypropylene pipe, end sections, tees and elbows have been inspected and accepted a sticker will be applied to the inside of the pipe. Do no use pipe sections, flared end sections, tees or elbows which do not have this seal of approval.

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-16-18) 422 SP4 R02A

Description

Bridge approach fills consist of backfilling behind bridge end bents with select material or aggregate to support all or portions of bridge approach slabs. Install drains to drain water from bridge approach fills and geotextiles to separate approach fills from embankment fills, ABC and natural ground as required. For bridge approach fills behind end bents with mechanically stabilized earth (MSE) abutment walls, reinforce bridge approach fills with MSE wall reinforcement connected to end bent caps. Construct bridge approach fills in accordance with the contract, accepted submittals and 2018 Roadway Standard Drawing Nos. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10.

Define bridge approach fill types as follows:

Approach Fills – Bridge approach fills in accordance with 2018 Roadway Standard Drawing Nos. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10;

Standard Approach Fill – Type I Standard Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.01;

Modified Approach Fill – Type II Modified Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.02 and

Reinforced Approach Fill – Type III Reinforced Bridge Approach Fill in accordance with Roadway Detail Drawing No. 422D10.

Materials

Refer to Division 10 of the *2018 Standard Specifications*.

Item	Section
Geotextiles, Type 1	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044

Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for standard and modified approach fills. For an approach fill behind a bridge end bent with an MSE abutment wall, backfill the reinforced approach fill with the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal. For MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

Excavate as necessary for approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place separation geotextiles or aggregate until approach fill dimensions and foundation material are approved.

For reinforced approach fills, cast MSE wall reinforcement or connectors into end bent cap backwalls within 3" of locations shown in the accepted MSE wall submittals. Install MSE wall reinforcement with the orientation, dimensions and number of layers shown in the accepted MSE wall submittals. If a reinforced approach fill is designed with geogrid reinforcement embedded in an end bent cap, cut geogrids to the required lengths and after securing ends of geogrids in place, reroll and rewrap portions of geogrids not embedded in the cap to protect geogrids from damage. Before placing aggregate, pull geosynthetic reinforcement taut so that it is in tension and free of kinks, folds, wrinkles or creases.

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent separation 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 separation geotextiles or MSE wall reinforcement.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with 2018 Roadway Standard Drawing Nos. 422.01 or 422.02. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the *2018 Standard Specifications* and place outlet pads in accordance with 2018 Roadway Standard Drawing No. 815.03.

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

Place select material or aggregate in 8" to 10" thick lifts. Compact fine aggregate for reinforced approach fills in accordance with Subarticle 235-3(C) of the *2018 Standard Specifications* except compact fine aggregate to a density of at least 98%. Compact select material for standard or modified approach fills and coarse aggregate for reinforced approach fills with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, MSE wall reinforcement or drains when placing and compacting select material or aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics or drain pipes until they are covered with at least 8" of select material or aggregate. Replace any damaged geosynthetics or drains to the satisfaction of the Engineer. When approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material or aggregate as shown in 2018 Roadway Standard Drawing No. 422.01 or 2018 Roadway Detail Drawing No. 422D10.

Measurement and Payment

Type I Standard Approach Fill, Station ____, *Type II Modified Approach Fill, Station ____* and *Type III Reinforced Approach Fill, Station ____* will be paid at the contract lump sum price. The lump sum price for each approach fill will be full compensation for providing labor, tools, equipment and approach fill materials, excavating, backfilling, hauling and removing excavated materials, installing geotextiles and drains, compacting backfill and supplying select material, aggregate, separation geotextiles, drain pipes, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct approach fills behind bridge end bents.

The contract lump sum price for *Type III Reinforced Approach Fill, Station ____* will also be full compensation for supplying and connecting MSE wall reinforcement to end bent caps but not designing MSE wall reinforcement and connectors. The cost of designing reinforcement and connectors for reinforced approach fills behind bridge end bents with MSE abutment walls will be incidental to the contract unit price for *MSE Retaining Wall No. __*.

Payment will be made under:

Pay Item	**Pay Unit**
Type I Standard Approach Fill, Station ____	Lump Sum
Type II Modified Approach Fill, Station ____	Lump Sum
Type III Reinforced Approach Fill, Station ____	Lump Sum

AGGREGATE SUBGRADE:

(5-15-18) 505 SP5 R8

Revise the *2018 Standard Specifications* as follows:

Page 5-8, Article 505-1 DESCRIPTION, lines 4-6, replace the paragraph with the following:

Construct aggregate subgrades in accordance with the contract. Install geotextile for soil stabilization and place Class IV subgrade stabilization at locations shown in the plans and as directed.

Undercut natural soil materials if necessary to construct aggregate subgrades. Define "subbase" as the portion of the roadbed below the Class IV subgrade stabilization. For Type 2 aggregate

subgrades, undercut subbases as needed. The types of aggregate subgrade with thickness and compaction requirements for each are as shown below.

Type 1 – A 6 to 24 inch thick aggregate subgrade with Class IV subgrade stabilization compacted to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

Type 2 – An 8 inch thick aggregate subgrade on a proof rolled subbase with Class IV subgrade stabilization compacted to 97% of AASHTO T 180 as modified by the Department.

Page 5-8, Article 505-3 CONSTRUCTION METHODS, line 12, insert the following after the first sentence of the first paragraph:

For Type 2 aggregate subgrades, proof roll subbases in accordance with Section 260 before installing geotextile for soil stabilization.

Page 5-8, Article 505-3 CONSTRUCTION METHODS, lines 16-17, replace the last sentence of the first paragraph with the following:

Compact ABC as required for the type of aggregate subgrade constructed.

Page 5-8, Article 505-4 MEASUREMENT AND PAYMENT, line 26, insert the following after the last sentence of the first paragraph:

Undercut Excavation of natural soil materials from subbases for Type 2 aggregate subgrades will be measured and paid in accordance with Article 225-7 or 226-3. No measurement will be made for any undercut excavation of fill materials from subbases.

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 *2018 Standard Specifications.*

The base price index for asphalt binder for plant mix is **$ 473.18** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **May 1, 2021**.

MILLING ASPHALT PAVEMENT:

(1-15-19) 607 SP6 R59

Revise the *2018 Standard Specifications* as follows:

Page 6-5, Article 607-2, EQUIPMENT, lines 14-16, delete the seventh sentence of this Article and replace with the following:

Use either a non-contacting laser or sonar type ski system with a minimum of three referencing stations mounted on the milling machine at a length of at least 24 feet.

ASPHALT CONCRETE PLANT MIX PAVEMENTS:
(2-20-18) (Rev.1-15-19) 610, 1012 SP6 R65

Revise the *2018 Standard Specifications* as follows:

Page 6-14, Table 609-3, LIMITS OF PRECISION FOR TEST RESULTS, replace with the following:

TABLE 609-3
LIMITS OF PRECISION FOR TEST RESULTS

Mix Property	Limits of Precision
25.0 mm sieve (Base Mix)	± 10.0%
19.0 mm sieve (Base Mix)	± 10.0%
12.5 mm sieve (Intermediate & Type P-57)	± 6.0%
9.5 mm sieve (Surface Mix)	± 5.0%
4.75 mm sieve (Surface Mix)	± 5.0%
2.36 mm sieve (All Mixes, except S4.75A)	± 5.0%
1.18 mm sieve (S4.75A)	± 5.0%
0.075 mm sieve (All Mixes)	± 2.0%
Asphalt Binder Content	± 0.5%
Maximum Specific Gravity (G_{mm})	± 0.020
Bulk Specific Gravity (G_{mb})	± 0.030
TSR	± 15.0%
QA retest of prepared QC Gyratory Compacted Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Density Gauge Comparison of QC Test	± 2.0% (% Compaction)
QA Density Gauge Verification Test	± 2.0% (% Compaction)

Page 6-17, Table 610-1, MIXING TEMPERATURE AT THE ASPHALT PLANT, replace with the following:

TABLE 610-1
MIXING TEMPERATURE AT THE ASPHALT PLANT

Binder Grade	JMF Temperature
PG 58-28; PG 64-22	250 - 290°F
PG 76-22	300 - 325°F

Page 6-17, Subarticle 610-3(C), Job Mix Formula (JMF), lines 38-39, delete the fourth paragraph.

Page 6-18, Subarticle 610-3(C), Job Mix Formula (JMF), line 12, replace "SF9.5A" with "S9.5B".

Page 6-18, Table 610-3, MIX DESIGN CRITERIA, replace with the following:

TABLE 610-3
MIX DESIGN CRITERIA

Mix Type	Design ESALs millions [A]	Binder PG Grade	Compaction Levels G_{mm} @ N_{ini}	Compaction Levels G_{mm} @ N_{des}	Max. Rut Depth (mm)	Volumetric Properties [B] VMA % Min.	VTM %	VFA Min.-Max.	$\%G_{mm}$ @ N_{ini}
S4.75A	< 1	64 - 22	6	50	11.5	16.0	4.0 - 6.0	65 - 80	≤ 91.5
S9.5B	0 - 3	64 - 22	6	50	9.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S9.5C	3 - 30	64 - 22	7	65	6.5	15.5	3.0 - 5.0	65 - 78	≤ 90.5
S9.5D	> 30	76 - 22	8	100	4.5	15.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0C	ALL	64 - 22	7	65	-	13.5	3.0 - 5.0	65 - 78	≤ 90.5
B25.0C	ALL	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
		Design Parameter					**Design Criteria**		
All Mix Types		Dust to Binder Ratio ($P_{0.075}$ / P_{be})					0.6 - 1.4 [C]		
		Tensile Strength Ratio (TSR) [D]					85% Min. [E]		

A. Based on 20 year design traffic.
B. Volumetric Properties based on specimens compacted to N_{des} as modified by the Department.
C. Dust to Binder Ratio ($P_{0.075}$ / P_{be}) for Type S4.75A is 1.0 - 2.0.
D. NCDOT-T-283 (No Freeze-Thaw cycle required).
E. TSR for Type S4.75A & B25.0C mixes is 80% minimum.

Page 6-19, Table 610-5, BINDER GRADE REQUIREMENTS (BASED ON RBR%), replace with the following:

TABLE 610-5
BINDER GRADE REQUIREMENTS (BASED ON RBR%)

Mix Type	%RBR ≤ 20%	21% ≤ %RBR ≤ 30%	%RBR ≥ 30%
S4.75A, S9.5B, S9.5C, I19.0C, B25.0C	PG 64-22	PG 64-22[A]	PG-58-28
S9.5D, OGFC	PG 76-22[B]	n/a	n/a

A. If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.
B. Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22 binder.

Page 6-20, Table 610-6, PLACEMENT TEMPERATURES FOR ASPHALT, replace with the following:

TABLE 610-6
PLACEMENT TEMPERATURES FOR ASPHALT

Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0C	35°F
I19.0C	35°F
S4.75A, S9.5B, S9.5C	40°F [A]
S9.5D	50°F

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

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 34-35, delete the second sentence and replace with the following:

Use an MTV for all surface mix regardless of binder grade on Interstate, US Routes, and NC Routes (primary routes) that have 4 or more lanes and median divided.

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 36-38, delete the fourth sentence and replace with the following:

Use MTV for all ramps, loops, Y-line that have 4 or more lanes and are median divided, full width acceleration lanes, full width deceleration lanes, and full width turn lanes that are greater than 1000 feet in length.

Page 6-23, Table 610-7, DENSITY REQUIREMENTS, replace with the following:

TABLE 610-7
DENSITY REQUIREMENTS

Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0 [A]
S9.5B	90.0
S9.5C, S9.5D, I19.0C, B25.0C	92.0

A. Compaction to the above specified density will be required when the S4.75A mix is applied at a rate of 100 lbs/sy or higher.

Page 6-24, Article 610-13, FINAL SURFACE TESTING, lines 35-36, delete the second sentence and replace with the following:

Final surface testing is not required on ramps, loops and turn lanes.

Page 6-26, Subarticle 610-13(A)(1), Acceptance for New Construction, lines 29-30, delete the second sentence and replace with the following:

Areas excluded from testing by the profiler may be tested using a 10-foot straightedge in accordance with Article 610-12.

Page 6-27, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 41-46, delete the eighth and ninth sentence of this paragraph and replace with the following:

Take profiles over the entire length of the final surface travel lane pavement exclusive of structures, approach slabs, paved shoulders, tapers, or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width acceleration or deceleration lanes and collector lanes.

Page 6-28, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 1-2, delete these two lines.

Page 6-32, Article 610-16 MEASUREMENT AND PAYMENT, replace with the following:

Pay Item	Pay Unit
Asphalt Concrete Base Course, Type B25.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0C	Ton
Asphalt Concrete Surface Course, Type S4.75A	Ton
Asphalt Concrete Surface Course, Type S9.5B	Ton
Asphalt Concrete Surface Course, Type S9.5C	Ton

Asphalt Concrete Surface Course, Type S9.5D Ton

Page 10-30, Table 1012-1, AGGREGATE CONSENSUS PROPERTIES, replace with the following:

TABLE 1012-1
AGGREGATE CONSENSUS PROPERTIES[A]

Mix Type	Coarse Aggregate Angularity[B]	Fine Aggregate Angularity % Minimum	Sand Equivalent % Minimum	Flat and Elongated 5 : 1 Ratio % Maximum
Test Method	*ASTM D5821*	*AASHTO T 304*	*AASHTO T 176*	*ASTM D4791*
S4.75A; S9.5B	75 / -	40	40	-
S9.5C; I19.0C; B25.0C	95 / 90	45	45	10
S9.5D	100 / 100	45	50	10
OGFC	100 / 100	45	45	10
UBWC	100 / 85	45	45	10

A. Requirements apply to the design aggregate blend.
B. 95 / 90 denotes that 95% of the coarse aggregate has one fractured face and 90% has 2 or more fractured faces.

12" CONCRETE TRUCK APRON:

Description

Construct 12" Concrete Truck Apron in accordance with the plans and as directed by the Engineer.

Materials

Concrete shall be Class AA Concrete meeting the requirements of Section 1000 of the *2018 Standard Specifications*.

Wire mesh reinforcement shall be 6x6-W4xW4 welded wire fabric meeting the requirements of Section 1070 of the *2018 Standard Specifications*. The wire mesh reinforcement shall be centered in the 12" slab.

Construction Methods

Joint spacing for the aprons shall be constructed as directed by the Engineer.

Measurement and Payment

12" Concrete Truck Apron will be measured and paid for in square yards of 12" Concrete

Truck Apron that has been completed and accepted. Such price and payment will be full compensation for all work of constructing the jointed concrete truck apron, including but not limited to excavating and backfilling, furnishing and placing concrete and wire mesh:, constructing joints, and sealing the concrete.

Pay Item	**Pay Unit**
12" Concrete Truck Apron	Square Yard

AUTOMATED MACHINE GUIDANCE

(1-2-11) 801 SP8 R01

General

This Special Provision contains requirements to be followed if the Contractor elects to use Global Positioning System (GPS) machine control grading and shall be used in conjunction with Section 801 of the *Standard Specifications*. The use of this technology is referenced as Automated Machine Guidance (AMG).

All equipment using AMG shall be able to generate end results that meet the *Standard Specifications*. Perform test sections for each type of work to be completed with AMG to demonstrate that the system has the capability to achieve acceptable results. If acceptable results cannot be achieved, conform to the requirements for conventional stakeout.

The Contractor shall be responsible for all errors resulting from the use of AMG and shall correct deficiencies to the satisfaction of the Engineer at no cost to the Department.

Submittals

If the Contractor elects to use AMG, a Digital Terrain Model (DTM) of the design surface and all intermediate surfaces shall be developed and submitted to the Engineer for review.

At least 90 days prior to beginning grading operations, the Contractor shall submit to the Engineer an AMG work plan to include, but not limited to, proposed equipment, control software manufacturer and version, types of work to be completed using AMG, project site calibration report, repetitive calibration methods for construction equipment and rover units to be used for the duration of the project, and local GPS base station to be used for broadcasting differential correction data to rover units (this may include the NC Network RTK). All surveys must be tied to existing project control as established by NCDOT.

Inspection

The Engineer will perform quality assurance checks of all work associated with AMG. If it is determined that work is not being performed in a manner that will assure accurate results, the Engineer may require corrective action at no cost to the Department.

The Contractor shall provide the Engineer with one GPS rover unit for use during the duration of the contract. The rover will be loaded with the same model that is used with the AMG and have the same capability as rover units used by the Contractor. The rover will be kept in the possession of the Engineer and will be returned to the Contractor upon completion of the contract. Any

maintenance or repairs required for the rover will be the responsibility of the Contractor. Formal training of at least 8 hours shall be provided to the Engineer by the Contractor on the use of the proposed AMG system.

Subgrade and Base Controls

If the Contractor elects to use AMG for fine grading and placement of base or other roadway materials, the GPS shall be supplemented with a laser or robotic total station. Include details of the proposed system in the AMG work plan. In addition, the following requirements apply for the use of AMG for subgrade and base construction.

Provide control points at intervals along the project not to exceed 1,000 feet. The horizontal position of these points shall be determined by static GPS sessions or by traverse connection from the original base line control points. The elevation of these control points shall be established using differential leveling from project benchmarks, forming closed loops where practical. A copy of all new control point information shall be provided to the Engineer prior to construction activities.

Provide control points and conventional survey grade stakes at 500 foot intervals and at critical points such as, but not limited to, PCs, PTs, superelevation transition points, and other critical points as requested by the Engineer.

Provide hubs at the top of the finished subgrade at all hinge points on the cross section at 500 foot intervals. These hubs shall be established using conventional survey methods for use by the Engineer to check the accuracy of construction.

Measurement and Payment

No direct payment will be made for work required to utilize this provision. All work will be considered incidental to various grading operations

.

SUPPLEMENTAL SURVEYING:

(4-20-21) 801 SP8 R03

Revise the *2018 Standard Specifications* as follows:

Page 8-7, Article 801-3 MEASUREMENT AND PAYMENT, lines 10-11, replace with the following:

Supplemental Surveying Office Calculations will be paid at the stated price of $85.00 per hour. *Supplemental Field Surveying* will be paid at the stated price of $145.00 per hour. The

6" CONCRETE DRIVEWAY:

Description

Construct 6" Concrete Driveway in accordance with the plans, Section 848 of the *Standard Specifications*, *NCDOT Roadway Standard Drawings*, and as directed by the Engineer.

Materials

Concrete shall be Class AA Concrete meeting the requirements of Section 1000 of the *2018 Standard Specifications*. Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-5 of the *2018 Standard Specifications*.

Wire mesh reinforcement shall be 6x6-W4xW4 welded wire fabric meeting the requirements of Section 1070 of the *2018 Standard Specifications*. The wire mesh reinforcement shall be centered in the 6" slab.

Measurement and Payment

6" Concrete Driveway will be measured and paid for in square yards of 6" Concrete Driveway that has been completed and accepted. Such price and payment will be full compensation for all work of constructing the concrete driveway, including but not limited to excavating and backfilling, furnishing and placing concrete and wire mesh, constructing joints, and other incidentals as needed.

Pay Item	**Pay Unit**
6" Concrete Driveway	Square Yard

MEDIAN HAZARD PROTECTION:

Description

Construct Median Hazard Protection at locations indicated 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 linear feet 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 incidentals necessary construct the Median Hazard Protection.

Payment will be made under:

Pay Item	**Pay Unit**
Median Hazard Protection	Linear Foot

GUARDRAIL END UNITS, TYPE - TL-2:

(10-21-08) (Rev. 7-1-17) 862 SP8 R64

Description

Furnish and install guardrail end units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2018 Standard Specifications*, and at locations shown in the plans.

Materials

Furnish guardrail end 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 end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 2 in accordance with Article 106-2 of the *2018 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the *2018 Standard Specifications*.

No modifications shall be made to the guardrail end 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 *2018 Standard Specifications* and is incidental to the cost of the guardrail end unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2018 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Guardrail End Units, Type TL-2	Each

GUARDRAIL END UNITS, TYPE - TL-3:

(4-20-04) (Rev. 7-1-17) 862 SP8 R65

Description

Furnish and install guardrail end units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2018 Standard Specifications*, and at locations shown in the plans.

Materials

Furnish guardrail end 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 end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 3, in accordance with Article 106-2 of the *2018 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the *2018 Standard Specifications*.

No modifications shall be made to the guardrail end 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 *2018 Standard Specifications* and is incidental to the cost of the guardrail end unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2018 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Guardrail End Units, Type TL-3	Each

GUARDRAIL ANCHOR UNITS AND TEMPORARY GUARDRAIL ANCHOR UNITS:
(1-16-2018) 862 SP8 R70

Guardrail anchor units will be in accordance with the details in the plans and the applicable requirements of Section 862 of the *2018 Standard Specifications*.

Revise the *2018 Standard Specifications* as follows:

Page 8-42, Article 862-6 MEASUREMENT AND PAYMENT, add the following:

Guardrail Anchor Units, Type ___ and Temporary Guardrail Anchor Units Type ___ will be measured and paid as units of each completed and accepted. No separate measurement will be made of any rail, terminal sections, posts, offset blocks, concrete, hardware or any other components of the completed unit that are within the pay limits shown in the plans for the unit as all such components will be considered to be part of the unit.

Payment will be made under:

Pay Item	**Pay Unit**
Guardrail Anchor Units, Type ____	Each
Temporary Guardrail Anchor Units, Type ___	Each

IMPACT ATTENUATOR UNITS, TYPE TL-3:
(4-20-04) (Rev. 12-18-18) SP8 R75

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 the Manual for Assessing Safety Hardware (MASH-16), Test Level 3, in accordance with Article 106-2 of the *2018 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 *2018 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 TL-3 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 TL-3	Each

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 1-16-18) 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 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 foundations for signal pedestals; see Section 1743 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing No. 1743.01.

Materials

Refer to the *2018 Standard Specifications*.

Item	Section
Conduit	1091-3
Grout, Type 2	1003

Item	Section
Polymer Slurry	411-2(B)(2)
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 *2018 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 *2018 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 *2018 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 *2018 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 the required slurry properties at all times 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 polymer 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 *2018 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 *2018 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2018 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2018 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2018 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 *2018 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 *2018 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 *2018 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. Place concrete against undisturbed soil or backfill and fill in accordance with Article 410-8 of the *2018 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces.

(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 *2018 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

(1-16-18) SP9 R07

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.

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 pcf,
(B) Friction angle (ϕ) = 30°,
(C) Cohesion (c) = 0 psf and
(D) Groundwater 7 feet 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 feet 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 *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 psf 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 2016 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 *2018 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 in 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, supplying and placing 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 *2018 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Overhead Footings	Cubic Yard

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY:

(9-15-20) 1000, 1014, 1024 SP10 R01

Revise the *2018 Standard Specifications* as follows:

Page 10-6, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum Slump		Cement Content			
		Air-Entrained Concrete		Non-Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4500	0.381	0.426	---	---	3.5[A]	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 – 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5[A] 1.5 machine placed	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	2.5[A] hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0[A]	---	715	---	---	---

Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	658	---	---	---
Flowable Fill excavatable	150 max. (at 56 days)	as needed	as needed	as needed	as needed	---	Flowable	---	---	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	---	Flowable	---	---	100	as needed
Pavement	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---
Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

A. The slump may be increased to 6 inches, provided the increase in slump is achieved by adding a chemical admixture conforming to Section 1024-3. In no case shall the water-cement ratio on the approved design be exceeded. Concrete exhibiting segregation and/or excessive bleeding will be rejected. Utilizing an Admixture to modify slump does not relinquish the contractor's responsibility to ensure the final product quality and overall configuration meets design specifications. Caution should be taken when placing these modified mixes on steep grades to prevent unintended changes to the set slope.

HIGH STRENGTH CONCRETE FOR DRIVEWAYS:

(11-21-00) (Rev. 1-17-12) 848 SP10 R02

Use high early strength concrete for all driveways shown in the plans and as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-5 of the *2018 Standard Specifications*.

Measurement and payment will be in accordance with Section 848 of the *2018 Standard Specifications*.

THERMOPLASTIC PAVEMENT MARKING MATERIAL – COLOR TESTING:

3-19-19 1087 SP10 R05

Revise the *2018 Standard Specifications* as follows:

Pages 10-183 and 10-184, Subarticle 1087-7(D)(1)(b) Yellow, lines 9-11, delete and replace with the following:

Obtain Color Values Y,x,y per ASTM E1349 using C/2° illuminant/observer.
Results shall be $Y \geq 45\%$, and x,y shall fall within PR#1 chart chromaticity limits.

POLYUREA PAVEMENT MARKING MATERIAL – TYPE 2 TYPICAL CERTIFIED MILL TEST REPORT:

3-19-19 1087 SP10 R06

Amend the *2018 Standard Specifications* as follows:

Page 10-184, Subarticle 1087-8 Material Certification, in accordance with Subarticle 106-3 provide a Type 2 Typical Certified Mill Test Report and a Type 3 Manufacturer's Certification for Polyurea pavement marking material.

When tested, the material shall meet the physical and chemical characteristics provided by the manufacturer. NCDOT reserves the right to compare these test results to baseline test results gathered by the NCDOT Materials and Test Unit.

MATERIALS FOR PORTLAND CEMENT CONCRETE:

(9-15-20) 1000, 1024 SP10 R24

Revise the *2018 Standard Specifications* as follows:

Page 10-52, Article 1024-4, WATER, lines 3-6, delete and replace with the following:

Test water from wells at all locations. Test public water supplies from all out of state locations and in the following counties: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell and Washington unless the Engineer waives the testing requirements.

Page 10-52, Table 1024-2, PHYSICAL PROPERTIES OF WATER, replace with the following:

Property	Requirement	Test Method
Compression Strength, minimum percent of control at 3 and 7 days	90%	ASTM C1602
Time of set, deviation from control	From 1:00 hr. earlier to 1:30 hr. later	ASTM C1602
pH	4.5 to 8.5	ASTM D1293 *
Chloride Ion Content, Max.	250 ppm	ASTM D512 *
Total Solids Content (Residue), Max.	1,000 ppm	SM 2540B *
Resistivity, Min.	0.500 kohm-cm	ASTM D1125 *

*Denotes an alternate method is acceptable. Test method used shall be referenced in the test report.

TEMPORARY SHORING:

(2-20-07) (Rev. 1-16-18) 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 feet 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 and "Temporary Wall Vendor" as the vendor supplying the 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 2018 Roadway Standard Drawing No. 1170.01. Define "concrete barrier" as unanchored or anchored PCB or an approved equal. Define "temporary guardrail" as temporary steel beam guardrail that meets 2018 Roadway Standard Drawing No. 862.02.

Materials

Refer to the *2018 Standard Specifications*.

Item	**Section**
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Neat Cement Grout	1003
Portland Cement Concrete	1000
Select Materials	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

Provide Type 6 material certifications for shoring materials in accordance with Article 106-3 of the *2018 Standard Specifications*. Use Class IV select material 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 *2018 Standard Specifications* or Type 1 grout for drilled-in piles. Provide untreated timber with a thickness of at least 3 inches and a bending stress of at least 1,000 pounds per square inch 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 inches 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 *2018 Standard Specifications*. Splice bars in accordance with Article 1070-9 of the *2018 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. 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

Use geogrids with a roll width of at least 4 feet and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from: connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.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 machine direction (MD) and cross-machine direction (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 *2018 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 feet, 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 PDF files of

working drawings and design calculations for temporary shoring designs in accordance with Article 105-2 of the *2018 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.

Provide temporary wall designs sealed by a Design Engineer licensed in the state of North Carolina and employed or contracted by the Temporary Wall Vendor. 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 pcf;

(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 psf.

(2) Traffic Surcharge

Design temporary shoring for a traffic surcharge of 250 pounds per square foot 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 pounds per foot applied 18 inches 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 inches above top of shoring if shoring is designed for traffic impact. Otherwise, extend shoring at least 6 inches above top of shoring.

Design cantilever, braced and anchored shoring for a maximum deflection of 3 inches 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 inches. 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 feet 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 inches 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 inches 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 feet, whichever is longer. Extend the reinforced zone at least 6 inches 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. For temporary geogrid walls with an R_c of less than 1.0, use a maximum horizontal clearance between geogrids of 3 feet 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 inch 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 feet 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 feet 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, Area 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 *2018 Standard Specifications* and 2018 Roadway Standard Drawing No. 1170.01. Use temporary guardrail in accordance with Section 862 of the *2018 Standard Specifications* and 2018 Roadway Standard Drawing Nos. 862.01, 862.02 and 862.03.

(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 inches of horizontal and vertical alignment shown in the accepted submittals, and

(3) Shoring plumbness (batter) is not negative and within 2 degrees 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 *2018 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 feet. Remove flowable fill and material in between H-piles as needed to install timber lagging. Position lagging with at least 3 inches 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 inches between the 1 and 10 minute readings or less than 0.08 inches 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 PDF files 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 inches with seams oriented perpendicular to the wall face. Hold geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement within 3 inches of locations shown in the plans and accepted submittals. Before placing shoring backfill, pull reinforcement taut so it is in tension and 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 inch 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 *2018 Standard Specifications*. Use only hand operated compaction equipment to compact backfill within 3 feet of welded wire facing. At a distance greater than 3 feet, compact shoring backfill with at least 4 passes of an 8 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 inches 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 *2018 Standard Specifications*. Bench temporary walls into the sides of excavations where applicable. For temporary geosynthetic walls with top of wall within 5 feet 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 *2018 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 *2018 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Shoring	Square Foot

EXTRUDED THERMOPLASTIC PAVEMENT MARKING THICKNESS:

3-19-19 1205 SP12 R05

Revise the *2018 Standard Specifications* as follows:

Page 12-6, Subarticle 1205-4(A)(1) General, lines 5-8, delete the second sentence and replace with the following:

Use application equipment that provides multiple width settings ranging from 4 inches to 12 inches and multiple thickness settings to achieve a minimum pavement marking thickness of 0.090 inch above the surface of the pavement.

Page 12-7, Table 1205-3, THICKNESS REQUIREMENTS FOR THERMOPLASTIC, replace with the following:

TABLE 1205-3
MINIMUM THICKNESS REQUIREMENTS FOR THERMOPLASTIC

Thickness	Location
240 mils	In-lane and shoulder-transverse pavement markings (rumble strips). May be placed in 2 passes.
90 mils	Center lines, skip lines, transverse bands, mini-skip lines, characters, bike lane symbols, crosswalk lines, edge lines, gore lines, diagonals, and arrow symbols

ROADWAY LIGHTING FOUNDATIONS:

(1-16-18) SP14 R04

Description

Roadway lighting foundations include foundations for high mount and light standards. High mount foundations for high mount standards and standard foundations for light standards consist of drilled piers or footings with pedestals, conduit and anchor rod assemblies. Construct roadway lighting foundations in accordance with the contract, *2018 Roadway Standard Drawings* and accepted submittals. Define "high mount foundation" as a drilled pier including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1402.01. Define "standard foundation" as a drilled pier or footing with pedestal including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1405.01.

Materials

Use roadway lighting foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision. Provide metal shrouds for median mounted light standards in accordance with Subarticle 1400-4(I) of the *2018 Standard Specifications*.

Roadway Lighting Foundations

(A) High Mount Foundations

Construct high mount foundations for the wind zone and high mount heights shown in the plans unless the following assumed site conditions are not applicable to high mount locations:

(E) Soil with unit weight (γ) $\geq$ 120 pcf and friction angle (ϕ) $\geq$ 30°,
(F) Groundwater at least 7 feet below finished grade and
(G) Slope of finished grade 6:1 (H:V) or flatter.

A subsurface investigation and high mount foundation design are required if the Engineer determines these assumed site conditions do not apply to a high mount location and the high mount cannot be moved. Subsurface conditions requiring a high mount foundation design 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 or high mount foundation designs.

(B) Standard Foundations

Construct standard foundation types for the light standard types shown in the plans and the site conditions at each light standard location. When weathered or hard rock, boulders or obstructions conflict with standard foundations, submit an alternate standard foundation design for acceptance in accordance with Article 105-2 of the *2018 Standard Specifications*. No extension of completion date or time will be allowed for alternate standard foundations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each high mount location requiring a subsurface investigation. Rough grade high mount 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.

High Mount Foundation Designs

Design high mount foundations for the wind zone and high mount heights shown in the plans and the slope of finished grade and subsurface conditions at each high mount location. Design drilled piers, footings and pedestals in accordance with the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges*. Use the computer software LPILE version 2016 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 0.5" at top of piers.

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 psf for footings. Submit boring logs, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2018 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 high mount foundation design submittals. Have high mount foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Grade around roadway lighting locations with cut and fill slopes as shown on 2018 Roadway Standard Drawing No. 1402.01 or 1405.01. Construct drilled piers, footings and pedestals and install anchor rod assemblies for roadway lighting foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

For median mounted light standards, place concrete for median barriers and underlying pedestals in the same pour. Construct concrete barriers in accordance with the contract and make concrete median barriers continuous through standard foundations. Coordinate construction of median mounted light standards with sign structures, concrete barriers, drainage structures, etc. to avoid conflicts.

Measurement and Payment

High Mount Foundations will be measured and paid in cubic yards. High mount foundations will be measured as the cubic yards of concrete shown on 2018 Roadway Standard Drawing No.

1402.01 for the high mount height and wind zone shown in the plans. All other high mount foundations will be measured as the cubic yards of foundation concrete for drilled piers, footings and pedestals shown in the accepted submittals. Subsurface investigations and high mount foundation designs required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2018 Standard Specifications*.

Standard Foundation ____ will be measured and paid in units of each. Standard foundations will be measured as the number of each standard foundation type. Alternate standard foundations will be measured as 1.5 times the number of each standard foundation type replaced.

The contract unit prices for *High Mount Foundations* and *Standard Foundation* ____ will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct roadway lighting foundations.

Payment will be made under:

Pay Item	**Pay Unit**
High Mount Foundations	Cubic Yard
Standard Foundation ____	Each

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 *2018 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(D) of the *2018 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

(10-16-18) (Rev.2-16-21) Z-4

Revise the *2018 Standard Specifications* as follows:

Division 6

Page 6-7, Article 609-1 DESCRIPTION, line 29, replace article number "609-10" with "609-9".

Division 7

Page 7-27, Article 725-1 MEASUREMENT AND PAYMENT, line 4, replace article number "725-1" with "724-4".

Page 7-28, Article 725-1 MEASUREMENT AND PAYMENT, line 10, replace article number "725-1" with "725-3".

Division 10

Page 10-78, Article 1056-4 GEOTEXTILES, TABLE 1056-1, Permittivity, Type 2, replace "Table 6^{D}" with "Table 7^{D}" and **Permittivity, Type 3^{B},** replace "Table 7^{D}" with "Table 8^{D}".

Page 10-121, Article 1076-7, REPAIR OF GALVANIZING, line 8, replace article number "1080-9" with "1080-7".

Page 10-162, Article 1080-50 PAINT FOR VERTICAL MARKERS, line 1, replace article number "1080-50" with "1080-10".

Page 10-162, Article 1080-61 EPOXY RESIN FOR REINFORCING STEEL, line 5, replace article number "1080-61" with "1080-11".

Page 10-162, Article 1080-72 ABRASIVE MATERIALS FOR BLAST CLEANING STEEL, line 22, replace article number "1080-72" with "1080-12".

Page 10-163, Article 1080-83 FIELD PERFORMANCE AND SERVICES, line 25, replace article number "1080-83" with "1080-13".

Division 17

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, lines 42-44, replace the second sentence with the following:

An example is an installation of a single 1.25 inch HDPE conduit would be paid as:

Directional Drill (1)(1.25″) Linear Foot

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES
(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer, Guava Root Knot Nematode, And Other Noxious Weeds)

(3-18-03) (Rev. 5-21-19) 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, 919-707-3730, or *https://www.ncagr.gov/plantindustry/Plant/quaran/table2.htm* 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, emerald ash borer, guava root knot nematode, 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

TITLE VI AND NONDISCRIMINATION:

(6-28-77)(Rev 6/19/2018) Z-6

Revise the *2018 Standard Specifications* as follows:

Replace Article 103-4(B) with the following:

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) **Title VI Assurances (USDOT Order 1050.2A, Appendix A)**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(a) Compliance with Regulations

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) Nondiscrimination

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts,

Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:
In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:
(i) Withholding payments to the contractor under the contract until the contractor complies; and/or
(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions
The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**
The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:
1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:
"The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 US.C. §§

2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award."

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.
5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.
6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.

(b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))

(c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))

(d) The Contractor is responsible for notifying subcontractors of NCDOT's External Discrimination Complaints Process.

1. Applicability
   Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.
2. Eligibility
   Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.
3. Time Limits and Filing Options
   Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:
   (i) The date of the alleged act of discrimination; or
   (ii) The date when the person(s) became aware of the alleged discrimination; or
   (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

   Title VI and related discrimination complaints may be submitted to the following entities:

- North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
- Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
- US Department of Transportation, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070

4. Format for Complaints
   Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.
5. Discrimination Complaint Form
   Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.
6. Complaint Basis
   Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

TABLE 103-1
COMPLAINT BASIS

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990

Religion (in the context of employment) *(Religion/ Creed in all aspects of any aviation or transit-related construction)*	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. ***Note:*** Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(3) **Pertinent Nondiscrimination Authorities**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

(a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.

(b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

(c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

(d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;

(e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

(f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

(g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

(h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

(i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

(j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with

disproportionately high and adverse human health or environmental effects on minority and low-income populations;

(k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

(l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).

(4) **Additional Title VI Assurances**

***The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*

(a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)
The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:
   (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. *
3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non¬ discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. *
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

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

STANDARD SHORING: **(1-16-18)**

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 Geotechnical Standard Detail No. 1801.01 or 1801.02.

Define "standard temporary shoring" as cantilever shoring that meets the standard temporary shoring detail (Geotechnical 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 (Geotechnical 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.

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
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Neat Cement Grout, Type 1	1003
Portland Cement Concrete, Class A	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3

Provide Type 6 material certifications for shoring materials. Use Class IV select material 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 Geotechnical 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 Geotechnical Standard Detail No. 1801.02. Provide Type 2 geotextile for separation and retention geotextiles. 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 Geotechnical Standard Detail No. 1801.02.

(2) Geogrid Reinforcement

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/Materials-Manual-by-Material.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 Geotechnical Standard Detail No. 1801.02. Geogrids are typically approved for ultimate tensile strengths in the machine direction (MD) and cross-machine direction (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

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 Geotechnical 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 Geotechnical Standard Detail No. 1801.01. Otherwise, use "slope or surcharge case with no traffic impact" in accordance with Geotechnical 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

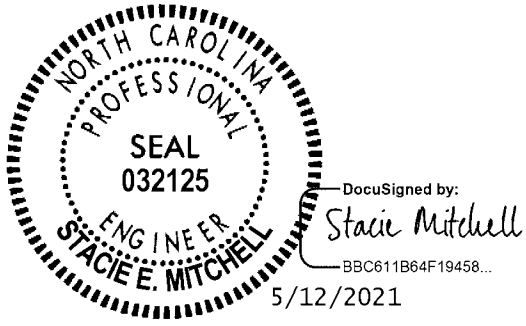
Based on actual wall height, groundwater elevation, slope or surcharge case, geotextile or geogrid reinforcement and shoring backfill in the reinforced zone at each standard temporary wall location, construct walls with the minimum required reinforcement length and number of reinforcement layers for each wall section in accordance with Geotechnical 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 Geotechnical 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.



TEMPORARY SOIL NAIL WALLS: (1-16-18)

Description

Construct temporary soil nail walls consisting of soil nails spaced at a regular pattern and connected to a reinforced shotcrete face. A soil nail consists of a steel bar grouted in a drilled hole inclined at an angle below horizontal. At the Contractor's option, use temporary soil nail walls instead of temporary shoring for full cut sections. Design and construct temporary soil nail walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Anchored Wall Contractor to construct temporary soil nail walls. Define "soil nail wall" as a temporary soil nail wall and "Soil Nail Wall Contractor" as the Anchored Wall Contractor installing soil nails and applying shotcrete. Define "nail" as a soil nail.

Provide positive protection for soil nail walls at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geocomposites	1056
Neat Cement Grout, Type 2	1003
Reinforcing Steel	1070
Shotcrete	1002
Select Material, Class IV	1016
Steel Plates	1072-2

Use Class IV select material for temporary guardrail. Provide soil nails consisting of grouted steel bars and nail head assemblies. Use deformed steel bars that meet AASHTO M 275 or M 31, Grade 60 or 75. Splice bars in accordance with Article 1070-9 of the *Standard Specifications*.

Fabricate centralizers from schedule 40 PVC plastic pipe or tube, steel or other material not detrimental to steel bars (no wood). Size centralizers to position bars within 1" of drill hole centers and allow tremies to be inserted to ends of holes. Use centralizers that do not interfere with grout placement or flow around bars.

Provide nail head assemblies consisting of nuts, washers and bearing plates. Use steel plates for bearing plates and steel washers and hex nuts recommended by the Soil Nail Manufacturer.

Provide Type 6 material certifications for soil nail materials in accordance with Article 106-3 of the *Standard Specifications*. 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 soil nail wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

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 soil nail walls except for barrier above walls. Concrete barrier with the minimum required clear distance is required above soil nail walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and soil nail walls. At the Contractor's option or if clear distance for soil nail walls is less than 4 ft, use temporary guardrail with 8 ft posts and a clear distance of at least 2.5 ft. Place ABC in clear distance and around guardrail posts instead of pavement.

(C) Soil Nail Wall Designs

Before beginning soil nail wall design, survey existing ground elevations in the vicinity of wall locations to determine actual design heights (H). Use a prequalified Anchored Wall Design Consultant to design soil nail walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Anchored Wall Design Consultant.

Submit PDF files of working drawings and design calculations for soil nail wall designs in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles, typical sections and details of soil nail wall design and construction sequence. Include details in working drawings of soil nail locations, unit grout/ground bond strengths, shotcrete reinforcement and if necessary, obstructions extending through walls or interfering with nails. Include details in construction sequence of excavation, grouting, installing reinforcement, nail testing and shotcreting with mix designs and shotcrete nozzleman certifications. Do not begin soil nail wall construction until a design submittal is accepted.

Design soil nail walls in accordance with the plans and allowable stress design method in the *FHWA Geotechnical Engineering Circular No. 7 "Soil Nail Walls"* (Publication No. FHWA-IF-03-017) unless otherwise required.

Design soil nails that meet the following unless otherwise approved:

(1) Horizontal and vertical spacing of at least 3 ft,

(2) Inclination of at least 12° below horizontal and

(3) Diameter of 4" to 10".

Do not extend nails beyond right-of-way or easement limits. If existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with nails, maintain a clearance of at least 6" between obstructions and nails.

Design soil nail walls for a traffic surcharge of 250 psf if traffic will be above and within H of walls. This traffic surcharge does not apply to construction traffic. Design soil nail walls for any construction surcharge if construction traffic will be above and within H of walls. For temporary guardrail with 8 ft posts above soil nail walls, analyze walls for a horizontal load of 300 lb/ft of wall.

Place geocomposite drain strips with a horizontal spacing of no more than 10 ft and center strips between adjacent nails. Attach drain strips to excavation faces. Use shotcrete at least 4" thick and reinforce shotcrete with #4 waler bars around nail heads. Two waler bars

(one on each side of nail head) in the horizontal and vertical directions are required for a total of 4 bars per nail.

(D) Preconstruction Meeting

Before starting soil nail wall construction, hold a preconstruction meeting to discuss the construction, inspection and testing of the soil nail walls. If this meeting occurs before all soil nail wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of soil nail walls without accepted submittals. The Resident, District or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Soil Nail Wall Contractor Superintendent will attend preconstruction meetings.

(E) Preconstruction Meeting

Before beginning wall construction, provide preconstruction test panels in accordance with Subarticle 1002-3(D) of the *Standard Specifications*.

Construction Methods

Control drainage during construction in the vicinity of soil nail walls. Direct run off away from soil nail walls and areas above and behind walls.

Install foundations located behind soil nail walls before beginning wall construction. Do not excavate behind soil nail walls. If overexcavation occurs, repair walls with an approved method and a revised soil nail wall design may be required.

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

(A) Excavation

Excavate for soil nail walls from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with no negative batter (excavation face leaning forward). Excavate lifts in accordance with the following:

(1) Heights not to exceed vertical nail spacing,

(2) Bottom of lifts no more than 3 ft below nail locations for current lift and

(3) Horizontal and vertical alignment within 6" of location shown in the accepted submittals.

Remove any cobbles, boulders, rubble or debris that will protrude more than 2" into the required shotcrete thickness. Rocky ground such as colluvium, boulder fills and weathered rock may be difficult to excavate without leaving voids.

Apply shotcrete to excavation faces within 24 hours of excavating each lift unless otherwise approved. Shotcreting may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.

If an excavation becomes unstable at any time, suspend soil nail wall construction and

temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soil nail wall design may be required.

Do not excavate the next lift until nail installations and testing and shotcrete application for the current lift are accepted and grout and shotcrete for the current lift have cured at least 3 days and 1 day, respectively.

(B) Soil Nails

Drill and grout nails the same day and do not leave drill holes open overnight. Control drilling and grouting to prevent excessive ground movements, damaging structures and pavements or fracturing rock and soil formations. If ground heave or subsidence occurs, suspend soil nail wall construction and take corrective action to minimize movement. If property damage occurs, make repairs with an approved method and a revised soil nail wall design may be required.

(1) Drilling

Use drill rigs of the sizes necessary to install soil nails and with sufficient capacity to drill through whatever materials are encountered. Drill straight and clean holes with the dimensions and inclination shown in the accepted submittals. Drill holes within 6" of locations and 2° of inclination shown in the accepted submittals unless otherwise approved.

Stabilize drill holes with temporary casings if unstable, caving or sloughing material is anticipated or encountered. Do not use drilling fluids to stabilize drill holes or remove cuttings.

(2) Steel Bars

Center steel bars in drill holes with centralizers. Securely attach centralizers along bars at no more than 8 ft centers. Attach uppermost and lowermost centralizers 18" from excavation faces and ends of holes.

Do not insert steel bars into drill holes until hole locations, dimensions, inclination and cleanliness are approved. Do not vibrate, drive or otherwise force bars into holes. If a steel bar cannot be completely and easily inserted into a drill hole, remove the bar and clean or redrill the hole.

(3) Grouting

Remove oil, rust inhibitors, residual drilling fluids and similar foreign materials from holding tanks/hoppers, stirring devices, pumps, lines, tremie pipes and any other equipment in contact with grout before use. 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.

Inject grout at the lowest point of drill holes through tremies, e.g., grout tubes, casings, hollow-stem augers or drill rods, in one continuous operation. Fill drill

holes progressively from ends of holes to excavation faces and withdraw tremies at a slow even rate as holes are filled to prevent voids in grout. Extend tremies into grout at least 5 ft at all times except when grout is initially placed in holes.

Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing). Cold joints in grout are not allowed except for test nails. Remove any temporary casings as grout is placed and record grout volume for each drill hole.

(4) Nail Heads

Install nail head assemblies after shotcreting. Before shotcrete reaches initial set, seat bearing plates and tighten nuts so plates contact shotcrete uniformly. If uniform contact is not possible, install nail head assemblies on mortar pads so nail heads are evenly loaded.

(C) Drain Strips

Install geocomposite drain strips as shown in the accepted submittals. Before installing shotcrete reinforcement, place drain strips with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, drain strips may be placed after shotcreting over weep holes through the shotcrete. Hold drain strips in place with anchor pins so strips are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous drain strips are not allowed. If splices are needed, overlap drain strips at least 12" so flow is not impeded. Cut off excess drain strip length and expose strip ends below shotcrete when soil nail wall construction is complete.

(D) Shotcrete

Clean ungrouted zones of drill holes and excavation faces of loose materials, mud, rebound and other foreign material. Moisten surfaces to receive shotcrete. Install shotcrete reinforcement in accordance with the contract and accepted submittals. Secure reinforcing steel so shooting does not displace or vibrate reinforcement. Install approved thickness gauges on 5 ft centers in the horizontal and vertical directions to measure shotcrete thickness.

Apply shotcrete in accordance with the contract, accepted submittals and Subarticle 1002-3(F) of the *Standard Specifications*. Use approved shotcrete nozzlemen who made satisfactory preconstruction test panels to apply shotcrete. Direct shotcrete at right angles to excavation faces except when shooting around reinforcing steel. Rotate nozzle steadily in small circular patterns and apply shotcrete from bottom of lifts up.

Make shotcrete surfaces uniform and free of sloughing or sagging. Completely fill ungrouted zones of drill holes and any other voids with shotcrete. Taper construction joints to a thin edge over a horizontal distance of at least the shotcrete thickness. Wet joint surfaces before shooting adjacent sections.

Repair surface defects as soon as possible after shooting. Remove any shotcrete which lacks uniformity, exhibits segregation, honeycombing or lamination or contains any voids or sand pockets and replace with fresh shotcrete to the satisfaction of the Engineer. Protect shotcrete from freezing and rain until shotcrete reaches initial set.

(E) Construction Records

Provide 2 copies of soil nail wall construction records within 24 hours of completing each lift. Include the following in construction records:

(1) Names of Soil Nail Wall Contractor, Superintendent, Nozzleman, Drill Rig Operator, Project Manager and Design Engineer;

(2) Wall description, county, Department's contract, TIP and WBS element number;

(3) Wall station and number and lift location, dimensions, elevations and description;

(4) Nail locations, dimensions and inclinations, bar types, sizes and grades and temporary casing information;

(5) Date and time drilling begins and ends, steel bars are inserted into drill holes, grout and shotcrete are mixed and arrives on-site and grout placement and shotcrete application begins and ends;

(6) Grout volume, temperature, flow and density records;

(7) Ground and surface water conditions and elevations if applicable;

(8) Weather conditions including air temperature at time of grout placement and shotcrete application; and

(9) All other pertinent details related to soil nail wall construction.

After completing each soil nail wall or stage of a wall, provide a PDF file of all corresponding construction records.

Nail Testing

"Proof tests" are performed on nails incorporated into walls, i.e., production nails. Define "test nail" as a nail tested with a proof test. Proof tests are typically required for at least one nail per nail row per soil nail wall or at least 5% of production nails, whichever is greater. More or less test nails may be required depending on subsurface conditions encountered. The Engineer will determine the number and locations of proof tests required. Do not test nails until grout and shotcrete attain the required 3 day compressive strength.

(A) Test Equipment

Use the following equipment to test nails:

(1) Two dial gauges with rigid supports,

(2) Hydraulic jack and pressure gauge and

(3) Jacking block or reaction frame.

Provide dial gauges with enough range and precision to measure the maximum test nail movement to 0.001". Use pressure gauges graduated in 100 psi increments or less. Submit identification numbers and calibration records for load cells, jacks and pressure gauges with the soil nail wall design. Calibrate each jack and pressure gauge as a unit.

Align test equipment to uniformly and evenly load test nails. Use a jacking block or reaction frame that does not damage or contact shotcrete within 3 ft of nail heads. Place dial gauges opposite each other on either side of test nails and align gauges within 5° of

bar inclinations. Set up test equipment so resetting or repositioning equipment during nail testing is not needed.

(B) Test Nails

Test nails include both unbonded and bond lengths. Grout only bond lengths before nail testing. Provide unbonded and bond lengths of at least 3 ft and 10 ft, respectively.

Steel bars for production nails may be overstressed under higher test nail loads. If necessary, use larger size or higher grade bars with more capacity for test nails instead of shortening bond lengths to less than the minimum required.

(C) Proof Tests

Determine maximum bond length (L_B) using the following:

$$L_B \leq (C_{RT} \times A_t \times f_y) / (Q_{ALL} \times 1.5)$$

Where,

L_B = bond length (ft),
C_{RT} = reduction coefficient, 0.9 for Grade 60 and 75 bars or 0.8 for Grade 150 bars,
A_t = bar area (in^2),
f_y = bar yield stress (ksi) and
Q_{ALL} = allowable unit grout/ground bond strength (kips/ft).

Determine design test load (DTL) based on as-built bond length and allowable unit grout/ground bond strength using the following:

$$DTL = L_B \times Q_{ALL}$$

Where,

DTL = design test load (kips).

Perform proof tests by incrementally loading nails to failure or a load of 150% of DTL based on the following schedule:

Load	Hold Time
AL*	Until movement stabilizes
0.25 DTL	Until movement stabilizes
0.50 DTL	Until movement stabilizes
0.75 DTL	Until movement stabilizes
1.00 DTL	Until movement stabilizes
1.25 DTL	Until movement stabilizes
1.50 DTL	10 or 60 minutes (creep test)
AL*	1 minute

* Alignment load (AL) is the minimum load needed to align test equipment and should not exceed 0.05 DTL.

Reset dial gauges to zero after applying alignment load. Record test nail movement at each load increment and monitor test nails for creep at the 1.5 DTL load increment. Measure and record movement during creep test at 1, 2, 3, 5, 6 and 10 minutes. If test nail movement between 1 and 10 minutes is greater than 0.04", maintain the 1.5 DTL load increment for

an additional 50 minutes and record movement at 20, 30, 50 and 60 minutes. Repump jack as needed to maintain load during hold times.

(D) Test Nail Acceptance

Submit 2 copies of test nail records including load versus movement and time versus creep movement plots within 24 hours of completing each proof test. The Engineer will review the test nail records to determine if test nails are acceptable. Test nail acceptance is based in part on the following criteria.

(1) Total movement during creep test is less than 0.04" between the 1 and 10 minute readings or less than 0.08" between the 6 and 60 minute readings and creep rate is linear or decreasing throughout hold time.

(2) Total movement at maximum load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(3) Pullout failure does not occur at or before the 1.5 DTL load increment. Define "pullout failure" as the inability to increase load while movement continues. Record pullout failure load as part of test nail data.

Maintain stability of unbonded lengths for subsequent grouting. If a test nail is accepted but the unbonded length cannot be satisfactorily grouted, do not incorporate the test nail into the soil nail wall and add another production nail to replace the test nail.

If the Engineer determines a test nail is unacceptable, either perform additional proof tests on adjacent production nails or revise the soil nail design or installation methods for the production nails represented by the unacceptable test nail as determined by the Engineer. Submit a revised soil nail wall design for acceptance, provide an acceptable test nail with the revised design or installation methods and install additional production nails for the nails represented by the unacceptable test nail.

After completing nail testing for each soil nail wall or stage of a wall, provide a PDF file of all corresponding test nail records.

Measurement and Payment

Temporary soil nail walls will be measured and paid in square feet. Temporary soil nail walls will be paid for at the contract unit price for *Temporary Shoring*. Temporary soil nail walls will be measured as the square feet of exposed wall face area. No measurement will be made for any embedment or pavement thickness above soil nail walls.

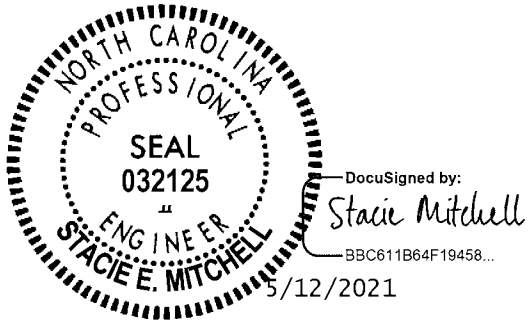
The contract unit price for *Temporary Shoring* will be full compensation for providing soil nail wall designs, submittals, labor, tools, equipment and soil nail wall materials, excavating, hauling and removing excavated materials, installing and testing soil nails, grouting, shotcreting and supplying drain strips and any incidentals necessary to construct soil nail walls. No additional payment will be made and no extension of completion date or time will be allowed for repairing property damage, overexcavations or unstable excavations, unacceptable test nails or thicker shotcrete.

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 *Standard Specifications*. No additional payment will be made for anchoring PCB for soil nail walls. Costs for anchoring PCB will be incidental to soil nail walls.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *Standard Specifications*.



TEMPORARY SOIL NAIL WALLS: (1-16-18)

Description

Construct temporary soil nail walls consisting of soil nails spaced at a regular pattern and connected to a reinforced shotcrete face. A soil nail consists of a steel bar grouted in a drilled hole inclined at an angle below horizontal. At the Contractor's option, use temporary soil nail walls instead of temporary shoring for full cut sections. Design and construct temporary soil nail walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified Anchored Wall Contractor to construct temporary soil nail walls. Define "soil nail wall" as a temporary soil nail wall and "Soil Nail Wall Contractor" as the Anchored Wall Contractor installing soil nails and applying shotcrete. Define "nail" as a soil nail.

Provide positive protection for soil nail walls at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geocomposites	1056
Neat Cement Grout, Type 2	1003
Reinforcing Steel	1070
Shotcrete	1002
Select Material, Class IV	1016
Steel Plates	1072-2

Use Class IV select material for temporary guardrail. Provide soil nails consisting of grouted steel bars and nail head assemblies. Use deformed steel bars that meet AASHTO M 275 or M 31, Grade 60 or 75. Splice bars in accordance with Article 1070-9 of the *Standard Specifications*.

Fabricate centralizers from schedule 40 PVC plastic pipe or tube, steel or other material not detrimental to steel bars (no wood). Size centralizers to position bars within 1" of drill hole centers and allow tremies to be inserted to ends of holes. Use centralizers that do not interfere with grout placement or flow around bars.

Provide nail head assemblies consisting of nuts, washers and bearing plates. Use steel plates for bearing plates and steel washers and hex nuts recommended by the Soil Nail Manufacturer.

Provide Type 6 material certifications for soil nail materials in accordance with Article 106-3 of the *Standard Specifications*. 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 soil nail wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

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 soil nail walls except for barrier above walls. Concrete barrier with the minimum required clear distance is required above soil nail walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and soil nail walls. At the Contractor's option or if clear distance for soil nail walls is less than 4 ft, use temporary guardrail with 8 ft posts and a clear distance of at least 2.5 ft. Place ABC in clear distance and around guardrail posts instead of pavement.

(C) Soil Nail Wall Designs

Before beginning soil nail wall design, survey existing ground elevations in the vicinity of wall locations to determine actual design heights (H). Use a prequalified Anchored Wall Design Consultant to design soil nail walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the Anchored Wall Design Consultant.

Submit PDF files of working drawings and design calculations for soil nail wall designs in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles, typical sections and details of soil nail wall design and construction sequence. Include details in working drawings of soil nail locations, unit grout/ground bond strengths, shotcrete reinforcement and if necessary, obstructions extending through walls or interfering with nails. Include details in construction sequence of excavation, grouting, installing reinforcement, nail testing and shotcreting with mix designs and shotcrete nozzleman certifications. Do not begin soil nail wall construction until a design submittal is accepted.

Design soil nail walls in accordance with the plans and allowable stress design method in the *FHWA Geotechnical Engineering Circular No. 7 "Soil Nail Walls"* (Publication No. FHWA-IF-03-017) unless otherwise required.

Design soil nails that meet the following unless otherwise approved:

(1) Horizontal and vertical spacing of at least 3 ft,

(2) Inclination of at least 12° below horizontal and

(3) Diameter of 4" to 10".

Do not extend nails beyond right-of-way or easement limits. If existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with nails, maintain a clearance of at least 6" between obstructions and nails.

Design soil nail walls for a traffic surcharge of 250 psf if traffic will be above and within H of walls. This traffic surcharge does not apply to construction traffic. Design soil nail walls for any construction surcharge if construction traffic will be above and within H of walls. For temporary guardrail with 8 ft posts above soil nail walls, analyze walls for a horizontal load of 300 lb/ft of wall.

Place geocomposite drain strips with a horizontal spacing of no more than 10 ft and center strips between adjacent nails. Attach drain strips to excavation faces. Use shotcrete at least 4" thick and reinforce shotcrete with #4 waler bars around nail heads. Two waler bars

(one on each side of nail head) in the horizontal and vertical directions are required for a total of 4 bars per nail.

(D) Preconstruction Meeting

Before starting soil nail wall construction, hold a preconstruction meeting to discuss the construction, inspection and testing of the soil nail walls. If this meeting occurs before all soil nail wall submittals have been accepted, additional preconstruction meetings may be required before beginning construction of soil nail walls without accepted submittals. The Resident, District or Bridge Maintenance Engineer, Area Construction Engineer, Geotechnical Operations Engineer, Contractor and Soil Nail Wall Contractor Superintendent will attend preconstruction meetings.

(E) Preconstruction Meeting

Before beginning wall construction, provide preconstruction test panels in accordance with Subarticle 1002-3(D) of the *Standard Specifications*.

Construction Methods

Control drainage during construction in the vicinity of soil nail walls. Direct run off away from soil nail walls and areas above and behind walls.

Install foundations located behind soil nail walls before beginning wall construction. Do not excavate behind soil nail walls. If overexcavation occurs, repair walls with an approved method and a revised soil nail wall design may be required.

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

(A) Excavation

Excavate for soil nail walls from the top down in accordance with the accepted submittals. Excavate in staged horizontal lifts with no negative batter (excavation face leaning forward). Excavate lifts in accordance with the following:

(1) Heights not to exceed vertical nail spacing,

(2) Bottom of lifts no more than 3 ft below nail locations for current lift and

(3) Horizontal and vertical alignment within 6" of location shown in the accepted submittals.

Remove any cobbles, boulders, rubble or debris that will protrude more than 2" into the required shotcrete thickness. Rocky ground such as colluvium, boulder fills and weathered rock may be difficult to excavate without leaving voids.

Apply shotcrete to excavation faces within 24 hours of excavating each lift unless otherwise approved. Shotcreting may be delayed if it can be demonstrated that delays will not adversely affect excavation stability. If excavation faces will be exposed for more than 24 hours, use polyethylene sheets anchored at top and bottom of lifts to protect excavation faces from changes in moisture content.

If an excavation becomes unstable at any time, suspend soil nail wall construction and

temporarily stabilize the excavation by immediately placing an earth berm up against the unstable excavation face. When this occurs, repair walls with an approved method and a revised soil nail wall design may be required.

Do not excavate the next lift until nail installations and testing and shotcrete application for the current lift are accepted and grout and shotcrete for the current lift have cured at least 3 days and 1 day, respectively.

(B) Soil Nails

Drill and grout nails the same day and do not leave drill holes open overnight. Control drilling and grouting to prevent excessive ground movements, damaging structures and pavements or fracturing rock and soil formations. If ground heave or subsidence occurs, suspend soil nail wall construction and take corrective action to minimize movement. If property damage occurs, make repairs with an approved method and a revised soil nail wall design may be required.

(1) Drilling

Use drill rigs of the sizes necessary to install soil nails and with sufficient capacity to drill through whatever materials are encountered. Drill straight and clean holes with the dimensions and inclination shown in the accepted submittals. Drill holes within 6" of locations and 2° of inclination shown in the accepted submittals unless otherwise approved.

Stabilize drill holes with temporary casings if unstable, caving or sloughing material is anticipated or encountered. Do not use drilling fluids to stabilize drill holes or remove cuttings.

(2) Steel Bars

Center steel bars in drill holes with centralizers. Securely attach centralizers along bars at no more than 8 ft centers. Attach uppermost and lowermost centralizers 18" from excavation faces and ends of holes.

Do not insert steel bars into drill holes until hole locations, dimensions, inclination and cleanliness are approved. Do not vibrate, drive or otherwise force bars into holes. If a steel bar cannot be completely and easily inserted into a drill hole, remove the bar and clean or redrill the hole.

(3) Grouting

Remove oil, rust inhibitors, residual drilling fluids and similar foreign materials from holding tanks/hoppers, stirring devices, pumps, lines, tremie pipes and any other equipment in contact with grout before use. 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.

Inject grout at the lowest point of drill holes through tremies, e.g., grout tubes, casings, hollow-stem augers or drill rods, in one continuous operation. Fill drill

holes progressively from ends of holes to excavation faces and withdraw tremies at a slow even rate as holes are filled to prevent voids in grout. Extend tremies into grout at least 5 ft at all times except when grout is initially placed in holes.

Provide grout free of segregation, intrusions, contamination, structural damage or inadequate consolidation (honeycombing). Cold joints in grout are not allowed except for test nails. Remove any temporary casings as grout is placed and record grout volume for each drill hole.

(4) Nail Heads

Install nail head assemblies after shotcreting. Before shotcrete reaches initial set, seat bearing plates and tighten nuts so plates contact shotcrete uniformly. If uniform contact is not possible, install nail head assemblies on mortar pads so nail heads are evenly loaded.

(C) Drain Strips

Install geocomposite drain strips as shown in the accepted submittals. Before installing shotcrete reinforcement, place drain strips with the geotextile side against excavation faces. For highly irregular faces and at the discretion of the Engineer, drain strips may be placed after shotcreting over weep holes through the shotcrete. Hold drain strips in place with anchor pins so strips are in continuous contact with surfaces to which they are attached and allow for full flow the entire height of soil nail walls. Discontinuous drain strips are not allowed. If splices are needed, overlap drain strips at least 12" so flow is not impeded. Cut off excess drain strip length and expose strip ends below shotcrete when soil nail wall construction is complete.

(D) Shotcrete

Clean ungrouted zones of drill holes and excavation faces of loose materials, mud, rebound and other foreign material. Moisten surfaces to receive shotcrete. Install shotcrete reinforcement in accordance with the contract and accepted submittals. Secure reinforcing steel so shooting does not displace or vibrate reinforcement. Install approved thickness gauges on 5 ft centers in the horizontal and vertical directions to measure shotcrete thickness.

Apply shotcrete in accordance with the contract, accepted submittals and Subarticle 1002-3(F) of the *Standard Specifications*. Use approved shotcrete nozzlemen who made satisfactory preconstruction test panels to apply shotcrete. Direct shotcrete at right angles to excavation faces except when shooting around reinforcing steel. Rotate nozzle steadily in small circular patterns and apply shotcrete from bottom of lifts up.

Make shotcrete surfaces uniform and free of sloughing or sagging. Completely fill ungrouted zones of drill holes and any other voids with shotcrete. Taper construction joints to a thin edge over a horizontal distance of at least the shotcrete thickness. Wet joint surfaces before shooting adjacent sections.

Repair surface defects as soon as possible after shooting. Remove any shotcrete which lacks uniformity, exhibits segregation, honeycombing or lamination or contains any voids or sand pockets and replace with fresh shotcrete to the satisfaction of the Engineer. Protect shotcrete from freezing and rain until shotcrete reaches initial set.

(E) Construction Records

Provide 2 copies of soil nail wall construction records within 24 hours of completing each lift. Include the following in construction records:

(1) Names of Soil Nail Wall Contractor, Superintendent, Nozzleman, Drill Rig Operator, Project Manager and Design Engineer;

(2) Wall description, county, Department's contract, TIP and WBS element number;

(3) Wall station and number and lift location, dimensions, elevations and description;

(4) Nail locations, dimensions and inclinations, bar types, sizes and grades and temporary casing information;

(5) Date and time drilling begins and ends, steel bars are inserted into drill holes, grout and shotcrete are mixed and arrives on-site and grout placement and shotcrete application begins and ends;

(6) Grout volume, temperature, flow and density records;

(7) Ground and surface water conditions and elevations if applicable;

(8) Weather conditions including air temperature at time of grout placement and shotcrete application; and

(9) All other pertinent details related to soil nail wall construction.

After completing each soil nail wall or stage of a wall, provide a PDF file of all corresponding construction records.

Nail Testing

"Proof tests" are performed on nails incorporated into walls, i.e., production nails. Define "test nail" as a nail tested with a proof test. Proof tests are typically required for at least one nail per nail row per soil nail wall or at least 5% of production nails, whichever is greater. More or less test nails may be required depending on subsurface conditions encountered. The Engineer will determine the number and locations of proof tests required. Do not test nails until grout and shotcrete attain the required 3 day compressive strength.

(A) Test Equipment

Use the following equipment to test nails:

(1) Two dial gauges with rigid supports,

(2) Hydraulic jack and pressure gauge and

(3) Jacking block or reaction frame.

Provide dial gauges with enough range and precision to measure the maximum test nail movement to 0.001". Use pressure gauges graduated in 100 psi increments or less. Submit identification numbers and calibration records for load cells, jacks and pressure gauges with the soil nail wall design. Calibrate each jack and pressure gauge as a unit.

Align test equipment to uniformly and evenly load test nails. Use a jacking block or reaction frame that does not damage or contact shotcrete within 3 ft of nail heads. Place dial gauges opposite each other on either side of test nails and align gauges within 5° of

bar inclinations. Set up test equipment so resetting or repositioning equipment during nail testing is not needed.

(B) Test Nails

Test nails include both unbonded and bond lengths. Grout only bond lengths before nail testing. Provide unbonded and bond lengths of at least 3 ft and 10 ft, respectively.

Steel bars for production nails may be overstressed under higher test nail loads. If necessary, use larger size or higher grade bars with more capacity for test nails instead of shortening bond lengths to less than the minimum required.

(C) Proof Tests

Determine maximum bond length (L_B) using the following:

$$L_B \leq (C_{RT} \times A_t \times f_y) / (Q_{ALL} \times 1.5)$$

Where,

L_B = bond length (ft),
C_{RT} = reduction coefficient, 0.9 for Grade 60 and 75 bars or 0.8 for Grade 150 bars,
A_t = bar area (in^2),
f_y = bar yield stress (ksi) and
Q_{ALL} = allowable unit grout/ground bond strength (kips/ft).

Determine design test load (DTL) based on as-built bond length and allowable unit grout/ground bond strength using the following:

$$DTL = L_B \times Q_{ALL}$$

Where,

DTL = design test load (kips).

Perform proof tests by incrementally loading nails to failure or a load of 150% of DTL based on the following schedule:

Load	Hold Time
AL*	Until movement stabilizes
0.25 DTL	Until movement stabilizes
0.50 DTL	Until movement stabilizes
0.75 DTL	Until movement stabilizes
1.00 DTL	Until movement stabilizes
1.25 DTL	Until movement stabilizes
1.50 DTL	10 or 60 minutes (creep test)
AL*	1 minute

* Alignment load (AL) is the minimum load needed to align test equipment and should not exceed 0.05 DTL.

Reset dial gauges to zero after applying alignment load. Record test nail movement at each load increment and monitor test nails for creep at the 1.5 DTL load increment. Measure and record movement during creep test at 1, 2, 3, 5, 6 and 10 minutes. If test nail movement between 1 and 10 minutes is greater than 0.04", maintain the 1.5 DTL load increment for

an additional 50 minutes and record movement at 20, 30, 50 and 60 minutes. Repump jack as needed to maintain load during hold times.

(D) Test Nail Acceptance

Submit 2 copies of test nail records including load versus movement and time versus creep movement plots within 24 hours of completing each proof test. The Engineer will review the test nail records to determine if test nails are acceptable. Test nail acceptance is based in part on the following criteria.

(1) Total movement during creep test is less than 0.04" between the 1 and 10 minute readings or less than 0.08" between the 6 and 60 minute readings and creep rate is linear or decreasing throughout hold time.

(2) Total movement at maximum load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(3) Pullout failure does not occur at or before the 1.5 DTL load increment. Define "pullout failure" as the inability to increase load while movement continues. Record pullout failure load as part of test nail data.

Maintain stability of unbonded lengths for subsequent grouting. If a test nail is accepted but the unbonded length cannot be satisfactorily grouted, do not incorporate the test nail into the soil nail wall and add another production nail to replace the test nail.

If the Engineer determines a test nail is unacceptable, either perform additional proof tests on adjacent production nails or revise the soil nail design or installation methods for the production nails represented by the unacceptable test nail as determined by the Engineer. Submit a revised soil nail wall design for acceptance, provide an acceptable test nail with the revised design or installation methods and install additional production nails for the nails represented by the unacceptable test nail.

After completing nail testing for each soil nail wall or stage of a wall, provide a PDF file of all corresponding test nail records.

Measurement and Payment

Temporary soil nail walls will be measured and paid in square feet. Temporary soil nail walls will be paid for at the contract unit price for *Temporary Shoring*. Temporary soil nail walls will be measured as the square feet of exposed wall face area. No measurement will be made for any embedment or pavement thickness above soil nail walls.

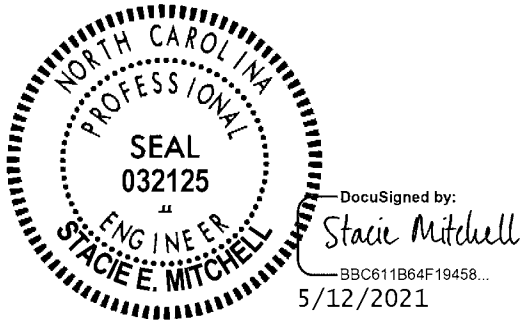
The contract unit price for *Temporary Shoring* will be full compensation for providing soil nail wall designs, submittals, labor, tools, equipment and soil nail wall materials, excavating, hauling and removing excavated materials, installing and testing soil nails, grouting, shotcreting and supplying drain strips and any incidentals necessary to construct soil nail walls. No additional payment will be made and no extension of completion date or time will be allowed for repairing property damage, overexcavations or unstable excavations, unacceptable test nails or thicker shotcrete.

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 *Standard Specifications*. No additional payment will be made for anchoring PCB for soil nail walls. Costs for anchoring PCB will be incidental to soil nail walls.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *Standard Specifications*.



MECHANICALLY STABILIZED EARTH RETAINING WALLS (1-16-18)

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 and pile sleeves 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 MSE wall terms as follows:
Geosynthetic or *Geogrid Reinforcement* – Polyester Type (PET), HDPE or Polypropylene (PP) geogrid reinforcement,
Geogrid – PET, HDPE or PP geogrid,
Reinforcement – Steel or geogrid reinforcement,
Aggregate – Coarse or fine aggregate,
Panel – Precast concrete panel,
Coping – Precast or CIP concrete coping,
MSE Wall – Mechanically stabilized earth retaining wall,
MSE Wall Vendor – Vendor supplying the chosen MSE wall system,
MSE Panel Wall – MSE wall with panels,
MSE Segmental Wall – MSE wall with segmental retaining wall (SRW) units and
Abutment Wall – 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).

For bridge approach fills behind end bents with MSE abutment walls, design reinforcement connected to end bent caps in accordance with the plans and this provision. Construct Type III Reinforced Bridge Approach Fills in accordance with the *Bridge Approach Fills* provision and Roadway Detail Drawing No. 422D10.

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
Corrugated Steel Pipe	1032-3

Epoxy, Type 3A	1081
Geosynthetics	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
Select Material, Class V	1016
Shoulder Drain Materials	816-2
Steel Pipe	1036-4(A)

Use galvanized corrugated steel pipe with a zinc coating weight of 2 oz/sf (G200) for pile sleeves. Provide Type 2 geotextile for filtration and separation geotextiles. Use Class A concrete for CIP coping, leveling concrete and pads. Use galvanized steel pipe, threaded rods and nuts for the PET geogrid reinforcement vertical obstruction detail. Provide galvanized Grade 36 anchor rods and Grade A hex nuts that meet AASHTO M 314 for threaded rods and nuts.

Use panels and SRW units from producers approved by the Department and licensed by the MSE Wall Vendor. Provide steel strip connectors embedded in panels fabricated from structural steel that meets the requirements for steel strip reinforcement. 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 geotextiles and geogrids 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 and 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 pH REQUIREMENTS

Aggregate Type (in reinforced zone)	Reinforcement or Connector Material	pH
Coarse or Fine	Steel	5 – 10
Coarse or Fine	PET	5 – 8
Coarse or Fine	Polyolefin (HDPE or Polypropylene)	4.5 – 9

AGGREGATE CHEMICAL REQUIREMENTS
(Steel Reinforcement/Connector Materials Only)

Aggregate Type (in reinforced zone)	Resistivity	Chlorides	Sulfates
Coarse	$\geq$ 5,000 Ω · cm	$\leq$ 100 ppm	$\leq$ 200 ppm
Fine	$\geq$ 3,000 Ω · cm		

Use aggregate from sources participating in the Department's Aggregate QC/QA Program as described in Section 1006 of the *Standard Specifications*. Sample and test aggregate in accordance with the *Mechanically Stabilized Earth Wall Aggregate Sampling and Testing Procedures*. Electrochemical testing is only required for coarse aggregate from sources in the Coastal Plain as defined by Subarticle 1018-2(B)(1).

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 steel strip reinforcement ("straps") that meet ASTM A572, A1011 or A463. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip reinforcement. Galvanize steel reinforcement in accordance with Section 1076 of the *Standard Specifications* or provide aluminized steel strip reinforcement that meet ASTM A463, Type 2-100.

2. Geosynthetic Reinforcement

Use HDPE or PP geogrid for geogrid reinforcement connected to backwalls of end bent caps. Use PET or HDPE geogrid for geogrid reinforcement connected to SRW units and only HDPE geogrid for geogrid reinforcement connected to panels.

Define machine direction (MD) and cross-machine direction (CD) for geogrids per Article 1056-3 of the *Standard Specifications*. Provide Type 1 material certifications and identify geogrid reinforcement in accordance with Article 1056-3 of the *Standard Specifications*.

Provide extruded geogrids manufactured from punched and drawn polypropylene sheets for PP geogrids that meet the following:

PP GEOGRID REQUIREMENTS

Property	Requirement[1]	Test Method
Aperture Dimensions[2]	1" x 1.2"	N/A
Minimum Rib Thickness[2]	0.07" x 0.07"	N/A
Tensile Strength @ 2% Strain[2]	580 lb/ft x 690 lb/ft	ASTM D6637, Method A
Tensile Strength @ 5% Strain[2]	1,200 lb/ft x 1,370 lb/ft	
Ultimate Tensile Strength[2]	1,850 lb/ft x 2,050 lb/ft	
Junction Efficiency[3] (MD)	93%	ASTM D7737
Flexural Rigidity[4]	2,000,000 mg–cm	ASTM D7748
Aperture Stability Modulus[5]	0.55 lb–ft/degrees	ASTM D7864
UV Stability (Retained Strength)	100% (after 500 hr of exposure)	ASTM D4355

1. MARV per Article 1056-3 of the *Standard Specifications* except dimensions and thickness are nominal.
2. Requirement for MD x CD.
3. Junction Efficiency (%) = (Average Junction Strength ($X_{j_{ave}}$) / Ultimate Tensile Strength in the MD from ASTM D6637, Method A) × 100.
4. Test specimens two ribs wide, with transverse ribs cut flush with exterior edges of longitudinal ribs, and sufficiently long to enable measurement of the overhang dimension.
5. Applied moment of 17.7 lb–inch (torque increment).

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) except durometer hardness for rubber pads may be 60 or 80 ± 5 and density testing for HDPE pads may be in accordance with ASTM D1505 or D792. 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 ≤ 30 sf	1/2"

30 sf < A ≤ 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 PDF files of working drawings and design calculations at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Segmental Wall Design Consultant to design MSE segmental walls. Provide MSE segmental wall designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Segmental Wall Design Consultant. Provide MSE panel wall designs sealed by a Design Engineer licensed in the state of North Carolina and employed or contracted by the MSE Wall Vendor.

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*. Connect reinforcement to panels or SRW units with methods or devices approved for the chosen system. 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. If an MSE wall system with geogrid reinforcement includes any steel parts for obstructions, bin walls, connections or other components, design steel exposed to aggregate for the design life noted in the plans and aggregate type in the reinforced zone. Use "loss of galvanizing" metal loss rates for nonaggressive backfill in accordance with the AASHTO LRFD specifications for galvanized and aluminized steel and metal loss rates for carbon steel in accordance with the following:

CARBON STEEL CORROSION RATES

Aggregate Type (in reinforced zone)	Carbon Steel Loss Rate (after coating depletion)
Coarse	0.47 mil/year
Fine (except abutment walls)	0.58 mil/year
Fine (abutment walls)	0.70 mil/year

For PET or HDPE geogrid reinforcement and geosynthetic connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone. For geogrid reinforcement connected to end bent caps, embed geosynthetic reinforcement or connectors in caps as shown in the plans. For PP geogrid reinforcement connected to end bent caps, use the following design parameters for the aggregate type in the reinforced approach fill.

PP GEOGRID REINFORCEMENT DESIGN PARAMETERS

Aggregate Type (in reinforced zone)	T_{al} (MD)	F*	α	ρ
Coarse	400 lb/ft	0.70	0.8	32.0°
Fine	428 lb/ft	0.54	0.8	28.35°

Where,

T_{al} = long-term design strength (LTDS),
F* = pullout resistance factor,
α = scale effect correction factor and
ρ = soil-geogrid friction angle.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 psf 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:

$$\phi\, T_{al}\, R_c \geq T_{max} + (T_l / RF_{CR})$$

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.

When shown in the plans for abutment walls, use pile sleeves to segregate piles from aggregate in the reinforced zone. 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. Design reinforcement for obstructions and locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations. Modify PET geogrid reinforcement for obstructions as shown in the plans.

Use 6" thick CIP 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 Roadway Standard Drawing No. 816.02.

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
$A \leq 30$ sf	25 ft	2
	35 ft[1]	3
30 sf $< A \leq 75$ 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 CIP concrete for MSE panel walls unless CIP coping is required as shown in the plans,
3. CIP concrete coping for MSE segmental walls and
4. At the Contractor's option and when shown in the plans, CIP 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 CIP 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, pile sleeves, 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, curved MSE walls with tight (short) radii 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 14.96 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, Area 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, an MSE Wall Vendor representative is required 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 and if required, pile sleeves 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 CIP 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. Before placing aggregate, pull geogrid reinforcement taut so it is in tension and 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 geogrids 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*. If pile sleeves are required, fill sleeves with loose uncompacted sand before constructing end bent caps.

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 CIP concrete coping in accordance with Subarticle 452-4(B) 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. If the gap between a single faced barrier and wall face is wider than 2", fill gap with Class V select material (standard size No. 78M stone). Otherwise, fill gap with backer rod and seal joint between barrier and MSE wall with silicone sealant.

When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold 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 and connector design for reinforcement connected to end bent caps, wall modifications for obstructions, pile sleeves filled with sand, joints sealed with silicone sealant and gaps between barriers and MSE walls filled with backer rod or No. 78M stone, 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. The contract unit price for *MSE Retaining Wall No. __* also does not include the cost for constructing bridge approach fills behind end bents with MSE abutment walls. See *Bridge Approach Fills* provision for measurement and payment of Type III Reinforced Bridge Approach Fills.

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

ARCHITECTURAL CONCRETE SURFACE TREATMENT (SPECIAL)

1.0 GENERAL

The work covered by this special provision consists of constructing textured surfaces on formed reinforced concrete surfaces as indicated on the Plans and in this Special Provision. The Contractor shall furnish all materials, labor, equipment, and incidentals necessary for the construction of architectural concrete surface treatment using simulated stone masonry form liners (molds) and a compatible concrete coloring system.

The architectural concrete surface treatment should match the appearance (stone size and shape, stone color, and stone texture, pattern, and relief) of natural stone and rock as directed by the Engineer. Grout pattern joints (mortar joints) and bed thickness should re-create the appearance and color of precast concrete surfaces as indicated in the Plans, this Special Provision, or as directed by the Engineer.

This special provision also consists of providing Segmental Retaining Wall (SRW) units with simulated stone and color consistent with the architectural surface treatment of precast panels on the same project.

2.0 SUBMITTALS

Shop Drawings - Submit for review and acceptance, a PDF file for plan and elevation views and details showing overall simulated stone pattern, joint locations and end, edge or other special conditions. The drawings should include typical cross sections of applicable surfaces, joints, corners, stone relief, stone size, pitch/working line, mortar joint and bed depths. For SRW units, provide drawing details for simulated stone and color. If necessary, revise the shop drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. The PDF file of shop drawings should be 22 inch x 34 inch in size and have enough resolution to show the details of all stone and joints patterns as well as overall appearance.

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall minimize construction joint lines. The top of wall must have untreated, non-textured, and uncolored areas within the distance from the top of wall to the bottom of the coping.

Shop drawings shall be reviewed and accepted prior to fabrication of form liners.

Sample Panels – After the shop drawings have been reviewed and accepted by the Engineer, submit a precast sample panel to the project site. The sample panel shall be transportable and minimum 4 foot x 4 foot in size. The materials used in construction of the sample panel shall comply with section 420 of the Standard Specifications. The sample panel shall be constructed using approved form liners and color system/stains. The sample panel can be colored on the project site in accordance with this provision. Any sample panel that is not accepted by the Engineer is to be removed from the project site and a new sample panel produced at no additional expense to the Department.

After the color, texture, and uniformity of the furnished samples are approved, produce a full scale unit meeting the design requirements. This mock-up and the furnished samples establish the standard quality for determining the acceptance of the panels.

If SRW units are used, a sample blocks showing the specified pattern shall be furnished.

Architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the accepted sample panels and/or SRW units. Upon acceptance by the Engineer, the sample panels and/or SRW units shall be used as the quality standard for the project. After the acceptance of the completed structure, dispose of the sample panels and/or SRW units as directed by the Engineer.

3.0 MATERIALS REQUIREMENTS

Form Liner – The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The architectural concrete surface treatment shall match the appearance (stone size and shape, stone texture, pattern, relief and joint) of natural stone to resemble a dry stack stone pattern or approved equal. All texture shall be in addition to the nominal thickness of the wall panels of four inches ±¼ inch. The maximum relief of the textured surface shall be 1.5 inch or less. The top 1'-0" of the top panel within each retaining wall segment shall have a smooth, non-textured and non-stained finish to resemble faux coping. For information purposes only, sources of form liners in the dry stack stone pattern include, but are not limited to:

Custom Rock Formliner
2020 West 7th Street
St. Paul, MN 55116
http://www.customrock.com

Architectural Polymers, Inc.
1220 Little Gap Road
Palmerton, PA 18071
http://www.apformliner.com/

Fitzgerald Form Liners
1500 East Chestnut Avenue
Santa Ana, CA 92701
http://formliners.com/

The contractor has the option of supplying an alternative pattern of simulated stone form liner, as long as the pattern selected is approved, in writing, as an equal or approved alternative by the Engineer.

Form Release Agent – Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product. Form release agents shall be compatible with the color system applied and any special surface finish.

SRW Unit - Use approved SRW units for standard block walls to match the appearance (stone size and shape, stone texture, pattern, relief and joint) of natural stone to resemble a dry stack stone pattern or approved equal. The list of approved SRW units is available from the Geotechnical web site.

Concrete color system/stain – The final coloration of the wall is to match the Grey Palette Color # FS 36270 found in the *Federal Standard 595B - Colors Used in Government Procurement*. Stain the sample panel using the proposed colors and the approved sample panel shall be the basis for determining the appropriate color/stain application.

The concrete color stains shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight, or weathering. Stain mix shall meet the requirements for mildew resistance of Federal Test Method Standard 144, Method 6271, and requirements for weathering resistance of 1,000 hours accelerated exposure measures by Weatherometer in accordance with ASTM G 26. Color samples must be submitted for approval.

Anti-Graffiti Coating Application – Apply the anti-graffiti coating that is compatible with the concrete color system/stain. After application, the anti-graffiti coating shall be dry to touch within one hour and shall achieve a final cure within three hours. The color of the anti-graffiti shall be clear after full cure. The contractor shall provide one gallon of graffiti remover, thinners, dryers and all necessary components recommended by the manufacturer to the North Carolina Department of Transportation Materials and Test Unit, Chemical Testing Engineer.

Quality Standards - Manufacturer of simulated stone masonry form liners and custom coloring system shall have at least five years of experience making stone masonry molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors.

After the Engineer has reviewed and approved the shop drawings, schedule a preconstruction conference with manufacturer representative and the Engineer to assure understanding of simulated stone masonry form liner use, color application, requirements for construction of sample panels, and to coordinate the work. Disclose the source of simulated stone masonry manufacturer and final coloration contractor at the Preconstruction Conference.

4.0 CONSTRUCTION METHODS

Form Liner Preparation – Before each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be accepted by the Engineer before being used. Form liner panels that do not perform as

intended or are no longer repairable shall be replaced. Use a technical representative from the form liner manufacturer for technical supervision during the installation and removal of form liners.

Form Release Agent – Form release agent shall be applied in accordance with the manufacturer's recommendations. The material shall be compatible with the form liner material and the concrete coloring system and in accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

Patching – All form tie holes and other defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal. Use patching materials and procedures in accordance with the manufacturer's recommendations.

Surface Finish – All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Pressure washing with water is the preferred method of removing latencies. Sandblasting will not be permitted.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption.

Reinforced concrete shall be finished in accordance with the Standard Specifications, except that curing of concrete should be done to accommodate the application of coloring and surface finish treatment.

Grout Pattern Joints – Grout pattern joints shall be constructed to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

Color/Stain Application – Maintain the concrete temperature between 40°F and 85°F during color/stain application and for 48 hours after color/stain application. Consult the manufacturer's recommendations for preparation, application, curing, and storage of coloring agents/stains. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Anti-Graffiti Coating Application – The anti-graffiti coating shall be applied by brush, roller or airless spray when the ambient temperature is between 40°F and 90°F, and the surface temperature is between 50° F and 100° F. Ensure the surface is clean and dry before applying the anti-graffiti coating. The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

Experience and Qualifications - The Contractor shall have a minimum of three consecutive years of experience in architectural concrete surface treatment construction on similar types of projects. A minimum of 10 days prior to the submission of shop drawings, furnish to the Engineer 5 references who were responsible for supervision of similar

projects and will testify to the successful completion of these projects. Include name, address, telephone number, and specific type of application.

5.0 MEASUREMENT AND PAYMENT

The quantity of architectural concrete surface treatment to be paid for will be the actual number of square feet of architectural concrete surface treatment that has been incorporated into the completed and accepted work.

The area of architectural concrete surface treatment will be measured by the area of front facing in place treated concrete panels and/or SRW units. Do not include the top surfaces and the end wall surfaces in the measurement. Area of sample panels and/or SRW units shall not be included in the measurement of architectural concrete surface treatment.

The area of architectural concrete surface treatment for MSE walls with SRW units will use the pay height equal to the difference between top of wall and top of leveling pad. Define "top of wall" as top of cap blocks.

6.0 BASIS OF PAYMENT

Architectural concrete surface treatment as described on the plans and in this Special Provision will be paid for at the contract unit price bid for "Architectural Concrete Surface Treatment". The above 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 shall include, but not be limited to, furnishing all labor, materials, equipment, and other incidentals, including sample panels and/or sample SRW units, necessary to complete this work.

Payment will be made under:

Architectural Concrete Surface Treatment.....Square Feet

ROCK EMBANKMENTS: **(SPECIAL)**

Description

Construct rock embankments in accordance with the contract. Rock embankments are required to construct embankments in water at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextile for Rock Embankments, Type 2	1056
Rip Rap Materials	1042
Select Materials	1016

Provide Type 2 geotextile for filtration geotextiles. Use Class II Rip Rap for rock embankments. Use Class VI select material (standard size No. 57) for core material and Class A rip rap and No. 57 stone to fill voids in rock embankments. Obtain aggregates from sources participating in the Department's Aggregate QC/QA Program in accordance with Section 1006 of the *Standard Specifications* or use similar size onsite material approved by the engineer.

Construction Methods

Construct rock embankments in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. Place Class II so smaller rocks are uniformly distributed throughout rock embankments. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments. When placing Class II in lifts, place core material to top of the current lift before placing the next lift of Class II.

Before placing embankment fill material or filtration geotextiles over rock embankments, fill voids in the top of rock embankments with Class A rip rap and No. 57 stone. Place and compact Class A rip rap. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install filtration geotextiles on top of Class II, rip rap and No. 57 stone in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

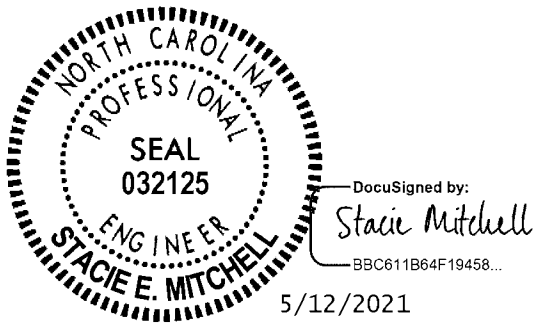
Measurement and Payment

Rock Embankments, *Rip Rap, Class A* and *#57 Stone* will be measured and paid in tons. Select material and rip rap will be measured by weighing material and rip rap in trucks in accordance with Article 106-7 of the *Standard Specifications*. The contract unit prices for *Rock Embankments*, *Rip Rap, Class A* and *#57 Stone* will be full compensation for providing, hauling, handling, placing, compacting and maintaining select material and rip rap.

Geotextile for Rock Embankments will be measured and paid in square yards. Geotextiles will be measured along the top of rock embankments as the square yards of exposed geotextiles before placing embankment fill material. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Rock Embankments* will be full compensation for providing, transporting and installing geotextiles.

Payment will be made under:

Pay Item	**Pay Unit**
Rock Embankments	Ton
Rip Rap, Class A	Ton
#57 Stone	Ton
Geotextile for Rock Embankments	Square Yard



PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (4/6/2021)

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 contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas, sample locations, 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", "I-5986B", "Individual Sheets/520 GeoEnvironmental":

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 areas shown on the plans, 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 transport all contaminated soil excavated from the project to a facility licensed to accept contaminated soil.

In the event that a stockpile is needed, the stockpile shall be created within the property boundaries of the source material and in accordance with the Diagram for Temporary Containment and Treatment of Petroleum-Contaminated Soil per North Carolina Department of Environmental Quality's (NCDEQ) Division of Waste Management UST Section GUIDELINES FOR EX SITU PETROLEUM CONTAMINATED SOIL REMEDIATION. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDEQ UST Section's Regional Office for off-site temporary storage. The Contractor shall provide copies of disposal manifests completed per the disposal facilities requirements and weigh tickets to the Engineer.

Measurement and Payment:

The quantity of contaminated soil hauled and disposed of shall be the actual number of tons of material, which has been acceptably transported and weighed with certified scales as documented by disposal manifests and weigh tickets. The quantity of contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Hauling and Disposal of Petroleum Contaminated Soil".

The above price and payment shall be full compensation for all work covered by this section, including, but not limited to stockpiling, loading, transportation, weighing, laboratory testing, disposal, equipment, decontamination of equipment, labor, and personal protective equipment.

Payment shall be made under:

Pay Item	Pay Unit
Hauling and Disposal of Petroleum Contaminated Soil	Ton

NORTH CAROLINA PROFESSIONAL SEAL 036892 ENGINEER Ethan J. Caldwell

DocuSigned by:
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4/6/2021

PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (4/6/2021)

The Contractor's attention is directed to the fact that soil contaminated with petroleum hydrocarbon compounds may exist within the project area. The potential areas of contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas, sample locations, 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", "I-5883", "Individual Sheets/520 GeoEnvironmental":

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 areas shown on the plans, 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 transport all contaminated soil excavated from the project to a facility licensed to accept contaminated soil.

In the event that a stockpile is needed, the stockpile shall be created within the property boundaries of the source material and in accordance with the Diagram for Temporary Containment and Treatment of Petroleum-Contaminated Soil per North Carolina Department of Environmental Quality's (NCDEQ) Division of Waste Management UST Section GUIDELINES FOR EX SITU PETROLEUM CONTAMINATED SOIL REMEDIATION. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDEQ UST Section's Regional Office for off-site temporary storage. The Contractor shall provide copies of disposal manifests completed per the disposal facilities requirements and weigh tickets to the Engineer.

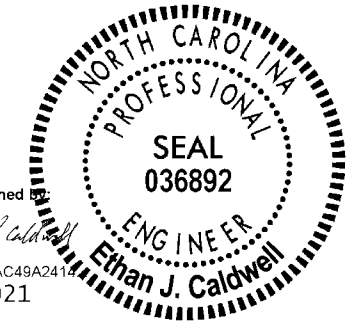
Measurement and Payment:

The quantity of contaminated soil hauled and disposed of shall be the actual number of tons of material, which has been acceptably transported and weighed with certified scales as documented by disposal manifests and weigh tickets. The quantity of contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Hauling and Disposal of Petroleum Contaminated Soil".

The above price and payment shall be full compensation for all work covered by this section, including, but not limited to stockpiling, loading, transportation, weighing, laboratory testing, disposal, equipment, decontamination of equipment, labor, and personal protective equipment.

Payment shall be made under:

Pay Item	Pay Unit
Hauling and Disposal of Petroleum Contaminated Soil	Ton



PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (5/17/2021)

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 contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas, sample locations, 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", "I-5878", "Individual Sheets/520 GeoEnvironmental":

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 transport all contaminated soil excavated from the project to a facility licensed to accept contaminated soil.

In the event that a stockpile is needed, the stockpile shall be created within the property boundaries of the source material and in accordance with the Diagram for Temporary Containment and Treatment of Petroleum-Contaminated Soil per North Carolina Department of Environmental Quality's Division of Waste Management UST Section GUIDELINES FOR EX SITU PETROLEUM CONTAMINATED SOIL REMEDIATION. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDEQ UST Section's Regional Office for off-site temporary storage. The Contractor shall provide copies of disposal manifests completed per the disposal facilities requirements and weigh tickets to the Engineer.

If groundwater is encountered and dewatering is required in areas of known contamination, then the contractor shall containerize the groundwater in vessels provided by the Department. The Department will be responsible for the sampling and disposal of the water. Handling contaminated ground water will be incidental to the project.

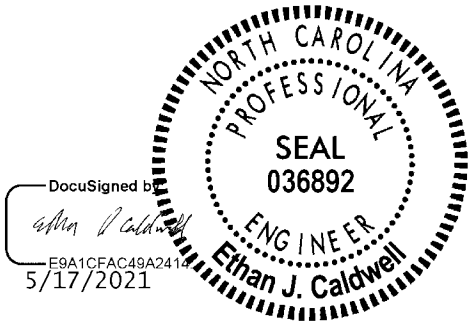
Measurement and Payment:

The quantity of contaminated soil hauled and disposed of shall be the actual number of tons of material, which has been acceptably transported and weighed with certified scales as documented by disposal manifests and weigh tickets. The quantity of contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Hauling and Disposal of Petroleum Contaminated Soil".

The above price and payment shall be full compensation for all work covered by this section, including, but not limited to stockpiling, loading, transportation, weighing, laboratory testing, disposal, equipment, decontamination of equipment, labor, and personal protective equipment.

Payment shall be made under:

Pay Item	**Pay Unit**
Hauling and Disposal of Petroleum Contaminated Soil	Ton



SPECIAL SEALED DRAINAGE SYSTEM (4/28/2020)

A Special Sealed Drainage System has been designated on the plans as "Sealed" and in the Drainage Summary Sheet as "Sealed System". Most of the special sealed drainage system passes through areas of documented groundwater contamination and with invert elevations potentially below the groundwater table. The work covered by the Special Sealed Drainage System provision consists of constructing a special sealed system of underground storm drainage pipes and structures. The extents of the Special Sealed Drainage System shall be adhered to as shown on the plans and drainage summary sheets, or as directed by the Engineer.

No underdrains will be allowed for any reason within the extents of the Special Sealed Drainage System, as referenced above.

Materials

Ductile Iron Pipe shall be Type 3, Pressure Classes 150 & 250 (as shown on the Drainage Summary Sheets) and shall conform to ANSI A21.51-17 (AWWA C151), Grade 60-42-10 for ductile iron pipe centrifugally cast in metal molds or sand lined molds. All ductile iron pipe shall conform to ANSI A21.50 (AWWA C150) for thickness design and shall be supplied in 18- or 20-foot nominal lengths, unless otherwise indicated on the Drawings. Fittings and specials shall be cast iron or ductile iron, conforming to the requirements of ANSI A21.10 (AWWA C110) and shall have a minimum rated working pressure of 250 psi, and minimum iron strength of 30,000 psi. Joints shall be a push on type conforming to ANSI A21.11 (AWWA C111), unless otherwise specified or shown on the Drawings.

Drainage Structures shall be precast concrete conforming to ASTM C478. Joints between sections shall conform to ASTM C443 and shall be sealed with O-Ring gaskets. O-Ring gaskets shall be made of material resistant to the contaminants identified in the Phase 2 investigation and shall be approved for use with precast drainage structure sections.

Connection of pipe to drainage structure shall be by a flexible, resilient connector conforming to ASTM C923. The drainage structure to pipe connector shall be made of material resistant to the contaminants identified in the Phase 2 investigation.

Non shrink cement grout shall be used in precast drainage structures per the requirements of Article 1040-9 of the *Standard Specifications.*

The Contractor shall submit to the Engineer catalog cuts and/or shop drawings for materials proposed to be used on the project. Allow 40 days for the review of each submittal.

Materials which have not been approved shall not be delivered to the project. Eight (8) copies of each catalog cut and/or drawing shall be submitted and each shall show the material description,

brand name, stock number, size, rating, manufacturing specification and the use for which it is intended.

The Engineer shall approve all backfill material.

Construction Methods

Installation of the sealed drainage system pipe and drainage structures shall meet the requirements of Section 300 and Section 1505 of the *Standard Specifications*.

All materials shall be carefully examined for defects before placing, and any defective materials shall be replaced. As the work progresses, the interior of the pipe shall be cleared of all foreign materials. Obtain approval by the Engineer prior to any cleaning or flushing activities. Any pipeline or drainage structure that contains silt, sedimentation, or other foreign material shall be flushed or otherwise cleaned out of the line and drainage structures. If it is determined by the Engineer to be contaminated, the material shall be handled and disposed of in a manner approved of by the Engineer.

Trenches shall be kept free from water until backfilled and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work. Handling of contaminated groundwater removed from the excavation and handling of excavated contaminated soil, including any soil that is excavated from below the groundwater table within an area indicated to have groundwater contamination, shall be governed by Special Provision GV-1A, GV-1B, and GV-1C.

Gasket joints for pipe and drainage structures shall be installed in accordance with the recommendations of the manufacturer.

Sealed Drainage System Testing

The sealed drainage system shall be tested in accordance with Article 1520-3 of the *Standard Specifications* for Gravity Sanitary Sewer. Both infiltration and exfiltration tests will be required. For the exfiltration test, the system shall be plugged and filled to the rim of the drainage structure as directed by the Engineer.

Measurement and Payment

Trenching, excavation and backfilling for Special Sealed Drainage System will be considered as included in the contract price for the applicable pay item and no separate measurement will be made, therefore. Such work as shoring, sheeting and dewatering of the excavation will also be considered as incidental to the contract price for the applicable pay item and no separate measurement will be made.

___" *Ductile Iron Pipe* for the sealed drainage system will be measured and paid at the contract unit price per linear foot. The quantity of sealed drainage system lines of the various sizes, which has been incorporated into the completed and accepted work, will be measured from end to end by the linear foot in place with no deduction for length through drainage structures. Where two different sizes enter or exit a drainage structure, each size will be measured to the center of the

drainage structure. Unless otherwise shown on the plans, branch connections, ells, or other fixtures will be included in the length measurement.

Sealed Precast Drainage Structures containing a maximum pipe size of 48" will be measured and paid for in units of each. The quantity of drainage structures containing a maximum pipe size of 48" for the sealed drainage system to be paid for will be actual volume of drainage structures which have been completed and accepted.

In addition, the quantity of drainage structures with a maximum pipe size of 48" above a height of 5 feet to be paid for will be the number of vertical linear feet in which the height of the drainage structure exceeds 5 feet. The height will be measured vertically to the nearest 0.1-feet from the top of the bottom slab to the top of the wall.

The quantity of drainage structures with a maximum pipe size of 48" measured as provided above and accepted will be paid for at the contract unit price per each for the various diameters and at the contract unit price per vertical linear foot of depth for that portion of the drainage structure from a height of 5 feet to 10 feet. For that portion of the drainage structure above a height of 10 feet, payment will be made at 1.3 times the contract unit price per vertical linear foot.

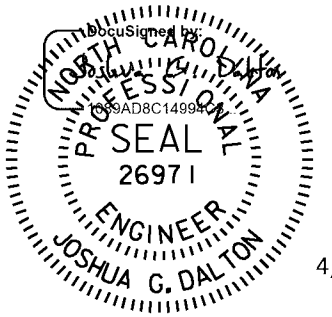
Sealed Precast Drainage Structures containing a minimum pipe size of 54" will be measured on a "cubic yard" basis. The quantity of drainage structures containing a minimum pipe size of 54" for the Special Sealed Drainage System to be paid for will be cubic yards for the actual volume of drainage structures which have been completed and accepted.

Foundation conditioning material will be paid for as stated in Article 300-9 of the Standard Specifications.

Such prices and payments will be full compensation for all work covered by these special provisions, including, but not limited to: materials, labor, equipment, backfilling, compaction, testing, pumping, O-Ring gaskets, pipe connectors, non-shrink cement grout, and incidentals necessary to complete the work as required.

Payment will be made under:

Pay Item	**Pay Unit**
16" Sealed Ductile Iron Pipe Class 250	Linear Foot
18" Sealed Ductile Iron Pipe Class 250	Linear Foot
36" Sealed Ductile Iron Pipe Class 150	Linear Foot
60" Sealed Ductile Iron Pipe Class 150	Linear Foot
Sealed Precast Drainage Structure	Each
Sealed Precast Drainage Structure	Linear Foot
Sealed Precast Drainage Structure	CY



NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS:

(07-23-19)

DESCRIPTION

Furnish, install, and maintain non-cast iron snowplowable pavement markers in accordance with the contract.

MATERIALS

Revise the *2018 Standard Specifications* as follows:

Pages 10-177 and 10-178, Subarticle 1086-3 SNOWPLOWABLE PAVEMENT MARKERS, delete items (A), (B) and (C)(1) and replace with the following:

(A) General

Use non-cast iron snowplowable pavement markers evaluated by NTPEP. The non-cast iron snowplowable pavement marker shall consist of a housing with one or more glass or plastic face lens type reflective lenses to provide the required color designation. The marker shall be designed or installed in a manner that minimizes damage from snowplow blades. Plastic lens faces shall use an abrasion resistant coating.

(B) Housings

(1) Dimensions

The dimension, slope and minimum area of reflecting surface shall conform to dimensions as shown in the plans. The minimum area of each reflecting surface shall be 1.44 sq.in.

(2) Materials

Use non-cast iron snowplowable pavement markers that are on the NCDOT Approved Products List.

(3) Surface

The surface of the housing shall be free of scale, dirt, rust, oil, grease or any other contaminant which might reduce its bond to the epoxy adhesive.

(4) Identification

Mark the housing with the manufacturer's name and model number of marker.

(C) Reflectors

(1) General

Laminate the reflector to an elastomeric pad and attach with adhesive to the housing. The thickness of the elastomeric pad shall be 0.04".

Pages 12-14, Subarticle 1250-3(C) Removal of Existing Pavement Markers, lines 19-29, delete and replace with the following:

Remove the existing raised pavement markers or the snowplowable pavement markers including the housings, before overlaying an existing roadway with pavement. Repair the pavement by filling holes as directed by the Engineer.

When traffic patterns are changed in work zones due to construction or reconstruction, remove all raised pavement markers or snowplowable markers including housings that conflict with the new traffic pattern before switching traffic to the new traffic pattern. Lens removal in lieu of total housing removal is not an acceptable practice for snowplowable markers.

Properly dispose of the removed pavement markers. No direct payment will be made for removal or disposal of existing pavement markers or repair of pavement, as such work will be incidental to other items in the contract.

CONSTRUCTION METHODS

Pages 12-16 and 12-17, Subarticle 1253-3 CONSTRUCTION METHODS, delete items (A), (B) and (C) and replace with the following:

(A) General

Bond marker housings to the pavement with epoxy adhesive. Mechanically mix and dispense epoxy adhesives as required by the manufacturer's specifications. Place the markers immediately after the adhesive has been mixed and dispensed.

If saw cutting, milling, or grooving operations are used, promptly remove all resulting debris from the pavement surface. Install the marker housings within 7 calendar days after saw cutting, milling, or grooving the pavement. Remove and dispose of loose material from the slots by brushing, blow cleaning, or vacuuming. Dry the slots before applying the epoxy adhesive. Install non-cast iron snowplowable pavement markers according to the manufacturer's recommendations.

Protect the non-cast iron snowplowable pavement markers until the epoxy has initially cured and is track free.

(B) Reflector Replacement

In the event that a reflector is damaged, replace the damaged reflector by using adhesives and methods recommended by the manufacturer of the markers and approved by the Engineer. This work is considered incidental if damage occurs during the initial installation of the marker housings and maintenance of initial non-cast iron snowplowable markers specified in this section. This work will be paid for under the pay item for the type of reflector replacement if the damage occurred after the initial installation of the non-cast iron snowplowable pavement marker.

Missing housings shall be replaced. Broken housings shall be removed and replaced. In both cases the slot for the housings shall be properly prepared prior to installing the new housing. Removal of broken housings and preparation of slots will be considered incidental to the work of replacing housings.

MAINTENANCE

Maintain all installed non-cast iron snowplowable pavement markers until acceptance.

MEASUREMENT AND PAYMENT

Non-Cast Iron Snowplowable Pavement Markers will be measured and paid as the actual number of non-cast iron snowplowable pavement markers satisfactorily placed and accepted by the Engineer.

Payment will be made under:

Pay Item	Pay Unit
Non-Cast Iron Snowplowable Pavement Marker	Each

DocuSigned by:
Matthew V. Springer
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8/27/2020

POLYUREA PAVEMENT MARKING MEDIA AND THICKNESS:
(08-27-20)

Amend the *NCDOT 2018 Standard Specifications* as follows:

Page 12-8, Subarticle 1205-5(B), lines 14-16, replace with the following:

Produce polyurea pavement marking lines that have a minimum dry thickness of 20 mils above the pavement surface when placed on concrete and asphalt pavements. Produce polyurea pavement marking lines that have a minimum dry thickness of 30 mils above the pavement surface on textured surfaces such as OGFC and on surfaces where the polyurea will be placed over a previously removed pavement marking.

Page 12-9, replace **Table 1205-4 Minimum Reflectometer Requirement for Polyurea** with the following:

TABLE 1205-4
MINIMUM REFLECTOMETER REQUIREMENTS
FOR POLYUREA

Item	Color	Reflectivity
Standard Glass Beads	White	375 mcd/lux/m^2
	Yellow	250 mcd/lux/m^2

The installer may choose to use an AASHTO Type 4/Type 1 or AASHTO Type 3/Type 1 double drop system, but no price adjustment will be made, and these systems will be incidental to the polyurea pavement marking.

Pay Item	Pay Unit
Polyurea Pavement Marking Lines,___",_____mils (Standard Glass Beads)	Linear Foot

TC-1

I-5878/I-5883/I-5986B Harnett and Johnston Counties

WORK ZONE TRAFFIC CONTROL
Project Special Provisions
Table of Contents

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George Karageorge
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NORTH CAROLINA PROFESSIONAL SEAL 042065 ENGINEER GEORGE M. KARAGEORGE

6/17/2021

TC-2

ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES:
(10/31/2017)

Description

Furnish, install, and maintain all ADA compliant pedestrian traffic control devices for existing sidewalks that are disrupted, closed, or relocated by planned work activities.

The ADA compliant pedestrian traffic control devices used to either close, redirect, divert or detour pedestrian traffic are Pedestrian Channelizing Devices and Audible Warning Devices.

Construction Methods

The ADA compliant pedestrian traffic control devices involved in the closing or redirecting of pedestrians as designated on the Transportation Management Plan (TMP) shall be manufactured and assembled in accordance with the requirements of the Americans with Disabilities Act (ADA) and be on the NCDOT approved products list.

Pedestrian Channelizing Devices shall be manufactured and assembled to be connected as to eliminate any gaps that allow pedestrians to stray from the channelizing path. Any Pedestrian Channelizing Devices used to close or block a sidewalk shall have a "SIDEWALK CLOSED" sign affixed to it and any audible warning devices, if designated on the TMP.

Audible Warning Devices shall be manufactured to include a locator tone activated by a motion sensor and have the ability to program a message for a duration of at least 1 minute. The motion sensor shall have the ability to detect pedestrians a minimum of 10' away. The voice module may be automatic or it may be push button activated. If push button activated, it shall be at the appropriate height to meet the ADA regulations.

Measurement and Payment

Pedestrian Channelizing Devices will be measured and paid as the maximum number of linear feet of Pedestrian Channelizing Devices acceptably placed and in use at any one time during the life of the project. Measurement will be made of the total length of each Pedestrian Channelizing Device along one rail. Relocation, replacement, repair, maintenance or disposal of Pedestrian Channelizing Devices will be incidental to the work. The measurement and payment for the ADA Compliant Pedestrian Traffic Control Devices will be measured and paid on a per each basis for the Audible Warning Devices. The measurement and payment for the Pedestrian Channelizing Devices will be by the linear foot.

TC-3

Payment for each of these devices is dependent upon satisfactory installation and acceptance by the Engineer. The unit prices include any costs associated with installation, maintenance and removal of the devices from the project.

Payment will be made under:

Pay Item	**Pay Unit**
Pedestrian Channelizing Devices	Linear Foot
Audible Warning Devices	Each

TC-4

TEMPORARY GLARE SCREEN:
(02/06/2013)

Description

Furnish, install, maintain, and remove Temporary Glare Screen in accordance with the plans and specifications.

Materials

Provide Temporary Glare Screen which are modular units consisting of vertical blades and a horizontal base rail. Provide blades and base rails manufactured from durable high impact resistant, non-warping, and non-metallic material.

Provide blades that have nominal widths between 6 inches and 9 inches. Provide blades which are a minimum of 24 inches high and capable of being locked down at an angle and spacing to provide a continuous cut-off angle of not less than 22 degrees. Provide modular units with a maximum length of 10 feet.

Anchor the modular units to the barrier using either a mechanical or adhesive system with a minimum pullout and shear strength of 3000 lbs. Use galvanized mounting hardware in accordance with Section 1076 of the 2018 Standard Specifications. An acceptable alternate may be used if approved by the Engineer. Do not place Modular units over barrier connector between adjoining barrier sections.

Install yellow or crystal encapsulated lens (high performance) retro-reflective sheeting or microprismatic retro-reflective sheeting on the surface of the leading blade of every section of concrete barrier. Provide sheeting that is a minimum of 2 inches x 12 inches and applied with a pressure sensitive adhesive. Have color of the retro-reflective sheeting match the color of the adjacent pavement marking edgeline. Provide reflective sheeting which meets the requirements of Section 1092 of the 2018 Standard Specifications.

Construction Methods

Section 1105-3 of the 2018 Standard Specifications applies to this special provision.

Maintenance

Maintain Temporary Glare Screen in accordance with Section 1105-4 of the 2018 Standard Specifications.

Method of Measurement

The quantity of Temporary Glare Screen to be paid for will be the number of linear feet of Temporary Glare Screen installed during the life of the project in accordance with the plans and accepted.

Basis of Payment

The quantity of Temporary Glare Screen measured as provided above, will be paid for at the contract unit price per linear foot for "Temporary Glare Screen".

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Glare Screen	Linear Foot

TC-6

SEQUENTIAL FLASHING WARNING LIGHTS:
(10/08/2016)

Description

Furnish and install Sequential Flashing Warning Lights on drums used for merging tapers during nightly work activities.

The purpose of these lights is to assist the motorist in determining which direction to merge when approaching a lane closure. It's also designed to reduce the number of late merges resulting in devices being struck and having to be reset to maintain positive guidance at the merge point. The successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path.

Materials

The Sequential Flashing Warning Lights shall meet all of the requirements for warning lights within the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

Each light unit shall be capable of operating fully and continuously for a minimum of 200 hours when equipped with a standard battery set.

Each light in the sequence shall be flashed at a rate of not less than 55 times per minute and not more than 75 times per minute. The flash rate and flash duration shall be consistent throughout the sequence.

Supply a Type 3 Certification (Independent Test Lab results) documenting all actual test results for the specified parameters contained in the Institute of Transportation Engineer's (ITE's) *Purchase Specification for Flashing and Steady Burn Warning Lights*. The laboratory shall also identify all manufacturer codes and part numbers for the incandescent lamp or LED clusters, lenses, battery, and circuitry, and the total width of the light with the battery in place. The complete assembly shall be certified as crashworthy when firmly affixed to the channelizing device.

All Sequential Flashing Warning Lights shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Construction Methods

Sequential Flashing Warning Lights are to be used for night time lane closures.

These lights shall flash sequentially beginning with the first light and continuing until the final light.

The Sequential Flashing Warning Lights shall automatically flash in sequence when placed on the drums that form the merging taper.

The number of lights used in the drum taper shall equal the number of drums used in the taper.

Drums are the only channelizing device allowed to mount sequential flashing warning lights.

The Sequential Flashing Warning Lights shall be weather independent and visual obstructions shall not interfere with the operation of the lights.

The Sequential Flashing Warning Lights shall automatically sequence when placed in line in an open area with a distance between lights of 10 to 100 feet. A 10 foot stagger in the line of lights shall have no adverse effect on the operation of the lights.

If one light fails, the flashing sequence shall continue. If more than 1 light fails, all of the lights are to be automatically turned to the "off" mode. Non-sequential flashing is prohibited.

When lane closures are not in effect, the Sequential Flashing Warning Lights shall be deactivated.

Measurement and Payment

Sequential Flashing Warning Lights will be measured and paid as the maximum number of sequential flashing warning lights satisfactorily installed and properly functioning at any one time during the life of the project.

This includes all materials and labor to install, maintain and remove all the Sequential Flashing Warning Lights.

Pay Item	**Pay Unit**
Sequential Flashing Warning Lights	Each

TC-8

I-5878/I-5883/I-5986B Harnett and Johnston Counties

WORK ZONE PRESENCE LIGHTING:
(10/14/19)

DESCRIPTION

Furnish and install Work Zone Presence Lighting to supplement the Contractor's construction/task (Portable Construction Lighting) and equipment lighting during nightly work activities on high speed (greater than 55 MPH) facilities and/or facilities that have significant traffic volumes and impacts.

MATERIALS

Anti-glare lighting systems are required. Work Zone Presence Lighting shall be installed in accordance with the attached detail and the Manufacturer's recommendations.

Supply a power source for each light to provide the light output as described in the chart below.

Each light unit shall be capable of providing a minimum of 14,000 lumens illuminating a minimum area of approximately 3,000 square feet. The light shall be capable of being elevated to a height of 14 feet above the pavement.

Each light unit support base or mounting stand shall have the capability of being leveled such that the light mast is plumb.

Provide Work Zone Presence Lighting listed on the NCDOT APL.

CONSTRUCTION METHODS

Work Zone Presence Lighting is permitted to be prestaged (up to 1 hour prior for single lane closures and up to 2 hours prior for double or triple lane closures) along with other traffic control devices or installed within 1 hour after the necessary traffic control has been installed for the lane closure(s). At the end of the work night, the Work Zone Presence Lights shall be removed within 1 hour before or after the lane closure(s) is removed.

Whenever possible, each light unit shall be placed on the outside paved shoulder, a minimum of 4 feet from the travel lane and spaced according to the chart below based on the amount of light output for each unit.

Work Zone Presence Lights are permitted to supplement the Portable Construction Lighting inside the lane closure. At no time shall Work Zone Presence Lighting be used in lieu of Portable Construction Lighting when required.

If there is sufficient existing overhead lighting, Work Zone Presence lighting may be eliminated as directed by the Engineer.

TC-9

Lighting Unit Installation Requirements

The lighting units shall be installed in advance of the lane closure as shown on the attached detail and spaced according to the chart below:

		AREA 1		AREA 2	
Light Output (Lumens)	**Illuminated Fixture Area (Sq. Ft.)**	**# of Lights**	**Spacing***	**# of Lights**	**Spacing***
14,000 - 35,000	4	6	640' (16 skips)	8	480' (12 skips)
35,001 - 59,999	5	5	800' (20 skips)	6	640' (16 skips)
60,000+	6+	4	1,000' (25 skips)	5	800' (20 skips)

*Skips refer to traditional 10' pavement marking lines with 30' gaps.

Area 1: Begins 2,640' downstream from CMS; Extends to just past 1st Lane Closure Sign

Area 2: Begins just past the 1st Lane Closure Sign; Extends to just past the last Lane Closure Sign

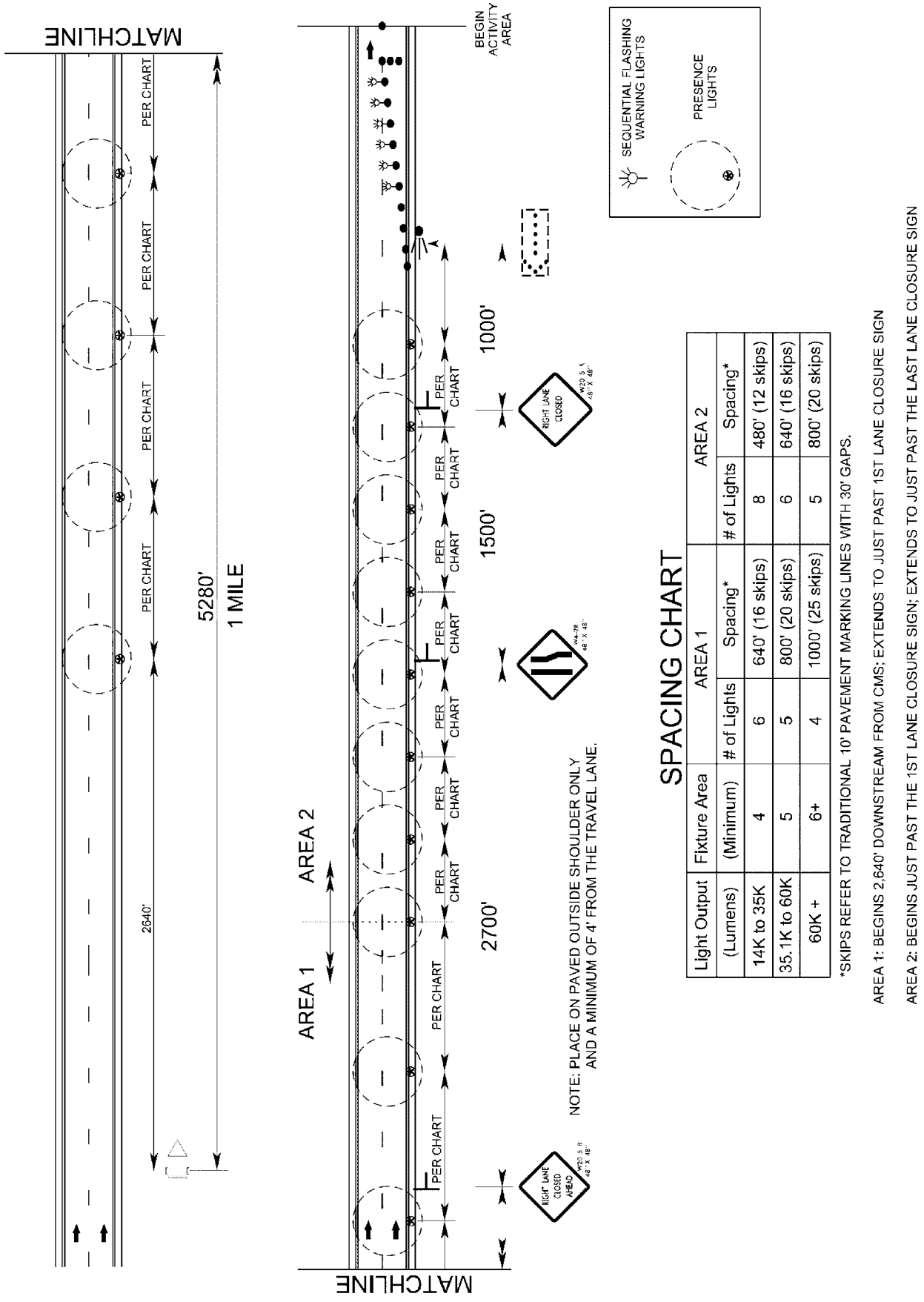
MEASUREMENT AND PAYMENT

Work Zone Presence Lighting will be measured and paid as the maximum number of lighting units satisfactorily placed, accepted by the Engineer, and in use at any one time during the life of the project.

Relocation, replacement, repair, removal, and maintenance of Work Zone Presence Lighting units will be incidental to the work of this section. No measurement or separate payment will be made for power generators, batteries, or other power supply devices.

Pay Item	**Pay Unit**
Work Zone Presence Lighting	Each

TC-10



SPACING CHART

Light Output	Fixture Area	AREA 1		AREA 2	
(Lumens)	(Minimum)	# of Lights	Spacing*	# of Lights	Spacing*
14K to 35K	4	6	640' (16 skips)	8	480' (12 skips)
35.1K to 60K	5	5	800' (20 skips)	6	640' (16 skips)
60K +	6+	4	1000' (25 skips)	5	800' (20 skips)

*SKIPS REFER TO TRADITIONAL 10' PAVEMENT MARKING LINES WITH 30' GAPS.

AREA 1: BEGINS 2,640' DOWNSTREAM FROM CMS; EXTENDS TO JUST PAST 1ST LANE CLOSURE SIGN

AREA 2: BEGINS JUST PAST THE 1ST LANE CLOSURE SIGN; EXTENDS TO JUST PAST THE LAST LANE CLOSURE SIGN

WORK ZONE PRESENCE LIGHTING

TC-11

I-5878/I-5883/I-5986B Harnett and Johnston Counties

WORK ZONE DIGITAL SPEED LIMIT SIGNS:
(9/30/2019)

Description

Furnish and install Work Zone Digital Speed Limit Signs on interstates and freeways with speed limits greater than 55 MPH and or facilities that have significant traffic volumes and impacts. These signs are regulatory speed limit signs with LED displays for the speed limit numbers.

The purpose of Digital Speed Limit signs is to easily change work zone speed limits between activities that necessitate the need for a lower speed limit and the ones that do not.

Materials

Digital Speed Limit Signs shall be a minimum 36" wide x 48" high. The speed limit sign (R2-1) shall be black on white with high intensity white prismatic sheeting.

The Digital Speed Limit sign shall be mounted such that the bottom of the sign is 7' above roadway.

The LED panel shall be a minimum of 28" wide x 18" high. The display on the LED panel shall be amber or white.

The LED numbers shall have a minimum 5 wide by 7 high pixel array with a minimum height of 18".

The LED panel shall have auto brightness/dimming capability.

The black on orange "WORK ZONE" sign shall be mounted above the Speed Limit sign. It shall be 36" wide x 24" high with high intensity prismatic orange sheeting.

The black on white "$250 FINE" sign shall be mounted below the Speed Limit sign. It shall be 36" wide x 24" high with high intensity prismatic white sheeting.

All digital speed limit systems shall have operational software and wireless communications that allows for remote operation and data monitoring. It shall be configured to allow access by the Engineer or his designee to change each sign independently or change the speed limit on all signs at once from a PC, tablet or cellular phone application.

Radar equipment to detect approaching speeds on the digital speed limit systems is optional. However, if the systems have radar, they will be equipped to store the detected speed data, this information should be available in a spreadsheet format and accessed remotely from a secure cloud location.

The Work Zone Digital Speed Limit systems shall have flashing beacons. The beacons are to be a minimum of 8" diameter LED circular yellow. They may be mounted either above/below or beside the sign assemblies and are to be centered. The beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.

In addition, the flashing beacons shall be mounted in such a manner that the $250 Speeding Fine sign is not obscured when in operation.

Digital Speed Limit Signs may be trailer mounted or stationary mounted. The unit shall be Solar powered and have the ability to operate continuously. It shall be supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system.

The batteries, when fully charged; shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

All Work Zone Digital Speed Limit equipment shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Digital Speed Limit Displays

The Speed Limit shall be continuously displayed on the signs. All other stationary speed limit signs shall be covered when Digital Speed Limit systems are in operation.

Reduced Speed Limit Displays

The Digital Speed Limit systems shall have beacons activated when the work zone speed limit is reduced. Otherwise, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The Digital Speed Limit systems shall display the reduced work zone speed limit without flashing the LED speed limit number unless approaching speeds are detected to be 6 MPH or higher than the displayed Speed Limit. If speeds are detected 6 MPH or above the displayed Speed Limit, then the LED shall flash the Speed Limit until the speeds are within the 6 MPH tolerance.

Existing Speed Limit Displays

When the existing Speed Limit is displayed on the Digital Speed Signs, the beacons are to remain off.

IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR: The Speed Limit number is not to flash unless the approaching speeds are detected to be 6 MPH or higher than the displayed Speed Limit.

TC-13

Other Construction Methods

The speed limits are the sole authority of the NCDOT. All speed limits are to be ordinanced by the State Traffic Engineer in order to have a lawfully enforceable speed limit.

The Regional Traffic Engineering Office and the Division Construction Engineer in coordination with the Work Zone Traffic Control Section will provide all Work Zone Speed Limit recommendations based on activities and conditions.

The Contractor will be responsible for coordinating with the Engineer when the Work Zone Speed Limits are to be changed and will have to seek approval by the Engineer or his designee before the Speed Limit is changed.

Whenever possible, each trailer mounted unit shall be placed on the paved shoulder and shall have the capability of being leveled.

Measurement and Payment

The measurement for the Work Zone Digital Speed Limit Signs is made according to the number of Work Zone Digital Speed Limit signs required per the spacing requirements according to the attached drawing. Payment will be made for the maximum number of Work Zone Digital Speed Limit signs satisfactorily installed and properly functioning at any one time during the life of the project.

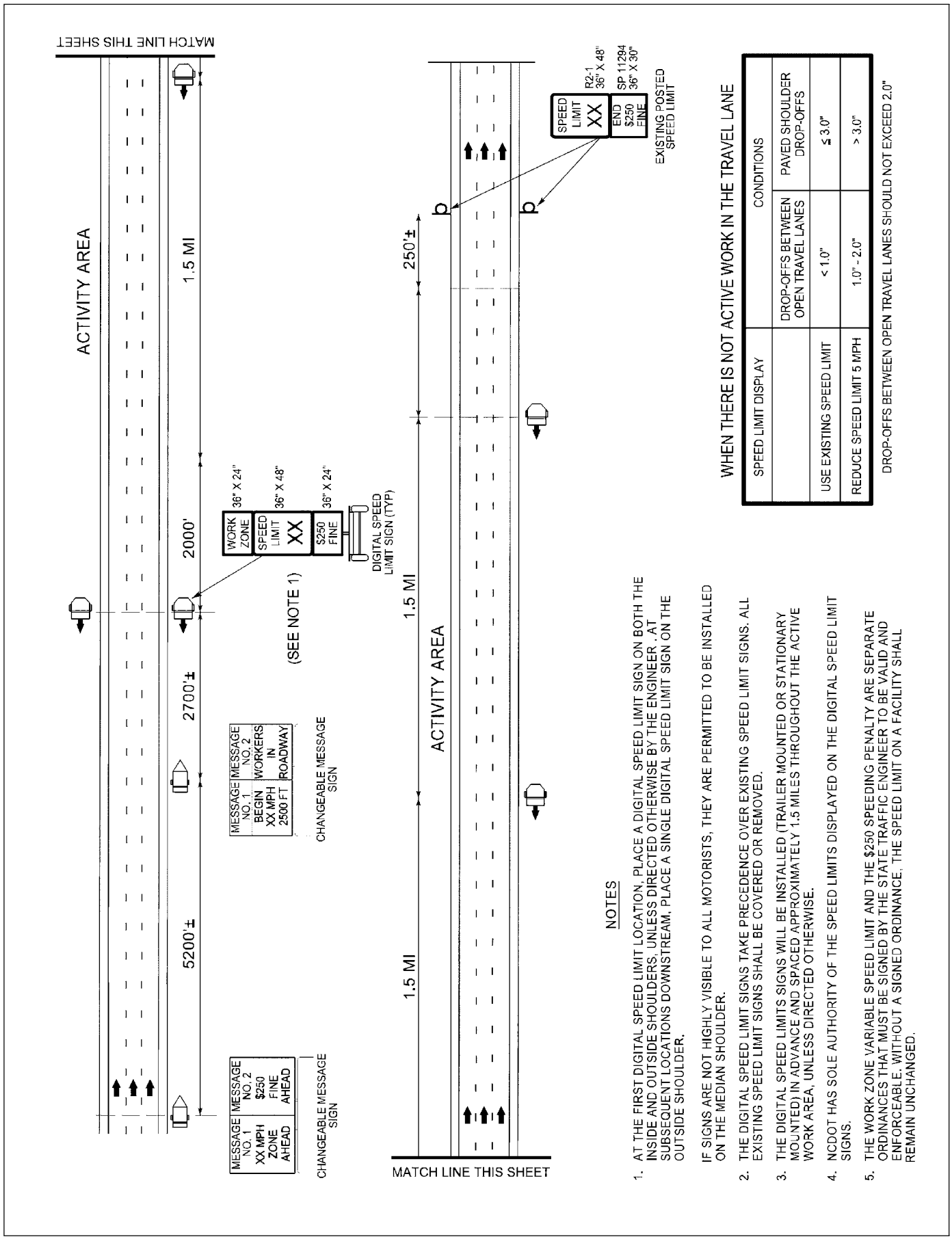
This includes all materials and labor to install, maintain and remove all the Work Zone Digital Speed Limit Units.

Pay Item	Pay Unit
Work Zone Digital Speed Limit Signs	Each

TC-14

I-5878/I-5883/I-5986B

Harnett and Johnston Counties



NOTES

1. AT THE FIRST DIGITAL SPEED LIMIT LOCATION, PLACE A DIGITAL SPEED LIMIT SIGN ON BOTH THE INSIDE AND OUTSIDE SHOULDERS, UNLESS DIRECTED OTHERWISE BY THE ENGINEER . AT SUBSEQUENT LOCATIONS DOWNSTREAM, PLACE A SINGLE DIGITAL SPEED LIMIT SIGN ON THE OUTSIDE SHOULDER.

   IF SIGNS ARE NOT HIGHLY VISIBLE TO ALL MOTORISTS, THEY ARE PERMITTED TO BE INSTALLED ON THE MEDIAN SHOULDER.
2. THE DIGITAL SPEED LIMIT SIGNS TAKE PRECEDENCE OVER EXISTING SPEED LIMIT SIGNS. ALL EXISTING SPEED LIMIT SIGNS SHALL BE COVERED OR REMOVED.
3. THE DIGITAL SPEED LIMITS SIGNS WILL BE INSTALLED (TRAILER MOUNTED OR STATIONARY MOUNTED) IN ADVANCE AND SPACED APPROXIMATELY 1.5 MILES THROUGHOUT THE ACTIVE WORK AREA, UNLESS DIRECTED OTHERWISE.
4. NCDOT HAS SOLE AUTHORITY OF THE SPEED LIMITS DISPLAYED ON THE DIGITAL SPEED LIMIT SIGNS.
5. THE WORK ZONE VARIABLE SPEED LIMIT AND THE $250 SPEEDING PENALTY ARE SEPARATE ORDINANCES THAT MUST BE SIGNED BY THE STATE TRAFFIC ENGINEER TO BE VALID AND ENFORCEABLE. WITHOUT A SIGNED ORDINANCE, THE SPEED LIMIT ON A FACILITY SHALL REMAIN UNCHANGED.

WHEN THERE IS NOT ACTIVE WORK IN THE TRAVEL LANE

SPEED LIMIT DISPLAY	CONDITIONS	
	DROP-OFFS BETWEEN OPEN TRAVEL LANES	PAVED SHOULDER DROP-OFFS
USE EXISTING SPEED LIMIT	< 1.0"	≤ 3.0"
REDUCE SPEED LIMIT 5 MPH	1.0" - 2.0"	> 3.0"

DROP-OFFS BETWEEN OPEN TRAVEL LANES SHOULD NOT EXCEED 2.0"

TC-15

I-5878/I-5883/I-5986B Harnett and Johnston Counties

WORK ZONE PERFORMANCE PAVEMENT MARKINGS:
(10/08/2016)
(Rev. 10/9/18)

Description

Furnish and install Work Zone Performance pavement markings that delineate the travel way for work zone traffic patterns. The purpose of Work Zone Performance pavement marking is to provide a more durable work zone pavement marking that lasts the full duration of a traffic pattern without requiring replacement or reapplication for a period of up to 12 months. Work Zone Performance pavement markings shall also provide a higher performance level in terms of retroreflectivity throughout the required 12-month duration than standard traffic paints to improve nighttime work zone visibility. All markings shown in the transportation management plan are scheduled as work zone performance markings. Paint may be used for short term durations during traffic pattern switches or between interim pavement layers as allowed by the Engineer. Paint will be paid for under other items in the contract.

Materials

A) General

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and a minimum retroreflectivity as described elsewhere in this contract for a period of at least 12 months.

The Work Zone Performance pavement markings shall be manufactured to bond successfully to both concrete and asphalt pavements. The following are approved materials to be used for Work Zone Performance pavement markings:

- Polyurea
- Thermoplastic (Extruded and Sprayed)
- Epoxy
- Polymer (Single System)
- Cold Applied Plastic (Type IV)

B) Material Qualifications/Certifications

Use Work Zone Performance pavement marking materials, as listed above, which are on the NCDOT Approved Products List at the time of installation.
In accordance with Article 106-3, and Section 1087-4 of the 2018 NCDOT Standard Specifications for Roads and Structures, provide a Type 3 Material Certification for all materials and a Type 3 and Type 4 certification for all reflective media.

(C) Performance

Poor performance of a Work Zone Performance pavement marking material at any site, whether or not related to a specific contract, may be grounds for removing the material from any project under contract and the NCDOT Approved Products List.

Construction Methods

Do not use hand applied methods or any other non-truck mounted application equipment /device to install Work Zone Performance pavement markings for applications longer than 1000 feet.

All Work Zone Performance pavement markings are to be installed in a single application. Multiple passes are not allowed.

"No track" dry times shall be 10 minutes or less. Traffic shall not be placed on any material until it's sufficiently dry/cured to eliminate wheel tracking.

A) Testing Procedures

All Work Zone Performance pavement marking installations will be tested by the Department through an independent Mobile Retroreflective Contractor. The Work Zone Performance pavement markings will be scanned to ensure the retroreflectivity requirements in Section C below are met.

B) Application Equipment

Application equipment shall be in accordance with Section 1205 of the 2018 NCDOT Standard Specifications for Roads and Structures.

C) Material Application

The Work Zone Performance pavement marking material shall be applied at the following minimum thicknesses:

Polyurea =	20 mils wet
Epoxy =	20 mils wet
Thermoplastic =	50 mils (Extruded or Sprayed)
Polymer =	20 mils wet
Cold Applied Plastic (IV) =	Manufacturer's recommendation

TC-17

The Work Zone Performance pavement marking line widths for interstates and freeways shall be as follows:

Edge lines, Solid Lane Lines, Skip and Mini-Skip Lines = 6"
Gorelines =12"

All other facilities shall utilize 4" line widths.

D) Retroreflectivity Requirements

Retroreflectivity Requirements for Work Zone Performance Pavement Markings

Color	Initial	6 Months	12 Months
White	375 mcd/lux/m2	275 mcd/lux/m2	150 mcd/lux/m2
Yellow	250 mcd/lux/m2	150 mcd/lux/m2	100 mcd/lux/m2

The minimum level of retroreflectivity for any Work Zone Performance pavement marking system selected shall meet the initial requirements in the chart above. In addition, the Work Zone Performance pavement markings shall maintain the corresponding retroreflectivity requirements for a period of up to 12 months.

The Contractor shall notify the Engineer a minimum of 7-10 days prior to the installation of Work Zone Performance pavement markings.

The Department will measure initial retroreflectivity within 30 days after placement to ensure compliance with the initial retroreflectivity levels in the chart above.

If the markings appear to be non-performing, the Engineer may request additional retroreflectivity readings. If measured and found to be noncompliant, the Contractor shall replace the Work Zone Performance pavement markings at no cost to the Department. Non-compliant retroreflectivity occurs when the average readings for the project are more than 15% below the requirements in the chart. Pay deductions are appropriate for deficiencies up to the 15% level.

If the Work Zone Performance pavement markings need to remain in place longer than 12 months, the markings are to be scanned by the Mobile Retroreflective Contractor to determine if they are meeting the minimum retroreflectivity levels. If they remain at or above these levels, the Work Zone Performance pavement markings may remain in place. If not, they shall be replaced by the Contractor within 15 days of the 12-month duration and compensation will be made at the contract unit price.

If and when this becomes necessary, the same notification procedure as described above shall be used to have the Work Zone Performance pavement markings scanned for the required retroreflectivity.

E) Snowplow Damage

All Work Zone Performance pavement markings shall be durable enough to withstand a single snow event requiring snow plowing without showing excessive fatigue in either bonding or retroreflectivity.

The Contractor shall replace the Work Zone Performance pavement markings if a single snowplow occurrence results in more than 25% of the pavement marking edgelines or skips being physically removed and/or the Work Zone Performance pavement markings do not meet the following minimum retroreflectivity values:

Retroreflective Requirements for Work Zone Performance Pavement Markings after a Single Snowplow Occurrence

Color	MINIMUM
White	150 mcd/lux/m2
Yellow	100 mcd/lux/m2

Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all non-compliant Work Zone Performance pavement markings within 30 days of determining they are non-compliant.

If the work zone experiences more than one snow event requiring snow plowing, the retroreflectivity values in the chart above will no longer apply. The Engineer will determine if the pavement markings are performing adequately and/or if replacement is necessary due to excessive damage caused solely by snowplow activities.

If the Work Zone Performance pavement markings are found to be deficient, they shall be replaced. In such case, compensation will be made at the contract unit price. Unless the temporary traffic pattern is to be modified within 30 days, the Contractor shall replace all Work Zone Performance pavement markings damaged due to multiple snowplow events within 30 days.

F) Surface Preparation

Prior to installation, all pavement surfaces to receive Work Zone Performance pavement markings shall be swept clean and prepared in accordance with the Manufacturer's recommendation.

G) Temperature and Weather Limitations

Work Zone Performance pavement markings shall only be applied unless the ambient air temperature and the pavement temperature is 50°F or higher for thermoplastic and is 40°F or higher for all other materials. Do not install unless the pavement surface is completely dry and not within 4 hours of a heavy rain event such as a thunderstorm with rainfall intensities greater than 1 inch/per hour.

In the event a traffic shift must take place when the air and pavement temperatures are below the required minimums or if a rain event occurs prior to or during a planned traffic shift, upon approval by the Engineer, an acceptable alternative is to install temporary pavement markings. Use 1 application of standard traffic paint to produce a 4" line at 15 mils (wet). Beads shall also be applied to provide proper retroreflectivity until the performance material can be installed. NCDOT will provide compensation for the 4",15 mil temporary paint. The Work Zone Performance pavement markings shall be applied within 90 days of installation of the temporary pavement markings.

Maintenance

Replace any Work Zone Performance pavement material that prematurely fails due to debonding or excessive wearing where it doesn't maintain its retroreflectivity for the required 12-month duration. Any traffic control and Work Zone Performance pavement marking costs due to replacement is at no cost to the Department unless it's due to excessive damage caused by snowplow damage.

Measurement and Payment

Work Zone Performance pavement marking lines will be measured and paid by the linear foot that's satisfactorily placed and accepted by the Engineer. The quantity of Work Zone Performance pavement marking-solid lines will be the summation of the linear feet of solid line measured end-to-end of the line. The quantity of skip or broken lines will be the summation of the linear feet derived by multiplying the nominal length of a line by the number of broken lines satisfactorily placed.

Work Zone Performance Pavement Marking *Symbols* will be measured as the actual number of pavement marking symbols satisfactorily placed and accepted by the Engineer.

Work Zone Performance Pavement Marking *Characters* will be measured as the actual number of pavement marking characters satisfactorily placed and accepted by the Engineer. A character is considered to be one letter or one number of a word message.

TC-20

I-5878/I-5883/I-5986B Harnett and Johnston Counties

Payment will be made under:

Pay Item	**Pay Unit**
Work Zone Performance Pavement Marking Lines, 4”	Linear Foot
Work Zone Performance Pavement Marking Lines, 6”	Linear Foot
Work Zone Performance Pavement Marking Lines, 8”	Linear Foot
Work Zone Performance Pavement Marking Lines, 12”	Linear Foot
Work Zone Performance Pavement Marking Lines, 24”	Linear Foot
Work Zone Performance Pavement Marking Symbols	Each
Work Zone Performance Pavement Marking Characters	Each

TC-21

I-5878/I-5883/I-5986B Harnett and Johnston Counties

HIGH VISIBILITY DEVICES:
(10/25/2019)

Description

Furnish and install High Visibility Devices for all locations including I-95 and all other roadways on this project, unless otherwise allowed by the Engineer. High Visibility Devices include drums, stationary work zone signs and rigid portable work zone signs. All of these devices shall be new. Used devices are not acceptable.

The purpose of High Visibility Devices is to enhance the conspicuity of the devices in order to improve both safety and mobility through the work zones. In addition, using new devices help to ensure they remain in compliance with required retroreflective properties for the full life of the project and to improve the overall appearance of significant work zones throughout the State.

Materials

A) General

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and retroreflectivity as described elsewhere in this specification for a period of at least 36 months.

The following are required High Visibility Devices to be used for work zone performance applications.

- Drums
- Stationary Work Zone Signs
- Rigid Portable Work Zone Signs

All drums shall be new and meet the existing requirements of Section 1089-5 of the North Carolina Standard Specifications for Roads and Structures and shall have Grade B flexible, fluorescent orange sheeting that meets the retroreflective requirements of Section 1092-2.

All stationary work zone signs shall be new and meet the existing requirements of Section 1089-1. Legend overlays are prohibited and shall not be accepted on the Interstate/Freeway or associated intersecting roadways. Vertical sign post reflector strips shall be added to all stationary sign supports. Use Grade B fluorescent orange for work zone signs and Grade B fluorescent yellow for exit sign supports. Install strips a minimum of 6' in length on sign supports with one sign mounted and a minimum of 4.5' in length for sign supports with two or more signs mounted vertically.

All portable work zone signs shall be new and have composite substrates as described in Section 1089-1. The remainder of the existing requirements of Section 1089-1 remain. Used sign stands are acceptable.

B) Material Qualifications/Certifications

Only use materials as listed above that are on the NCDOT Approved Products List. In addition, provide a Type 3 Material Certification for all materials in accordance with Section 106-3 and Section 1087-4.

(C) Performance

Poor performance of any device or sign at any site, whether or not related to a specific contract may be grounds for removing the material from the NCDOT Approved Products List and/or removing from any project under contract.

Construction Methods

All requirements of Section 1110-3 and Section 1130-3 shall apply except roll up signs are not permitted for use.

The use of skinny drums is prohibited for any nighttime lane closures on Interstates and Freeways.

Maintenance

Replace any sign or drum that prematurely fails due to any damage or defect that causes it to perform unsatisfactorily with an "in kind" device of similar quality and age according to the guidelines set forth in the American Traffic Safety Service Association's (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices. An "in kind" replacement sign or drum is not required to be new, however, it shall be less than 1 year old and have 100% of its original sheeting area and at least 85% of the retroreflective qualities of a new device, so that it is undetectable adjacent to the original devices and signs placed on the project.

Measurement and Payment

High Visibility Drums will be measured and paid as the maximum number of drums placed and in use at any one time during the life of the project.

High Visibility Stationary Signs will be measured as the actual number of square feet satisfactorily installed at each location and accepted by the Engineer. Where a particular sign is used at more than one location, measurement will be made at each location.

High Visibility Portable Signs will be measured and paid as the actual number of square feet satisfactorily installed and accepted by the Engineer. Payment will be made for the initial installation only. Relocation of signs will be incidental to the measurement of the quantity of signs.

No direct payment will be made for stationary work zone sign supports or portable work zone sign stands. All stationary work zone sign support or portable work zone sign stands will be incidental to the work of providing work zone signs.

Payment will be made under:

TC-23

I-5878/I-5883/I-5986B Harnett and Johnston Counties

Pay Item:	**Pay Unit**
High Visibility Drums	Each
High Visibility Stationary Signs	Square Foot
High Visibility Portable Signs	Square Foot

TC-24

CONNECTED LANE CLOSURE DEVICES:
(10/29/2018)

Description

Furnish, install, operate, maintain, relocate, and remove connected lane closure devices for use on Interstate and Freeway lane closures. The connected lane closure devices shall transmit the location of the lane closure to navigational companies such as WAZE, Google Maps, Inrix, Here, TrafficCast, TomTom, Apple Maps, Panasonic, the Statewide Transportation Operations Center, (STOC), and any other navigational companies that requests it. A connected lane closure device shall be installed on the flashing arrow board identifying the beginning of a lane closure, and another connected lane closure device shall be installed on a crashworthy traffic control device (such as a drum) at the end of the same lane closure.

Materials

The connected lane closure devices shall be designed and built to transmit the location of the lane closure to the navigational companies as well as the STOC. The format of the information received by each of these shall be approved by each entity, and at minimum, consist of an XML file. The connected lane closure devices shall be capable of obtaining wireless communication by either cellular or satellite technology.

The initial connected device shall be designed and attached to the flashing arrow board in such a manner that it is only activated when either the left or right arrows are displayed, not when the flashing arrow board is operated in caution mode. When the lane closure is removed, and the flashing arrow board turned off or changed to caution mode, the connected device shall automatically turn off simultaneously.

The second connected device in a lane closure shall be installed on a crashworthy traffic control device. It shall have an easily accessible power switch and a small status indicator light mounted such that it is visible when passing by in a vehicle at operating speed. When switched to the ON position, the light shall indicate that device has established communication and is transmitting. The light may be either steady burn or flashing and shall not exceed one (1) inch in diameter.

The devices shall have battery life sufficient to maintain operation for the duration of the lane closure or have the ability to be recharged without deactivating the device.

Construction Methods

Connected lane closure devices shall be used on all lane closures on freeways and interstates throughout the project.

Two connected lane closure devices shall be installed per grouping of lane closures (single, double, or triple); one attached and wired into the flashing arrow board at the beginning of the first taper, and the other at the last traffic control device at the end of the lane closure(s). Supplemental flashing arrow boards in advance of the first lane closure taper or flashing arrow

boards in subsequent lane closures (for double and triple lane closures) shall not have connected devices. Subsequent lane closures occurring downstream of where all lanes have been reopened and lane closures in the opposite direction of travel will require additional connected devices.

The second connected lane closure device shall be manually turned ON and OFF by crews installing and removing the lane closure, unless the device can be controlled by the initial connected device. The unit shall be turned on immediately upon installation of the lane closure and turned off immediately upon removal of the lane closure.

Once installed, the Contractor shall verify that the connected lane closure devices are transmitting information prior to leaving the device unattended and re-verify transmission every 72 hours for long-term installations.

Technical Requirements

The connected devices shall be run continuously during any active lane closures for the length of the contract.

The GPS within the connected devices shall have a horizontal accuracy of 50 feet, 95% of the time.

The connected device information, including the location, transmission status, and battery status shall be transmitted within five (5) minutes of initiation and updated every fifteen (15) minutes. In addition to transmitting information to the Department, the Contractor shall keep the retain device information for one (1) year after the contract ends. Information shall include timestamps, device name, and GPS location. This information shall be made available to the Department upon request.

The battery voltage shall be collected at least once an hour. The information shall be stored and available for troubleshooting. The system shall transmit an alert if the battery voltage of a device is under a specified threshold.

The connected devices shall emit an audible an alert if a device is not transmitting its position for a period of 1 hour.

The outputs from the connected device on the arrow board and the downstream connected device at the end of the lane closure shall be easily identifiable as a single pair, either by sequential device IDs, identical project names, or other method as approved by the Engineer. Additional pairs on the project shall have unique identifiable information such that it is not confused with another project pair.

Measurement and Payment

Connected Lane Closure Devices will be measured and paid as the maximum number of connected devices acceptably placed and in use at any one time during the life of the project. Each group of lane closures will require two (2) connected lane closure devices; one connected

to the flashing arrow board and the other on a crashworthy device at the downstream end of the lane closure. No payment will be made for either device unless both devices are satisfactorily installed.

The price for each connected lane closure device will cover all material, labor, maintenance, relocation, removal, and communication costs required for the duration of the project.

Flashing Arrow Boards will be measured and paid in accordance with Section 1115.

Crashworthy devices (such as drums) used to mount the downstream connected lane closure device shall be considered be incidental.

Pay Item	**Pay Unit**
Connected Lane Closure Device	Each

TC-27

TYPICAL MEDIAN ACCESS AREAS:
(12/18/18)

Description

Perform the work covered by this section including, but not limited to, constructing, maintaining, and removing Typical Median Access Areas for construction vehicle ingress to and egress from the median to/from active travel lanes on controlled access facilities.

Typical Median Access Areas are not required when construction vehicle ingress and egress is conducted using lane closures as shown on detail 1101.05, Sheet 2 of 2 of the *2018 Roadway Standard Drawings*.

Materials

Refer to Divisions 6, 10, 11, 12, and 17 in the *2018 Standard Specifications for Roads and Structures.*

Provide temporary traffic control devices listed on the NCDOT Approved Products List (APL).

Provide Work Zone Performance Pavement Markings (See Project Special Provision)

Provide High Visibility Devices (See Project Special Provision)

Flashing Beacon and Detection System:

(A) General

Provide flashing beacon and detection system components listed on the NCDOT ITS and Signals Qualified Products List (QPL).

Provide a trailer mounted flashing beacon and warning sign assembly that meets or exceeds the physical and operational requirements of the MUTCD, or other mounting method approved by the Department. The following specifications supplement those basic requirements.

Provide a totally mobile complete unit capable of being located as traffic conditions demand.

The warning sign height shall comply with detail 1110.01, sheet 1 of 3 of the *2018 Roadway Standard Drawings* when raised in the upright position.

The flashing beacon housing assembly shall be of weather resistant construction.

(B) Power System

Provide a unit that is solar powered and supplemented with a battery backup system that includes a 110/120 VAC powered on-board charging system.

The unit shall also be capable of being powered by standard 110/120 VAC power source.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power.

Store the battery bank and charging system in a lockable, weather, and vandal resistant box.

(C) Controller

Provide automatic brightness/dimming of the display and a manual override dimming switch.

The controller shall provide a battery-charge status indicator.

Mobile radio or any other radio transmissions shall not affect the controller.

Store the controller in a lockable, weather and vandal resistant box.

(D) Trailer

Finish all exterior metal surfaces with Federal orange enamel per Federal Standard 595a, color chip ID# 13538 or 12473 respectively. The trailer shall be able to support a 100 mph wind load with the display fully extended.

The trailer shall be equipped with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

The trailer shall be properly equipped in compliance with North Carolina Law governing motor vehicles.

Provide a minimum 4 inch wide strip of fluorescent orange retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The retroreflective sheeting shall be Grade B that conforms to Article 1092-2 in the *2018 Standard Specifications for Roads and Structures.* Drums may be supplemented around the unit in place of the sheeting.

(E) Reliability

Provide a sign unit, flashing beacons, and detection system with all components rated to operate at temperatures ranging from -30°F to 165°F.

Construction Methods

See Typical Median Access Detail (attached).

Temporary Acceleration Lane

TC-29

Construct a temporary acceleration lane with a minimum length of 1720' and a minimum clear width of 12' for the full length of the Temporary Acceleration Lane. At least 920' of parallel merge/diverge area is required adjacent to the active travel lanes. The detection zone will be located from the beginning of the paved area to within 100' of the end of the PCB. It shall have protection separating it from the active travel lanes for the first 500'.

The Temporary Acceleration Lane shall use either existing or proposed pavement, where available. If existing or proposed pavement is not available, construct temporary pavement as follows: 1.25" S9.5B, 2.5" I19.0C, and 8" ABC. Install and maintain pavement in accordance with Division 6.

Using Work Zone Performance Pavement Markings, install 12" yellow diagonals lines (2:1 slope) at 100' intervals throughout the upstream half of the parallel merge/diverge area, and at 55' intervals throughout the downstream half of the parallel merge/diverge area. Remove any conflicting markings in accordance with Section 1205.

Flashing Beacons and Detection System

Provide High Visibility advance warning signage as shown in the attached detail. Provide a flashing beacon system with two (2) flashing lights per sign to alert motorists in the active travel lanes of work vehicles entering from the median.

Provide a non-intrusive detection system capable of detecting vehicles in the work area in advance of the parallel merge/diverge area. The detection system shall be programmed such that passing public traffic in active travel lanes and vehicles in the work area not intending to use the parallel merge/diverge area are not detected.

Once detection occurs, the beacons on the advance warning sign(s) shall begin flashing immediately at a rate of not less than 50 or more than 60 times per minute. The beacons on the advance warning sign(s) shall flash continuously in an alternating pattern at all times that work vehicles are detected. The beacons shall continue flashing for thirty (30) seconds after detection ceases before turning off, and personnel on site shall have the ability to adjust this time based on field conditions. The flashing beacon system shall remain dark when idle.

Expedite repairs due to failure, malfunction or damage to the flashing beacons and/or detection system. Furnish another flashing beacon system or detection system approved by the Department during the repair time. Repair or replace flashing beacon system and/or detection systems immediately; otherwise, suspend all construction activities requiring the use of the Median Access Area until the flashing beacon system and/or detection system is restored to operation.

Perform all maintenance operations recommended by the manufacturer of the flashing beacon system and detection system

Location, Placement, and Use

TC-30

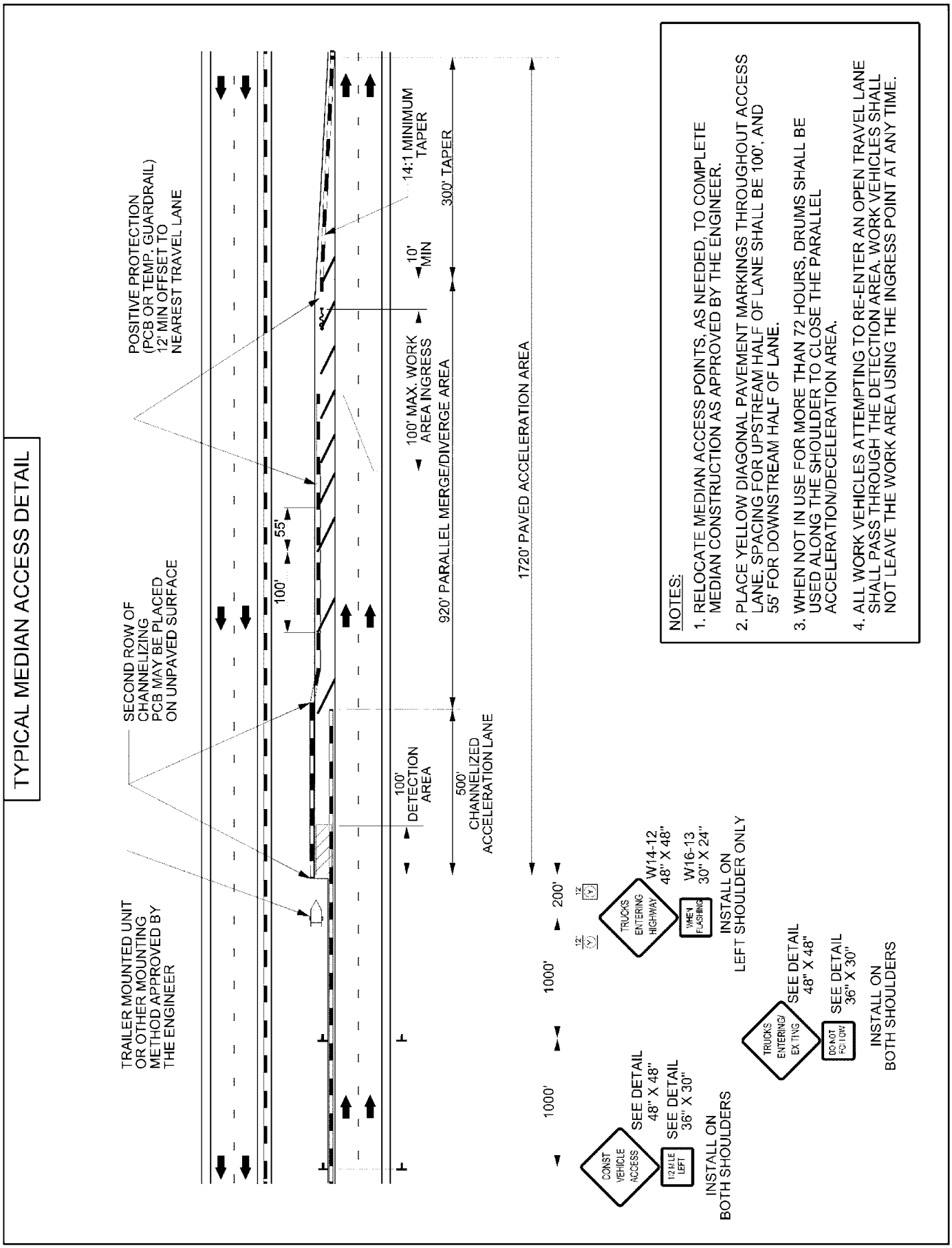
Typical Median Access Areas shall not be located within one-half (1/2) mile of any interchange acceleration or deceleration lanes, unless approved by the Department. All proposed locations for Typical Median Access Areas shall be reviewed and approved by the Department prior to installation.

Work vehicles using a particular Median Access Area shall not utilize any interchange ramp (on-ramp or off-ramp) within one (1) mile of the Median Access area.

Typical Median Access Areas installed in accordance with this section will not require the use of temporary lane closures for ingress/egress of work vehicles.

The Contractor shall comply with multiple and single vehicle hauling restrictions as shown in the TMP when performing hauling of equipment or materials to or from the project while using Typical Median Access Areas.

TC-31



SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 5'-6"
HEIGHT: 5'-6"
TOTAL AREA: 30.3 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0"
WIDTH: 0"
RADII: 0"

NO. Z BARS: 2
LENGTH: 58.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

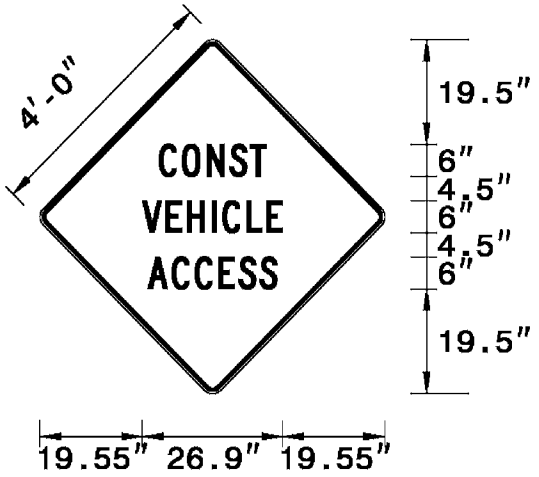
USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV:WZTC



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																												Series/Size Text Length
		C	O	N	S	T																						C 2000
	22.7	4.4	4.7	4.4	3.9	3.1	22.7																					20.5
		V	E	H	I	C	L	E																				C 2000
	19.6	4.6	4.1	4.7	2	4.6	3.9	3.1	19.6																			26.9
		A	C	C	E	S	S																					C 2000
	20.6	4.6	4.4	4.6	3.8	4.1	3.4	20.6																				24.8

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 3'-0"
HEIGHT: 2'-6"
TOTAL AREA: 7.5 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0.47"
WIDTH: 0.83"
RADII: 1.5"

NO. Z BARS:
LENGTH:

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

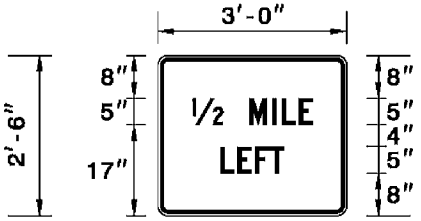
USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV:WZTC



BORDER
R=1.5"
TH=0.63"
IN=0.47"

Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
		1/2		M	I	L	E																				C 2000
	6.6	5.9	5	4.4	1.8	3.3	2.6	6.6																			22.9
		L	E	F	T																						C 2000
	12	3.3	3.4	2.8	2.6	12																					12.1

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

I-5878/I-5883/I-5986B

TC-33

Harnett and Johnston Counties

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 5'-6"
HEIGHT: 5'-6"
TOTAL AREA: 30.3 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0"
WIDTH: 0"
RADII: 0"

NO. Z BARS: 2
LENGTH: 58.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

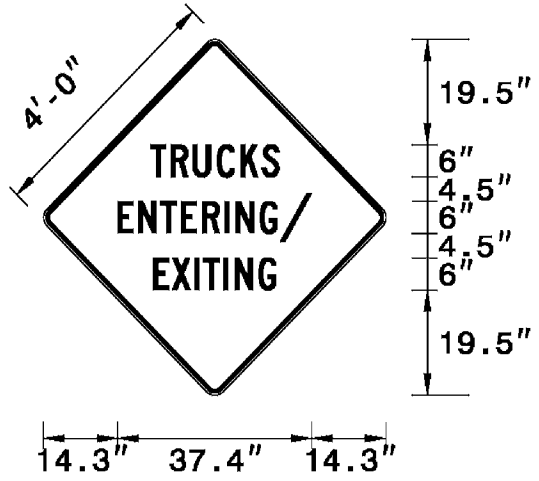
USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV: DIV



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
		T	R	U	C	K	S																				C 2000
	20.6	3.9	4.4	4.6	4.6	4.1	3.4	20.6																			24.8
		E	N	T	E	R	I	N	G	/																	C 2000
	14.3	4.1	4.2	3.9	4.1	4.4	2.2	4.6	3.9	6.1	14.3																37.4
		E	X	I	T	I	N	G																			C 2000
	21.2	3.6	4.4	1.7	3.9	2.2	4.6	3.4	21.2																		23.6

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

I-5878/I-5883/I-5986B

TC-34

Harnett and Johnston Counties

TC-35

I-5878/I-5883/I-5986B

Harnett and Johnston Counties

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

SIGN WIDTH: 3'-0"
HEIGHT: 2'-6"
TOTAL AREA: 7.5 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0.47"
WIDTH: 0.63"
RADII: 1.5"

NO. Z BARS:
LENGTH:

MAT'L: 0.080" (2.0 mm) ALUMINUM

USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV:WZTC

Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

	D	O		N	O	T		Series/Size Text Length
	7.2	3.7	3	3.8	3.6	2.6	7.2	C 2000 21.6
	F	O	L	L	O	W		C 2000 20.9
	7.9	3.1	3.9	3.3	3.2	3.6	3.8	7.2

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

TC-36

I-5878/I-5883/I-5986B Harnett and Johnston Counties

Traffic Control Supervisor

This provision supersedes Article 1101-13 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures.

The Contractor shall furnish a Traffic Control Supervisor for the entire project (I-5878, I-5883, I-5986B) who is knowledgeable of Transportation Management Plan design, devices and application, and has full authority to ensure traffic is maintained in accordance with the plans and specifications.

The Traffic Control Supervisor shall be on the entire project (I-5878, I-5883, I-5986B) overseeing all work zone traffic control operations including but not limited to road closures and detours, lane closures, temporary alignments, and median crossover operations to ensure traffic control devices are properly installed and adjusted as necessary. The Traffic Control Supervisor shall also make necessary changes to the traffic control operations and aide in the monitoring of traffic queuing.

The Contractor shall identify a Traffic Control Supervisor. The name and contact information of the work zone supervisor shall be provided to the Engineer prior to or at the preconstruction conference. The Traffic Control Supervisor shall have the following qualifications:

(1) A minimum 24 months of On-the-Job Training in supervision and work zone set up and implementation on similar projects.

(2) Be certified by responsible party (contractor or NCDOT) to have the required experience and training and is qualified to perform the duties of this position. If certified by the Contractor, a notarized certification letter shall be furnished to the Engineer at the preconstruction meeting. The letter shall state the Traffic Control Supervisor is qualified, and state that the Traffic Control Supervisor has the authority to ensure traffic is maintained in accordance with the contract documents.

The Traffic Control Supervisor shall perform the following:

(1) During construction, be available or on call 24 hours per day, 7 days per week to direct / make any necessary changes in the traffic control operations in a timely and safe manner. The Contractor shall provide NCDOT the name of the Traffic Control Supervisor and support personnel, and the phone number(s) where they can be reached 24 hours per day, seven days per week.

(2) Coordinate and cooperate with traffic control supervisors of adjacent, and overlapping construction projects, as well as construction projects in proximity to the subject project, to ensure safe and adequate traffic control setup is maintained throughout the entire project (I-5878, I-5883, I-5986B) at all times, including periods of construction inactivity.

(3) Coordinate and cooperate with the NCDOT Statewide Operations Center (STOC) to ensure proper messages are displayed on the CMSs and DMSs

(4) Provide traffic control setup that ensures safe traffic operations and workers' safety throughout the construction area.

(5) Attend all scheduled traffic control coordination meetings, as required by the Engineer.

(6) Monitor traffic delays and backups within the work zone.

Measurement and Payment

The *Traffic Control Supervisor* will be incidental to the project for which no direct compensation will be made.

PROJECT SPECIAL PROVISIONS
LIGHTING

1.00 DESCRIPTION

The work covered by this Section consists of furnishing, installing, connecting, and placing into satisfactory operating condition roadway lighting at locations shown on the plans. Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (*2018 Standard Specifications*).

Perform all work in conformance with Division 14 of the *2018 Standard Specifications* except as modified or added to by these Special Provisions. Install all bore pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

In addition to the requirements of Division 1400, other specific Sections of the *2018 Standard Specifications* applicable to the work on this project are listed below.

Section 1401	High Mount Standard and Portable Drive Unit
Section 1404	Light Standards
Section 1407	Electric Service Pole and Lateral
Section 1408	Light Control System
Section 1409	Electrical Duct
Section 1410	Feeder Circuits
Section 1411	Electrical Junction Boxes
Section 1412	Underpass Lighting

2.00 LIGHT STANDARD LIGHT EMITTING DIODE (LED) LUMINAIRES

2.10 DESCRIPTION

Furnish, install and place into satisfactory operation luminaire, either on a bracket arm or directly mounted to the standard, complete with all light sources, drivers, wiring inside standard from circuit conductors to luminaire, in-line breakaway fuseholders and fuses and ground wiring at the pole on light standards less than 55 ft. in height.

Type	HPS Replacement Equivalent	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens
185W LED	250W	3500K ±500K	83%	15,500
285W LED	400W	3500K ±500K	83%	19,150

Third party certified photometric files in IES format are required to be submitted with the catalog cuts for the proposed LED roadway luminaire. Photometric files must show that proposed luminaire will meet or exceed the design shown in the plans.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

2.20 MATERIALS

2.21 LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:
  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Report number
  - Date
  - Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
  - Description of luminaire, LED light source(s), and LED driver(s)
  - Goniophotometry
  - Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of a single piece die cast aluminum housing. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities.
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 3-0-3 and an IESNA distribution of Type II or Type III as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the plans. The same BUG rating and distribution type shall be used throughout the project.

- Minimum Ingress Protection (IP) dust and moisture ratings for the luminaire electrical components (driver and surge protection) and luminaire optical components shall be IP65 and IP66, respectively, as specified in ANSI C136.25.
- Luminaire shall have external and internal labels per ANSI C136.15 and ANSI C136.22, respectively. Internal label shall identify the manufacturer, year and month of manufacture and the manufacturer's part number.
- Luminaire shall have an internal bubble level.
- Luminaires shall start and operate in -20°C to +40°C ambient.
- Luminaires shall be rated for continuous service at an ambient temperature of 40°C (104°F)
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.4 square feet and 46 lbs.
- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31.
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Luminaire shall have a 1.25" to 2.0" adjustable tenon mount for connection to luminaire bracket arm assembly.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.
- Grommets shall be installed in cable entry holes. Cable entry holes shall be free from sharp edges which might cut conductors or an ungloved hand.
- All conductors inside the luminaire shall be neatly secured with tie-wraps as needed to prevent pinch points and assist in trouble shooting.

B. Driver
- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20°C to +40°C.
- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- Shall provide UL Class II output.

C. Surge Suppression
- Integral surge protection shall meet ANSI/IEEE C62.45 procedures based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High 10kV/10kA test, IEC 61000-4-2 (Electrostatic Discharge) 8kV Air/4kV Contact test and IEC 61000-4-4 (Fast Transients).

D. Electromagnetic interference
- Luminaires shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Luminaires shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing
- Luminaires shall be listed for wet locations.
- Luminaires shall be UL listed and labeled.

F. Finish
- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.
- Exterior surfaces shall be smooth and free of burrs.

G. Thermal management
- Mechanical design of protruding external surfaces (heat sink fins) on roadway luminaries shall facilitate hose-down cleaning and discourage debris accumulation.
- Liquids or moving parts will not be allowed for thermal management.

H. Color Quality
- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics
- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37
- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines. Terminal blocks shall be easily accessible to installers or repair personnel. Wire nuts are prohibited inside the luminaire housing.

K. Latching and hinging
- Refractor and housing door holders and hinges shall be designed to maintain positive control of door to the luminaire body so as not to allow the accidental disengagement of either door.

- Drivers shall be mounted to a housing door designed to be opened from the bottom of the luminaire. Housing door shall allow easy removal for troubleshooting/repair on the ground.

L. Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and/or email.

2.30 WARRANTY

Provide a minimum ten-year warranty covering maintained integrity and functionality of the luminaire housing, wiring, and connections, LED light source(s) and LED driver. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

Warranty period shall begin after project acceptance by the Department. Supplier shall furnish documentation of warranty procedures to the Contractor stating that warranty is for NCDOT.

2.40 CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion will be replaced by the Contractor at no additional cost to the Department.

2.50 MEASUREMENT AND PAYMENT

The roadway luminaries measured as provided above will be paid for at the contract unit price per each "Roadway Light Standard Luminaire – ____LED". Such price and payment will be considered full compensation for providing and installing the LED roadway luminaire on the bracket arm, wiring inside the standard from the circuit conductors to the LED roadway luminaire, in-line breakaway fuseholders with fuses and ground wiring at the pole on the light standard.

Payment will be made under:

Roadway Light Standard Luminaire – ____LED..... Each

3.00 HIGH MAST LIGHT EMITTING DIODE (LED) LUMINAIRES

3.10 DESCRIPTION

Furnish, install and place into satisfactory operation, LED luminaires on high mount standards as detailed in these Special Provisions.

The Contractor shall supply Holophane or Cooper LED high mount luminaires as specified below or approved equal.

Mounting Height	# of Fixtures	Holophane Part Number	Cooper Part Number
120’	8	HMLED3-PK3-40K-HVOLT-G-AW-P7	GAN-AF-10-LED-8-5WQ-AP-MA-4N7
100’	6	HMLED3-PK3-40K-HVOLT-G-AW-P7	GAN-AF-10-LED-8-5WQ-AP-MA-4N7
80’	8	HMLED3-PK1-40K-HVOLT-G-AW-P7	GAN-AF-06-LED-8-5WQ-AP-MA-4N7
60’	4	HMLED3-PK1-40K-HVOLT-G-AW-P7	GAN-AF-06-LED-8-5WQ-AP-MA-4N7

Any alternate luminaire submitted for approval must meet the minimum requirements in the table and sections below.

Mounting Height	Max. LED Fixture Wattage	Number & HPS Replacement Equivalent	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens (per fixture)
120’	560W	8 x 750W	3500K ±500K	87%	54,000
100’	560W	6 x 750W	3500K ±500K	87%	54,000
80’	335W	8 x 400W	3500K ±500K	87%	27,000
60’	335W	4 x 400W	3500K ±500K	87%	27,000

The Contractor shall supply the Department with current catalog cuts and 3rd party certified photometric data files in Illuminating Engineering Society (IES) format for any alternate high mount luminaire submitted for approval. The Department will thoroughly evaluate alternate luminaires to determine if proposed alternate high mount luminaire meets or exceeds design criteria.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

High mount luminaire retrofit LED kits are not an acceptable alternative.

3.20 MATERIALS

3.21 LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:
  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Report number
  - Date
  - Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
  - Description of luminaire, LED light source(s), and LED driver(s)
  - Goniophotometry
  - Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of aluminum. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities.
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 5-0-5 and an IESNA distribution of Type V as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the plans. The same BUG rating and distribution type shall be used throughout the project.
- Luminaire LED modules shall meet dust and moisture rating of IP-66, minimum.
- Luminaire shall have an external label per ANSI C136.15.
- Luminaires shall have an internal label per ANSI C136.22.
- Luminaires shall start and operate in -20°C to +40°C ambient.
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.3 square feet and 65 lbs.
- Luminaires shall be designed for ease of electrical component replacement.

- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31-2010
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.

B. Driver
- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20°C to +40°C.
- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.

C. Surge Suppression
- Integral surge protection shall meet ANSI/IEEE C62.45 procedures based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High 10kV/10kA test, IEC 61000-4-2 (Electrostatic Discharge) 8kV Air/4kV Contact test and IEC 61000-4-4 (Fast Transients).

D. Electromagnetic interference
- Luminaires shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Luminaires shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing
- Luminaires shall be listed for wet locations.
- Luminaires shall be UL listed and labeled.

F. Finish
- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.

G. Thermal management

- Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation.

H. Color Quality
- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics
- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal/mechanical/chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37
- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines
- Latching and hinging

K. Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and/or email.

3.30 WARRANTY

Provide a minimum ten-year warranty covering maintained integrity and functionality of the luminaire housing, wiring, and connections, LED light source(s) and LED driver. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

Warranty period shall begin after project acceptance by the Department.

3.40 CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Securely terminate the wiring for each high mount luminaire and include an equipment grounding conductor to bond the housing to the supply cord grounding conductor.

Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion will be replaced by the Contractor at no additional cost to the Department.

3.50 MEASUREMENT AND PAYMENT

The high mount luminaires measured as provided above will be paid for at the contract unit price per each "(height) High Mount Luminaire – LED". Such price and payment will be considered

full compensation for providing and installing the LED high mount luminaire on the carrier ring tenon arm and connecting the LED high mount luminaire to the supply cord on the carrier ring.

Payment will be made under:

(height) High Mount Luminaire – LED ..... Each

4.00 LIGHTING CONTROL SYSTEM

4.10 DESCRIPTION

The work covered under this section consists of furnishing and installing an entire control system, including enclosure, control panel, breakers, terminal blocks, wiring, conduits, lightning arrester, a concrete foundation, metal pole and galvanized slotted channel is also included.

The control system will be standard electrical components in a stainless steel enclosure mounted on a metal pole with a concrete foundation as shown in the contract.

4.20 MATERIALS

Refer to Division 10 of the *2018 Standard Specifications*.

Item	**Section**
Conduit	1091-3
Portland Cement Concrete, Class A	1000-4
Wire and Cable	1091-2, 1400-2

Provide concrete foundations and wire in accordance with the *2018 Standard Specifications*.

Use a piece of 4" rigid galvanized steel conduit (RGC), embedded in concrete as shown in the plans, for mounting the control system.

Provide a NEMA type 3R stainless steel enclosure with external stainless mounting flanges, drip shield, back panel and continuous hinge door with a print pocket. Provide a door closing mechanism interlocked with a flange mounted operator handle to prevent the opening of the door with the service circuit breaker in the ON position, except by use of safety override devices.

Provide an enclosure approximately 36" (h) x 30" (w) x 10" (d) unless noted otherwise in the plans. Provide only openings necessary for the entrance of conduits as shown in the plans. Do not use knockouts. Ensure the enclosure conforms with NEC Article 312 and mount the devices so the NEC clearances will be provided, except use 1.5" where not specified or noted in the tables for minimum wire bending space.
Use minimum 1-5/8" x 1-5/8" galvanized slotted steel framing channel with straps and bolts for the mounting brackets and hardware for attaching the enclosure. Use galvanized finish on the brackets and hardware and coat all field cuts or scratches with organic zinc repair paint.

Provide a neutral bar, bonded to the panel, with sufficient box lug type terminals to accept the required number of wires.

Mount components to the back panel with manufacturer supplied mounting brackets or permanently attached screw studs.

Use a service circuit breaker providing an minimum interrupting rating of 22,000 A. Provide thermal magnetic, molded case, permanent trip breakers. Provide multi-tap, solderless, load side box lugs or distribution terminal blocks of the appropriate size. Use insulating material approved for NEMA 3R applications. Provide a breaker with a voltage and amperage rating as indicated in the plans.

Use feeder circuit breakers which are rated 14,000 A minimum interrupting capacity and have an open type molded case with a non-adjustable thermal magnetic trip setting as noted in the plans.

Where Communication Gateways are required, provide a single pole, open type gateway circuit breaker rated at 240 VAC phase to ground with a minimum interrupting current capacity of 5,000 A and a high magnetic trip setting of 15 A.

Use a Type 1 surge protection device (SPD) meeting UL 1449 and UL 96A, designed to contain and arrest an arc of 20,000 A. Install the SPD on the load side of the service breaker.

Use terminals and lugs rated for the connection of the appropriate size copper conductors. All conductors shall be made of copper and neatly wrapped in bundles or run in plastic raceways.

Perform all galvanizing in accordance with Section 1076.

Provide a drawing to scale showing the location, brand and catalog number of each component of the control system for approval. The completed light control system shall be marked "Suitable for Use as Service Equipment", in a prominent location in the enclosure, in accordance with NEC Article 409.110. If the control system is not made in a certified UL 508A Panel Shop, a third party, recognized by the Department of Insurance as having the authority, shall label the control systems.

4.30 CONSTRUCTION METHODS

Construct the new control system foundation at the new location as shown in Standard Drawing 1408 of the Roadway Standard Drawings, with the top of the foundation 3 inches above finished grade.

Fasten the enclosure to the pole by means of a galvanized bracket assembly as shown in the plans. Make all cuts square and remove all rough edges. Have mounting holes match existing mounting holes of the enclosure.

Arrange all conduits entering the enclosure in a neat symmetrical manner and extend directly downward into the foundation. Install six RGC feeder circuit conduits as shown in the Roadway Standard Drawings.

Install a Control System Junction Box as shown in the plans. Stub all feeder circuit conduits and spare conduits from Control System in the Control System Junction Box. See Section 1412 of the *2018 Standard Specifications* for junction box construction methods. See plans for conduit sizes. Place pull cord in any unused conduits and cap unused conduit in junction box.

To prevent the creation of electrically parallel paths, install a bonded conduit choke on the underground termination point of the system grounding conductor conduit in accordance with NEC Article 250.64(E). Do not terminate the system grounding conduit under the concrete foundation pad.

Install a grounding electrode system consisting of a minimum of two ground rods spaced not less than 6 feet apart at all new lighting control system panels. Connect ground rods with an appropriately sized bonding jumper.

Apply two coats of organic zinc repair paint to all field cut metal and conduit threads as specified in Article 1076-7 of the *2018 Standard Specifications*.

Install a 4" to 2" galvanized reducing bushing to the top of the 4" RGC the control system enclosure is mounted to. Install a 10' section of 2" RGC on the reducing bushing and install a cap on the top of the 2" RGC.

4.40 MEASUREMENT AND PAYMENT

Lighting Control System will be measured and paid for as the actual number of the lighting control systems that have been provided, installed and accepted. Such price and payment shall be considered full compensation for the foundation, conduits, enclosure with components and mounting hardware.

Payment will be made under:

Light Control Equipment, Type RW, 240/480V..... Each

5.00 COMMUNICATION GATEWAY

5.10 DESCRIPTION

The Contractor shall provide and install a communication gateway at the lighting control panels noted on the plans. The communication gateway will be used to provide communication from the control nodes on the luminaires to a centralized monitoring software package. The communication gateway will be mounted on a piece of rigid galvanized conduit installed above the lighting control panel.

5.20 MATERIAL

The communication gateway shall be a GE LightGrid gateway rated for the voltage shown in the plans.

Use conduit and conductors as specified in Article 1400-2 of the *2018 Standard Specifications*.

Provide stainless steel straps, galvanized conduit hangers, galvanized bolts, washers and nuts, and liquid-tight flexible metallic conduit (LFMC).

5.30 CONSTRUCTION METHODS

Mount the communication gateway to the 2" RGC pole, installed as part of the control system special provision, using the bands included with the gateway. Remove an existing cable gland in the bottom of the gateway enclosure and replace with a ½" RGC fitting. Install ½" RGC and appurtenances required to route conduit to bottom of lighting control panel enclosure. Transition RGC to LFMC to make the turn into the bottom of the enclosure. Secure LFMC to bottom of enclosure using a weatherproof fitting. Install a bonding bushing on the LFMC fitting inside the enclosure and attach to bonding jumper inside the enclosure.

Strap standoffs with rigid conduit hangers to the 2" RGC and secure ½" conduit to the conduit hanger. Install #12 THWN conductors inside the ½" RGC for power from the gateway circuit breaker in the control system enclosure to the gateway. Use a UV resistant cable tie to secure the magnetic GPS antenna to the frame.

See Section 7.00 below for commissioning requirements.

5.40 MEASUREMENT AND PAYMENT

Communication Gateway will be measured and paid as the actual number of communication gateways installed and accepted. Such price and payment includes mounting of the communication gateway on the 2" RGC pipe, installation of the RGC conduit from the gateway into the control system and installation of the conductors.
Payment will be made under:

Communication Gateway.....Each

6.00 CONTROL NODE

6.10 DESCRIPTION

The Contractor shall provide and install a communication node with each new LED luminaire on the project. The communication node will be used to interface with the Department's Statewide lighting control system. The communication node shall be provided with 10 years of service from the manufacturer.

6.20 MATERIALS

The communication node shall be a GE LightGrid version 2.0 (or higher) node rated for the same service voltage as the luminaire. No other materials are required for this section.

6.30 CONSTRUCTION METHODS

Install communication node on the seven-pin photocell receptacle of the luminaire. The communication node utilizes a twist-lock connection to ensure positive connection to the luminaire.

See Section 7.00 below for commissioning requirements.

6.40 MEASUREMENT AND PAYMENT

Control Node will be measured and paid for as the actual number of control nodes provided, installed and accepted. Per node service charge fee for a period of 10 years is incidental to the control node.

Payment will be made under:

Control Node ..... Each

7.00 SMART CONTROL SYSTEM INITILIZATION AND COMMISSIONING

7.10 DESCRIPTION

The Communication Gateway(s) and Control Nodes as described in the prior sections require commissioning to enable communication with the existing Statewide lighting control system.

After project award, the Contractor shall coordinate with Brady/Trane Services (Brady) at 919-232-5764 or warranty.request@bradyservices.com to have Brady commission the smart controls system, incorporate new gateways and smart nodes into the LightGrid infrastructure and troubleshoot communication issues. Brady shall bill the contractor directly for these services.

7.20 MATERIALS

No materials are required for this section.

7.30 CONSTRUCTION METHODS

As part of this contract, the Contractor shall provide new GE LightGrid gateways and control nodes. See Sections 5.00 and 6.00, respectfully, of these Project Special Provisions for gateway and control node requirements.

As a function of the LightGrid system, the Contractor is unable to turn the lights on for testing during the day. The luminaires installed as part of this project are powered 24/7; however, the control node installed on each luminaire has an integral photocontrol, preventing the luminaire from operating during daylight hours.

The Contractor shall notify Brady at least two weeks prior to beginning the construction work. Brady will remotely commission the new LightGrid system, override the internal control node photocontrol and turn all of the control nodes on for 24/7 operation for the duration of the lighting construction. This will allow the Contractor to turn the lighting circuits on and off during the day via the breakers in the lighting control panel.

The Contractor shall notify Brady again when lighting work is complete. At that point Brady will remotely confirm that there is communication between the control nodes and the gateway, and will place the system to normal dusk to dawn operation.

In the event that a communication failure of some, or all, smart nodes or the gateway is encountered, the Contractor shall coordinate with Brady to troubleshoot and resolve the failure.

7.40 MEASUREMENT AND PAYMENT

The Contractor will be reimbursed by the Department for the actual verified cost of charges by Brady for LightGrid service charges. The service charges may include efforts by Brady to: commission the newly installed gateways and control nodes; place the GE LightGrid system into 24/7 operation; place the system in normal dusk to dawn operation; troubleshoot communication issues with the LightGrid system.

8.00 REMOVE SINGLE ARM LIGHT STANDARDS

8.10 DESCRIPTION

The work covered by this section consists of the removal of existing single arm metal light standards on breakaway bases and concrete foundations at locations shown on the plans. The standards are less than 50' mounting height, and are attached to the foundations with anchor bolts.

Concrete foundations to be removed or abandoned may be located in areas where, due to knockdowns, there are no light standards to be removed.

8.20 MATERIALS

No materials are required for this work except such miscellaneous items as tape and terminal devices to dead-end circuits serving the light standards.

8.30 CONSTRUCTION METHODS

Maintain operation of the existing lighting system until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NC DOT Traffic Services Supervisor to assure that circuits can be de-energized where and when necessary.

Carefully remove the luminaire with the GE LightGrid smart node from bracket arm assembly. If the smart node is removed from the luminaire, the Contractor must institute a tagging system so that the same smart node can be reinstalled on the same luminaire.

Remove light standard and arms, couplings, anchor nuts, washers, transformer bases with doors and connecting bolts and fuse holders.

A quantity of ten (10) of the removed light standards, arms, transformer bases and attachment hardware shall be salvaged. The salvaged light standards, arms, transformer bases and attachment hardware shall be delivered to the NCDOT storage facility at 1041 Prison Camp Road, Durham, NC 27704. The Contractor shall notify Robert Lynch in the Division 5 Traffic Services Office by phone at 919-536-4000 during normal working hours at least 48 hours in advance to schedule pole delivery.

All hoisting and lifting shall be with rope or web slings fastened in such a manner as to prevent damaging or marking any of the salvaged materials. The Contractor shall provide proper transportation, protection and supports so that rain, etc. will not damage salvaged equipment. The Contractor shall furnish labor, blocking materials and equipment to unload and properly store all salvaged materials at the NCDOT warehouse.

All removed luminaires and smart nodes will be reused and installed on proposed light standards installed as part of this project. Refer to Section 9.00 of these Special Provisions. Refer to Section 11.00 of these Project Special Provisions if these luminaires and smart nodes are to be stored between removal and reinstallation.

Remove or abandon existing concrete light standard foundations as defined in Standard Specifications Section 1400-10. Dispose of the removed concrete, reinforcing steel and anchor bolts in a manner acceptable to the Engineer. Backfill the holes with suitable material and compact backfill as required.

Abandon or remove the conductors and the conduit for the removed light standards as shown on the plans. Refer to Standard Specifications Section 1400-10.

8.40 MEASUREMENT AND PAYMENT

The quantity of removed light standards to be paid for will be the actual number which have been dismounted from existing foundations and delivered in good condition to the NCDOT Warehouse or disposed of.

The quantity of removed foundations to be paid for will be the actual number which have been removed or abandoned and accepted.

The salvaged light standards will be paid for at the contract unit price per each "Remove Single Arm Light Standard - Salvage". Such price and payment will be considered full compensation for disassembly and delivery of the shaft, arm, fuseholders, transformer base and hardware to the NCDOT storage area.

The disposed light standards will be paid for at the contract unit price per each "Remove Single Arm Light Standard - Dispose". Such price and payment will be considered full compensation for disassembly and disposal of the shaft, arm, fuseholders, transformer base and hardware.

The removed foundations will be paid for at the contract unit price per each "Remove Light Standard Foundation". Such price and payment will be considered full compensation for removing or abandoning foundation concrete, reinforcing steel and anchor bolts. It also includes backfilling the holes with suitable material and compaction the backfill material as required. Payment will be made under:

Remove Single Arm Light Standard - Salvage.....Each
Remove Single Arm Light Standard - Dispose.....Each
Remove Light Standard Foundation.....Each

9.00 REINSTALL LUMINAIRES

9.10 DESCRIPTION

Reuse the cobrahead and high mast light emitting diode (LED) luminaires and GE LightGrid smart nodes removed from the single arm and high mast poles at the I-95/NC 50 interchange as part of this project. See Section 8.00 of these Project Special Provisions. If the smart nodes are removed from the luminaire, the Contractor must institute a tagging system so that the same smart node can be reinstalled on the same luminaire.

9.20 CONSTRUCTION METHODS

For the reused cobrahead luminaires, install and place into satisfactory operation the used luminaire and smart node on a bracket arm on a twin arm light standard. Include new wiring inside the standard from circuit conductors to luminaires, new in-line breakaway fuseholders and fuses and new ground wiring at the standard.

For the reused high mast luminaires, securely terminate the wiring for each luminaire and include an equipment grounding conductor to bond the housing to the supply cord grounding conductor.

Level and secure each luminaire in all directions. Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion will be replaced by the Contractor with a new luminaire meeting the requirements of Section 2.00 or 3.00 of these Special Provisions. The Contractor will be reimbursed at the bid item price for "Roadway Light Standard Luminaire – ____LED" for any replacement cobrahead luminaire, and at the bid item price for "100' High Mount Luminaire – LED" for any replacement high mast luminaire.

9.30 MEASUREMENT AND PAYMENT

The cobreahead luminaries measured as provided above will be paid for at the contract unit price per each "Reinstall Cobrahead Luminaire". Such price and payment will be considered full compensation for installing the LED cobrahead luminaire on the bracket arm, wiring inside the standard from the circuit conductors to the LED roadway luminaire, in-line breakaway fuseholders with fuses and ground wiring at the pole on the light standard.

The high mast luminaries measured as provided above will be paid for at the contract unit price per each "Reinstall High Mast Luminaire". Such price and payment will be considered full compensation for installing the LED high mast luminaire on the tenon and providing an equipment grounding conductor to bond the luminaire housing to the supply cord grounding conductor.

Payment will be made under:

Reinstall Cobrahead Luminaire .....Each
Reinstall High Mast Luminaire .....Each

10.00 REMOVE 100' HIGH MOUNT STANDARDS

10.10 DESCRIPTION

The work covered by this section consists of the removal of existing 100' High Mount Standards on concrete foundations at locations shown on the plans. The standards are attached to the foundations with anchor bolts.

Remove or abandon concrete foundations.

10.20 MATERIALS

No materials are required for this work except such miscellaneous items as tape and terminal devices to dead-end circuits serving the standards.

10.30 CONSTRUCTION METHODS

Maintain operation of the existing lighting system until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NC DOT Traffic Services Supervisor to assure that circuits can be de-energized where and when necessary.

Carefully remove the luminaire with the GE LightGrid smart node from head frame carrier ring. If the smart node is removed from the luminaire, the Contractor must institute a tagging system so that the same smart node can be reinstalled on the same luminaire. All high mast luminaires will be reinstalled on new high mast poles installed as part of this project. Refer to Section 11.00 of these special provisions if the luminaires are to be stored before reuse.

Dismount high mast pole and remove lowering device head frame and carrier ring. High mast pole and all components shall be disposed of by the Contractor.

Remove or abandon existing concrete high mast foundations as defined in Standard Specifications Section 1400-10. Dispose of the removed concrete, reinforcing steel and anchor bolts in a manner acceptable to the Engineer. Backfill the holes with suitable material and compact backfill as required.

Abandon or remove the conductors and the conduit for the removed high mast light standards as shown on the plans. Refer to Standard Specifications Section 1400-10.

10.40 MEASUREMENT AND PAYMENT

The quantity of removed high mast standards to be paid for will be the actual number which have been dismounted from existing foundations and properly disposed of.

The quantity of removed foundations to be paid for will be the actual number which have been removed or abandoned and accepted.

The removed high mast light standards measured as provided above will be paid for at the contract unit price per each "Remove 100' High Mast Standard". Such price and payment will be considered full compensation for disassembly and disposal of the high mast pole and all components.

The removed foundations measured as provided above will be paid for at the contract unit price per each "Remove 100' High Mast Standard Foundation". Such price and payment will be considered full compensation for removing or abandoning foundation concrete, reinforcing steel, transformer bases and anchor bolts. It also includes backfilling the holes with suitable material and compaction the backfill material as required.

Payment will be made under:

Remove 100' High Mast Standard.....Each
Remove 100' High Mast Standard Foundation.....Each

11.00 LUMINAIRE STORAGE

11.10 DESCRIPTION

The work covered in this section consists of providing all equipment, labor, materials and transportation necessary to transport and store LED luminaires and LightGrid smart nodes at a bonded and climate controlled warehouse facility.

11.20 MATERIALS

The Contractor shall provide pallets and straps for storing and transporting the luminaire and smart nodes.

11.30 CONSTRUCTION METHODS

Should storage of the LED luminaires and corresponding smart nodes be necessary during the project, the Contractor is required to store the luminaires and smart nodes in a bonded, climate controlled warehouse facility.

The Contractor shall securely strap the luminaires with smart nodes to a pallet, and transport the pallet(s) to the warehouse facility. If the smart nodes are removed from the luminaires during storage, the Contractor must institute a tagging system so that the same smart node can be reinstalled on the same luminaire. The Contractor shall provide proof to the Department that a bonded and climate controlled warehouse is being used. Bonding and climate control are required in order for the Department to maintain the warranty provided by Brady for any of the existing luminaires and smart nodes which are reused and reinstalled as part of this project.

When luminaires are to be reinstalled, the Contractor shall retrieve the luminaires and smart nodes from the warehouse facility and reinstall.

11.40 MEASUREMENT AND PAYMENT

The luminaires to be stored and reinstalled will be paid for at the contract lump sum unit price "Luminaire Storage". Such price and payment will be considered full compensation for storing the removed luminaires and smart nodes in a bonded, climate controlled warehouse. It also includes transportation of the luminaires to and from the warehouse.

Payment will be made under:

Luminaire Storage.....Lump Sum

12.00 RELOCATE CONTROL SYSTEM

11.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to move an existing control system to a new foundation at the location shown on the plans. It also includes storage of materials to be reused, removal of the existing foundation and construction of a new foundation.

12.20 MATERIALS

Reuse existing materials, including control system enclosure and all internal components. Replace materials that are to be reused if they are damaged during relocation. Materials damaged during relocation will be replaced with new materials at no additional cost to the Department.

The Contractor is responsible for the storage and protection of the reused materials against loss or damage.

12.30 CONSTRUCTION METHODS

Maintain operation of the existing lighting system until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NC DOT Traffic Services Supervisor to assure that circuits can be de-energized where and when necessary.

Disconnect circuitry and remove control system enclosure from conduit and support structure, leaving all internal components intact. Abandon or remove underground circuitry, concrete pad and support structure. Refer to Standard Specifications Section 1400-10.

Dispose of the removed concrete, reinforcing steel, support structure and conduit in a manner acceptable to the Engineer.

All hoisting and lifting shall be with rope or web slings fastened in such a manner as to prevent damaging or marking any of the salvaged materials. The Contractor shall provide proper transportation, protection and supports so that rain, etc. will not damage equipment. The Contractor shall furnish labor, blocking materials and equipment to unload and properly store all salvaged materials.

Install a new foundation and mounting hardware. See Section 1408 of the Standard Specifications and Standard Drawings for installation of relocated control system and foundation. Install new rigid galvanized conduit above ground and new feeder circuitry as shown on the plans.

12.40 MEASUREMENT AND PAYMENT

The relocated control system measured as provided above will be paid for at the contract unit price per each "Relocate Control System". Such price and payment will be considered full compensation for disconnecting circuitry, disassembly, transportation, storage, reassembly, installing new connecting hardware and conduit, connection of new circuitry, removal of existing foundation and support structure, disposing of concrete, backfilling, compaction, construction of new foundation and support structure and all incidentals necessary to complete the work.

The quantity of relocated control systems to be paid for will be the actual number which have been dismantled and relocated to new proposed location.

Payment will be made under:

Relocate Control System.....Each

13.00 COORDINATION WITH STATEWIDE LIGHTING MAINTENANCE FIRM

13.10 DESCRIPTION

The existing lighting system installed at the East Main Street interchange is being monitored and maintained by Brady/Trane Services (Brady) under a Statewide service agreement. As part of the service agreement with Brady, a smart lighting control system (GE LightGrid) has been installed at this interchange to monitor the power usage and status of the lighting system. The smart lighting control system consists of a wireless gateway installed at the control panel location and smart nodes installed on each luminaire.

The Contractor shall coordinate with Brady at 919-232-5764 or warranty.request@bradyservices.com to have Brady turn the smart lighting control system on and off for the roadway lighting system reconfiguration, installation and testing, troubleshoot communication issues and incorporate new smart nodes installed on new luminaires into the LightGrid infrastructure. Brady shall bill the contractor directly for these services.

13.20 MATERIALS

No materials are required for this section.

13.30 CONSTRUCTION METHODS

As a function of the LightGrid system, the Contractor is unable to turn the lights on for testing during the day using the Hand-Off-Auto switch in the existing control panel. The existing luminaires are powered 24/7 and the smart node installed on each luminaire has an integral photocontrol, preventing the luminaire from operating during daylight hours.

The Contractor shall notify Brady at least two weeks prior to beginning the construction work for the reconfiguration of the existing lighting system. Brady will remotely turn all the lights on for

24/7 operation for the duration of the lighting construction. This will allow the Contractor to turn the lighting circuits on and off during the day via the existing breakers in the existing control panel. When not in conflict and where construction allows, the lighting circuits shall be energized at night.

As part of this contract, the Contractor shall provide new GE LightGrid smart nodes for each new luminaire. See Section 6.00 of these Project Special Provisions for smart node requirements. The Contractor shall coordinate with Brady to have these new smart nodes added to the existing gateway to allow for proper communication of the GE LightGrid system.

The Contractor shall notify Brady again when work is complete. At that point Brady will remotely confirm that there is communication between the original smart nodes, the newly installed smart nodes and the gateway, and return the system to normal dusk to dawn operation.

In the event that this reconfiguration project causes a communication failure of some or all smart nodes or the gateway, the Contractor shall coordinate with Brady to troubleshoot and resolve the failure.

13.40 MEASUREMENT AND PAYMENT

The Contractor will be reimbursed by the Department for the actual verified cost of charges by Brady for LightGrid service charges. The service charges may include: efforts by Brady/Trane Services to place the GE LightGrid system into 24/7 operation and return the system to normal dusk to dawn operation, efforts required to add new smart nodes into the existing GE LightGrid infrastructure, efforts by Brady to troubleshoot communication issues with the LightGrid system and efforts for commissioning of the new smart nodes installed as part of this project.

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Roger Kluckman
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3/26/2021

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PROJECT SPECIAL PROVISIONS
STREET LIGHTING CONDUIT

1.00 DESCRIPTION

The work covered by this Section consists of installing, connecting, and placing into satisfactory condition a street lighting conduit system along Spring Branch/Pope Road, US 421 and NC 50 (E. Main Street) as shown on the plans. Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (*2018 Standard Specifications*). Erection of light standards, and installation of circuit conductors and light standard luminaires will be performed by Duke Energy Progress or the Town of Benson at a later date.

Perform all work in conformance with Division 14 of the *2018 Standard Specifications* except as modified or added to by these Special Provisions. Install all bore pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

In addition to the requirements of Division 1400, other specific Sections of the *2018 Standard Specifications* applicable to the work on this project are listed below.

Section 1409 Electrical Duct

2.00 STREET LIGHTING CONDUIT INSTALLATION

2.10 DESCRIPTION

Amend Article 1409-1 as shown below.
Install conduit for street lighting along the subject project as shown in the lighting plans including equipment and labor for trenching/open cut along the road shoulder and directional bore under roadway.

2.20 MATERIALS

Amend Article 1409-2 as shown below:
Duke Energy Progress has provided the City of Dunn with the required 2" conduit to be installed along US 421 west of the I-95 interchange. The Contractor shall contact Mathew Boone, Assistant City Manager, with the City at 910-230-3502 or mboone@dunn-nc.org to arrange pick up location and time of this conduit. The contractor is responsible for providing all other conduit to be installed at US 421 east of I-95 and along Spring Branch/Pope Road as shown in the plans.

The Town of Benson will provide the required 2" PVC conduit for the NC 50 (E. Main Street) installation. The Contractor shall contact Glenn Core, Electric Distribution System Supervisor with the Town of Benson, at 919-894-3553 to arrange pick up location and time and obtain conduit required for installation along NC 50.

Contractor shall notify the City of Dunn and the Town of Benson no less than three weeks before conduit is required. After conduit is accepted by the Contractor, the Contractor becomes the owner and is responsible for loss or damage to material.

2.30 CONSTRUCTION METHODS

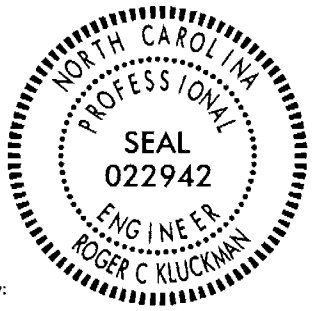
Same as Article 1409-3.

2.40 MEASUREMENT AND PAYMENT

Street Lighting Conduit Installation (2" PVC) will be measured and paid for as the actual number of linear feet of conduit, measured in place to the nearest whole foot, installed and accepted along US 421 west of the I-95 interchange in Dunn and along NC 50 (E. Main Street) in Benson. Retrieval of conduit from the City of Dunn and the Town of Benson is incidental to the installation.

Payment will be made under:

Pay Item	**Pay Unit**
Street Lighting Conduit Installation for _____ (2" PVC)	Linear Foot



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Utility Construction

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7/7/2021

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Revise the 2018 Standard Specifications as follows:

Page 10-62, Sub-article 1036-1 General, paragraph 1:
replace sentence 1 with the following:

All materials when used to convey potable drinking water shall meet National Sanitation Foundation (NSF)/ANSI 61 and NSF/ANSI 372.

Page 10-62, Sub-article 1036-3 Plastic Pipe:
add the following sentence:

All plastic pipe system components and related materials shall be in conformance with NSF/ANSI 14.

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
add the following sentences:

The utility owners are the Town of Benson (Benson) and Johnston County Department of Public Utilities. For work involving Benson's facilities, the Contractor shall contact Tim Robbins, Public Works/Utilities Director at (919) 894-3553. Johnston County has no utility conflicts within the project, but they have a sewer force main crossing NC 50 at the east end of the project which connects to the Town's 8" gravity sewer line at the intersection of Morgan and Hamlin Roads, sections of which are being relocated as part of the project (PS100 and PS500). The contractor must coordinate with the County when tying in these two sewer line relocations. The contact for the County is Mike Keen, Utility Projects Manager, at (919) 795-1944.

Representatives from Benson shall be given the opportunity to witness all tests performed on their water and sewer facilities. Test results shall be provided to Benson for any tests involving their facilities.

The Contractor shall notify Benson in writing, at least two weeks prior to beginning any work. If the work does not commence on the date specified in the written notice, then a new notice will be required with sufficient lead time to allow the rescheduling of inspection forces.

The Contractor must schedule a pre-construction conference with Benson staff at least two weeks before construction begins and must coordinate with Benson for regular inspection visitations and acceptance of the water and/or sewer system. Construction work shall be performed during the normal working hours of from 8:00 am to 5:00 pm Monday through Friday. Holiday, nights and weekend work shall only be done with prior approval. There are several areas where the roadway fill must be placed before proposed water or sewer mains can be installed, in order to maintain approximately 3' of cover from proposed finished grade.

Page 15-1, Sub-article 1500-3 Utility Locations and Contractor's Responsibility:
add the following paragraph:

The Contractor will be responsible for any and all repairs due to leakage damage from poor workmanship during the one (1) year warranty period once the water or sewer system improvements have been accepted by Benson. Benson will provide maintenance and repairs when requested and bill the Contractor if necessary due to lack of response within 48 hours of notification of warranty work. The Contractor will be responsible for any and all repairs due to damages resulting from failure to locate the new water or sewer lines and associated appurtenances for other utilities and until the water and sewer lines have been approved by NCDEQ and accepted by Benson. The final inspection of water or sewer system improvements cannot be scheduled with Benson until the roads have been paved; the rights of way and utility easements have been seeded and stabilized with an adequate stand of grass in place to prevent erosion issues on site.

Page 15-2, Sub-article 1500-7 Submittals and Records, paragraph 3:
replace sentence 3 with the following:

As-built drawings shall be provided to the Owners of water/sewer utilities, showing the size and type of material installed and the coordinates of all utility horizontal and vertical locations of all installed piping and appurtenances. Any and all field changes made during construction shall be properly documented on the as-built drawings, and shall also include lot numbers. As-built drawings shall be signed, sealed, and dated on each sheet by a North Carolina registered professional engineer (PE) as part of the Owner's acceptance process. As-built drawings shall be marked "Record Drawings", and all applicable information listed in the Owner's as-built drawing checklist shall be included. As-built drawings shall be submitted and approved prior to issuance of final acceptance. Provide two copies of as-built drawings to Benson. As-built drawings shall also be submitted to Benson electronically in AutoCAD format.

Page 15-2, Sub-article 1500-9 Placing Pipelines into Service, paragraph 2:
replace sentence 4 with the following:

Please note that in accordance with 15A NCAC 18C .0309(a), no construction, alteration, or expansion of a water system shall be placed into service or made available for human consumption until the Public Water Supply Section has issued Final Approval. Final Approval will be issued and mailed to the applicant upon receipt of both an Engineer's Certification and an Applicant's Certification submitted in accordance with 15A NCAC 18C .0303(a) and (c). A copy of the Final Approval shall also be forwarded to Benson staff for a final inspection. Prior to acceptance, all services will be inspected to ensure that they are installed at the proper depth. All meter boxes must be flush with proposed final grade. Meters are to be a minimum of 8" below the box lid.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated conditions:

In the event that contaminated areas are discovered in the field, provisions should be in place to notify the Engineer, NCDOT, and Benson of the contaminants encountered so that corrective measures and removal/remediation can be provided prior to installation of the water mains.

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) is encountered, use contaminant gasket material. Contaminant gasket material shall be fluoroelastomer or nitrile rubber in accordance with ASTM 1418 and ISO 1629. Gaskets shall be consistent with pipe manufacturer and Engineer's recommendation for any other contaminants encountered. The gaskets shall be furnished by the D.I. pipe manufacturer.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated and corrosive conditions:

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) and or corrosive and highly organic soils are encountered, provide polyethylene encasement in underground installations of ductile iron piping for water and sewer. Polyethylene wrap in tube or sheet form for piping encasement shall be manufactured of virgin polyethylene material conforming to the requirements of ANSI/ASTM Standard Specification D1248. The specified nominal thickness for low-density polyethylene film is 0.008 in. (8 mils). The specified nominal thickness for high-density cross-laminated polyethylene film is 0.004 in. (4 mils). The minus thickness tolerance shall not exceed 10 percent of the nominal thickness on both material types.

Page 15-4, Sub-article 1505-3(E) Thrust Restraint, second paragraph:
add the following sentences:

Benson requires pressurized pipelines and appurtenances to be restrained by concrete thrust restraint and restrained retainer glands or restrained joint DI pipe along the pipelines as shown on the plans and in the concrete thrust blocking details.

Page 15-4, Sub-article 1505-3, Add Polyethylene Encasement:
Add requirements for Installation of Polyethylene Encasement:

The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely air and watertight enclosure. Overlaps shall be secured by the use of polyethylene adhesive tape, plastic string or other non-degradable material approved by the Engineer and capable of holding the encasement in place until backfilling operations are completed. Pipe and fittings shall be wrapped with polyethylene prior to pouring concrete thrust blocks.

<u>Method A - For use with Polyethylene Tubes:</u>

1. Cut polyethylene tube to a length approximately two feet (2') longer than the pipe section.

2. Slip the tube around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears the pipe ends.

3. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.

4. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points.

5. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method B - For use with Polyethylene Tubes:

1. Cut polyethylene tube to a length approximately one foot (1') shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide six inches (6") of bare pipe at each end. Take up the slack at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points; secure the ends as described herein under Method A.

2. Before making a joint, slip a three-foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. After completing the joint, pull the three-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1').

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method C - For use with Polyethylene Sheets:

1. Cut polyethylene sheet to a length approximately two feet (2') longer than that of the pipe section. Center the cut length to provide a one foot (1') overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of polyethylene sheet at intervals of approximately three feet (3').

2. Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as described herein under Method A.

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Appurtenances:

Pipe-Shaped Appurtenances:

Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

Odd-Shaped Appurtenances:

1. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice, and taping down.

2. Tape polyethylene securely in place at valve stem and other penetrations.

Repairs:

Repair any cuts, tears, punctures, or damage to polyethylene with polyethylene adhesive tape or with a short length of polyethylene sheet or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Openings:

Openings in the encasement shall provide for branches, blow-offs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut with tape. Service taps and other taps without tapping sleeves should be made directly through the polyethylene after wrapping the pipe with 2-3 layers of polyethylene tape, with any resulting damaged areas being repaired as described herein.

Terminations:

Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least three feet (3'). Secure the end with circumferential turns of tape. Service lines and other attached lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of three feet (3') away from the ductile-iron pipe.

Backfilling for Polyethylene-Wrapped Pipe:

1. Use the same backfill material as specified for pipe without polyethylene wrap, exercising care to prevent damage to the polyethylene wrapping when placing backfill material.

2. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Backfill shall be as specified for the pipe without polyethylene encasement.

Page 15-5, Sub-article 1510-2 Materials, last paragraph:
add the following sentences:

Utility locator wires shall be terminated at the top of valve boxes on water mains. No spliced wire connections shall be made underground on locator wires. Locator wires may be secured with duct tape to top of pipe before backfilling.

Page 15-6, Sub-article 1510-3(A) General, fifth paragraph:
add the following sentence to the beginning of the paragraph:

Protect all pipes during loading, transport, unloading, staging, and installation.

Page 15-6, Sub-article 1510-3(B) Testing and Sterilization, first paragraph:
add the following sentences:

The hydrostatic pressure tests on Benson mains must be witnessed by Benson Staff. The Contractor must notify Benson staff when lines are ready to begin filling and coordinate with them to witness all pressure testing.

Page 15-7, Sub-article 1510-3(B) Testing and Sterilization, ninth paragraph:
add the following sentence to the beginning of the paragraph:

All water samples for bacteria testing on Benson's mains will be collected by the Contractor and witnessed by a representative of Benson.

Page 15-8, Sub-article 1515-3(A) Valves, first paragraph:
add the following sentences:

Install a 4"x4" concrete valve marker at the edge of the right of way to identify the location of each gate valve installed in the relocated water or sewer system with the exception of the fire hydrant isolation valves. Measure the distance from the center of the concrete marker to the center of the valve box. This distance (in linear feet) shall be stamped on the brass plate located on the top of the concrete valve marker.

Page 15-8, Sub-article 1515-3(A) Valves, second paragraph:
add the following to the beginning of the paragraph:

Conduct a pneumatic pressure test using compressed air or other inert gas on the stainless steel tapping sleeves prior to making the tap on the existing water mains. This pneumatic pressure test must be witnessed by Benson staff.

Page 15-8, Sub-article 1515-3(B) Meters:
add the following paragraph:

New water meters shall be all brass. Use ABB, Kent, Dewey Brothers (C3000) or approved equal for ¾" or 1" services.

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

Plan Sheets UC-3A, UC-8, and UC-12; Steel Pile Piers. For the proposed 12" sanitary gravity sewer line (PS500), install Steel Pile Piers per the details shown on Sheet UC-3A and to the depth shown on sheet UC-12 or to refusal, whichever is less, using a Pilemaster 24-750, Pilemaster 24-900, or approved equal. The locations of the proposed Steel Pile Piers are shown on Sheet UC-12. Piles shall not be placed in the centerline of the outlet channel of the 2@6'x9' RCBC. All steel shall conform to the requirements of ASTM A992 Grade 50. All welds shall be by a certified welder. All steel members and straps will be power tool cleaned to a minimum of SSPC-SP3 and hot-dipped galvanized per ASTM A123. Bolts and washers will be hot-dip galvanized per ASTM A153. All welds will be grinded and coated with 2 coats of a cold applied galvanizing paint.

Measurement and Payment:

Payment for *Steel Pile Piers*, installed in accordance with the plans and Special Provisions herein and accepted, will be measured and paid for at the contract unit price each for "*Steel Pile Piers*". Such price and payment will be full compensation for all materials, labor, installation, excavation, equipment including pile driving, backfilling, and incidentals necessary to complete the work as required.

Pay Item:	**Pay Unit**
Steel Pile Piers	Each

END OF SECTION

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Revise the 2018 Standard Specifications as follows:

Page 10-62, Sub-article 1036-1 General, paragraph 1:
replace sentence 1 with the following:

All materials when used to convey potable drinking water shall meet National Sanitation Foundation (NSF)/ANSI 61 and NSF/ANSI 372.

Page 10-62, Sub-article 1036-3 Plastic Pipe:
add the following sentence:

All plastic pipe system components and related materials shall be in conformance with NSF/ANSI 14.

Page 15-1, Sub-article 1500-1 Description, paragraph 1:
add the following sentence:

All utility construction work shall be performed by a Contractor licensed for utility work in the State of North Carolina.

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
add the following sentences:

The utility owners are the City of Dunn (Dunn) and Harnett Regional Water (HRW). For work involving Dunn's facilities, the Contractor shall contact Heather Adams, Utilities Director at (910) 892-2948. For work involving HRW facilities, the Contractor shall contact Shane Cummings, Senior Utility Engineer at (910) 893-7575, ext. 3275 or (910) 984-4059(C).

Representatives from Dunn and HRW shall be given the opportunity to witness all tests performed on their water and sewer facilities. Test results shall be provided to each Utility Owner for any tests involving their facilities.

The Contractor shall notify NCDOT, Dunn, and Mr. Alan Moss, HRW Utility Construction Inspector in writing, at least two weeks prior to beginning any work. If the work does not commence on the date specified in the written notice, then a new notice will be required with sufficient lead time to allow the rescheduling of inspection forces. Any construction installed prior to authorization will not be accepted or approved, and water service will not be made available.

The Contractor must schedule a pre-construction conference with the Engineer, Mr. Alan Moss, HRW Utility Construction Inspector, and with Dunn staff at least two weeks before construction begins and the Contractor must coordinate with HRW and Dunn for regular inspection visitations and acceptance of the water and/or sewer system. Construction work shall be performed during the normal working hours of HRW and the City of Dunn from 8:00 am to 5:00 pm Monday through Friday. Holiday, nights and weekend work shall only be done with prior approval. There are several areas where the roadway fill must be placed before proposed water or sewer mains can be installed, in order to maintain approximately 3' of cover from proposed finished grade.

Page 15-1, Sub-article 1500-3 Utility Locations and Contractor's Responsibility:
add the following paragraph:

The Contractor will be responsible for any and all repairs due to leakage damage from poor workmanship during the one (1) year warranty period once the water or sewer system improvements have been accepted by HRW or the City of Dunn. HRW or the City of Dunn will provide maintenance and repairs when requested and bill the Contractor if necessary due to lack of response within 48 hours of notification of warranty work. The Contractor will be responsible for any and all repairs due to damages resulting from failure to locate the new water or sewer lines and associated appurtenances for other utilities and until the water and sewer lines have been approved by NCDEQ and accepted by HRW or the City of Dunn. The final inspection of water or sewer system improvements cannot be scheduled with HRW or the City of Dunn until the roads have been paved; the rights of way and utility easements have been seeded and stabilized with an adequate stand of grass in place to prevent erosion issues on site.

Page 15-2, Sub-article 1500-7 Submittals and Records, paragraph 1:
Add the following sentences:

Submittals pertaining to HRW facilities shall be reviewed by the Engineer, and the Engineer shall provide a cover letter to HRW certifying conformance with the plans and Special Provisions and summarizing any exceptions or concerns.

Page 15-2, Sub-article 1500-7 Submittals and Records, paragraph 3:
replace sentence 3 with the following:

As-built drawings shall be provided to the Owners of water/sewer utilities, showing the size and type of material installed and the coordinates of all utility horizontal and vertical locations of all installed piping and appurtenances. Any and all field changes made during construction shall be properly documented on the as-built drawings, and shall also include lot numbers. As-built drawings shall be signed, sealed, and dated on each sheet by a North Carolina registered professional engineer (PE) as part of the Owner's acceptance process. As-built drawings shall be

marked "Record Drawings", and all applicable information listed in the Owner's as-built drawing checklist shall be included. As-built drawings shall be submitted and approved prior to issuance of final acceptance. Provide four copies of as-built drawings to HRW, two copies to Dunn, and two copies to Dunn's Engineer, Davis-Martin-Powell. As-built drawings shall also be submitted to HRW and Dunn electronically in AutoCAD format.

Page 15-2, Sub-article 1500-9 Placing Pipelines into Service, paragraph 2:
replace sentence 4 with the following:

Please note that in accordance with 15A NCAC 18C .0309(a), no construction, alteration, or expansion of a water system shall be placed into service or made available for human consumption until the Public Water Supply Section has issued Final Approval. Final Approval will be issued and mailed to the applicant upon receipt of both an Engineer's Certification and an Applicant's Certification submitted in accordance with 15A NCAC 18C .0303(a) and (c). A copy of the Final Approval shall also be forwarded to Mr. Alan Moss of HRW and to Dunn staff for a final inspection. Prior to acceptance, all HRW and Dunn services will be inspected to ensure that they are installed at the proper depth. All HRW meter boxes must be flush with proposed final grade and Dunn meter boxes shall be set 2" above finish grade. Meters are to be a minimum of 8" below the box lid.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated conditions:

In the event that contaminated areas are discovered in the field, provisions should be in place to notify the Engineer, NCDOT, and HRW or the City of Dunn of the contaminants encountered so that corrective measures and removal/remediation can be provided prior to installation of the water mains.

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) is encountered, use contaminant gasket material. Contaminant gasket material shall be fluoroelastomer or nitrile rubber in accordance with ASTM D1418 and ISO 1629. Gaskets shall be consistent with pipe manufacturer and Engineer's recommendation for any other contaminants encountered. The gaskets shall be furnished by the D.I. pipe manufacturer.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated and corrosive conditions:

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) and or corrosive and highly organic soils are encountered, provide polyethylene encasement in underground installations of ductile iron piping for water and sewer. Polyethylene wrap in tube or sheet form for piping encasement shall be manufactured of virgin polyethylene material conforming to the requirements of ANSI/ASTM Standard Specification D1248. The specified nominal thickness for low-density polyethylene film is 0.008 in. (8 mils). The specified nominal thickness for high-density cross-laminated polyethylene film is 0.004 in. (4 mils). The minus thickness tolerance shall not exceed 10 percent of the nominal thickness on both material types.

Page 15-4, Sub-article 1505-3(E) Thrust Restraint, second paragraph:
add the following sentences:

HRW and the City of Dunn require pressurized pipelines and appurtenances to be restrained by concrete thrust restraint and restrained retainer glands or restrained joint DI pipe along the pipelines as shown on the plans and in the concrete thrust blocking details.

Page 15-4, Sub-article 1505-3, Add Polyethylene Encasement:
Add requirements for Installation of Polyethylene Encasement:

The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely air and watertight enclosure. Overlaps shall be secured by the use of polyethylene adhesive tape, plastic string or other non-degradable material approved by the Engineer and capable of holding the encasement in place until backfilling operations are completed. Pipe and fittings shall be wrapped with polyethylene prior to pouring concrete thrust blocks.

Method A - For use with Polyethylene Tubes:

1. Cut polyethylene tube to a length approximately two feet (2') longer than the pipe section.

2. Slip the tube around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears the pipe ends.

3. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.

4. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points.

5. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method B - For use with Polyethylene Tubes:

1. Cut polyethylene tube to a length approximately one foot (1') shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide six inches (6") of bare pipe at each end. Take up the slack at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points; secure the ends as described herein under Method A.

2. Before making a joint, slip a three-foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. After completing the joint, pull

the three-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1').

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method C - For use with Polyethylene Sheets:

1. Cut polyethylene sheet to a length approximately two feet (2') longer than that of the pipe section. Center the cut length to provide a one foot (1') overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of polyethylene sheet at intervals of approximately three feet (3').

2. Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as described herein under Method A.

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Appurtenances:

Pipe-Shaped Appurtenances:

Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

Odd-Shaped Appurtenances:

1. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice, and taping down.

2. Tape polyethylene securely in place at valve stem and other penetrations.

Repairs:

Repair any cuts, tears, punctures, or damage to polyethylene with polyethylene adhesive tape or with a short length of polyethylene sheet or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Openings:

Openings in the encasement shall provide for branches, blow-offs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut with tape. Service taps and other taps without tapping sleeves should be made directly through the polyethylene after wrapping the pipe with 2-3 layers of polyethylene tape, with any resulting damaged areas being repaired as described herein.

Terminations:

Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least three feet (3'). Secure the end with circumferential turns of tape. Service lines and other attached lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of three feet (3') away from the ductile-iron pipe.

Backfilling for Polyethylene-Wrapped Pipe:

1. Use the same backfill material as specified for pipe without polyethylene wrap, exercising care to prevent damage to the polyethylene wrapping when placing backfill material.

2. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Backfill shall be as specified for the pipe without polyethylene encasement.

Page 15-5, Sub-article 1510-2 Materials, last paragraph:
add the following sentences:

Utility locator wires shall be terminated at the top of valve boxes on HRW water mains and Dunn water mains and force mains. No spliced wire connections shall be made underground on locator wires. Locator wires may be secured with duct tape to top of pipe before backfilling.

Page 15-6, Sub-article 1510-3(A) General, fifth paragraph:
add the following sentence to the beginning of the paragraph:

Protect all pipes during loading, transport, unloading, staging, and installation.

Page 15-6, Sub-article 1510-3(B) Testing and Sterilization, first paragraph:
add the following sentences:

The hydrostatic pressure tests on HRW or City of Dunn mains must be witnessed by Mr. Alan Moss for HRW or by Dunn Staff. The Contractor must notify HRW or the City of Dunn when lines are ready to begin filling and coordinate with HRW or the City of Dunn to witness all pressure testing.

Page 15-6, Sub-article 1510-3(B) Testing and Sterilization:
add the following paragraphs after the fourth paragraph:

After flushing the water lines, the Contractor shall be responsible to furnish sample points at various points along the lines under the direct observation of the HRW Utility Construction Inspector and the Engineer. While the Contractor is responsible to furnish sterilized bottles and take water samples for testing, the HRW Utility Construction Inspector will generally furnish sterilized bottles and take water samples to the HRW laboratory for testing and bacteria analysis. The HRW laboratory is a state certified laboratory and this service is free of charge at this time, but subject to change if lab fees become necessary to maintain the state certified laboratory.

All water samples for bacteria testing on Dunn's mains will be collected by the Contractor and witnessed by a representative of the City of Dunn.

Page 15-8, Sub-article 1515-3(A) Valves, first paragraph:
add the following sentences:

Install a 4"x4" concrete valve marker at the edge of the right of way to identify the location of each gate valve installed in the relocated HRW or City of Dunn water or sewer system with the exception of the fire hydrant isolation valves. Measure the distance from the center of the concrete marker to the center of the valve box. This distance (in linear feet) shall be stamped on the brass plate located on the top of the concrete valve marker.

Page 15-8, Sub-article 1515-3(A) Valves, second paragraph:
add the following to the beginning of the paragraph:

Conduct a pneumatic pressure test using compressed air or other inert gas on the stainless steel tapping sleeves prior to making the tap on the existing HRW or Dunn water mains. This pneumatic pressure test must be witnessed by Mr. Alan Moss of HRW or by Dunn staff. Use Romac brand stainless steel tapping sleeves or approved equal for HRW.

Page 15-8, Sub-article 1515-3(B) Meters:
add the following paragraphs:

Install new or relocated water service lines crossing state maintained roads inside a Schedule 40 PVC encasement per detail W-12 on sheet UC-3B.

New water meters shall be all brass. Use ABB, Kent, Dewey Brothers (C3000) or approved equal for ¾" or 1" services.

Page 15-8, Sub-article 1515-3(C) Backflow Prevention Assembly, second paragraph:
replace sentence 1 with the following:

Licensed installers shall conduct test in accordance with the HRW Water and Sewer Use Ordinance or City of Dunn Construction Guidelines and certify RPZDA backflow prevention installations.

Page 15-9, Sub-article 1515-3(D) Fire Hydrants:
add the following paragraphs:

All fire hydrant installations for HRW must meet all requirements established by the Harnett County Fire Marshall's office. All fire hydrants that are being relocated shall be installed at approximately the same elevation as before relocation and access shall not be impeded. All fire hydrant installations must be inspected by the Harnett County Deputy Fire Marshall. The Contractor shall notify the HRW Fire Marshall at (910) 893-7580 once the construction is complete to request a site inspection of all fire hydrant installations.

All fire hydrants for the City Of Dunn must meet all requirements of the City of Dunn's Construction Guidelines.

Page 15-17, Sub-article 1530-3(C) Remove Water Meter:
add the following sentence to the end of the paragraph:

Provide a list of abandoned services to HRW Customer Service.

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

Page 15-8, Section 1515. The Contractor's attention is directed to this section. The Contractor will install insert valves at all locations shown on the plans. Insert valves shall conform to the following:

The Ductile Iron 250 psig Insert Valve shall be a Resilient Wedge Gate Valve designed for use in potable water, raw water, reclaimed water, sewage, irrigation and backflow control systems. The design will allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service as usual.

Ductile Iron Construction: The ductile iron body, bonnet and wedge provide strength and a pressure rating that meets or exceeds the requirements of AWWA C515. Insert Valve shall be ductile iron construction meeting ASTM A536 Grade 65-45-12. Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Sizes 12" and smaller must be capable of working on Cast/Grey Iron or Ductile Iron Class A, B, C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body.

Insert valves shall have 250 psig maximum working pressure. The pressure rating markings must be cast into the body of the insert valve.
After the installation of the insert valve body on to the existing pipe a pressure test of 1.1 times that of the contents shall sustained for 15 minutes. Once the pressure test is affectively achieved, the insert valve body must not be moved in accordance with AWWA Standards. If the insert valve is moved the pressure test must be completed again. The insert valve must not be moved or repositioned once the pressure test is achieved.

Resilient Wedge Gate Assembly:
The construction of the Resilient Wedge shall comply with AWWA C509 requirements. The ductile

iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process. This will assure the ductile gate is fully coated with molded rubber – no exposed iron.

The resilient wedge shall seat on the valve body and not the pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal. Abrasion results thus shorting the life and quality of the shut down if the wedge contacts the pipe.

Pressure equalization on the down or upstream side of the closed wedge shall not be necessary to open the valve. The wedge shall be symmetrical and seal equally well with flow in either direction. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. The resilient wedge must have more support than the operating stem as the resilient wedge enters and exits the water (fluid) way. The flow way shall be unobstructed to provide optimum flow.

Fusion-Bonded Epoxy:

The insert valve is fully epoxy coated on the interior and the exterior. The fusion-bonded coating is applied prior to assembly so that even the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated. The valve shall be coated with a minimum of 8 mils epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61.

Gaskets and Triple O-Ring Stem Seals:

This insert valve features triple O-Ring stem seals. Two O-Rings are located above, and one O-Ring is located below the thrust collar. The lower two O-Rings provide a permanently sealed lubrication chamber that will make the valve easier to operate over a longer period of time. The upper O-Ring ensures that sand, dirt or grit cannot enter the valve to cause damage to the lower O-Rings. This is especially important for buried and sewage service applications.

Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross- sectional shape.

Valve Stem & Thrust Washers:

The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Two thrust washers are used. One is located above, and one is located below the stem thrust collar. Two thrust washers ensure easy operation at all times. Valves shall be operated by a 2" square wrench nut according to ASTM A126 CL.B and shall open counterclockwise.

Quality Assurance:

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

Hardware:

Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.

Extended Life Value:

The stuffing box, operating stem and resilient wedge (complete bonnet and all moving parts) shall be removable, repairable and or replaceable under pressure. In other words, even while the valve is fully pressurized in the system all moving components can be removed under pressure. In the event the valve stem is broken or damaged the bonnet can be removed under pressure.

Internal pressure equalization system assures the safe entry and removal of the valve bonnet during initial installation as well as future maintenance. This alleviates the need for additional pipe penetration taps or foreign methods (i.e. compressed air or auxiliary water source) to equalize pressure.

Split Restraint Devices:

Split restraint devices shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Three test bars shall be incrementally poured per production shift as per U.L. specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Gland body wedges and wedge actuating components shall be cast from grade 65-45- 12 ductile iron material in accordance with ASTM A536.

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Set screw pressure point type hardware shall not be used. Restraint devices shall be listed by Underwriters Laboratories and Approved by Factory Mutual (3" through 12" inch size).

Measurement and Payment:

Payment for insert valve shall be per each valve, and paid for under the contract price for "___" Insert Valve". Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work, as required.

Pay Item:	**Pay Unit**
___" Insert Valve	Each

END OF SECTION

PROJECT SPECIAL PROVISIONS
Utility Construction

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DocuSigned by: Randy McNeill 7/7/2021

100% UC Special Provisions Last Updated 7/7/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Revise the 2018 Standard Specifications as follows:

Page 10-62, Sub-article 1036-1 General, paragraph 1:
replace sentence 1 with the following:

All materials when used to convey potable drinking water shall meet National Sanitation Foundation (NSF)/ANSI 61 and NSF/ANSI 372.

Page 10-62, Sub-article 1036-3 Plastic Pipe:
add the following sentence:

All plastic pipe system components and related materials shall be in conformance with NSF/ANSI 14.

Page 15-1, Sub-article 1500-1 Description, paragraph 1:
add the following sentence:

All utility construction work shall be performed by a Contractor licensed for utility work in the State of North Carolina.

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
add the following sentences:

The utility owners are the City of Dunn (Dunn) and Harnett Regional Water (HRW). For work involving Dunn's facilities, the Contractor shall contact Heather Adams, Utilities Director at (910) 892-2948. For work involving HRW facilities, the Contractor shall contact Shane Cummings, Senior Utility Engineer at (910) 893-7575, ext. 3275 or (910) 984-4059(C).

Representatives from Dunn and HRW shall be given the opportunity to witness all tests performed on their water and sewer facilities. Test results shall be provided to each Utility Owner for any tests involving their facilities.

The Contractor shall notify NCDOT, Dunn, and Mr. Alan Moss, HRW Utility Construction Inspector in writing, at least two weeks prior to beginning any work. If the work does not commence on the date specified in the written notice, then a new notice will be required with

sufficient lead time to allow the rescheduling of inspection forces. Any construction installed prior to authorization will not be accepted or approved, and water service will not be made available.

The Contractor must schedule a pre-construction conference with the Engineer, Mr. Alan Moss, HRW Utility Construction Inspector, and with Dunn staff at least two weeks before construction begins and the Contractor must coordinate with HRW and Dunn for regular inspection visitations and acceptance of the water and/or sewer system. Construction work shall be performed during the normal working hours of HRW and the City of Dunn from 8:00 am to 5:00 pm Monday through Friday. Holiday, nights and weekend work shall only be done with prior approval. There are several areas where the roadway fill must be placed before proposed water or sewer mains can be installed, in order to maintain approximately 3' of cover from proposed finished grade.

Page 15-1, Sub-article 1500-3 Utility Locations and Contractor's Responsibility:
add the following paragraph:

The Contractor will be responsible for any and all repairs due to leakage damage from poor workmanship during the one (1) year warranty period once the water or sewer system improvements have been accepted by HRW or the City of Dunn. HRW or the City of Dunn will provide maintenance and repairs when requested and bill the Contractor if necessary due to lack of response within 48 hours of notification of warranty work. The Contractor will be responsible for any and all repairs due to damages resulting from failure to locate the new water or sewer lines and associated appurtenances for other utilities and until the water and sewer lines have been approved by NCDEQ and accepted by HRW or the City of Dunn. The final inspection of water or sewer system improvements cannot be scheduled with HRW or the City of Dunn until the roads have been paved; the rights of way and utility easements have been seeded and stabilized with an adequate stand of grass in place to prevent erosion issues on site.

Page 15-2, Sub-article 1500-7 Submittals and Records, paragraph 1:
Add the following sentences:

Submittals pertaining to HRW facilities shall be reviewed by the Engineer, and the Engineer shall provide a cover letter to HRW certifying conformance with the plans and Special Provisions and summarizing any exceptions or concerns.

Page 15-2, Sub-article 1500-7 Submittals and Records, paragraph 3:
replace paragraph 3 with the following:

As-built drawings shall be provided to the Owners of water/sewer utilities, showing the size and type of material installed and the coordinates of all utility horizontal and vertical locations of all installed piping and appurtenances. Any and all field changes made during construction shall be properly documented on the as-built drawings, and shall also include lot numbers. As-built drawings shall be signed, sealed, and dated on each sheet by a North Carolina registered professional engineer (PE) as part of the Owner's acceptance process. As-built drawings shall be marked "Record Drawings", and all applicable information listed in the Owner's as-built drawing checklist shall be included. As-built drawings shall be submitted and approved prior to issuance of final acceptance. Provide four copies of as-built drawings to HRW, two copies to Dunn, and

two copies to Dunn's Engineer, Davis-Martin-Powell. As-built drawings shall also be submitted to HRW and Dunn electronically in AutoCAD format.

Page 15-2, Sub-article 1500-9 Placing Pipelines into Service, paragraph 2:
replace sentence 4 with the following:

Please note that in accordance with 15A NCAC 18C .0309(a), no construction, alteration, or expansion of a water system shall be placed into service or made available for human consumption until the Public Water Supply Section has issued Final Approval. Final Approval will be issued and mailed to the applicant upon receipt of both an Engineer's Certification and an Applicant's Certification submitted in accordance with 15A NCAC 18C .0303(a) and (c). A copy of the Final Approval shall also be forwarded to Mr. Alan Moss of HRW and to Dunn staff for a final inspection. Prior to acceptance, all HRW and Dunn services will be inspected to ensure that they are installed at the proper depth. All HRW meter boxes must be flush with proposed final grade and Dunn meter boxes shall be set 2" above finish grade. Meters are to be a minimum of 8" below the box lid.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated conditions:

In the event that contaminated areas are discovered in the field, provisions should be in place to notify the Engineer, NCDOT, and HRW or the City of Dunn of the contaminants encountered so that corrective measures and removal/remediation can be provided prior to installation of the water mains.

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) is encountered, use contaminant gasket material. Contaminant gasket material shall be fluoroelastomer or nitrile rubber in accordance with ASTM D1418 and ISO 1629. Gaskets shall be consistent with pipe manufacturer and Engineer's recommendation for any other contaminants encountered. The gaskets shall be furnished by the D.I. pipe manufacturer.

Page 15-3, Sub-article 1505-2 Materials:
Add the following paragraphs for pipe protection in contaminated and corrosive conditions:

Where shown on the Drawings or where contaminant petroleum (Diesel, Gasoline) and or corrosive and highly organic soils are encountered, provide polyethylene encasement in underground installations of ductile iron piping for water and sewer. Polyethylene wrap in tube or sheet form for piping encasement shall be manufactured of virgin polyethylene material conforming to the requirements of ANSI/ASTM Standard Specification D1248. The specified nominal thickness for low-density polyethylene film is 0.008 in. (8 mils). The specified nominal thickness for high-density cross-laminated polyethylene film is 0.004 in. (4 mils). The minus thickness tolerance shall not exceed 10 percent of the nominal thickness on both material types.

Page 15-4, Sub-article 1505-3(E) Thrust Restraint, second paragraph:
add the following sentences:

HRW and the City of Dunn require pressurized pipelines and appurtenances to be restrained by concrete thrust restraint and restrained retainer glands or restrained joint DI pipe along the pipelines as shown on the plans and in the concrete thrust blocking details.

Page 15-4, Sub-article 1505-3, Add Polyethylene Encasement:
Add requirements for Installation of Polyethylene Encasement:

The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely air and watertight enclosure. Overlaps shall be secured by the use of polyethylene adhesive tape, plastic string or other non-degradable material approved by the Engineer and capable of holding the encasement in place until backfilling operations are completed. Pipe and fittings shall be wrapped with polyethylene prior to pouring concrete thrust blocks.

Method A - For use with Polyethylene Tubes:

1. Cut polyethylene tube to a length approximately two feet (2') longer than the pipe section.

2. Slip the tube around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears the pipe ends.

3. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.

4. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points.

5. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method B - For use with Polyethylene Tubes:

1. Cut polyethylene tube to a length approximately one foot (1') shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide six inches (6") of bare pipe at each end. Take up the slack at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points; secure the ends as described herein under Method A.

2. Before making a joint, slip a three-foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. After completing the joint, pull the three-foot length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1').

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Method C - For use with Polyethylene Sheets:

1. Cut polyethylene sheet to a length approximately two feet (2') longer than that of the pipe section. Center the cut length to provide a one foot (1') overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of polyethylene sheet at intervals of approximately three feet (3').

2. Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as described herein under Method A.

3. Any cuts, tears, punctures, or other damage to the polyethylene shall be repaired in accordance with Repairs.

Appurtenances:

Pipe-Shaped Appurtenances:

Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

Odd-Shaped Appurtenances:

1. When it is not practical to wrap valves, tees, crosses and other odd-shaped pieces in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice, and taping down.

2. Tape polyethylene securely in place at valve stem and other penetrations.

Repairs:

Repair any cuts, tears, punctures, or damage to polyethylene with polyethylene adhesive tape or with a short length of polyethylene sheet or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Openings:

Openings in the encasement shall provide for branches, blow-offs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut with tape. Service taps and other taps without tapping sleeves should be made directly through the polyethylene after wrapping the pipe with 2-3 layers of polyethylene tape, with any resulting damaged areas being repaired as described herein.

Terminations:

Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least three feet (3'). Secure the end with circumferential turns of tape. Service lines and other attached lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a minimum clear distance of three feet (3') away from the ductile-iron pipe.

Backfilling for Polyethylene-Wrapped Pipe:

1. Use the same backfill material as specified for pipe without polyethylene wrap, exercising care to prevent damage to the polyethylene wrapping when placing backfill material.

2. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage the polyethylene. Backfill shall be as specified for the pipe without polyethylene encasement.

Page 15-5, Sub-article 1510-2 Materials, last paragraph:
add the following sentences:

Utility locator wires shall be terminated at the top of valve boxes on HRW water mains and Dunn water mains and force mains. No spliced wire connections shall be made underground on locator wires. Locator wires may be secured with duct tape to top of pipe before backfilling.

Page 15-6, Sub-article 1510-3(A) General, fifth paragraph:
add the following sentence to the beginning of the paragraph:

Protect all pipes during loading, transport, unloading, staging, and installation.

Page 15-6, Sub-article 1510-3(B) Testing and Sterilization, first paragraph:
add the following sentences:

The hydrostatic pressure tests on HRW or City of Dunn mains must be witnessed by Mr. Alan Moss for HRW or by Dunn Staff. The Contractor must notify HRW or the City of Dunn when lines are ready to begin filling and coordinate with HRW or the City of Dunn to witness all pressure testing.

Page 15-6, Sub-article 1510-3(B) Testing and Sterilization:
add the following paragraphs after the fourth paragraph:

After flushing the water lines, the Contractor shall be responsible to furnish sample points at various points along the lines under the direct observation of the HRW Utility Construction Inspector and the Engineer. While the Contractor is responsible to furnish sterilized bottles and take water samples for testing, the HRW Utility Construction Inspector will generally furnish sterilized bottles and take water samples to the HRW laboratory for testing and bacteria analysis. The HRW laboratory is a state certified laboratory and this service is free of charge at this time, but subject to change if lab fees become necessary to maintain the state certified laboratory.

All water samples for bacteria testing on Dunn's mains will be collected by the Contractor and witnessed by a representative of the City of Dunn.

Page 15-8, Sub-article 1515-3(A) Valves, first paragraph:
add the following sentences:

Install a 4"x4" concrete valve marker at the edge of the right of way to identify the location of each gate valve installed in the relocated HRW or City of Dunn water or sewer system with the exception of the fire hydrant isolation valves. Measure the distance from the center of the concrete marker to the center of the valve box. This distance (in linear feet) shall be stamped on the brass plate located on the top of the concrete valve marker.

Page 15-8, Sub-article 1515-3(A) Valves, second paragraph:
add the following to the beginning of the paragraph:

Conduct a pneumatic pressure test using compressed air or other inert gas on the stainless steel tapping sleeves prior to making the tap on the existing HRW or Dunn water mains. This pneumatic pressure test must be witnessed by Mr. Alan Moss of HRW or by Dunn staff. Use Romac brand stainless steel tapping sleeves or approved equal for HRW.

Page 15-8, Sub-article 1515-3(B) Meters:
add the following paragraphs:

Install new or relocated water service lines crossing state maintained roads inside a Schedule 40 PVC encasement per detail W-12 on sheet UC-3B.

New water meters shall be all brass. Use ABB, Kent, Dewey Brothers (C3000) or approved equal for ¾" or 1" services.

Page 15-8, Sub-article 1515-3(C) Backflow Prevention Assembly, second paragraph:
replace sentence 1 with the following:

Licensed installers shall conduct test in accordance with the HRW Water and Sewer Use Ordinance or City of Dunn Construction Guidelines and certify RPZDA backflow prevention installations.

Page 15-9, Sub-article 1515-3(D) Fire Hydrants:
add the following paragraphs:

All fire hydrant installations for HRW must meet all requirements established by the Harnett County Fire Marshall's office. All fire hydrants that are being relocated shall be installed at approximately the same elevation as before relocation and access shall not be impeded. All fire hydrant installations must be inspected by the Harnett County Deputy Fire Marshall. The Contractor shall notify the HRW Fire Marshall at (910) 893-7580 once the construction is complete to request a site inspection of all fire hydrant installations.

All fire hydrants for the City Of Dunn must meet all requirements of the City of Dunn's Construction Guidelines.

Page 15-17, Sub-article 1530-3(C) Remove Water Meter:
add the following sentence to the end of the paragraph:

Provide a list of abandoned services to HRW Customer Service.

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

Page 15-8, Section 1515. The Contractor's attention is directed to this section. The Contractor will install insert valves at all locations shown on the plans. Insert valves shall conform to the following:

The Ductile Iron 250 psig Insert Valve shall be a Resilient Wedge Gate Valve designed for use in potable water, raw water, reclaimed water, sewage, irrigation and backflow control systems. The design will allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service as usual.

Ductile Iron Construction: The ductile iron body, bonnet and wedge provide strength and a pressure rating that meets or exceeds the requirements of AWWA C515. Insert Valve shall be ductile iron construction meeting ASTM A536 Grade 65-45-12. Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Sizes 12" and smaller must be capable of working on Cast/Grey Iron or Ductile Iron Class A, B, C and D, IPS PVC, C900 and C909 PVC, Steel, AC pipe diameters without changing either top or bottom portion of split valve body.

Insert valves shall have 250 psig maximum working pressure. The pressure rating markings must be cast into the body of the insert valve.
After the installation of the insert valve body on to the existing pipe a pressure test of 1.1 times that of the contents shall sustained for 15 minutes. Once the pressure test is affectively achieved, the insert valve body must not be moved in accordance with AWWA Standards. If the insert valve is moved the pressure test must be completed again. The insert valve must not be moved or repositioned once the pressure test is achieved.

Resilient Wedge Gate Assembly:
The construction of the Resilient Wedge shall comply with AWWA C509 requirements. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process. This will assure the ductile gate is fully coated with molded rubber – no exposed iron.

The resilient wedge shall seat on the valve body and not the pipe to obtain the optimum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal. Abrasion results thus shorting the life and quality of the shut down if the wedge contacts the pipe.

Pressure equalization on the down or upstream side of the closed wedge shall not be necessary

to open the valve. The wedge shall be symmetrical and seal equally well with flow in either direction. The Resilient wedge must ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. The resilient wedge must have more support than the operating stem as the resilient wedge enters and exits the water (fluid) way. The flow way shall be unobstructed to provide optimum flow.

Fusion-Bonded Epoxy:

The insert valve is fully epoxy coated on the interior and the exterior. The fusion-bonded coating is applied prior to assembly so that even the bolt holes and body-to-bonnet flange surfaces are fully epoxy coated. The valve shall be coated with a minimum of 8 mils epoxy in compliance with AWWA C550 and certified to ANSI/NSF-61.

Gaskets and Triple O-Ring Stem Seals:

This insert valve features triple O-Ring stem seals. Two O-Rings are located above, and one O-Ring is located below the thrust collar. The lower two O-Rings provide a permanently sealed lubrication chamber that will make the valve easier to operate over a longer period of time. The upper O-Ring ensures that sand, dirt or grit cannot enter the valve to cause damage to the lower O-Rings. This is especially important for buried and sewage service applications.

Side flange seals shall be of the O-Ring type of either round, oval, or rectangular cross- sectional shape.

Valve Stem & Thrust Washers:

The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Two thrust washers are used. One is located above, and one is located below the stem thrust collar. Two thrust washers ensure easy operation at all times. Valves shall be operated by a 2" square wrench nut according to ASTM A126 CL.B and shall open counterclockwise.

Quality Assurance:

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

Hardware:

Bolting materials shall develop the physical strength requirements of ASTM A307 with dimensions conforming to ANSI B18.2.1.

Extended Life Value:

The stuffing box, operating stem and resilient wedge (complete bonnet and all moving parts) shall be removable, repairable and or replaceable under pressure. In other words, even while the

valve is fully pressurized in the system all moving components can be removed under pressure. In the event the valve stem is broken or damaged the bonnet can be removed under pressure.

Internal pressure equalization system assures the safe entry and removal of the valve bonnet during initial installation as well as future maintenance. This alleviates the need for additional pipe penetration taps or foreign methods (i.e. compressed air or auxiliary water source) to equalize pressure.

Split Restraint Devices:

Split restraint devices shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating of 350 psi for 4-12 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

Chemical and modularity tests shall be performed as recommended by the Ductile iron Society, on a per ladle basis. Three test bars shall be incrementally poured per production shift as per U.L. specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Gland body wedges and wedge actuating components shall be cast from grade 65-45- 12 ductile iron material in accordance with ASTM A536.

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly. Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts. Set screw pressure point type hardware shall not be used. Restraint devices shall be listed by Underwriters Laboratories and Approved by Factory Mutual (3" through 12" inch size).

Measurement and Payment:

Payment for insert valve shall be per each valve, and paid for under the contract price for "___" Insert Valve". Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work, as required.

Pay Item:	**Pay Unit**
___" Insert Valve	Each

Page 15-16; Section 1530. The Contractor's attention is directed to this section. Vaults that are required to be removed shall have the top slab and access doors, walls, and base removed. All work shall meet the approval of the Engineer. All sections of vault and piping including bypass shall become the property of the Contractor and shall be disposed of by him. Existing valves shall be stockpiled in an area accessible by truck or as directed by the Engineer. Existing master water meter is to be relocated into a new vault, described elsewhere in these Special Provisions.

After the valves are stockpiled, the Contractor shall contact Heather Adams at (910) 892-2948 in order for the City of Dunn to receive.

Measurement and Payment:
Payment for removal of existing vaults, bypass and stockpiling valves shall be per each vault, and paid for under the contract price for "Remove Existing Vault, Bypass and Stockpile Valves". Such price and payments will be full compensation for all labor, materials, excavation, removal, disposal, backfilling, stockpiling, and any incidentals necessary to complete the work, as required.

Pay Item:	**Pay Unit**
Remove Existing Vault, Bypass and Stockpile Valves	Each

Plan Sheets UC-3C and UC-7C: Relocate Master Meter and Install New Vault: The Contractor's attention is directed to these plan sheets. The existing water meter assembly to be relocated, the new vault, piping, valves, and fittings as shown on detail on sheet UC-3C shall be installed in accordance with the applicable utility provisions herein, as shown on the utility plans, and/or as directed by the Engineer.

The existing master water meter assembly that is to be relocated shall be installed in a new utility vault at the location shown on the utility plans, or as directed by the Engineer.

The relocation of water meter assembly with new vault shall include furnishing and installing a new concrete utility vault and relocating the existing water meter assembly from the existing meter vault to the new meter vault. Any valves, pipe, and fittings inside the new vault that are necessary to reconnect the relocated meter assembly to the water line will be considered incidental. Any valves, pipe, and fittings outside of the vault that are necessary to complete the relocation and for the by-pass as shown on the details will also be considered incidental.

The new meter vault shall meet the requirements of Sections 840 and 1077 of the Standard Specifications, and shall be approved by the Engineer. The new meter vault shall be placed as shown on the utility plans, or as directed by the Engineer. The new meter vault shall have minimum interior dimensions of 9'-0" wide x 12'-0" long x 6'-6" deep. The vault shall have a concrete traffic-bearing top, and shall have an aluminum double-door access hatch that is lockable and H-20 rated with minimum dimensions of 6'x4'. The vault shall have a concrete floor, with a 6" drain opening.

All work shall be in accordance with the applicable plumbing codes, as shown on the plans, and as directed by the Engineer.

The new meter vault shall be installed such that the top of the vault is approximately flush with finished grade.

Measurement and Payment:
Payment for *Relocate Master Meter and Install New Vault* shall be per lump sum, and paid for under the contract price for "*Relocate Master Meter and Install New Vault*". Such price and payment will be full compensation for all labor, materials (including the new concrete vault, access hatch, valves, pipe and fittings inside and outside the vault, and pipe supports), relocating the existing meter assembly from the existing vault to the new vault, excavation, backfilling, and any incidentals necessary to complete the work as required.

Pay Item:	**Pay Unit**
Relocate Master Meter and Install New Vault	Lump Sum

END OF SECTION

PROJECT SPECIAL PROVISIONS
Utilities by Others

Michael Baker
INTERNATIONAL

Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, North Carolina 27518
Phone: 919-463-5488
Fax: 919-463-5490

General:

The following utility companies have facilities that will be in conflict with the construction of this project:

A) Duke Energy – Power (Distribution)
B) Town of Benson – Power (Distribution)
C) South River EMC – Power (Distribution)
D) CenturyLink – Communications
E) Spectrum - Communications
F) Piedmont Natural Gas – Gas (Distribution)
G) Piedmont Natural Gas – Gas (Transmission)

The conflicting facilities of these concerns 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 done by the utility owners. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105-8 of the 2018 Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans.

A) Duke Energy – Power (Distribution)
1) Duke Energy's relocation work will be completed by January 26, 2024.
2) Duke Energy will need four weeks' notice and one week to attach to South River EMC's pole at approximate -L- 1379+33, right of center.
3) Duke Energy will install a temporary distribution feed to accommodate the proposed sewer construction at approximate -L- Sta. 1385+00 - 1395+00. This work will be completed by January 26, 2024.
4) Contact person for Duke Energy is Jimmy Sharpe at 919-654-6696 or JGSharpe@pike.com.

PROJECT SPECIAL PROVISIONS
Utilities by Others

B) Town of Benson – Power (Distribution)
1) The Town of Benson's relocation work will be completed by January 26, 2024.
2) The Town of Benson will need two months' notice and one week to back feed the aerial span over I-95 at -L- 1328+40 for noise wall 33-1 construction.
3) The Town of Benson will need two weeks' notice and one week to attach to Duke Energy's pole at approximate -L- 1395+00, left of center.
4) Contact person for the Town of Benson is Glen Core at 919-796-7705 or gcore@townofbenson.com.

C) South River EMC – Power (Distribution)
1) South River EMC's relocation work will be completed by February 25, 2022.
2) Contact person for South River EMC is Jeffrey Carroll at 919-820-2770 or jcarroll@sremc.com

D) CenturyLink – Communications
1) CenturyLink's relocation work will be completed by December 22, 2023.
2) Contact person for CenturyLink is Kevin Godwin at 910-366-2142 or Kevin.Godwin@lumen.com.

D) Spectrum – Communications
1) Spectrum relocation will be completed by March 29, 2024.
2) Spectrum will need four weeks' notice prior to the completion of Duke Energy's relocation and two months to complete their work.
3) Contact person for Charter is Tommy Roberts at 919-920-7409 or troberts@ telics.com.

E) Piedmont Natural Gas – Gas (Distribution)
1) Piedmont Natural Gas's relocation work will be completed by January 20, 2023.
2) Contact person for Piedmont Natural Gas is Linda Scharf-Byers at 919-705-5042 or linda.scharf@duke-energy.com.

F) Piedmont Natural Gas – Gas (Transmission)
1) Piedmont Natural Gas's relocation work will be completed by February 18, 2022.
2) Piedmont Natural Gas requires one-week notice prior to all construction activities over or near the transmission line.
3) Contact person for Piedmont Natural Gas is Jayson Womack at 704-731-4502 or jaysonwomack@duke-energy.com.

PROJECT SPECIAL PROVISIONS
Utilities by Others

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General:

The following utility companies have facilities that will be in conflict with the construction of this project:

A) Duke Energy – Power (Distribution)
B) Duke Energy – Power (Transmission)
C) CenturyLink – Communications
D) Conterra – Communications
E) Spectrum - Communications
F) Piedmont Natural Gas – Gas (Distribution)
G) City of Dunn – Gravity Sewer

The conflicting facilities of these concerns 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 done by the utility owners. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105-8 of the 2018 Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans.

A) Duke Energy – Power (Distribution)
1) Duke Energy relocations will be completed prior to Date of Availability from approximate -L- Sta. 1125+10 – 1232+00 (end of project limits). The following areas include: -SR15- (George Perry Lee Road), -SR16- (Sadler Road), -Y26- (George Perry Lee Road/new location) -Y17- (Hodges Chapel Road), -SR17- (Robin Hood Road).
2) Duke Energy relocations will be completed by May 27, 2022 from the beginning of project limits at -L- Sta. 1063+00 – 1125+10. The following areas include: -SR13-, and -Y16- (Jonesboro Road).
3) Contact person for Duke Energy is Jimmy Sharpe at 919-654-6696 or JGSharpe@pike.com.

PROJECT SPECIAL PROVISIONS
Utilities by Others

B) Duke Energy – Power (Transmission)
   1) Contact person for Duke Energy (Transmission) is Jacob Garner at 919-546-6251 or jacob.garner@duke-energy.com

C) CenturyLink – Communications
   1) CenturyLink relocations will be completed prior to Date of Availability from approximate -L- Sta. 1125+10 – 1232+00 (end of project limits). The following areas include: -SR15- (George Perry Lee Road), -SR16- (Sadler Road), -Y26- (George Perry Lee Road/new location) -Y17- (Hodges Chapel Road), -SR17- (Robin Hood Road).
   2) CenturyLink's relocations will be completed by August 26, 2022 from the beginning of project limits at -L- Sta. 1063+00 – 1125+10. The following areas include: -SR13-, and -Y16- (Jonesboro Road).
   3) Contact person for CenturyLink is Kevin Godwin at 910-366-2142 or Kevin.Godwin@lumen.com.

D) Conterra – Communications
   1) Conterra's relocation will be completed by November 26, 2021.
   2) Contact person for Conterra is Ashley Chandler at 980-240-0375 or a.chandler@goacp.com.

E) Spectrum – Communications
   1) Spectrum's relocation will be completed by August 26, 2022
   2) Contact person for Charter is Tommy Roberts at 919-920-7409 or troberts@telics.com.

F) Piedmont Natural Gas – Gas (Distribution)
   1) Contact person for Piedmont Natural Gas is Linda Scharf-Byers at 919-705-5042 or linda.scharf@duke-energy.com.

G) City of Dunn – Gravity Sewer
   1) Contact person for the City of Dunn is Heather Adams at 910-892-2948 or hadams@dunn-nc.org

PROJECT SPECIAL PROVISIONS
Utilities by Others

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General:

The following utility companies have facilities that will be in conflict with the construction of this project:

A) Duke Energy – Power (Distribution)
B) CenturyLink – Communications
C) Conterra – Communications
D) Spectrum - Communications
E) Piedmont Natural Gas – Gas (Distribution)
F) Piedmont Natural Gas – Gas (Transmission)

The conflicting facilities of these concerns 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 done by the utility owners. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105-8 of the 2018 Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans.

A) Duke Energy – Power (Distribution)
   1) Duke Energy relocations will be completed by November 25, 2022 from beginning of project limits to approximate -L- Sta. 997+00. The following areas include: -SR9- (Elm Street Ext./), -Y24- (Bud Hawkins Road), -SR9A- (new location) -Y14- (Spring Branch/Pope Road).
   2) Duke Energy relocations will be completed by July 28, 2023 from approximate -L- Sta. 997+00 – end of project limits. The following areas include: -SR18- (Jackson Road), -Y15- (US 421/E. Cumberland Street), -SR11-(Stoney Run), and -SR13-.
   3) Duke Energy will require poles to be supported during drainage construction along -Y15- (US 421/E. Cumberland Street) from Sta. 2+00 - 8+00, right of

PROJECT SPECIAL PROVISIONS
Utilities by Others

center. Duke Energy request four weeks' notice prior to drainage construction.

4) Duke Energy's fiber glass light poles will temporarily remain in place from approximate -Y15- (US 421/E. Cumberland Street) Sta. 35+00 – end of project limits until construction work begins in this area. Duke Energy requires four weeks' notice to remove the light poles.
5) Contact person for Duke Energy is Jimmy Sharpe at 919-654-6696 or JGSharpe@pike.com.

B) CenturyLink – Communications
1) CenturyLink relocations will be completed by February 24, 2023 from beginning of project limits to approximate -L- Sta. 999+00. The following areas include: -SR9- (Elm Street Ext./), -Y24- (Bud Hawkins Road), -SR9A- (new location) -Y14- (Spring Branch/Pope Road).
2) CenturyLink relocations will be completed by June 24, 2023 from approximate -L- Sta. 999+00 – end of project limits. The following areas include: -SR18- (Jackson Road), -Y15- (US 421/E. Cumberland Street), -SR11-(Stoney Run), and -SR13-.
3) Contact person for CenturyLink is Kevin Godwin at 910-366-2142 or Kevin.Godwin@lumen.com.

C) Conterra – Communications
1) Conterra's relocations will be completed by February 18, 2022 from approximate -L- Sta. 991+00 – end of project limits. The following areas include: -SR18- (Jackson Road), -Y15- (US 421/E. Cumberland Street), -SR11-(Stoney Run), and -SR13-.
2) Contact person for Conterra is Ashley Chandler at 980-240-0375 or a.chandler@goacp.com.

D) Spectrum – Communications
1) Spectrum relocations will be completed by March 24, 2023 from beginning of project limits to approximate -L- Sta. 997+00. The following areas include: -SR9- (Elm Street Ext./), -Y24- (Bud Hawkins Road), -SR9A- (new location), -Y14- (Spring Branch/Pope Road).
2) Spectrum relocations will be completed by October 27, 2023 from approximate -L- Sta. 997+00 – end of project limits. The following areas include: -SR18- (Jackson Road), -Y15- (US 421/E. Cumberland Street), -SR11-(Stoney Run), and -SR13-.
3) Contact person for Spectrum is Tommy Roberts at 919-920-7409 or troberts@telics.com.

PROJECT SPECIAL PROVISIONS
Utilities by Others

D) Piedmont Natural Gas – Gas (Distribution)
   1) Piedmont Natural Gas relocations will be completed by September 16, 2022 from approximate -L- Sta. 984+00 – end of project limits. The following areas include: -SR18- (Jackson Road), -Y15- (US 421/E. Cumberland Street), -SR11-(Stoney Run), and -SR13-.
   2) Contact person for Piedmont Natural Gas is Linda Scharf-Byers at 919-705-5042 or linda.scharf@duke-energy.com.

E) Piedmont Natural Gas – Gas (Transmission)
   1) Piedmont Natural Gas transmission line (Reference #453) crossing at Sta. -L-945+50 will remain in place.
   2) Contractor to provide three weeks' notice prior to working within the boundaries of the transmission gas line.
   3) Contact person for Piedmont Natural Gas is Eddie Sykes at 919-429-2352 or eddie.sykes@duke-energy.com

Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:
(4-30-2019)

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. 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: **(East)**

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.

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Serengeti
2nd Millennium	Essential	Kalahari	Shelby
3rd Millennium	Evergreen 2	Kitty Hawk 2000	Sheridan
Apache III	Falcon IV	Legitimate	Signia
Avenger	Falcon NG	Lexington	Silver Hawk
Barlexas	Falcon V	LSD	Sliverstar
Barlexas II	Faith	Magellan	Shenandoah Elite
Bar Fa	Fat Cat	Matador	Sidewinder
Barrera	Festnova	Millennium SRP	Skyline
Barrington	Fidelity	Monet	Solara
Barrobusto	Finelawn Elite	Mustang 4	Southern Choice II
Barvado	Finelawn Xpress	Ninja 2	Speedway
Biltmore	Finesse II	Ol' Glory	Spyder LS
Bingo	Firebird	Olympic Gold	Sunset Gold
Bizem	Firecracker LS	Padre	Taccoa
Blackwatch	Firenza	Patagonia	Tanzania
Blade Runner II	Five Point	Pedigree	Trio
Bonsai	Focus	Picasso	Tahoe II
Braveheart	Forte	Piedmont	Talladega
Bravo	Garrison	Plantation	Tarheel
Bullseye	Gazelle II	Proseeds 5301	Terrano
Cannavaro	Gold Medallion	Prospect	Titan ltd
Catalyst	Grande 3	Pure Gold	Titanium LS
Cayenne	Greenbrooks	Quest	Tracer
Cessane Rz	Greenkeeper	Raptor II	Traverse SRP
Chipper	Gremlin	Rebel Exeda	Tulsa Time
Cochise IV	Greystone	Rebel Sentry	Turbo
Constitution	Guardian 21	Rebel IV	Turbo RZ
Corgi	Guardian 41	Regiment II	Tuxedo RZ
Corona	Hemi	Regenerate	Ultimate
Coyote	Honky Tonk	Rendition	Venture
Darlington	Hot Rod	Rhambler 2 SRP	Umbrella
Davinci	Hunter	Rembrandt	Van Gogh
Desire	Inferno	Reunion	Watchdog
Dominion	Innovator	Riverside	Wolfpack II
Dynamic	Integrity	RNP	Xtremegreen
Dynasty	Jaguar 3	Rocket	
Endeavor	Jamboree	Scorpion	

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from 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 **(East)**

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation 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.

March 1 - August 31		**September 1 - February 28**	
18#	Creeping Red Fescue	18#	Creeping Red Fescue
6#	Indiangrass	6#	Indiangrass
8#	Little Bluestem	8#	Little Bluestem
4#	Switchgrass	4#	Switchgrass
25#	Browntop Millet	35#	Rye Grain
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*.

All areas seeded and mulched shall be tacked with asphalt. Crimping of straw in lieu of asphalt tack shall not be allowed on this project.

CRIMPING STRAW MULCH:

Crimping shall be required on this project adjacent to any section of roadway where traffic is to be maintained or allowed during construction. In areas within six feet of the edge of pavement, straw is to be applied and then crimped. After the crimping operation is complete, an additional application of straw shall be applied and immediately tacked with a sufficient amount of undiluted emulsified asphalt.

Straw mulch shall be of sufficient length and quality to withstand the crimping operation.

Crimping equipment including power source shall be subject to the approval of the Engineer providing that maximum spacing of crimper blades shall not exceed 8".

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. Sweet Sudan Grass, 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 on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. 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 10-20-20 analysis and as directed.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas 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*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding 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 4 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 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.

CONSTRUCTION MATERIALS MANAGEMENT

(3-19-19) (rev. 04-27-19)

Description

The requirements set forth shall be adhered to in order to meet the applicable materials handling requirements of the NCG010000 permit. Structural controls installed to manage construction materials stored or used on site shall be shown on the E&SC Plan. Requirements for handling materials on construction sites shall be as follows:

Polyacrylamides (PAMS) and Flocculants

Polyacrylamides (PAMS) and flocculants shall be stored in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures designed to protect adjacent surface waters. PAMS or other flocculants used shall be selected from the NC DWR List of Approved PAMS/Flocculants The concentration of PAMS and other flocculants used shall not exceed those specified in the NC DWR List of Approved PAMS/Flocculants and in accordance with the manufacturer's instructions. The NC DWR List of Approved PAMS/Flocculants is available at:

https://files.nc.gov/ncdeq/Water%20Quality/Environmental%20Sciences/ATU/ApprovedPAMS4_1_2017.pdf

Equipment Fluids

Fuels, lubricants, coolants, and hydraulic fluids, and other petroleum products shall be handled and disposed of in a manner so as not to enter surface or ground waters and in accordance with applicable state and federal regulations. Equipment used on the site must be operated and maintained properly to prevent discharge of fluids. Equipment, vehicle, and other wash waters shall not be discharged into E&SC basins or other E&SC devices. Alternative controls should be provided such that there is no discharge of soaps, solvents, or detergents.

Waste Materials

Construction materials and land clearing waste shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (15A NCAC 13B). Areas dedicated for managing construction material and land clearing waste shall be at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. Paint and other liquid construction material waste shall not be dumped into storm drains. Paint and other liquid construction waste washouts should be located at least 50 feet away from storm drain inlets unless there is no alternative. Other options are to install lined washouts or use portable, removable bags or bins. Hazardous or toxic waste shall be managed in accordance with the federal Resource Conservation and Recovery Act (RCRA) and NC Hazardous Waste Rules at 15A NCAC, Subchapter 13A. Litter and sanitary waste shall be managed in a manner to prevent it from entering jurisdictional waters and shall be disposed of offsite.

Herbicide, Pesticide, and Rodenticides

Herbicide, pesticide, and rodenticides shall be stored and applied in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, North Carolina Pesticide Law of 1971 and labeling restrictions.

Concrete Materials

Concrete materials onsite, including excess concrete, must be controlled and managed to avoid contact with surface waters, wetlands or buffers. No concrete or cement slurry shall be discharged from the site. (Note that discharges from onsite concrete plants require coverage under a separate NPDES permit – NCG140000.) Concrete wash water shall be managed in accordance with the *Concrete Washout Structure* provision. Concrete slurry shall be managed and disposed of in accordance with *NCDOT DGS and HOS DCAR Distribution of Class A Residuals Statewide* (Permit No. WQ0035749). Any hardened concrete residue will be disposed of, or recycled on site, in accordance with state solid waste regulations.

Earthen Material Stock Piles

Earthen material stock piles shall be located at least 50 feet away from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available.

Measurement and Payment

Conditions set within the *Construction Materials Management* provision are incidental to the project for which no direct compensation will be made.

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:

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/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	≥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 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: **(East)**

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.

The geotextile for the spillway liner shall meet the following minimum physical properties for low permeability, woven polypropylene geotextiles:

Property	Test Method	Value	Unit
Tensile Strength	ASTM D-4632	315	lb.
Tensile Elongation (Maximum)	ASTM D-4632	15	%
Trapezoidal Tear	ASTM D-4533	120	lbs.
CBR Puncture	ASTM D-6241	900	lbs.
UV Resistance (% retained at 500 hrs.)	ASTM D-4355	70	%
Apparent Opening Size (AOS)	ASTM D-4751	40	US Std. Sieve
Permittivity	ASTM D-4491	0.05	sec^{-1}
Water Flow Rate	ASTM D-4491	4	$gal/min/ft^2$

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 Type 4 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 low permeability polypropylene 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*.

Low Permeability Geotextile will be measured and paid for as the actual number of square yards measured along the surface of the spillway over which the geotextile is installed and accepted.

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
Low Permeability Geotextile	Square Yard

TIERED SKIMMER BASIN WITH BAFFLES: **(East)**

Description

Provide a tiered skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Tiered Skimmer Basin Detail sheet provided in the erosion control plans. Tiered Skimmer Basins shall be installed in areas where topography creates a large elevation difference between the inlet and outlet of a single skimmer basin. Work includes constructing sediment basins, installation of coir fiber baffles, installation of temporary slope drain pipe, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing geotextile spillway liners, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drain pipe, 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
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.

The geotextile for the spillway liner shall meet the following minimum physical properties for low permeability, woven polypropylene geotextiles:

Property	**Test Method**	**Value**	**Unit**
Tensile Strength	ASTM D-4632	315	lb.
Tensile Elongation (Maximum)	ASTM D-4632	15	%
Trapezoidal Tear	ASTM D-4533	120	lbs.
CBR Puncture	ASTM D-6241	900	lbs.
UV Resistance (% retained at 500 hrs.)	ASTM D-4355	70	%
Apparent Opening Size (AOS)	ASTM D-4751	40	US Std. Sieve
Permittivity	ASTM D-4491	0.05	sec^{-1}
Water Flow Rate	ASTM D-4491	4	$gal/min/ft^2$

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 basins 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 spillways according to the Tiered Skimmer Basin Detail sheet in the erosion control plans.

Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*. Multiple upper basins, or Modified Silt Basins Type 'B' as labeled on the detail, may be required based on site conditions and as directed.

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 spillways with low permeability polypropylene 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 primary spillways 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 Tiered Skimmer Basin with Baffles detail.

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. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

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.

Low Permeability Geotextile will be measured and paid for as the actual number of square yards measured along the surface of the spillway over which the geotextile is installed and accepted.

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
Low Permeability Geotextile	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 Environmental Quality Division of Water Resources 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

SILT FENCE COIR FIBER WATTLE BREAK:
(8-21-12) 1605,1630

Description

Silt fence coir fiber wattle breaks are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting and used in conjunction with temporary silt fence at the toe of fills to intercept runoff. Silt fence coir fiber wattle breaks 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, maintenance and removing Silt fence coir fiber wattle breaks.

Materials

Coir fiber wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12"
Minimum Length	10 ft
Minimum Density	3.5 lb/cf ± 10%
Net Material	Coir Fiber
Net Openings	2" x 2"
Net Strength	90 lb.
Minimum Weight	2.6 lb/ft ± 10%

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

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 a trench the entire length of each wattle with a depth of 1" to 2" for the wattle to be placed. Secure silt fence coir fiber wattle breaks to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the silt fence coir fiber wattle break according to the detail provided in the

plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Install temporary silt fence in accordance with Section 1605 of the *Standard Specifications* and overlap each downslope side of silt fence wattle break by 6".

Maintain the silt fence coir fiber wattle breaks until the project is accepted or until the silt fence coir fiber wattle breaks are removed, and remove and dispose of silt accumulations at the silt fence coir fiber wattle breaks when so directed in accordance with Section 1630 of the *Standard Specifications*.

Measurement and Payment

Coir Fiber Wattle will be measured and paid as the actual number of linear feet of wattles installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the silt fence coir fiber wattle break.

Payment will be made under:

Pay Item	**Pay Unit**
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 Environmental Quality Division of Water Resources 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

BORROW PIT DEWATERING BASIN:
(3-17-09) (Rev 3-2-11)

Description

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.

Construct, maintain and remove earth embankments used to reduce turbidity from dewatering borrow sites. Work includes providing porous coir fiber baffle, filtration geotextile, stone and outlet structures; cleaning out, maintaining, removing and disposing of the borrow pit dewatering basin and all components; and reshaping, dressing, seeding and mulching the area.

Materials

Refer to Division 10

Item	Section
Riprap, Class A, B, 1, and 2	1042
Geotextile for Drainage, Type 2	1056
Coir Fiber Baffle	1640-2

Use suitable excavated materials, as specified in Sections 225, 230 and 240 of the *Standard Specifications* in the construction of earth embankments for borrow pit dewatering basins, except where otherwise specified.

Construction Methods

Construct borrow pit dewatering basins according to the detail in the erosion control plans, and at locations shown on Reclamation Plans or in areas as directed.

The volume of the borrow pit dewatering basin will be based on a 2 hour retention time. The pump rate shall not exceed 1,000 GPM. The Contractor, at his option, may use a greater retention time for managing turbidity.

The straight line distance between the inlet and outlet shall be divided to include a forebay chamber in the upper quarter cell. Install one porous coir fiber baffle across the full width of the basin to

delineate the forebay chamber. Do not use earthen or rock baffle. Install filtration geotextile on the interior side slopes and the floor of the forebay.

The water pumped from the borrow pit into the dewatering basin shall be obtained from the top of the water column and shall be discharged into the forebay in a non-erodible manner.

The borrow pit dewatering basin outlet shall be a vertical non-perforated riser pipe or flash board riser attached with a watertight connection to a barrel that carries the water through the embankment.

Maintenance and Removal

Maintain the borrow pit dewatering basin, coir fiber baffle, and remove and dispose of silt accumulations in accordance with Article 1630-3 of the *Standard Specifications*. The Contractor may include a drain device for maintenance and removal at his discretion.

Remove the borrow pit dewatering basin once dewatering operations are completed. Grade, seed, and mulch the area after removal of the borrow pit dewatering basin in accordance with Section 1660 of the *Standard Specifications*. The area shall be stabilized with an approved groundcover before final acceptance of the site.

Measurement and Payment

No direct payment will be made for borrow pit dewatering basins with the exception of the work of silt removal during dewatering basin operation and the work of seeding and mulching after removal of the dewatering basin. All other work and materials required for installation, maintenance and removal of borrow pit dewatering basins shall be incidental to *Borrow Excavation*. Such price and payments will be full compensation for the work of constructing, maintaining and removing the borrow pit dewatering basin including, but not limited to, the construction and removal of the borrow pit dewatering basin; furnishing of the outlet structure, baffle, filtration geotextile, stone and optional drain devices; and removal of all such items once dewatering operations are completed.

Removal and disposal of silt accumulations during dewatering operations will be measured and paid at the contract unit price per cubic yard for *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications.*

Grading, seeding, and mulching the area after removal of the borrow pit dewatering basin will be measured and paid at the contract unit price per acre for *Seeding and Mulching* in accordance with Section 1660-8 of the *Standard Specifications*.

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

PUMP AROUND OPERATION:

Description

The work covered by this section consists of furnishing, installing, maintaining and removing any and all pump around systems used on this project. The Contractor shall install a pump around system in locations as shown in the plans and in other locations approved by the Engineer. The pump around system shall provide a passageway for the stream flow around the work site.

The quantity of pump around systems may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work. See NCDOT *Best Management Practices for Construction and Maintenance Activities* manual for example pump around operation.

Materials

Item	Section
Special Stilling Basin	1639

Impervious Dike shall meet the specifications as provided elsewhere in this contract.

Pumps shall be of sufficient size to divert the stream flow around the work area, as approved by the Engineer.

Construction Methods

Install *impervious dike(s)* as shown on the plans or as directed. Pump water around the work site. If the water is turbid or exposed to bare soil, pump through a *special stilling basin*. Once the work is complete in an area remove the *impervious dike(s)* and pump system, and stabilize the area.

Measurement and Payment

Impervious Dike will be measured and paid for as provided elsewhere in this contract.

Special Stilling Basin will be measured and paid for in accordance with Article 1639-4 of the *Standard Specifications*.

Payment for pumping operations shall be considered incidental to the work of installing pipes and culverts. The pumping operations shall include but not be limited to, diverting the stream flow around the work area and pumping runoff from the work area into a stilling basin, special stilling basin or other sediment control device. No additional payment will be made for furnishing materials or maintenance of the pumping operations for the installation of pipes and culverts.

The above prices and payments will be full compensation for all work covered by this section including, but not limited to furnishing all of the necessary materials, construction, maintenance and removal of the impervious dike and pump around system.

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

FLOATING TURBIDITY CURTAIN:

Description

This work consists of furnishing a *Floating Turbidity Curtain* to deter silt suspension and movement of silt particles during construction. The floating turbidity curtain shall be constructed at locations as directed.

Materials

The curtain material shall be made of a tightly woven nylon, plastic or other non-deteriorating material meeting the following specifications:

Property	Value
Grab tensile strength	*md-370 lbs *cd-250 lbs
Mullen burst stength	480 psi
Trapezoid tear strength	*md-100 lbs *cd-60 lbs
Apparent opening size	70 US standard sieve
Percent open area	4% permittivity 0.28 sec-1

*md - machine direction
*cd - cross machine direction

In the event that more than one width of fabric is required, a 6" overlap of the material shall also be required.

The curtain material shall be supported by a flotation material having over 29 lbs/ft buoyancy. The floating curtain shall have a 5/16" galvanized chain as ballast and dual 5/16" galvanized wire ropes with a heavy vinyl coating as load lines.

Construction Methods

The Contractor shall maintain the *Floating Turbidity Curtain* in a satisfactory condition until its removal is requested by the Engineer. The curtain shall extend to the bottom of the jurisdictional resource. Anchor the curtain according to manufacturer recommendations.

Measurement and Payment

Floating Turbidity Curtain will be measured and paid for as the actual number of square yards of curtain furnished as specified and accepted. Such price and payment will be full compensation for the work as described in this section including but not limited to furnishing all materials, tools, equipment, and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Floating Turbidity Curtain	Square Yard

CONCRETE WASHOUT STRUCTURE:
(12-10-20)

Description

Concrete washout structures are enclosures above or below grade to contain concrete waste water and associated concrete mix from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids, so that this material does not migrate to surface waters or into the ground water. These enclosures are not intended for concrete waste not associated with wash out operations.

The concrete washout structure may include constructed devices above or below ground and or commercially available devices designed specifically to capture concrete wash water.

Materials

Item	Section
Temporary Silt Fence	1605

Safety Fence shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall meet the following minimum physical properties for low permeability; it shall consist of a polypropylene or polyethylene 10 mil think geomembrane. If the minimum setback dimensions can be achieved the liner is not required. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

Construction Methods

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed.

Install temporary silt fence around the perimeter of the enclosure in accordance with the details and as directed if structure is not located in an area where existing erosion and sedimentation control devices are capable to containing any loss of sediment.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel. Install safety fence as directed for visibility to construction traffic.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

https://connect.ncdot.gov/resources/roadside/SoilWaterDocuments/ConcreteWashoutStructuredetail.pdf

Alternate details for accommodating concrete washout may be submitted for review and approval.

The alternate details shall include the method used to retain and dispose of the concrete waste water within the project limits and in accordance with the minimum setback requirements. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

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 and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. Grade the earth material to match the existing contours and permanently seed and mulch area.

Measurement and Payment

Concrete Washout Structure will be paid for per each enclosure installed in accordance with the details. If alternate details or commercially available devices are approved, then those devices will also be paid for per each approved and installed device.

Temporary Silt Fence will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

Safety Fence shall be measured and paid for as provided elsewhere in this contract.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	Pay Unit
Concrete Washout Structure	Each

FABRIC INSERT INLET PROTECTION DEVICE (HIGH FLOW)
(6-29-17)
Description

This work shall consist of installing, maintaining, and removing *Fabric Insert Inlet Protection Device*, of the type specified, in inlet structures (catch basins, drop inlets, etc) in areas where

asphalt or concrete may prevent the proper installation of a Rock Inlet Sediment Traps Type C, or as directed.

Materials

The product shall be a fabric inlet protection device composed of a fitted woven polypropylene geotextile double sewn with nylon thread suspended sack. The *Fabric Insert Inlet Protection Device* shall be manufactured to fit the opening of the catch basin or drop inlet or shall have a deflector to direct runoff from the curb opening into the fabric sack. The *Fabric Insert Inlet Protection Device* shall have a rigid frame or support system to support the loaded weight of the product. The product shall have lifting loops for removing the device from the basin and will have dump straps attached at the bottom to facilitate the emptying of the device. The *Fabric Insert Inlet Protection Device* shall have an overflow system to allow stormwater to enter the inlet structure and avoid ponding on the roadway when the device reaches capacity.

The stitching shall meet the following physical properties:

Physical	Test Method	English
Average Wide Width Strength	ASTM D-4884	165 lb/in

The fitted filter assembly shall have the following physical properties:

Physical	Test Method	English
Grab Tensile	ASTM D-4632	255 x 275 lbs
Minimum Puncture Strength	ASTM D-4833	125 lbs
Mullen Burst	ASTM D-3786	420 PSI
Minimum UV Resistance	ASTM D-4355	70 %.
Flow Rate	ASTM D-4491	200 gal/min/ft^2
Apparent Opening	ASTM D-4751	20 US Sieve
Permittivity	ASTM D-4491	1.5 sec^{-1}

Construction Methods

Strictly comply with manufacturer's installation instructions and recommendations. Maintenance shall include regular daily inspections and after each qualifying rain event. The *Fabric Insert Inlet Protection Device* shall be emptied, cleaned and placed back into the basin when it reaches 50% capacity or as directed.

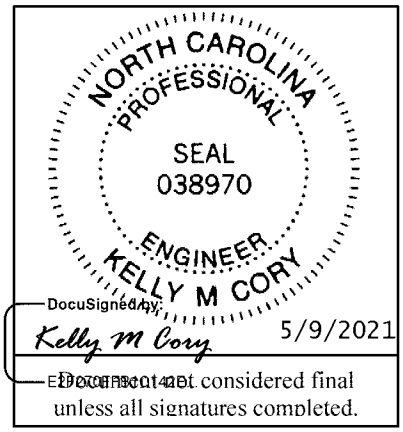
Measurement and Payment

This work will be paid for at the contract unit price per *Fabric Insert Inlet Protection Device* of the type specified, complete in place and accepted. Such payment shall be full compensation for furnishing and installing the *Fabric Insert Inlet Protection Device* in accordance with this specification and for all required maintenance.

Maintenance of the device, cleanout and disposal of accumulated sediments shall be paid for by *Fabric Insert Inlet Protection Device Cleanout*.

Payment will be made under:

Pay Item	**Pay Unit**
Fabric Insert Inlet Protection Device	Each
Fabric Insert Inlet Protection Device Cleanout	Each



Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 18.5)

Prepared By: *Kelly M Cory, PE, PTOE*
7-May-21

Contents

1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read "Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications, Standard Drawings,* and the project plans."

Page 17-4, revise sentence beginning on line 21 to read "Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications, Standard Drawings*, and test requirements."

1.2. GENERAL REQUIREMENTS – Construction Methods (1700-3(M))

Page 17-4, Replace the sentence beginning on line 41 with "Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer."

1.3. WOOD POLES – Construction Methods (1720-3)

Page 17-18, revise sentence starting on line 13 to read "On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole."

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.

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, wire outlet bodies, wire entrance fitting brackets and end caps when supplied as components of 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, rigid vehicle signal head mounting brackets for mast-arm attachments, messenger cable hanger components or balance adjuster components.

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 messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts 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 2018 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 2018 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.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for "Pedestrian Traffic Control Signal Indications" and the following sections of the ITE standard for "Vehicle Traffic Control Signal Heads" in effect on the date of advertisement:

- Section 3.00 - "Physical and Mechanical Requirements"
- Section 4.01 - "Housing, Door, and Visor: General"
- Section 4.04 - "Housing, Door, and Visor: Materials and Fabrication"
- Section 7.00 - "Exterior Finish"

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long. Where required by the plans, provide 12-inch pedestrian signal heads with traditional three-sided, rectangular visors, 8 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

Provide standard R10-3 signs with mounting hardware that comply with the MUTCD in effect on the date of advertisement. Provide R10-3E signs for countdown pedestrian heads and R10-3B for non-countdown pedestrian heads.

Design the LED pedestrian traffic signal modules (hereafter referred to as modules) for installation into standard pedestrian traffic signal sections that do not contain the incandescent signal section reflector, lens, eggcrate visor, gasket, or socket. Provide modules that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp. Use LEDs that are of the latest aluminum indium gallium phosphorus (AlInGaP) technology for the Portland Orange hand and countdown displays. Use LEDs that are of the latest indium gallium nitride (InGaN) technology for the Lunar White walking man displays. 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.

Design all modules to operate using a standard 3 - wire field installation. Provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard pedestrian signal housing. 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.

Provide modules in the following configuration: 16-inch displays which have the solid hand/walking man overlay on the left and the countdown on the right, and 12-inch displays which have the solid hand/walking man module as an overlay. 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 2018 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 "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9
Countdown Indication	16	13

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.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

D. 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. CONTROLLERS WITH CABINETS

3.1. 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

3.2. 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 -40° F to +185° 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

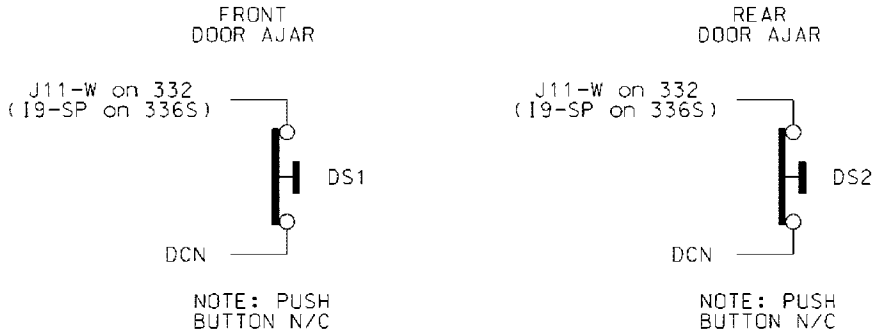
Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

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

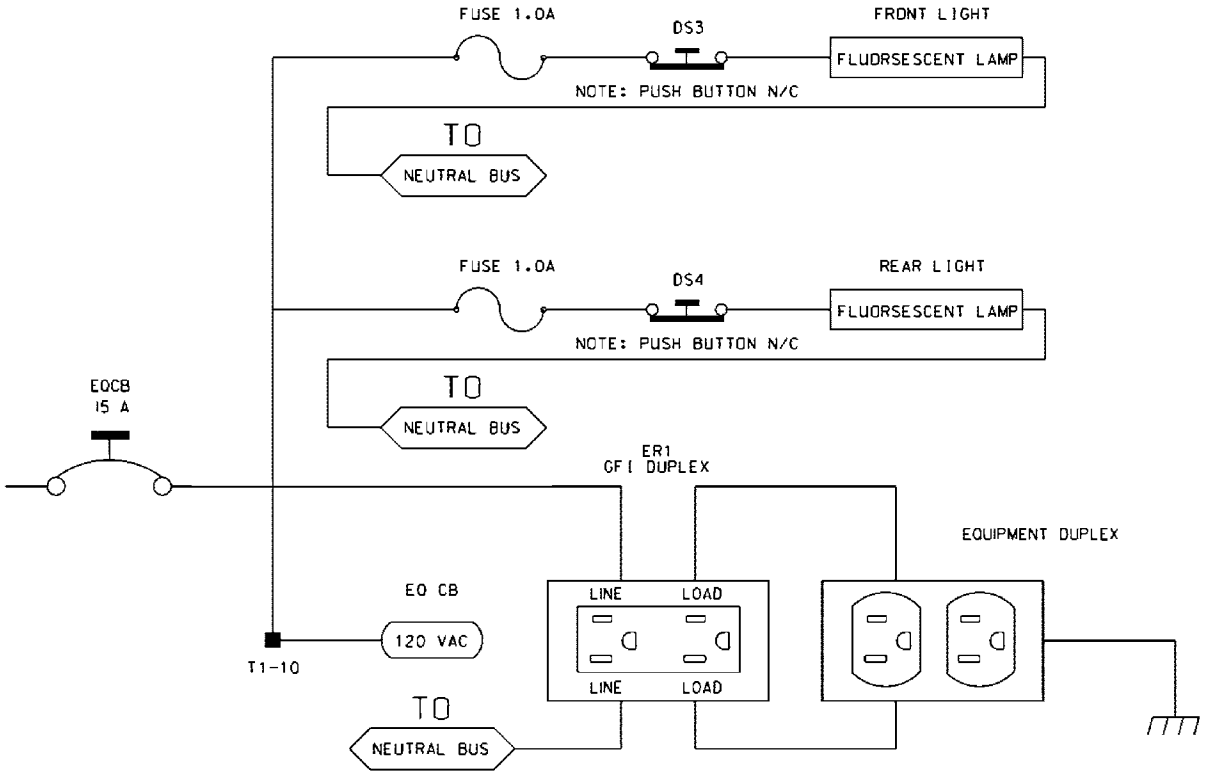
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

If additional surge protected power outlets are needed to accommodate field ethernet switches, 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.

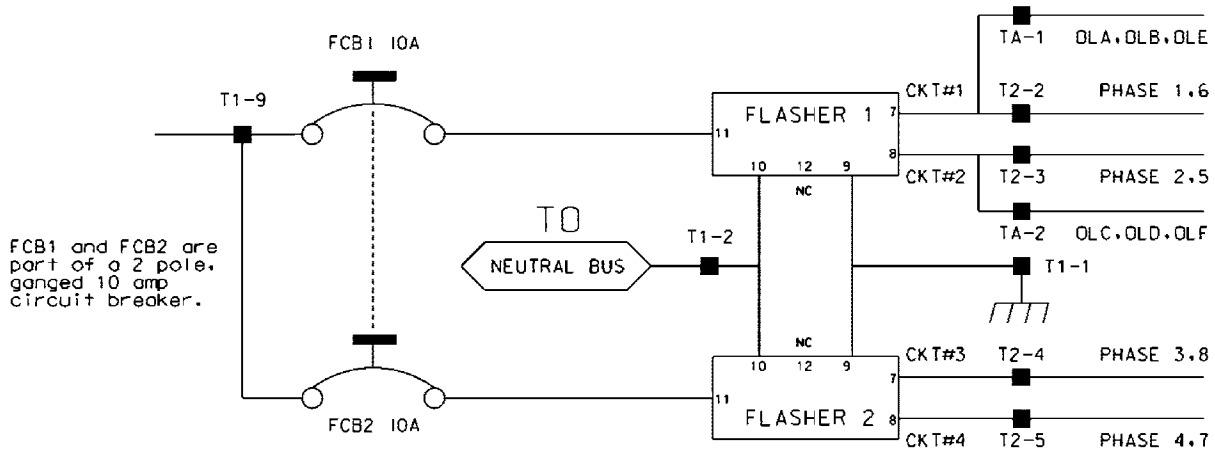
	P20 Connector				
PIN	FUNCTION	CONN TO	PIN	FUNCTION	CONN TO
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 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.

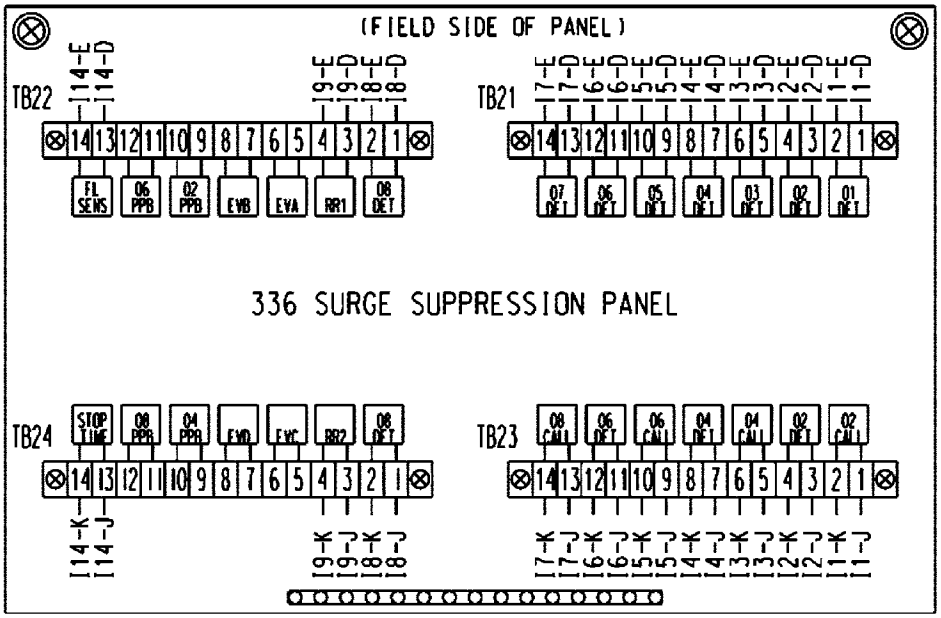
Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place

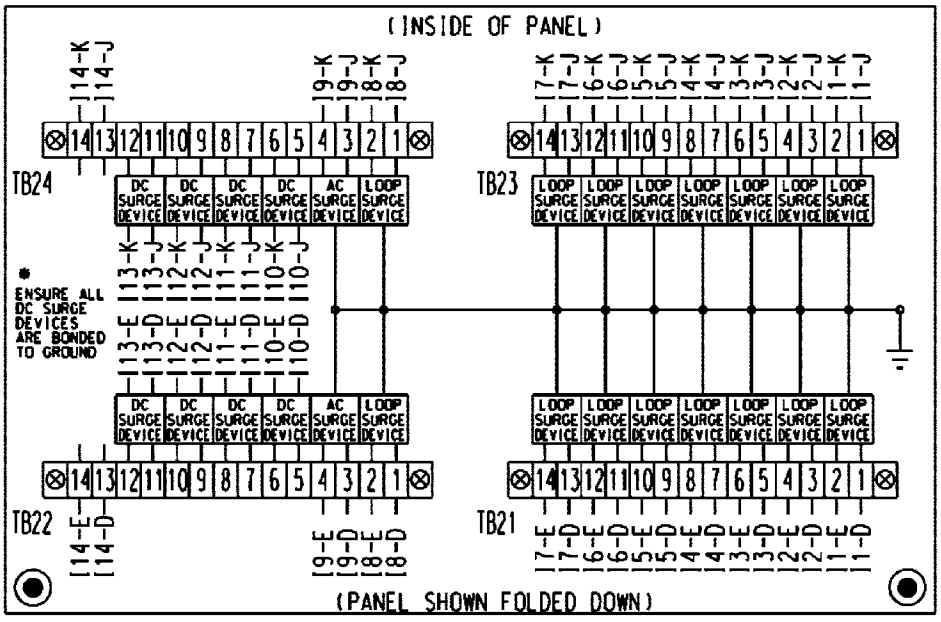
the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

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 +/- 150 ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150 ms (210 mode).

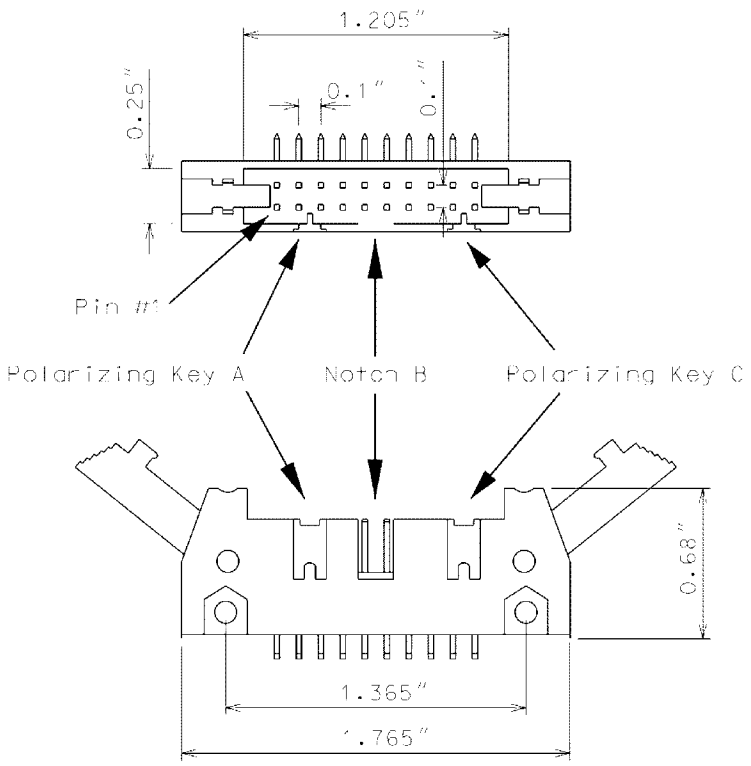
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

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 +/- 17 ms (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 2070 controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less than 700 ms when used with a 170 controller and 1200 ms when used with a 2070 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 pair for the following fault conditions: Conflict, Flash Rate Detection, 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

If a FYA channel pair is enabled for FYA operation, the conflict monitor will monitor the FYA logical channel pair for the additional following conditions:

1. **Conflict:** Channel conflicts are detected based on the permissive programming jumpers on the program card. This operation remains unchanged from normal operation except for the solid Yellow arrow (FYA clearance) signal.
2. **Yellow Change Interval Conflict:** During the Yellow change interval of the Permissive Turn channel (flashing Yellow arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active. These conflicting channels shall be determined by the program card compatibility programming of the Permissive Turn channel (flashing Yellow arrow). During the Yellow change interval of the Protected Turn channel (solid Green arrow) the conflict monitor shall verify that no conflicting channels to the solid Yellow arrow channel (clearance) are active as determined by the program card compatibility programming of the Protected Turn channel (solid Green arrow).

3. **Flash Rate Detection:** The conflict monitor unit shall monitor for the absence of a valid flash rate for the Permissive turn channel (flashing Yellow arrow). If the Permissive turn channel (flashing Yellow arrow) is active for a period greater than 1600 milliseconds, ensure the conflict monitor triggers and puts the intersection into flash. If the Permissive turn channel (flashing Yellow arrow) is active for a period less than 1400 milliseconds, ensure the conflict monitor does not trigger. Ensure the conflict monitor 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. Provide a jumper or switch that will enable and disable the Flash Rate Detection function. Ensure that when the jumper is not present or the switch is in the OFF position the Flash Rate Detection function is enabled. Ensure that when the jumper is present or the switch is in the ON position the Flash Rate Detection function is disabled.
4. **Red Monitoring or Absence of Any Indication (Red Failure):** The conflict monitor unit shall detect a red failure if there is an absence of voltage on all four of the inputs of a FYA channel pair (RA, YA, FYA, GA).
5. **Dual Indications on the Same Channel:** The conflict monitor unit shall detect a dual indication if two or more inputs of a FYA channel pair (RA, YA, FYA, GA) are "on" at the same time.
6. **Short/Missing Yellow Indication Fault (Clearance Error):** The conflict monitor unit shall monitor the solid Yellow arrow for a clearance fault when terminating both the Protected Turn channel (solid Green arrow) interval and the Permissive Turn channel (flashing Yellow arrow) interval.

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 170/2070 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	-

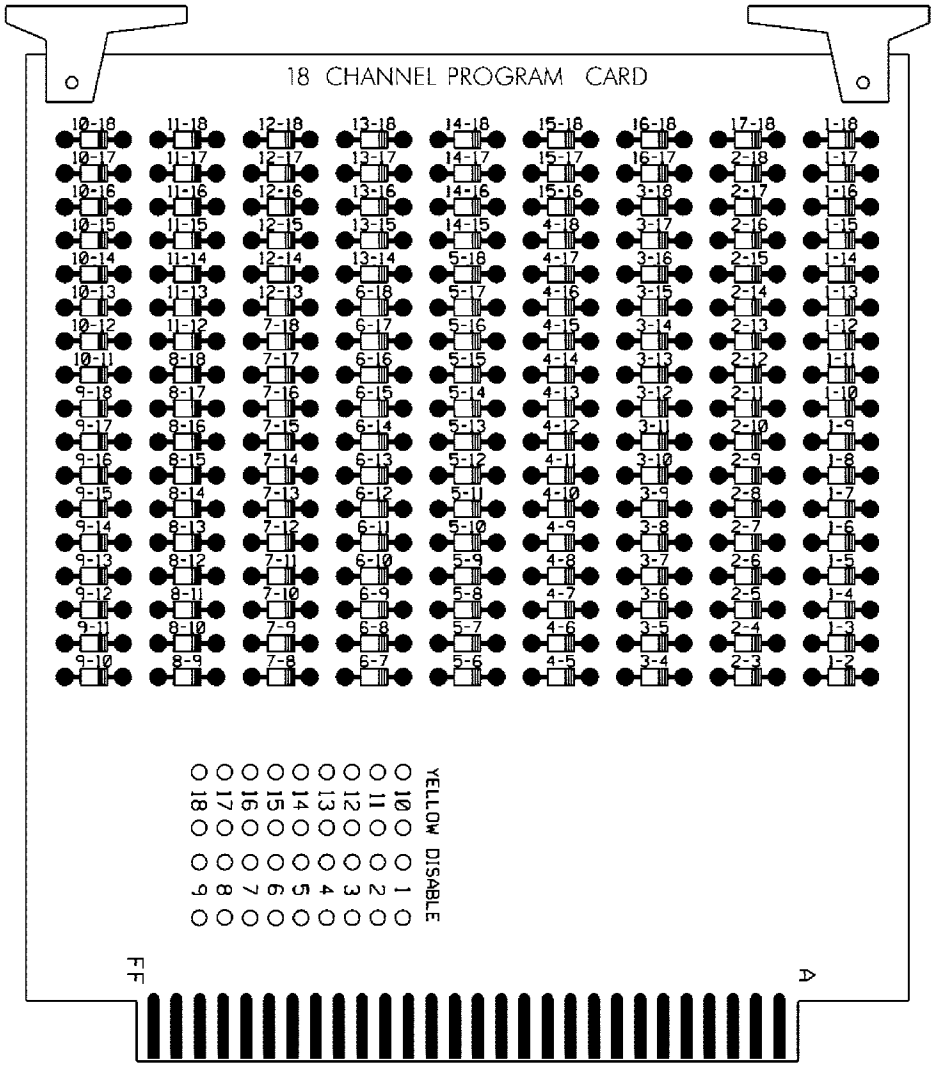
MONITOR BOARD EDGE CONNECTOR			
Pin #	**Function (Back Side)**	**Pin #**	**Function (Component Side)**
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 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.

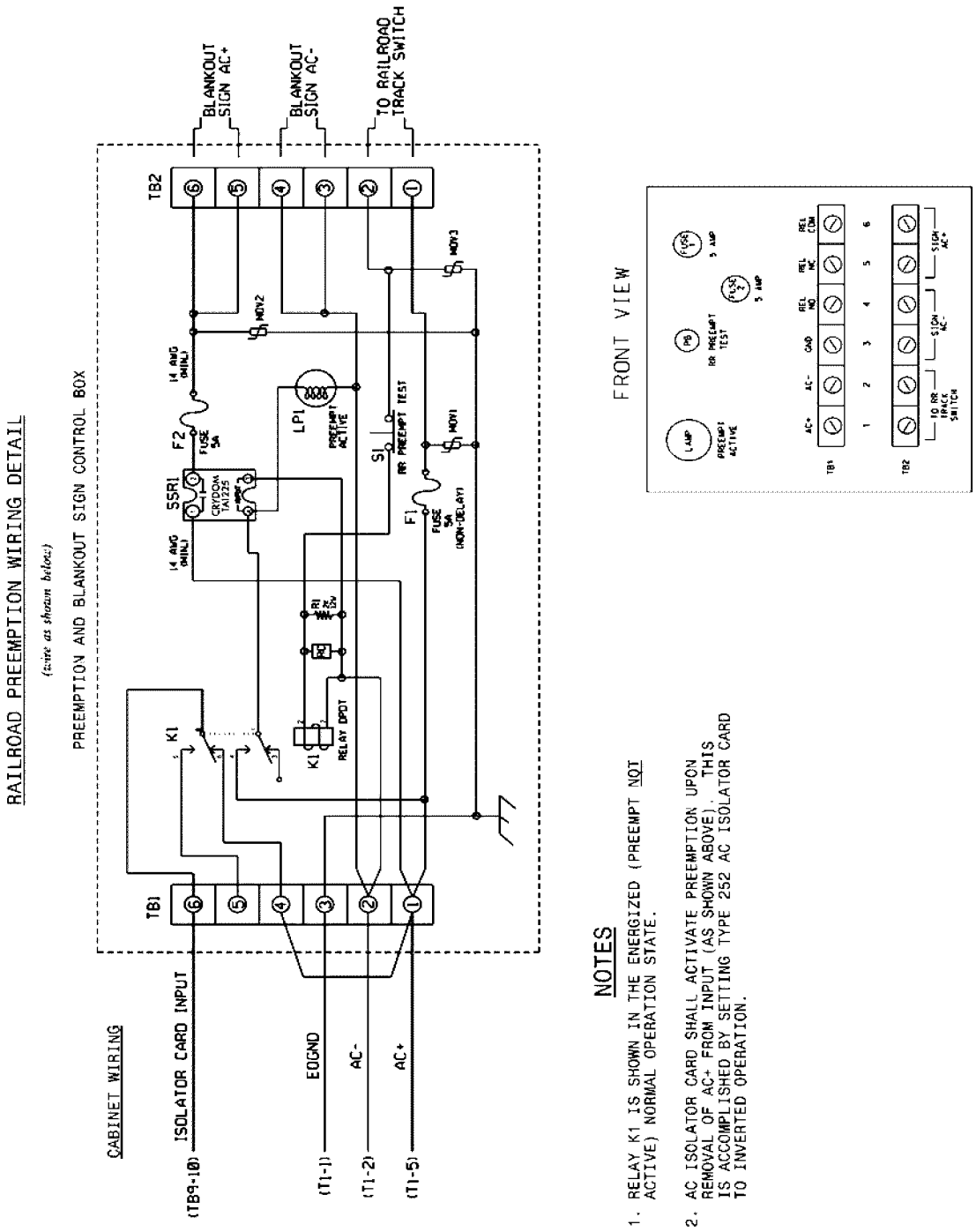


Figure 1

3.3. 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.

3.4. MATERIALS – TYPE 2070LX CONTROLLERS

Furnish model 2070LX controller units that conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010 and Errata 2 dated December 5, 2014) except as required herein.

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 2070LX controllers with Linux kernel 2.6.18 or higher and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1C, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- 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 2070-4A, Power Supply Module, 10 AMP

Provide a Board Support Package (BSP) to the state and to any specified applications software manufacturer when requested by the state to facilitate the porting of application software.

4. MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE DETECTION ZONES

4.1. DESCRIPTION

Design, furnish and install a microwave vehicle detection system with the manufacturer recommended cables and hardware in accordance to the plans and specifications. Ensure the detection system provides multiple detection zones.

4.2. MATERIALS

Provide design drawings showing design details and microwave sensor locations for review and acceptance before installation. Provide mounting height and location requirements for microwave sensor units on the design based on a site survey. Design microwave vehicle detection system with all necessary hardware. Indicate all necessary poles, spans, mast arms, luminaire arms, cables, microwave sensor mounting assemblies and hardware to achieve the required detection zones where Department owned poles are not adequate to locate the microwave sensor units. Do not design for the installation of poles in medians.

Obtain the Engineer's approval before furnishing microwave vehicle detection system. The contractor is responsible for the final design of microwave vehicle detection system. Review and acceptance of the designs by the Department does not relieve the contractor from the responsibility to provide fully functional systems and to ensure that the required detection zones can be provided. With the exception of contractor-furnished poles, mast arms, and luminaire arms, furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Submit and obtain Engineer's approval of shop drawings for any poles, mast arms, and luminaire arms provided by the contractor prior to ordering from manufacturer.

Provide a detector for either side-fire or forward-fire configuration. Ensure the detector will detect vehicles in sunny, cloudy, rainy, snowy, and foggy weather conditions. Ensure the detector can operate from the voltage supplied by a NEMA TS-1/TS-2 or Type 332 or 336 traffic signal cabinet. Ensure the detector can provide detection calls to the traffic signal controller within a NEMA TS-1/TS-2 or Type 332 or 336 cabinet. Ensure the detection system provides a constant call in the event of a component failure or loss of power. Ensure the detector has an operating temperature range of -30 to 165 degrees F and operates within the frequency range of 10 to 25 GHz. Ensure the detector is provided with a water-tight housing offering NEMA 4X protection and operates properly in up to 95% relative humidity, non-condensing.

Provide each detector unit to allow the placement of at least 8 detection zones with a minimum of 8 detection channel outputs. When the microwave vehicle detection system requires an integrated card rack interface(s), provide only enough interface cards to implement the vehicle detection shown on the signal plans. Provide a means acceptable to the Engineer to configure traffic lanes and detection zones. Provide each channel output with a programmable means to delay the output call upon activation of a detection zone that is adjustable in one second increments (maximum) over the range of 0 to 25 seconds. Provide each channel output with a programmable means to extend the output call that is adjustable in one second increments (maximum) over the range of 0 to 25 seconds. Ensure both delay and extend timing can be set for the same channel output.

For advance detection system, ensure the detector senses vehicles in motion at a range of 50 to 400 feet from the detector unit for forward-fire configuration and a range of 50 to 200 feet from the detector unit for side-fire configuration with an accuracy of 95% for both configurations. Ensure the advance detection system provides each channel output call of at least 100 ms in duration.

For stop bar presence detection system, ensure the detector outputs a constant call while a vehicle is in the detection zone and removes the call after all vehicles exit the detection zone. Ensure the presence detector unit can cover a detection zone as shown on the plans and has an effective range of 10 to 120 feet from the detector unit.

For units without an integrated card rack interface, provide Form C output relay contacts rated a minimum of 3A, 24VDC.

If a laptop is used to adjust detector settings, ensure that software is licensed for use by the Department and by any other agency responsible for maintaining or operating the microwave detection system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

After initial detector configuration and installation, ensure routine adjustments or calibration are not needed to maintain acceptable performance.

4.3. CONSTRUCTION METHODS

Install the microwave vehicle detection system in accordance with the manufacturer's recommendations.

Monitor and maintain each detector unit during construction to ensure microwave vehicle detection system is functioning properly and aimed for the detection zone shown in the plans. Refer to Subarticle 1700-3 (D) Maintenance and Repair of Materials of the *Standard Specifications* for failure to maintain the microwave detection system.

4.4. MEASUREMENT AND PAYMENT

Actual number of microwave vehicle detection systems – multiple zones furnished, installed, and accepted.

No measurement will be made of cables or hardware, as these will be considered incidental to furnishing and installing microwave vehicle detection systems.

Payment will be made under:

Microwave Vehicle Detection System – Multiple Zones ..... Each

5. METAL POLE SUPPORTS

5.1. METAL POLES

A. General:

Furnish and install metal poles, grounding systems, and all necessary hardware. Work covered under this special provision includes requirements for design, fabrication, and installation of standard and custom/site-specific designed metal pole supports and associated foundations.

Comply with applicable sections of the *2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications.* Provide designs of completed assemblies with hardware equaling or exceeding AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 (hereinafter called 6th Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi-sided cross section with no less than six sides. The sides may be straight, convex, or concave.

For bid purposes, pole heights shown on plans are estimated from available data. Prior to furnishing metal poles, use field measurements and adjusted cross-sections to determine whether pole heights will meet required clearances. If pole heights do not meet required clearances, the Contractor should immediately notify the Engineer of the required revised pole heights.

Standard Drawings for Metal Poles are available that supplement these project special provisions. The drawings are located on the Department's website:

https://connect.ncdot.gov/resources/safety/pages/ITS-Design-Resources.aspx

Comply with article 1098-1B of the *Standard Specifications* for submittal requirements. Furnish shop drawings for approval. Provide copies of detailed shop drawings for each type of structure as summarized below. Ensure shop drawings include material specifications for each component. Ensure shop drawings identify welds by type and size on the detail drawing only, not in table format. **Do not release structures for fabrication until shop drawings have been approved by NCDOT**. Ensure shop drawings contain an itemized bill of materials for all structural components and associated connecting hardware.

Comply with article 1098-1A of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, signal or asset inventory number(s) and project number or work order number.

Summary of information required for metal pole review submittal:

Item	Electronic Submittal	Comments / Special Instructions

Sealed, Approved Signal or ITS Plan/Loading Diagram	1 set	All structure design information needs to reflect the latest approved Signal or ITS plans
Custom Pole Shop Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a unique drawing number for each project.
Standard Strain Pole Shop Drawings (from the QPL)	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a unique drawing number for each project.
Structure Calculations	1 set	Not required for Standard QPL Poles
Standard Strain Pole Foundation Drawings	1 set	Submit drawings on 11" x 17" format media. Submit a completed Standard Foundation Selection form for each pole using foundation table on Metal Pole Drawing M8.
Custom Foundation Drawings	1 set	Submit drawings on 11" x 17" format media. Show NCDOT signal or asset inventory number(s), Contractor's name and relevant revision number in the title block. All drawings must have a unique drawing number for each project. If QPL Poles are used, include the corresponding QPL pole shop drawings with this submittal.
Foundation Calculations	1 set	**Submit copies of LPILE input, output, and pile tip deflection graph per Section titled Drilled Pier Foundations for Metal Poles of this specification for each foundation.** Not required for Standard Strain Poles (from the QPL)
Soil Boring Logs and Report	1 set	Report shall include a location plan and a soil classification report including soil capacity, water level, hammer efficiency, soil bearing pressure, soil density, etc. for each pole.

NOTE – All shop drawings and custom foundation design drawings must be sealed by a Professional Engineer licensed in the state of North Carolina. All geotechnical information must be sealed by either a Professional Engineer or Geologist licensed in the state of North Carolina. Include a title block and revision block on the shop drawings and foundation drawings showing the NCDOT signal or asset inventory number(s).

Shop drawings and foundation drawings may be submitted together or separately for approval. However, shop drawings must be approved before foundations can be reviewed. Foundation designs will be returned without review if the associated shop drawing has not been approved. Boring reports shall include the following: Engineer's summary, boring location maps, soil classification per AASHTO Classification System, hammer efficiency, and Metal Pole Standard Foundation Selection Form. Incomplete submittals will be returned without review. The Reviewer

has the right to request additional analysis and copies of the calculations to expedite the approval process.

B. Materials:

Fabricate metal pole from coil or plate steel that meet the requirements of ASTM A 595 Grade A tubes. For structural steel shapes, plates, and bars use, as a minimum, ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr 50, or an approved equivalent. Provide pole shafts of round or near round (18 sides or more) cross-section, or multi-sided tubular cross-section with no less than six sides, having a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single-ply plate or coil. For anchor base fabrication, conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Use the submerged arc process, or other NCDOT previously approved process suitable for shafts, to continuously weld pole shafts along their entire length. Finish the longitudinal seam weld flush with the outside contour of the base metal. Ensure shaft has no circumferential welds except at the lower end joining the shaft to the pole base. Use full penetration groove welds with backing ring for all tube-to-transverse-plate connections in accordance with 6th Edition AASHTO. Provide welding that conforms to Article 1072-18 of the *Standard Specifications.* No field welding on any part of the pole will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel poles and all assembly components in accordance with section 1076-3 of the *Standard Specifications*. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Galvanize hardware in accordance with section 1076-4 of the *Standard Specifications*. Ensure threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing in accordance with section 1076-7 of the Standard *Specifications. Ensure* all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring the Designer/Fabricator specifies connecting hardware and/or materials that prevent a dissimilar metal corrosive reaction.

Ensure each anchor rod is 2-inch minimum diameter and 60-inch length. Provide 10-inch minimum thread projection at the top of the rod, and 8-inch minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials complying with SP09_R005, hereinafter referred to as *Foundations and Anchor Rod Assemblies for Metal Poles.*

Ensure anchor bolt hole diameters are ¼-inch larger than the anchor bolt diameters in the base plate.

Provide a circular anchor bolt lock plate securing the anchor bolts at the embedded end with two (2) washers and two (2) nuts. Provide a base plate template matching the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼-inch minimum thick steel with a minimum width of 4 inches. Hot-dip galvanizing is not required for both plates.

Provide four (4) heavy hex nuts and four (4) flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material. Ensure anchor bolts have required diameters, lengths, and positions, and will develop strengths comparable to their respective poles.

For each pole, provide a grounding lug with a ½-inch minimum thread diameter, coarse thread stud and nut that will accommodate #4 AWG ground wire. Ensure the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

Provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap

attached to the pole with a sturdy stainless-steel chain that is long enough to permit cap to hang clear of the pole-top opening when cap is removed.

Where required by the plans, furnish couplings 42 inches above bottom of the pole base for mounting of pedestrian pushbuttons. Provide mounting points consisting of 1½-inch internally threaded half-couplings complying with the NEC, mounted within the poles. Ensure that couplings are essentially flush with the outside surfaces of the poles and are installed before any required hot-dip galvanizing. Provide a threaded plug in each mounting point. Ensure the surface of the plug is essentially flush with the outer end of the mounting point when installed and has a recessed slot that will accommodate a ½ "drive standard socket wrench.

Metal poles may be erected and fully loaded after concrete has attained a minimum allowable compressive strength of 3,000 psi.

Connect poles to grounding electrodes and bond them to the electrical service grounding electrodes.

When field drilling is necessary for wire or cable entrances into the pole, comply with the following requirements:

- Do not drill holes within 2 inches of any welds.
- Do not drill any holes larger than 3 inches in diameter without checking with the ITS & Signals Structure Engineers.
- Avoid drilling multiple holes along the same cross section of tube shafts.
- Install rubber grommets in all field drilled holes that wire, or cable will directly enter unless holes are drilled for installation of weather heads or couplings.
- Treat the inside of the drilled holes and repair all galvanized surfaces in accordance with Section 1076-7 of the latest edition of the *Standard Specification prior to installing grommets, caps, or plugs.*
- Cap or plug any existing field drilled holes that are no longer used with rubber, aluminum, or stainless-steel hole plugs.

When street lighting is installed on metal signal structures, isolate the conductors feeding the luminaires inside the pole shaft using liquid tight flexible metal conduit (Type LFMC), liquid tight flexible nonmetallic conduit (Type LFNC), high density polyethylene conduit (Type HDPE), or approved equivalent.. All conductors supplying power for luminaires must run through an external disconnect prior to entrance into the structure. Comply with applicable National Electrical Safety Codes (NESC). Refer to Article "G" Luminaire Arms.

Install a ¼-inch thick plate for a concrete foundation tag to include the following information: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation. Install galvanized wire mesh to cover gap between the base plate and top of foundation for debris and pest control. Refer to standard drawing M7 for further details.

Immediately notify the Engineer of any structural deficiency that becomes apparent in any assembly, or member of any assembly, because of the design requirements imposed by these specifications, the plans, or the typical drawings.

C. Design:

Unless otherwise specified, design all metal pole support structures using the following 6th Edition AASHTO specifications:

- Design for a 50-year service life as recommended by Table 3.8.3-2.
- Use wind pressure map developed from 3-second gust speeds, as provided in Section 3.8.

- Assume wind loads as shown in Figures 3.9.4.2-2 and 3.9.4.2-3 of the 6th Edition AASHTO for Group III loading with Ice.
- Ensure metal pole support structures include natural wind gust loading and truck-induced gust loading for fatigue design, as provided in Sections 11.7.1.2 and 11.7.1.3, respectively. Designs need not consider periodic galloping forces.
- Assume 11.2 mph natural wind gust speed in North Carolina. For natural wind fatigue stress calculations, utilize a drag coefficient (C_d) based on the yearly mean wind velocity of 11.2 mph.
- When selecting Fatigue Importance Factors, utilize Fatigue Importance Category II, as provided for in Table 11.6-1, unless otherwise specified.
- Calculate all stresses using applicable equations from Section 5. The Maximum allowable stress ratio for all metal pole support designs is 0.9.
- Conform to Sections 10.4.2 and 11.8 for deflection requirements. For CCTV support structures, ensure maximum deflection at top of pole does not exceed 2.0 percent of pole height.
- Assume the combined minimum weight of a messenger cable bundle (including messenger cable, signal cable and detector lead-in cables) is 1.3 lbs/ft. Assume the combined minimum diameter of the cable bundle is 1.3 inches.

Unless otherwise specified by special loading criteria, the following computed surface area for ice load on signal heads shall be used:

- 3-section, 12-inch, Surface area: 26.0 ft^2
- 4-section, 12-inch, Surface area: 32.0 ft^2
- 5-section, 12-inch, Surface area: 42.0 ft^2

Design a base plate for each pole. The minimum base plate thickness for all poles is determined by the following criteria:

Case 1 Circular or rectangular solid base plate with the upright pole welded to the top surface of base plate with full penetration butt weld, where no stiffeners are provided. A base plate with a small center hole, which is less than 1/3 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 is $M = (P \times D_1) / 2$, where

M = bending moment at the critical section of the base plate induced by one (1) anchor bolt

P = anchoring force of each anchor bolt

D_1 = horizontal distance between the anchor bolt center and the outer face of the upright, or the difference between the bolt circle radius and the outside radius of the upright

Locate the critical section at the face of the anchor bolt and perpendicular to the bolt circle radius. The overlapped part of two (2) adjacent critical sections is considered ineffective.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two (2) lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/3 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt is $M = P \times D_2$,

where P = anchoring force of each anchor bolt

D_2 = horizontal distance between the face of the upright and the face of the anchor bolt nut

Locate the critical section at the face of the anchor bolt top nut and perpendicular to the radius of the bolt circle. The overlapped part of two (2) adjacent critical sections is considered ineffective.

If the base plate thickness calculated for Case 2 is less than Case 1, use the thickness calculated for Case 1.

The following additional requirements apply concerning pole base plates.

- Ensure that whichever case governs as defined above, the anchor bolt diameter is set to match the base plate thickness. If the minimum diameter required for the anchor bolt exceeds the thickness required for the base plate, set the base plate thickness equal to the required bolt diameter.
- For all metal poles, use a full penetration groove weld with a backing ring to connect the pole upright component to the base. Refer to Metal Pole Standard Drawing Sheet M3 or M4.

The Professional Engineer is wholly responsible for the design of all poles. Review and acceptance of these designs by the Department does not relieve the said Professional Engineer of his or her responsibility.

D. Strain Poles:

Refer to Metal Pole Standard Drawing Sheets M2 and M3 for fabrication details.

Provide two (2) messenger cable (span wire) clamps and associated hardware for attachment of messenger cable. Ensure diameter of the clamp is appropriate to its location on the pole and is appropriately designed for adjustment from 1'-6" below the top, down to 6'-6" below the top of the pole. Do not attach more than one (1) support cable to a messenger cable clamp.

Provide a minimum of three (3) 2-inch holes equipped with an associated coupling and weatherhead on the messenger cable load side of the pole to accommodate passage of signal cables from inside the pole. Provide galvanized threaded plugs for all unused couplings at pole entrance points. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Provide designs with a 6" x 12" hand hole with reinforcing frame for each pole.

Provide a terminal compartment with cover and screws in each pole encompassing the hand hole and containing a 12-terminal barrier type terminal block. Provide two (2) terminal screws with a removable shorting bar between them for each termination. Furnish terminal compartment covers attached to the pole by a sturdy chain or cable approved by the Engineer. Ensure chain or cable is long enough to permit cover to hang clear of the compartment opening when cover is removed and is strong enough to prevent vandalism. Ensure chain or cable will not interfere with service to cables in the pole base.

Have poles permanently stamped above the hand holes with the identification tag details as shown on Metal Pole Standard Drawing Sheets M2 and M3.

Provide grounding lug(s) in the approximate vicinity of the messenger cable clamp for bonding and grounding messenger cable. Lugs must accept #4 AWG wire to bond messenger cables to the

pole in order to provide an effective ground fault circuit path. Refer to Metal Pole Standard Drawing Sheet M6 for construction details.

Install metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Ensure the installed pole, when fully loaded, is within 1 degree 40 minutes (1°40') of vertical. Install poles with the manufacturer's recommended "rake." Where required, use threaded leveling nuts to establish rake.

5.2. DRILLED PIER FOUNDATIONS FOR METAL POLES

Analysis procedures and formulas shall be based on AASHTO 6th Edition, latest ACI-318 code and the *Drilled Shafts: Construction Procedures and Design Methods* FHWA-NHI-10-016 manual. Design methods based on engineering publications or research papers must have prior approval from NCDOT. The Department reserves the right to accept or reject any method used for the analysis.

Use the following Safety Factors for the foundation design:

- 1.0 x Service (Unfactored) Loads for LPile Shaft Lateral Deflection
- 1.3 x Torsion (Unfactored) Load for Drilled Shaft Concrete and Steel Strength
- (1.3 / 1.33) x Torsion (Unfactored) Load for Shaft Soil-to-Concrete Torsion Capacity
- (2.0 / 1.33) x Axial (Unfactored) Load for Shaft Axial Capacity in Soil

Ensure deflection at top of foundation does not exceed 1 inch for worst-case lateral load.

Use LPILE Plus V6.0 or later for lateral analysis. Submit inputs, results and corresponding graphs with the design calculations.

Calculate skin friction using the α-method for cohesive soils and the β-method for cohesion-less soils (**Broms method will not be accepted**). Detailed descriptions of the "α" and "β" methods can be found in *FHWA-NHI-10-016*.

Omit first 2.5 feet for cohesive soils when calculating skin friction.

Assume a hammer efficiency of 0.70 unless value is provided.

Design custom foundations to carry maximum capacity of each metal pole. For standard case strain poles with custom design, use actual shear, axial and moment reactions from the Standard Strain Pole Foundation Selection Table shown on Standard Drawing No. M8.

When poor soil conditions are encountered, which could create an excessively large foundation design, consideration may be given to allow an exemption to the maximum capacity design. The Contractor must gain approval from the Engineer before reducing a foundation's capacity. On projects where poor soil is known to be present, the Contractor should have foundation designs approved before releasing poles for fabrication.

Have the Contractor notify the Engineer if the proposed foundation is to be installed on a slope other than 8H: 1V or flatter.

A. Description:

Furnish and install foundations for NCDOT metal poles with all necessary hardware in accordance with the plans and specifications.

Metal Pole Standards have been developed and implemented by NCDOT for use at signalized intersections in North Carolina. If the plans call for a standard strain pole, then a standard foundation may be selected from the plans. However, the Contractor is not required to use a standard foundation. If the Contractor chooses to design a non-standard site-specific foundation for a standard strain pole or if the plans call for a non-standard site-specific pole, design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standard Drawings and Section

B4 (Non-Standard Foundation Design) below. If non-standard site-specific foundations are designed for standard QPL approved strain poles, the foundation designer must use the design moment specified by load case on Metal Pole Standard Drawing Sheet M8. Failure to conform to this requirement will be grounds for rejection of the design.

If the Contractor chooses to design a non-standard foundation for a standard strain pole and the soil test results indicate a standard foundation is feasible for the site, the Contractor will be paid the cost of the standard foundation. Any additional cost associated with a non-standard site-specific foundation including additional materials, labor and equipment will be considered incidental to the cost of the standard foundation. All costs for the non-standard foundation design will be considered incidental to the cost of the standard foundation.

B. Soil Test and Foundation Determination:

1. General:

Drilled piers are reinforced concrete sections, cast-in-place against in situ, undisturbed material. Drilled piers are of straight shaft type and vertical.

2. Soil Test:

Perform a soil test at each proposed metal pole location. Complete all required fill placement and excavation at each pole location to finished grade before drilling each boring. Soil tests performed that are not in compliance with this requirement may be rejected and will not be paid. Drill one boring to a depth of 26 feet within a 25-foot radius of each proposed foundation.

Perform standard penetration tests (SPT) in accordance with ASTM D 1586 at depths of 1, 2.5, 5, 7.5, 10, 15, 20 and 26 feet. Discontinue the boring if one of the following occurs:

- A total of 100 blows have been applied in any two consecutive 6-inch intervals.
- A total of 50 blows have been applied with < 3-inch penetration.

Describe each pole location along the project corridor in a manner that is easily discernible to both the Contractor's Designer and NCDOT Reviewers. If the pole is at an intersection, label the boring the "Intersection of *(Route or SR #)*, *(Street Name)* and *(Route or SR #)*, *(Street Name)*, _____ County, Signal or Asset Inventory No. _____". Label borings with "B- *N, S, E, W, NE, NW, SE or SW*" corresponding to the quadrant location within the intersection.

If the pole location is located between intersections, provide a coordinate location and offset, or milepost number and offset. Pole numbers should be made available to the Drill Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers. For each boring, submit a legible (hand-written or typed) boring log signed and sealed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at each depth, depth of the boring, hammer efficiency, depth of water table and a general description of the soil types encountered using the AASHTO Classification System.

Borings that cannot be easily correlated to their specific pole location will be returned to the Contractor for clarification; or if approved by the Engineer, the foundation may be designed using the worst-case soil condition obtained as part of this project.

3. Standard Foundation Determination:

Use the following method for determining the Design N-value:

$$N_{AVG} = \frac{N_{@1'} + N_{@2.5'} + \cdots + N_{@Deepest\ Boring\ Depth}}{Total\ Number\ of\ N\ values}$$

$$Y = (N_{@1'})^2 + (N_{@2.5'})^2 + \cdots + (N_{@Deepest\ Boring\ Depth})^2$$

$$Z = N_{@1'} + N_{@2.5'} + \cdots + N_{@Deeepest\ Boring\ Depth}$$

$$N_{STD\ DEV} = \sqrt{\left(\frac{(Total\ Number\ of\ N\ values \times Y) - Z^2}{(Total\ Number\ of\ N\ values) \times (Total\ Number\ of\ N\ values - 1)}\right)}$$

Design N-value equals lesser of the following two conditions:

$$N_{AVG} - (N_{STD\ DEV} \times 0.45)$$

OR

$$Average\ of\ First\ Four\ (4) N\ values = \frac{N_{@1'} + N_{@2.5'} + N_{@5'} + N_{@7.5'}}{4}$$

Note: If less than four (4) N-values are obtained because of criteria listed in Section 2 above, use average of N-values collected for second condition. Do not include the N-value at the deepest boring depth for above calculations if the boring is discontinued at or before the required boring depth because of criteria listed in Section 2 above. Use N-value of zero (0) for weight of hammer or weight of rod. If N-value is greater than fifty (50), reduce N-value to fifty (50) for calculations.

If standard NCDOT strain poles are shown on the plans and the Contractor chooses to use standard foundations, determine a drilled pier length, "L," for each signal pole from the Standard Strain Pole Foundations Chart (sheet M8) based on the Design N-value and the predominant soil type. For each standard pole location, submit a completed "Metal Pole Standard Foundation Selection Form" signed by the Contractor's representative. Signature on form is for verification purposes only. Include the Design N-value calculation and resulting drilled pier length, "L," on each form.

If non-standard site-specific poles are shown on the plans, submit completed boring logs collected in accordance with Section 2 (Soil Test) along with pole loading diagrams from the plans to the Contractor-selected pole Fabricator to assist in the pole and foundation design.

If one of the following occurs, the Standard Foundations Chart shown on the plans may not be used and a non-standard foundation may be required. In such case, contact the Engineer.

- The Design N-value is less than four (4).
- The drilled pier length, "L", determined from the Standard Foundations Chart, is greater than the depth of the corresponding boring.

In the case where a standard foundation cannot be used, the Department will be responsible for the additional cost of the non-standard foundation.

Foundation designs are based on level ground around the traffic signal pole. If the slope around the edge of the drilled pier is steeper than 8:1 (H:V) or the proposed foundation will be less than 10

feet from the top of an embankment slope, the Contractor is responsible for providing slope information to the foundation Designer and to the Engineer so it can be considered in the design.

The "Metal Pole Standard Foundation Selection Form" may be found at:

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (Soil Test). Design drilled piers for side resistance in accordance with Section 4.6 of the *2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition.* Use computer software LPILE version-6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use computer software gINT V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide a drilled pier foundation for each pole with a length and diameter resulting in horizontal lateral movement less than 1 inch at top of the pier, and horizontal rotational movement less than 1 inch at the edge of pier. Contact the Engineer for pole loading diagrams of standard poles used for non-standard foundation designs. Submit non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval, before construction.

C. Drilled Pier Construction:

Construct drilled pier foundation and Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Standard Special Provision SP09-R005 located at:

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

5.3. POLE NUMBERING SYSTEM

A. New Poles

Attach an identification tag to each pole shaft section as shown on Metal Pole Standard Sheet M2 "Typical Fabrication Details for All Metal Poles."

5.4. MEASUREMENT AND PAYMENT

Actual number of metal strain signal poles (without regard to height or load capacity) furnished, installed and accepted.

Actual number of soil tests with SPT borings drilled furnished and accepted.

Actual volume of concrete poured in cubic yards of drilled pier foundation furnished, installed and accepted.

No measurement will be made for foundation designs prepared with metal pole designs, as these will be considered incidental to designing Traffic Signal or CCTV support structures.

Payment will be made under:

Metal Strain Signal Pole ..... Each

Soil Test ..... Each

Drilled Pier Foundation ..... Cubic Yard

6. JUNCTION BOX MARKERS

6.1. DESCRIPTION

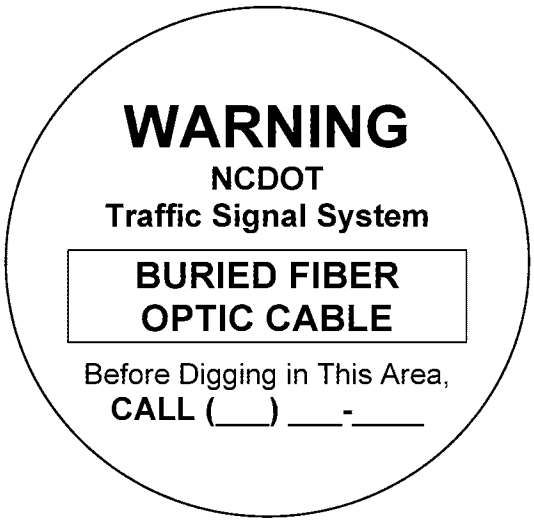
Furnish and install junction box markers with all necessary hardware and adhesives to warn of buried fiber-optic communications cable.

6.2. MATERIALS

A. Junction Box Markers

Furnish durable, non-reflective junction box markers, also known as curb markers, fabricated from UV-resistant, non-metallic materials other than ceramic material, such as polyurethane or high impact polypropylene or other high impact plastic. Provide junction box markers that are designed for outdoor use, that are waterproof, that resist fading, that are temperature stable and that resist chemical and mechanical abrasion. Furnish junction box markers with a quick-setting adhesive designed for use with the junction box markers supplied and designed to permanently adhere junction box markers to Portland cement/concrete, steel, and cast iron as well as other non-porous hard surfaces. Do not provide markers that require intrusive fasteners to secure the marker to the surface. Do not provide adhesives that are not designed for use with the junction markers supplied. Provide junction box markers that do not require special tools such as torches, tamping machines or drills or hardware or special surface preparation for installation. Furnish junction box markers from a manufacturer that has been producing such junction box markers (i.e., curb markers) for a minimum of 10 consecutive years.

Order the junction box marker with the Division's Phone Number printed on the marker, hand written sharpie labeling is not acceptable. Consult with the Engineer to ensure the junction box labels are ordered with the correct Division phone number. Provide junction box markers that contain the text and symbols, text emphasis and text proportions depicted in the example format shown below.:



Overall Junction Box Marker Dimensions: 2.5" diameter
Text: Black
Background: Light Gray (to blend with concrete and granite surfaces)

Submit samples of proposed junction marker to the Engineer for approval before installation. In lieu of designing a custom junction box marker, the Contractor may submit for the Engineer's approval a stock/standard junction box marker format (i.e., off-the-shelf format) from the junction box marker manufacturer that differs from the example format proposed above but that still embodies the content and intent conveyed by the example format.

Have the junction box marker manufacturer provide a list of references along with contract information for at least five different municipal government agencies and/or state departments of transportation that have installed the proposed manufacturer's markers and can attest to the performance of the manufacturer's markers over a continuous period of no less than seven years. Submit these references to the Engineer for review in conjunction with submission of the sample.

6.3. CONSTRUCTION METHODS

A. Junction Box Markers

Apply junction box markers to the surface of the junction box cover/lid on all new and/or existing junction boxes that are to be reused to house the fiber-optic communications cable. Additionally, at locations where a junction box is perpendicular to a raised curb place an additional junction box marker on the curb.

Clean surface to which the junction box marker will be applied. Make sure application surface is dry and free of any loose debris or cracks. Apply adhesive to back side of the junction box marker in accordance with manufacturer's instructions. Apply additional adhesive when surface is uneven or textured to fill voids and assure secure adhesion. Apply the junction box marker to the application surface and press firmly. Ensure that entire edge around perimeter of marker is sealed to the application surface.

Position the marker in the approximate center of the junction box cover and orient the marker so that its text is parallel to long side of the cover. On curb sections install the marker on the flattest surface of the curb at a point that is is perpendicular to the junction box.

Junction box markers are not required to be place on flat surfaces of the roadway where there is no curbing, unless required by the Engineer.

6.4. MEASUREMENT AND PAYMENT

Junction Box Marker will be measured and paid for as the actual number of junction box markers furnished, installed, and accepted.

No measurement will be made of junction box marker adhesive as this will be considered incidental to furnishing and installing the junction box marker.

Payment will be made under:

Junction Box Marker.....Each

7. ETHERNET EDGE SWITCH

Furnish and install a managed Ethernet edge switch as specified below that is fully compatible, interoperable, and completely interchangeable and functional within the existing City or Division traffic signal system communications network.

7.1. DESCRIPTION

A. Ethernet Edge Switch:

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for traffic signal controllers as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 100 megabits per second from each remote ITS device location to the routing switches.

Contact the City or Division to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the Project IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum five (5) days working notice to allow the City or Division to program the new devices.

B. Network Management:

Ensure that the edge switch is fully compatible with the City's or Division's existing Network Management Software.

7.2. MATERIALS

A. General:

Ensure that the edge switch is fully compatible and interoperable with the trunk Ethernet network interface and that the edge switch supports half and full duplex Ethernet communications.

Furnish an edge switch that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

B. Compatibility Acceptance

The Engineer has the authority to require the Contractor to submit a sample Field Ethernet Switch along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch for deployment**. The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City Signal System network, monitoring software and Traffic Operations Center network hardware.** Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed

C. Standards:

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);
- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;

- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications;
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX;
- IEEE 802.3x standard regarding flow control with full duplex operation; and
- IFC 2236 regarding IGMP v2 compliance.
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3ad Ethernet Link Aggregation
- IEEE 802.3i for 10BASE-T (10 Mbit/s over Fiber-Optic)
- IEEE 802.3ab for 1000BASE-T (1Gbit/s over Ethernet)
- IEEE 802.3z for 1000BASE-X (1 Gbit/s Ethernet over Fiber-Optic)

D. Functional:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard.
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous).
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- A minimum 4-kilobit MAC address table.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP).
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of remote monitoring (RMON-1 & RMON-2) of the Ethernet agent.
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

E. Physical Features:

Ports: Provide 10/100/1000 Mbps auto-negotiating ports (RJ-45) copper Fast Ethernet ports for all edge switches. Provide auto-negotiation circuitry that will automatically negotiate the highest

possible data rate and duplex operation possible with attached devices supporting the IEEE 802.3 Clause 28 auto-negotiation standard.

Optical Ports: Ensure that all fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide Type LC connectors for the optical ports, as specified in the Plans or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an edge switch having a minimum of two optical 100/1000 Base X ports capable of transmitting data at 100/1000 megabits per second. Ensure that each optical port consists of a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. Ensure that the optical ports have an optical power budget of at least 15 dB.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5E unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

Port Security: Ensure that the edge switch supports/complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access;
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward; and
- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

F. Management Capabilities:

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing/convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and

- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

Network Capabilities: Provide an edge switch that supports/complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON–I groups, at a minimum:
  - Part 1: Statistics
  - Part 2: History
  - Part 3: Alarm
  - Part 9: Event
- Provide support for the following RMON–2 groups, at a minimum:
  - Part 13: Address Map
  - Part 16: Layer Host
  - Part 17:Layer Matrix
  - Part 18:User History
- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet/CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

Network Security: Provide an edge switch that supports/complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

G. Electrical Specifications:

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

H. Environmental Specifications:

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as

defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)
- IEC 61000-6-2 (generic industrial)
- EMF – FCC Part 15 CISPR (EN5502) Class A

I. Ethernet Patch Cable:

Furnish a factory pre-terminated/pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 5e or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB
- Return Loss: 10dB
- Propagation Delay: 548 nsec

7.3. CONSTRUCTION METHODS

A. General:

Ensure that the edge switch is UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 5E and Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the Signal Shop a minimum of 5 days prior to installation for the most current edge switch IP Address, VLAN, subnet mask, default gateway and configuration files.

B. Edge Switch:

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the upper end of the right rear vertical rail of the equipment rack using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware and fasteners.

Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that has connectors on both ends, primarily used for interconnecting termination or patching facilities and/or equipment.

7.4. MEASURMENT AND PAYMENT

Ethernet edge switch will be measured and paid as the actual number of Ethernet edge switches furnished, installed, and accepted.

No separate measurement will be made for Ethernet patch cable, power cord, mounting hardware, nuts, bolts, brackets, or edge switch programming as these will be considered incidental to furnishing and installing the edge switch.

Payment will be made under:

Ethernet Edge Switch.....Each

8. FIBER-OPTIC TRAINING

8.1. DESCRIPTION

Provide training for the installation, operation and maintenance of the fiber-optic communications cable, field ethernet switches, interconnect centers, splice trays and other related fiber-optic equipment in accordance with the plans and specifications.

8.2. MATERIALS

Provide training to properly install, operate, maintain, diagnose and repair each piece of equipment associated with the fiber-optic system. Provide approved manufacturer's representatives or other qualified personnel to conduct training courses. Provide training for a minimum of fifteen Department personnel.

Before beginning the training course, submit detailed course curricula, draft manuals, and handouts, and resumes of the instructors for review and approval. The Engineer may request modification of the material and request courses desired by the Department.

Conduct all training courses at a location provided by the Department within the Division and at a time mutually agreed upon, but not later than the start of fiber-optic cable testing. Provide training material, manuals, and other handouts to serve not only as subject guidance, but also as quick reference for use by the students. Deliver course material in reproducible form immediately following the course.

Record each training course onto DVD(s) and deliver to the Engineer.

Provide instruction on basic fiber-optic theories and principals as well as the installation, operation, maintenance, identification, detection, and correction of malfunctions in fiber-optic communications cable and related hardware. Include field level troubleshooting as an integral part of the training.

Provide training for the fiber-optic system for the following categories and for the minimum number of hours shown:

COURSE OUTLINES (L = Lecture; D = Demonstration; H = Hands-on by Student)

FIELD ETHERNET SWITCHES

DAY 1 (4 Hours)

Safety - (L)

Introduction to Field Ethernet Switches - (L)

Review of Maintenance Manual - (L)

Review of Operations Manual - (L)

Question and answer session

FIBER-OPTIC CABLE SYSTEM

DAY 1 (8 Hours)

Safety - (L)

Introduction to fiber optics, theory, and principals - (L)

Fiber and cable types -(L, H)

National Electrical Code considerations - (L, H)

plenum and riser type cable

out door cable, etc.

Introduction to terminating hardware, end equipment, and applications - (L, D, H)

connectors (ST, SC, etc.)

splice enclosure, splice trays, and connector panels

cable placement techniques

Question and answer session

DAY 2 (8 Hours)

Cable handling and preparation (sheath removal, grip installation, etc.) - (L, D, H)

Splicing and terminating methods - (L, D, H)

mechanical splicing using various techniques

fusion splicing

field termination of connectors types

Introduction to cable plant testing procedures - (L, D, H)

proper usage of optical light generator and power meter

optical time domain reflectometer usage

Class project (build working system using cables/connectors made by attendees) - (L, D, H)

Question and answer session

DAY 3 (4 Hours)

Class project -- Testing and troubleshooting -- (L, D, H)

Cable system maintenance and restoration -- (L)

Question and answer session

8.3. MEASUREMENT AND PAYMENT

Lump sum for fiber-optic training with training packages completed and accepted.

Payment will be made under:

Fiber-optic Training.....Lump Sum

9. MODIFY SPREAD SPECTRUM WIRELESS RADIO

9.1. DESCRIPTION

Make modifications to existing Spread Spectrum Radio installations.

9.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Departments' QPL.

Reference Article 1098-18 "Spread Spectrum Wireless Radio" of the Standard Specifications for Roads and Structures.

9.3. CONSTRUCTION METHODS

This item of work involves making modifications to existing wireless installations which include relocating an existing radio from an existing cabinet to a new cabinet, and/or relocating existing components of the radio system from an existing pole to new poles (wood poles, metal strain poles, metal poles with mast arms, etc.). This item of work includes, but may not be limited to, the following:

Relocating existing radio from an existing cabinet to a new cabinet

Relocating or installing new Coaxial Cable

Furnishing and installing new N-Type Connectors

Furnishing new Coaxial Cable and Shield Grounding Kits

Relocating Antenna Mounting Hardware

Relocating Antennas

This item of work may also involve converting an existing standalone radio site to a repeater site. This item of work includes, but may not be limited to, the following:

Furnishing and installing new antenna(s)

Furnishing and installing new antenna mounting hardware kits

Furnishing and installing new 6 foot coaxial cable jumpers with N-Type Connectors

Furnishing and installing new coaxial cable – power divider (Splitters)

9.4. MEASUREMENT AND PAYMENT

Modify Radio Installation will be measured as the actual number of modified radio installations that are modified and accepted.

This item includes relocating the radio, and furnishing and/or relocating and installing coaxial cable, N-Type Connectors, coaxial cable shield grounding kits, antenna mounting hardware, antennas, coaxial cable and power dividers. This item of work may also involve furnishing and installing new decals and furnishing or relocating signs. This item of work may also involve re-programming the radio.

Payment for new risers will be covered separately.

Payment will be made under:

Modify Radio Installation .....Each

10. OBSERVATION PERIOD

10.1. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be considered part of work to be completed by the project completion date.

Upon successful completion of all project work the 30-day Observation Period may commence. Examples of project work includes but is not limited to:

- Installation of all project devices and communications infrastructure.
- Field Acceptance Testing of all devices.
- Central System Testing of all devices and network communications.
- Correction of all deficiencies and punch list items. (including minor construction items)

This observation consists of a 30-day period of normal, day-to-day operations of the field equipment in operation with new or existing central equipment without any failures. The purpose of

this period is to ensure that all components of the system function in accordance with the Plans and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct any failures within forty-eight (48) hours (includes time of notification). Any failure that affects a major system component as defined below for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the Contractor is was notified that the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or a failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period for that system. The 30-day Observation Period will be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- CCTV Cameras and Central Operations
- Dynamic Message Sign (DMS) and Central equipment/Operations
- Portable Changeable Message Sign (PCMS)
- Communications infrastructure (examples: Fiber, Radios, Ethernet Switches, Core Switches, etc.)
- Any other ITS Devices not named above (examples: DSRC radios, Radar and Out-of-Street Detection, signals, etc.)

10.2. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The completed System will be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including as-built plans.

10.3. MEASUREMENT AND PAYMENT

There will be no payment for this item of work as it is incidental to the project as a whole and to the item of work in which it is associated.

11. REMOVE ETHERNET RADIO

11.1. DESCRIPTION

Remove and replace spread spectrum radio assembly and all necessary hardware and signage as shown in the Project Plans.

11.2. CONSTRUCTION METHODS

After final wireless signal communications system is operational, remove the additional 900 MHz Serial/Ethernet Radio assemblies, as shown in the Project Plans. Return the equipment to Division 4 at 509 Ward Boulevard, Wilson, NC 27895.

After fiber optic cable construction is complete and the closed loop system is communicating over to fiber, remove the 900 MHz Serial/Ethernet Radio assemblies, as shown in the Project Plans. Return the equipment to Division 6 at 450 Transportation Drive, Fayetteville, NC 28301.

11.3. MEASUREMENT AND PAYMENT

Remove 900MHz Radio will be measured and paid for as the actual number of 900 MHz radio assemblies removed and returned to the Division.

No measurement will be made of removing the antennas, radios, power supplies, disconnect/snap switch, signs, decals, Ethernet cable, coaxial cable, lightning arrestor, radio frequency signal jumper, coaxial cable power divider (splitter), coaxial cable connectors, coaxial cable shield grounding system with weatherproofing or other necessary hardware as these are incidental to removing the radio.

Payment of a new radio is a separate pay item under Section 1736 of the Standard Specifications. Replacing a radio will be paid as a new 900 MHz Serial/Ethernet Radio.

Payment will be made under:

Remove 900MHz Radio ..... Each

Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 18.5)

Prepared By: William J. Hamilton, P.E., PTOE
12-May-21

Contents

1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read "Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications, Standard Drawings,* and the project plans."

Page 17-4, revise sentence beginning on line 21 to read "Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications, Standard Drawings*, and test requirements."

1.2. GENERAL REQUIREMENTS – Construction Methods (1700-3(M))

Page 17-4, Replace the sentence beginning on line 41 with "Prior to placing signal in the steady (stop-and-go) mode, the signal should be placed in the flashing mode for up to 7 days or as directed by the Engineer. The signal should not be placed in the steady (stop-and-go) mode on a Saturday or Sunday without prior approval from the Engineer. Do not place the signal in steady (stop-and-go) mode until inspected and without the prior approval of the Engineer."

1.3. WOOD POLES – Construction Methods (1720-3)

Page 17-18, revise sentence starting on line 13 to read "On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is mechanically crimped using an irreversible compression tool with die to a single ground rod installed at base of pole or to the electrical service grounding electrode system located within 10 feet of the pole."

2. DIGITAL CCTV CAMERA ASSEMBLY

2.1. DESCRIPTION

Furnish and install a Digital CCTV Camera Assembly as described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the video management software currently in use by the Region and the Statewide Traffic Operations Center (STOC). Provide a Pelco Spectra Enhanced low light 30X minimum zoom, Axis Dome Network Camera low light 30X minimum zoom or an approved equivalent that meets the requirements of these Project Special Provisions.

Materials

A. General

Furnish and install new CCTV camera assembly at the locations shown on the Plans and as approved by the Engineer. Each assembly consists of the following:

- One dome CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories in a single enclosed unit
- A NEMA-rated enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing.
- Motorized pan, tilt, and zoom
- Built-in video encoder capable of H.264/MPEG-4 compression for video-over IP transmission
- Pole-mount camera attachment assembly

- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components.
- All necessary cable, connectors and incidental hardware to make a complete and operable system.

B. Camera and Lens

1. Cameras

Furnish a new CCTV camera that utilizes charged-coupled device (CCD) technology or Complementary Metal-Oxide-Semiconductor (CMOS) technology. The camera must meet the following minimum requirements:

- Video Resolution: Minimum 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Wide Dynamic Range (WDR) operation
- Electronic Image Stabilization (EIS)
- Automatic focus with manual override

2. Zoom Lens

Furnish each camera with a motorized zoom lens that is a high-performance integrated dome system or approved equivalent with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- 30X minimum optical zoom, and 12X minimum digital zoom
- Preset positioning: minimum of 128 presets

The lens must be capable of both automatic and remote manual control iris and focus override operation. The lens must be equipped for remote control of zoom and focus, including automatic movement to any of the preset zoom and focus positions. Mechanical or electrical means must be provided to protect the motors from overrunning in extreme positions. The operating voltages of the lens must be compatible with the outputs of the camera control.

Communication Standards:

The CCTV camera shall support the appropriate NTCIP 1205 communication protocol (version 1.08 or higher), ONVIF Profile G protocol, or approved equal.

Networking Standards:

- Network Connection: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
    - Video 1: H.264 (Main Profile, at minimum)

  - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4, IP6
- 130 db Wide Dynamic Range (WDR)

The video camera shall allow for the simultaneous encoding and transmission of the two digital video streams, one in H.264 format (high-resolution) and one in H.264 or MJPEG format (low-resolution).

Initially use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The 10/100BaseTX port shall support half-duplex or full-duplex and provide auto negotiation and shall be initially configured for full-duplex.

The camera unit shall be remotely manageable using standard network applications via web browser interface administration. Telnet or SNMP monitors shall be provided.

C. Camera Housing

Furnish new dome style enclosure for the CCTV assembly. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass. The pendant must meet NEMA Type 4X, IP66 rating and use 1-1/2-inch NPT thread. The sustained operating temperature must be -50 to 60C (-58 to 144F), condensing temperature 10 to 100% Relative Humidity (RH).

D. Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit must be integral to the high-performance integrated dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units must meet or exceed the following specifications:

- Pan: continuous 360 Degrees rotation
- Tilt: up/down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: minimum of 128 presets
- Low latency for improved Pan and Tilt Control
- FCC, Class A; UL/cUL Listed

E. Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units must be built into the camera housing and require no additional equipment to transmit encoded video over IP networks.

Encoders must have the following minimum features:

- Network Interface: Ethernet 10/100Base-TX (RJ-45 connector)
- Protocols: IPv4, Ipv6, HTTP, UpnP, DNS, NTP, RTP, RTSP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface

- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p
- Aspect Ratio: 16:9
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps – 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

F. Control Receiver/Driver

Provide each new camera unit with a control receiver/driver that is integral to the CCTV dome assembly. The control receiver/driver will receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan/tilt unit, camera controls, and motorized lens. As a minimum, the control receiver/drivers must provide the following functions:

- Zoom in/out
- Automatic focus with manual override
- Tilt up/down
- Automatic iris with manual override
- Pan right/left
- Minimum 128 preset positions for pan, tilt, and zoom, 16 Preset Tours, 256 Dome Presets
- Up to 32 Window Blanks.

In addition, each control receiver/driver must accept status information from the pan/tilt unit and motorized lens for preset positioning of those components. The control receiver/driver will relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver/driver must accept "goto" preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan/tilt and motorized zoom lens to the correct preset position. The preset commands from the camera control unit will consist of unique values for the desired pan, tilt, zoom, and focus positions.

G. Electrical

The camera assembly shall support Power-over-Ethernet (PoE) in compliance with IEEE 802.3. Provide any external power injector that is required for PoE with each CCTV assembly.

H. CCTV Camera Attachment to Pole

Furnish and install an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer.

Furnish CCTV attachments that allow for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather tight, seal that does not allow moisture to enter the enclosure.

Furnish a CCTV Camera Attachment Assembly that can withstand wind loading at the maximum wind speed and gust factor called for in these Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

I. Riser

Furnish material meeting the requirements of Section 1091-3 and 1098-4 of the 2018 Standard Specifications for Roads and Structures. Furnish a 1" riser with weatherhead for instances where the riser is only carrying an Ethernet cable. For installations where fiber optic cable is routed to the cabinet through a 2" riser with heat shrink tubing the Contractor may elect to install the Ethernet cable in the same riser with the fiber cable.

J. Data line Surge Suppression

Furnish data line surge protection devices (SPD) shall meet the following minimum requirements:

- UL497B
- Service Voltage: < 60 V
- Protection Modes: L-G (All), L-L (All)
- Response Time: <5 nanoseconds
- Port Type: Shielded RJ-45 IN/Out
- Clamping Level: 75 V
- Surge Current Rating: 20 kA/Pair
- Power Handling: 144 Watts
- Data Rate: up to 10 GbE
- Operating Temperature: -40° F to + 158° F
- Standards Compliance: Cat-5e, EIA/TIA 568A and EIA/TIA 568B
- Warranty: Minimum of 5-year limited warranty

The data line surge protector shall be designed to operate with Power Over Ethernet (POE) devices. The SPD shall be designed such that when used with shielded cabling, a separate earth ground is not required. It shall be compatible with Cat-5e, Cat 6, and Cat-6A cablings.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections.

K. POE Injector

Furnish POE Injectors meeting the following minimum performance requirements and that is compatible with the CCTV Camera and Ethernet Switch provided for the project.

- Working temp/humidity: 14° F to 131° F/maximum 90%, non-condensing
- Connectors: Shielded RJ-45, EIA 568A and EIA 568B
- Input Power: 100 to 240 VAC, 50 to 60 Hz
- Pass Through Data Rates: 10/100/1000 Mbps
- Regulatory: IEEE 802.3at (POE)
- Number of Ports: 1 In and 1 Out
- Safety Approvals: UL Listed

Ensure the POE Injector is designed for Plug-and-Play installation, requiring no configurations and supports automatic detection and protection of non-standard Ethernet Terminal configurations.

2.2. Construction Methods

A. General

Obtain approval of the camera locations and orientation from the Engineer prior to installing the CCTV camera assembly.

Mount CCTV camera units at a height to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height is 45 feet above ground level unless specified elsewhere or directed by the Engineer.

Mount the CCTV camera units such that a minimum 5 feet of clearance is maintained between the camera and the top of the pole.

Mount CCTV cameras on the side of poles nearest intended field of view. Avoid occluding the view with the pole.

Install the data line surge protection device and POE Injector in accordance with the manufacturer's recommendations.

Install the riser in accordance with Section 1722-3 of the 2018 Standard Specifications for Roads and Structures. Install the Ethernet cable in the riser from the field cabinet to the CCTV camera.

B. Electrical and Mechanical Requirements

Install an "Air Terminal and Lightning Protections System" in accordance with the Air Terminal and Lightning Protection System Specification for the the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

2.3. General Test Procedure

Test the CCTV Camera and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

2.4. COMPATIBILITY TESTS

A. CCTV System

Compatibility Tests are applicable to CCTV cameras that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

2.5. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. CCTV System

Final CCTV locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the camera assembly field site in accordance with the test plans and in the presence of the Engineer. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.

- Verify installation of specified cables and connection between the camera, PTZ, camera control receiver, and control cabinet.
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the camera control address.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.
- Ensure camera field of view is adjusted properly and there are no objects obstructing the view.
- Ensure camera lens is dust-free.
- Ensure risers are bonded and conduits entering cabinets are sealed properly.
- Lightning arrestor bonded correctly.

Central Operations Testing

- Interconnect the CCTV Camera's communication interface device with one of the following methods as depicted on the plans:
    - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.

    OR

    - to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on/off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and/or change presets.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

2.6. Measurement and Payment

Digital CCTV Camera Assembly will be measured and paid as the actual number of digital CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for electrical cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, PoE Injectors, PoE Cable, Air Terminal and Lightning Protection System, compatibility testing, operational testing or any other equipment or labor required to install the digital CCTV assembly.

Payment will be made under:

Digital CCTV Camera Assembly .....Each

3. CCTV FIELD EQUIPMENT CABINET

3.1. Description

For standalone CCTV Camera installations, furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

The cabinet housing must conform to Sections 6.2.2 (Housing Construction), 6.2.3 (Door Latches and Locks), 6.2.4 (Housing Ventilation), and 6.2.5 (Hinges and Door Catches) of the CALTRANS TSCES. Do not equip the cabinet housings with a police panel.

The cabinet cage must conform to Section 6.3 of the CALTRANS TSCES.

Terminal blocks on the PDA #3 Assembly have internal wiring for the Model 200 switch pack sockets. Do not use terminal blocks on PDA #3 as power terminals for cabinet devices. Do not furnish cabinet with "Input Panels" described in Section 6.4.7.1 of the TSCES. Do furnish cabinet with "Service Panels" as described in Section 6.4.7.1 of the TSCES and as depicted on drawing TSCES-9 in the TSCES. Use service panel #2.

Do not furnish cabinets with C1, C5, or C6 harness, input file, output file, monitor units, model 208 unit, model 430 unit, or switch packs.

Furnish terminal blocks for power for cabinet CCTV and communications devices as needed to accommodate the number of devices in the cabinet.

Furnish all conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment and terminate conduit in the equipment cabinet.

3.2. Materials

A. Shelf Drawer

Provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent in the equipment cabinet. Furnish a pullout drawer that extends a minimum of 14 inches that is capable of being lifted to gain access to the interior of the drawer. Minimum interior dimensions of the drawer are to be 1 inch high, 13 inches deep, and 16 inches wide. Provide drawers capable of supporting a 40-pound device or component when fully extended.

B. Cabinet Light

Each cabinet must include two (2) fluorescent lighting fixtures (one front, one back) mounted horizontally inside the top portion of the cabinet. The fixtures must include a cool white lamp and must be operated by normal power factor UL-listed ballast. A door-actuated switch must be installed to turn on the applicable cabinet light when the front door or back door is opened. The lights must be mounted not to interfere with the upper door stay.

C. Surge Protection for System Equipment

Each cabinet must be provided with devices to protect the CCTV and communications equipment from electrical surges and over voltages as described below.

1. Main AC Power Input

Each cabinet must be provided with a hybrid-type, power line surge protection device mounted inside the power distribution assembly. The protector must be installed between the applied line voltage and earth ground. The surge protector must be capable of reducing the effect of lighting transient voltages applied to the AC line. The protector must be mounted inside the Power Distribution Assembly housing facing the rear of the cabinet. The protector must include the following features and functions:

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must be provided with the following terminals:
- Main Line (AC Line first stage terminal).
- Main Neutral (AC Neutral input terminal).
- Equipment Line Out (AC line second state output terminal, 19 amps).
- Equipment Neutral Out (Neutral terminal to protected equipment).
- GND (Earth connection).
- The Main AC line in and the Equipment Line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid-state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must have an MOV similar solid-state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.

- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment.

2. Ground Bus

Provide a neutral bus that is not connected to the earth ground or the logic ground anywhere within the cabinet. Ensure that the earth ground bus and the neutral ground bus each have ten compression type terminals, each of which can accommodate wires ranging from number 14 through number 4 AWG.

3. Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output

Output Power Capacity	480 Watts / 750 VA
Max Configurable Power	480 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5:1
Waveform Type	Sine wave
Output Connections	(4) NEMA 5-15R

Input

Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V

Battery Type

Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.

Typical recharge time	2 hours

Communications & Management

Interface Port(s)	DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs

Surge Protection and Filtering

Surge energy rating	480 Joules
Environmental	
Operating Environment	-32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%
Conformance	
Regulatory Approvals	FCC Part 15 Class A, UL 1778

3.3. CONSTRUCTION METHODS

A. General

For each field equipment cabinet installation, use stainless steel banding or other methods approved by the Engineer to fasten the cabinet to the pole. Install field equipment cabinets so that the height to the middle of the enclosure is 4 feet from ground level. No risers shall enter the top or sides of the equipment cabinet.

Install all conduits, condulets, and attachments to equipment cabinets in a manner that preserves the minimum bending radius of cables and creates waterproof connections and seals.

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

3.4. MEASUREMENT AND PAYMENT

Field equipment cabinet will be measured and paid as the actual number of CCTV equipment cabinets furnished, installed and accepted.

No payment will be made for the UPS, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, or any other equipment or labor required to install the field equipment cabinet and integrate the cabinets with the CCTV equipment.

Payment will be made under:

CCTV Field Equipment Cabinet.....Each

4. CCTV WOOD POLE

4.1. DESCRIPTION

Furnish and install wood poles, grounding systems and all necessary hardware for CCTV camera installations. Reference applicable Sections of Article 1720 of the 2018 Standard Specifications for Roads and Structures for Materials and Construction.

Furnish an air terminal and lightning protection system in accordance with the "Air Terminal & Lightning Protection System" Project Special Provisions.

Furnish and install wood poles with grounding systems and all necessary hardware in accordance with Section 1720 of the Standard Specifications.

4.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL. For Wood poles refer to Sub articles 1082-3(F) Treated Timber and Lumber – Poles and 1082-4(A) – General; 1082-4 (B) – Timber Preservatives; 1082-4(G) – Poles; in the 2018 Standard Specifications for Roads and Structures.

4.3.CCTV WOOD POLE

Unless otherwise specified in the Plans, furnish Class 3 or better wood poles that are a minimum of 60' long to permit the CCTV camera to be mounted approximately 45 feet above the ground and a minimum 5 feet from the top of the pole.

4.4. CONSTRUCTION METHODS

Mark final pole locations and receive approval from the Engineer before installing poles. Comply with all requirements of Section 1720-3 of the Standard Specifications.

Install the required Air Terminal & Lightning Protection System as described in the Air Terminal & Lighting Protection Specifications and as referenced in the following Typical Details:

- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

4.5. MEASUREMENT AND PAYMENT

CCTV Wood Pole will be measured and paid as the actual number of wood poles for CCTV camera furnished, installed and accepted.

No measurement will be made for equipment, labor and materials, to install the wood pole as these items of work will be incidental to furnishing and installing CCTV wood poles.

No measurement will be made for furnishing and installing the "Air Terminal and Lightning Protection System" as this will be considered incidental to the "CCTV Wood Pole" installation.

Payment will be made under:

CCTV Wood Pole .....Each

5. DYNAMIC MESSAGE SIGN (DMS)

5.1. DESCRIPTION

To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 or latest version software (also referred to hereinafter as the "Control Software"). Contact the engineer to inquire about the current version being used.

Furnish and install DMSs compliant with UL standards 48, 50 and 879.

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the Project Plans.

Furnish operating Dynamic Message Signs, not limited to, the following types. Dimensions represent DMS sizes commonly used by the Department, other size DMS may be specified in the project plans.

DMS Naming Convention	
Type	Color
Type 1 – Front Access Type 2 – Walk-in Type 3 – Embedded Type 4 – Lane Control	A – Amber – 66mm C – Full Color – 20mm

- **DMS Type 1A** – Front Access Amber 66mm – 27 pixels high by 60 pixels wide
  - 3 lines, 10 characters per line, using 18" high characters.
- **DMS Type 1C** – Front Access Full Color 20mm – 96 pixels high by 208 pixels wide
  - 3 lines, 11 characters per line, using 18" high characters.
- **DMS Type 2A** – Walk-in Amber 66mm – 27 pixels high by 90 pixels wide
  - 3 lines, 15 characters per line, using 18" high characters.
- **DMS Type 2C** – Walk-in Full Color 20mm – 96 pixels high by 288 pixels wide
  - 3 lines, 15 characters per line, using 18" high characters.
- **DMS Type 3A** – Embedded Front Access Tri-color 66mm – 7 pixels high by 35 pixels wide
  - 1 line, 7 characters per line, using 18" high characters.
- **DMS Type 3C** – Embedded Front Access Full Color 20mm – 24 pixels high by 160 pixels wide
  - 1 line, 8 characters per line, using 18" high characters.
- **DMS Type 4C** – Lane Control Sign Full Color 20mm – 48- or 64-pixels square
  - 48 pixels high by 48 pixels wide
    - 1 line, 2 characters per line using 18" high characters
  - 64 pixels high x 64 pixel wide
    - 2 lines, 3 characters per line using 18" high characters

Use only UL listed and approved electronic and electrical components in the DMS system.

Use only approved DMS models listed on the NCDOT Qualified Products List (QPL) at the time of construction. NCDOT Qualified Products List can be accessed via official website at https://apps.ncdot.gov/products/qpl/

5.2. MATERIALS

A. Environmental Requirements

Construct the DMS and DMS controller cabinet so the equipment within is protected against moisture, dust, corrosion, and vandalism.

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2016.

B. Viewing Requirements for all DMS

Each line of text should be clearly visible and legible to a person with 20/20 corrected vision from a distance of 900 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

Any line must display equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height (unless otherwise noted in the plans) and composed from a luminous dot matrix.

C. Housing Requirements for all DMS

Construct the external skin of the sign housing out of aluminum alloy 5052 H32 that is a minimum of 1/8 inches thick for all walk-in DMS and 0.090-inch-thick for all front access or embedded DMS. Ensure the interior structure is constructed of aluminum. Ensure that no internal frame connections or external skin attachments rely upon adhesive bonding or rivets. Ensure the sign housing meets the requirements of Section 3 of NEMA TS 4-2016.

Ensure that all drain holes and other openings in the sign housing are screened to prevent the entrance of insects. Design and construct the DMS unit for continuous usage of at least 20 years. Ensure that the top of the housing includes multiple steel lifting eyebolts or equivalent hoisting points. Ensure hoist points are positioned such that the sign remains level when lifted. Ensure that the hoist points and sign frame allow the sign to be shipped, handled, and installed without damage. Ensure all external assembly and mounting hardware, including but not limited to; nuts, bolts, screws, and locking washers are corrosion resistant galvanized steel and are sealed against water intrusion. Ensure all exterior housing surfaces, excluding the sign face, and all interior housing surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum. Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist. Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet. Do not paint the stainless-steel bolts on the Z-bar assemblies used for mounting the enclosure.

D. Housing Requirements for Walk-in type DMS

Ensure the sign housing meets the requirements of Section 3.2.8 of NEMA TS 4-2016. Ensure that exterior seams and joints, except the finish coated face pieces, are continuously welded using an inert gas welding method. Stitch weld the exterior housing panel material to the internal structural members to form a unitized structure. Ensure that exterior mounting assemblies are fabricated from aluminum alloy 6061-T6 extrusions a minimum of 3/16 inches thick. Ensure housing access is provided through an access door at each end of the sign enclosure that meets the requirements of NEMA TS 4-2016, Section 3.2.8.1. Ensure the access doors include a keyed tumbler lock and a door handle with a hasp for a padlock. Ensure the doors include a closed-cell neoprene gasket and stainless-steel hinges. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.8.3 for service lighting. All service lighting should be LED, incandescent and fluorescent lamps are not permitted. Ensure that the sign housing includes LED emergency lighting that automatically illuminates the interior when the door is open in the event of a power outage. Emergency lighting must be capable of operation without power

for at least 90 minutes. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.9 for convenience outlets.

E. Housing Requirements for Front Access DMS

Comply with the requirements of Section 3.2.5 and 3.2.6 of NEMA TS 4-2016 as it applies to front access enclosures. The following requirements complement TS 4-2016. Ensure access door does not require specialized tools or excessive force to open. Provide multiple access doors that allow maintenance personnel access to 2 or 3 sign modules are a time. Vertically hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend each door the full height of the display matrix. Provide a retaining latch mechanism for each door to hold the door open at a 90-degree angle. Each door will form the face panel for a section of the sign. Mount the LED modules to the door such that they can be removed from the door when in the open position. Other sign components can be located inside the sign enclosure and be accessible through the door opening. Provide for each door a minimum of two (2) screw-type captive latches to lock them in the closed position and pull the door tight and compress a gasket located around the perimeter of each door. Install the gasket around the doors to prevent water from entering the cabinet.

F. Housing Face Requirements for all DMS

Ensure the sign face meets the requirements of NEMA TS 4-2016, Section 3.1.3. Protect the DMS face with contiguous, weather-tight, removable panels. The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix. The panels shall be fabricated using aluminum sheeting on the exterior and polycarbonate sheeting on the interior of the panel. These panels must be a polycarbonate material that is ultraviolet protected and have an antireflection coating. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade semi-gloss black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years. Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

G. Housing Face Requirements for Walk-in type DMS

The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix.

No exposed fasteners are allowed on the housing face. Ensure that display modules can be easily and rapidly removed from within the sign without disturbing adjacent display modules.

H. Housing Face Requirements for Front Access type DMS

The DMS front face shall be constructed with multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

I. Housing Face Requirements for Embedded Front Access type DMS

Front Face shall be constructed with a single, horizontally hinged rigid face panel which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

J. Sign Housing Ventilation System for all DMS

Install a minimum of one (1) temperature sensor that is mounted near the top of the DMS interior. The sensor(s) will measure the temperature of the air in the enclosure over a minimum range of -40°F to +176°F. Ensure the DMS controller will continuously monitor the internal temperature sensor output and report to the DMS control software upon request.

Design the DMS with systems for enclosure ventilation, face panel fog and frost prevention, and safe over-temperature shutdown.

Design the DMS ventilation system to be thermostatically controlled and to keep the internal DMS air temperature lower than +140°F, when the outdoor ambient temperature is +115°F or less.

The ventilation system will consist of two or more air intake ports located near the bottom of the DMS rear wall. Cover each intake port with a filter that removes airborne particles measuring 500 microns in diameter and larger. Mount one or more ball bearing-type ventilation fans at each intake port. These fans will positively pressure the DMS enclosure.

Design the ventilation fans and air filters to be removable and replaceable from inside the DMS housing. To ease serviceability, mount the ventilation fans no more than four (4) feet from the floor of the DMS enclosure. Position ventilation fans so they do not prevent removal of an LED pixel board or driver board.

Provide each ventilation fan with a sensor to monitor its rotational speed, measured in revolutions per minute and report this speed to the sign controller upon request.

The ventilation system will move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. Design the airflow system to move air from the bottom of the enclosure towards the top to work with natural convection to move heat away from the modules.

Install each exhaust port near the top of the rear DMS wall. Provide one exhaust port for each air intake port. Screen all exhaust port openings to prevent the entrance of insects and small animals.

Cover each air intake and exhaust port with an aluminum hood attached to the rear wall of the DMS. Thoroughly seal all intakes and exhaust hoods to prevent water from entering the DMS.

Provide a thermostat near the top of the DMS interior to control the activation of the ventilation system.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal enclosure air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F. The DMS provide an output to the controller to notify the Vanguard client when the DMS shuts down due to high temperature.

K. Sign Housing Ventilation System for Walk-in DMS

Ensure the sign includes a fail-safe ventilation subsystem that includes a snap disk thermostat that is independent of the sign controller. Preset the thermostat at 140°F. If the sign housing's interior reaches 140°F, the thermostat must override the normal ventilation system, bypassing the sign controller and turning on all fans. The fans must remain on until the internal sign housing temperature falls below 115°F.

L. Sign Housing Photoelectric sensors

Install three photoelectric sensors with ½ inch minimum diameter photosensitive lens inside the DMS enclosure. Use sensors that will operate normally despite continual exposure to direct sunlight. Place the sensors so they are accessible and field adjustable. Point one sensor north or bottom of the sign. Place the other two, one on the back wall and one on the front wall of the sign enclosure. Alternate designs maybe accepted, provided the sensor assemblies that are accessible and serviceable from inside the sign enclosure.

Provide controls so that the Engineer can field adjust the following:

- The light level emitted by the pixels in each Light Level Mode,
- The ambient light level at which each Light Level Mode is activated.

M. Display Modules

Manufacture each display module with a standard number of pixels which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

Design display modules that are interchangeable, self-addressable, and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module. Ensure that the sign has a full matrix display area as defined in NEMA TS 4-2016, Section 1.6.

Design each module to display:

- All upper- and lower-case letters,
- All punctuation marks,
- All numerals 0 to 9,
- Special user-created characters.

Display upper-case letters and numerals over the complete height of the module. Optimize the LED grouping and mounting angle within a pixel for maximum readability.

Design Type 3A and 3C DMS with at least the following message displays:

- A static display, green in color, reading "OPEN"
- A static display, red in color, reading "CLOSED"
- A static display, amber in color, with the ability to display a toll rate in the following format "$ XX.XX"

Furnish two (2) spare display modules per each DMS installed for emergency restoration.

N. Discrete LEDs

Provide discrete LEDs with a nominal viewing cone of 30 degrees with a half-power angle of 15 degrees measured from the longitudinal axis of the LED. Make certain, the viewing cone tolerances are as specified in the LED manufacturer's product specifications and do not exceed +/- 3 degrees half-power viewing angle of 30 degrees.

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing AlInGaP technology for Red and InGaN technology for Green and Blue. No substitutions will be allowed. Provide LEDs that emit a full color.

Provide LEDs with a MTBF (Mean Time Before Failure) of at least 100,000 hours of permanent use at an operating point of 140° F or below at a specific forward current of 20mA. Discrete LED failure is defined as the point at which the LED's luminous intensity has degraded to 50% or less of its original level.

Obtain the LEDs used in the display from a single LED manufacturer. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display.

Individually mount the LEDs on circuit boards that are at least 1/16" thick FR-4 fiberglass, flat black printed circuit board in a manner that promotes cooling. Protect all exposed metal on both sides of the LED pixel board (except the power connector) from water and humidity exposure by a thorough application of acrylic conformal coating. Design the boards so bench level repairs to individual pixels, including discrete LED replacement and conformal coating repair is possible.

Operate the LED display at a low internal DC voltage not to exceed 24 Volts.

Design the LED display operating range to be –20° F to +140° F at 95% relative humidity, non-condensing.

Supply the LED manufacturer's technical specification sheet with the material submittals.

O. LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 24 volts DC or less. Wire the power supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the power supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

Provide power supplies to operate within a minimum input voltage range of +90 to +135 volts AC and within a temperature range of –22° F to 140° F. Power supply output at 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide power supplies that are overload protected by means of circuit breakers, that have an efficiency rating of at least 75%, a power factor rating of at least .95, and are UL listed. Provide all power supplies from the same manufacturer and with the same model number for each Type of DMS. Design the power driver circuitry to minimize power consumption.

Design the field controller to monitor the operational status (normal or failed) of each individual power supply and be able to display this information on the Client Computer screen graphically. Color code power supply status, red for failed and green for normal.

P. LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel with either 66mm or 20mm spacing depending on the type of DMS called for in the plans.

Construct the pixels with strings of LEDs. It is the manufacturer's responsibility to determine the number of LEDs in each string to produce the candela requirement as stated herein.

Use continuous current to drive the LEDs at the maximum brightness level. Design the light levels to be adjustable for each DMS / controller so the Engineer may set levels to match the luminance requirements at each installation site.

Ensure each pixel produces a luminous intensity of 40 Cd when driven with an LED drive current of 20 mA per string.

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel and does not lower the luminous intensity of the pixel more than 25% of the 40Cd requirement. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed.

Q. DMS Mini Controller

For Walk-In and Front Access DMS Types only, furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber-optic cable. The mini controller will enable a technician to perform all functions available from the main controller. Provide the mini controller with an LCD/keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

R. DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the supporting structures. Design the DMS enclosure supports and structure to allow full access to the DMS enclosure inspection door. Mount the DMS enclosure according to the manufacturer's recommendations.

Furnish and install U-bolt connections of hanger beams to truss chords with a double nut at each end of the U-bolt. Bring the double nuts tight against each other by the use of two wrenches.

Submit plans for the DMS enclosure, structure, mounting description and calculations to the Engineer for approval. Have such calculations and drawings approved by a Professional Engineer registered in the state of North Carolina, and bear his signature, seal, and date of acceptance.

Provide removable lifting eyes or the equivalent on the DMS enclosure rated for its total weight to facilitate handling and mounting the DMS enclosure.

Design the DMS structure to conform to the applicable requirements of the most recent version of the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, currently in use by the department and the section titled "DMS Assemblies" of these Project Special Provisions.

S. DMS / DMS Controller Interconnect

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the DMS controller located in the equipment cabinet. Use approved manufacturer's specifications and the Project Plans for cable and conduit types and sizes. Use fiber-optic cable to interconnect sign and controller. Install fiber-optic interconnect centers in the sign enclosure and cabinet to securely install and terminate the fiber-optic cable. Submit material submittal cut sheets for the interconnect center.

T. DMS Controller and DMS Cabinet

Furnish and install one DMS controller with accessories per DMS in a protective cabinet. Controlling multiple DMS with one controller is allowed when multiple DMS are mounted on the same structure. Mount the controller cabinet on the Sign support structure. Install cabinet so that the height from the ground to the middle of the cabinet is 4 feet. Ensure a minimum of 3' x 3' level working surface under each cabinet that provides maintenance technicians with a safe working environment.

Provide the DMS controller as a software-oriented microprocessor and with resident software stored in non-volatile memory. The Control Software, controller and communications must comply with the NTCIP Standards identified in these Project Special Provisions. Provide sufficient non-volatile memory to allow storage of at least 500 multi-page messages and a test pattern program.

For DMS Type 4C installations provide a single controller that can control up to eight (8) signs simultaneously.

Furnish the controller cabinet with, but not limited to, the following:

- Power supply and distribution assemblies,
- Power line filtering hybrid surge protectors,
- Radio Interference Suppressor,
- Communications surge protection devices,
- Industrial-Grade UPS system and local disconnect,
- Microprocessor based controller,
- Display driver and control system (unless integral to the DMS),
- RJ45 Ethernet interface port for local laptop computer,
- Local user interface,
- Interior lighting and duplex receptacle,
- Adjustable shelves as required for components,
- Temperature control system,
- All interconnect harnesses, connectors, and terminal blocks,
- All necessary installation and mounting hardware.

Furnish the DMS controller and associated equipment completely housed in a NEMA 3R cabinet made from 5052 H32 sheet aluminum at least 1/8" thick. Use natural aluminum cabinets. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

Slant the cabinet roof away from the front of the cabinet to prevent water from collecting on it.

Do not place a manufacturer name, logo, or other information on the faces of the controller cabinet visible to the motorist.

Provide cabinets capable of housing the components and sized to fit space requirement. Design the cabinet layout for ease of maintenance and operation, with all components easily accessible. Submit a cabinet layout plan for approval by the Engineer.

Locate louvered vents with filters in the cabinet to direct airflow over the controller and auxiliary equipment, and in a manner that prevents rain from entering the cabinet. Fit the inside of the cabinet, directly behind the vents, with a replaceable, standard size, commercially available air filter of sufficient size to cover the entire vented area.

Provide a torsionally rigid door with a continuous stainless-steel hinge on the side that permits complete access to the cabinet interior. Provide a gasket as a permanent and weather resistant seal at the cabinet door and at the edges of the fan / exhaust openings. Use a non-absorbent gasket material that will maintain its resiliency after long term exposure to the outdoor environment. Construct the

doors so that they fit firmly and evenly against the gasket material when closed. Provide the cabinet door with louvered vents and air filters near the bottom as described in the paragraph above.

The cabinet shall contain a full-height standard EIA 19-inch rack. The rack shall be secured within the cabinet by mounts at the top and bottom.

The rack shall contain a minimum of one (1) pullout drawer. The drawer shall be suitable for storing manuals and small tools. The drawer shall be able to latch in the out position to function as a laptop/utility shelf.

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless-steel material. Key all locks on the project alike and provide 1 key per lock to the Engineer. In addition, design the handle to permit padlocking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

Arrange the equipment to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a 3-inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

Provide power supply monitoring circuitry to detect power failure and to automatically report the occurrence to the Control Software.

Install two 15-watt fluorescent light strips with shields, one in the top of the cabinet and the other under the bottom shelf. Design both lights to automatically turn on when the cabinet door is opened and turn off when the door closes.

Mount and wire a 120V (+10%) GFCI duplex receptacle of the 3-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

No cabinet resident equipment may utilize the GFCI receptacle. Furnish one spare non-GFCI duplex receptacle for future equipment.

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on between 80° F and 160° F with a differential of not more than 10° F between automatic turn on and turn off. Mount it in an easily accessible location, but not within 6 inches of the fan.

Install additional fans and/or heaters as needed to maintain the temperature inside the cabinet within the operating temperature range of the equipment within the cabinet as recommended by equipment manufacturer(s).

1. Wiring

The requirements stated herein apply wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards etc.

Neatly arrange and secure the wiring inside the cabinet. Where cable wires are clamped to the walls of the control cabinet, provide clamps made of nylon, metal, plastic with rubber or neoprene protectors, or similar. Lace and jacket all harnesses or tie them with nylon tie wraps spaced at 6 inches maximum to prevent separation of the individual conductors.

Individually and uniquely label all conductors. Ensure all conductor labels are clearly visible without moving the conductor. Connect all terminal conductors to the terminal strip in right angles.

Remove excess conductor before termination of the conductor. Mold the conductor in such a fashion as to retain its relative position to the terminal strip if removed from the strip. Do not run a conductor across a work surface with the exception of connecting to that work surface. No conductor bundles can be support by fasteners that support work surfaces. Install all connectors, devices and conductors in accordance to manufactures guidelines. Comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang loose or create a snag hazard. Protect all conductors from damage. Ensure all solder joints are completed using industry accepted practices and will not fail due to vibration or movement. Protect lamps and control boards from damage.

No splicing will be allowed for feeder conductors and communication cables from the equipment cabinet to the DMS enclosure.

Insulate all conductors and live terminals so they are not hazardous to maintenance personnel.

Route and bundle all wiring containing line voltage AC and / or shield it from all low voltage control circuits. Install safety covers to prevent accidental contact with all live AC terminals located inside the cabinet.

Use industry standard, keyed type connectors with a retaining feature for connections to the controller.

Label all equipment and equipment controls clearly.

Supply each cabinet with one complete set of wiring diagrams that identify the color-coding or wire tagging used in all connections. Furnish a water-resistant packet adequate for storing wiring diagrams, operating instructions, and maintenance manuals with each cabinet.

2. Power Supply and Circuit Protection

Design the DMS and controller for use on a system with a line voltage of 120V + 10% at a frequency of 60 Hz ± 3 Hz. Under normal operation, do not allow the voltage drop between no load and full load of the DMS and its controller to exceed 3% of the nominal voltage.

Blackout, brownout, line noise, chronic over-voltage, sag, spike, surge, and transient effects are considered typical AC voltage defects. Protect the DMS system equipment so that these defects do not damage the DMS equipment or interrupt their operation. Equip all cabinets with devices to protect the equipment in the cabinet from damage due to lightning and external circuit power and current surges.

3. Circuit Breakers

Protect the DMS controller, accessories, and cabinet utilities with thermal magnetic circuit breakers. Provide the controller cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the controller, sign display and accessories and for servicing DMS equipment and cabinet utilities.

Provide a subpanel in the sign enclosure with a main and branch circuit breakers sized appropriately per NEC.

Provide a detailed plan for power distribution within the cabinet and the sign. Label all breaker and conductor with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans for review and approval.

4. Surge Suppressor

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within 2 inches.

Provide power line surge protector that meets the following requirements:

Peak surge current occurrences	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape	50,000 Amperes
Energy Absorption	> 500 Joules
Clamp voltage	240 Volts
Response time	<1 nanosecond
Minimum current for filtered output	15 Amperes for 120VAC*
Temperature range	-40°F to +158°F

*Capable of handling the continuous current to the equipment

5. Transients and Emissions

DMS and DMS controller will be designed in such a way to meet the latest NEMA TS-4 for Transients and Emissions.

6. Transient Protection

The RS232 and Ethernet communication ports in the DMS sign controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

7. Lightning Arrester

Protect the system with an UL approved lightning arrester installed at the main service disconnect that meets the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single phase, 3 wires
Maximum current	100,000 Amps
Maximum energy	3000 Joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground Wire	Separate

8. Uninterruptible Power Supply (UPS)

Provide the cabinet with an industrial grade power conditioning UPS unit to supply continuous power to operate the equipment connected to it if the primary power fails. **The UPS must continue to condition power supplied to the DMS controller in the event of battery failure within the UPS.** The UPS must detect a power failure and provide backup power within 20 milliseconds. Transition to the UPS source from primary power must not cause loss of data or damage to the equipment being

supplied with backup power. Provide an UPS with at least three outlets for supplying conditioned AC voltage to the DMS controller. Provide a unit to meet the following requirements:

Input Voltage Range	120VAC +12%, -25%
Power Rating	1000 VA, 700 Watts
Input Frequency	45 to 65 Hz
Input Current	7.2A
Output Voltage	120VAC +/- 3%
Output Frequency	50/60 +/-1 Hz
Output Current	8.3A
Output Crest Factor Ratio	@50% Load Up to 4.8:1 @75% Load Up to 3.2:1 @100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.
Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input/Output Short Circuit Input/Output Overload Excessive Battery Discharge
Specifications	UL1778, FCC Class A, IEE 587

Provide the UPS unit capable of supplying **30 minutes** of continuous backup power to the cabinet equipment connected to it when the equipment is operating at full load.

9. Controller Communications Interface

Provide the controller with the following interface ports:

- An EIA/TIA-232E port for remote communication using NTCIP,
- An 10/100 Ethernet port for remote communication using NTCIP,
- An EIA/TIA-232E port for onsite access using a laptop,

- An EIA/TIA-232E auxiliary port for communication with a field device such as a UPS,
- Fiber-optic ports for communication with the sign,
- RJ45 ports for communication with the sign using CAT-5 cable,
- RJ45 ports for communication with mini controller located inside the sign enclosure.

10. Controller Local User Interface

Provide the controller with a Local User Interface (LUI) for at least the following functions:

- On / Off Switch: controls power to the controller,
- Control Mode Switch: for setting the controller operation mode to either remote or local mode,
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc.) running diagnostics, viewing peripherals status, message creation, message preview, message activation, etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

Protected access to the LUI with an alphanumeric and PIN passwords. Allow the user to select a preferred method of password protection. Default and hardcoded passwords are not allowed.

11. Controller Address

Assign each DMS controller a unique address. Preface all commands from the Control Software with a particular DMS controller address. The DMS controller compares its address with the address transmitted; if the addresses match, then the controller processes the accompanying data.

12. Controller Functions

Design the DMS controller to continuously control and monitor the DMS independent of the Control Software. Design the controller to display a message on the sign sent by the Control Software, a message stored in the sign controller memory, or a message created on site by an operator using the controller keypad.

Provide the DMS controller with a watchdog timer to detect controller failures and to reset the microprocessor, and with a battery backed up clock to maintain an accurate time and date reference. Set the clock through an external command from the Control Software or the Local User Interface.

13. DMS Controller Memory

Furnish each DMS controller with non-volatile memory. Use the non-volatile memory to store and reprogram at least one test pattern sequence and 500 messages containing a minimum of two pages of 45 characters per page. The Control Software can upload messages into and download messages from each controller's non-volatile memory remotely.

Messages uploaded and stored in the controller's non-volatile memory may be erased and edited using the Control Software and the controller. New messages may be uploaded to and stored in the controller's non-volatile memory using the Control Software and the controller.

U. Equipment List

Provide a general description of all equipment and all information necessary to describe the basic use or function of the major system components. Include a general "block diagram" presentation. Include tabular charts listing auxiliary equipment, if any is required. Include the nomenclature, physical and electrical characteristics, and functions of the auxiliary equipment unless such information is contained in an associated manual; in this case include a reference to the location of the information.

Include a table itemizing the estimated average and maximum power consumption for each major piece of equipment.

V. Physical Description

Provide a detailed physical description of size, weight, center of gravity, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and operation of the equipment.

W. Parts List

Provide a parts list that contains all information needed to describe the characteristics of the individual parts, as required for identification. Include a list of all equipment within a group and a list of all assemblies, sub-assemblies, and replacement parts of all units. Arrange this data in a table, in alpha numerical order of the schematic reference symbols, which gives the associated description, manufacturer's name, and part number, as well as alternate manufacturers and part numbers. Provide a table of contents or other appropriate grouping to identify major components, assemblies, etc.

X. Character Set Submittal

Submit an engineering drawing of the DMS character set including at a minimum, 26 upper case and lower case letters, 10 numerals, 9 punctuation marks (. , ! ? – ‘ “ ; :) 12 special characters (# & * + / ( ) [ ] < > @) and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

Y. Wiring Diagrams

Provide a wiring diagram for each DMS and each controller cabinet, as well as interconnection wiring diagrams for the system as a whole.

Provide complete and detailed schematic diagrams to component level for all DMS assemblies and subassemblies such as driver boards, control boards, DMS controller, power supplies, and etc. Ensure that each schematic enables an electronics technician to successfully identify any component on a board or assemblies and trace its incoming and outgoing signals.

Z. Routine of Operation

Describe the operational routine, from necessary preparations for placing the equipment into operation to securing the equipment after operation. Show appropriate illustrations with the sequence of operations presented in tabular form wherever applicable. Include in this section a total list of the test instruments, aids and tools required to perform necessary measurements and measurement techniques for each component, as well as set up, test, and calibration procedures.

AA. Maintenance Procedures

Specify the recommended preventative maintenance procedures and checks at pre-operation, monthly, quarterly, semiannual, annual, and "as required" periods to assure equipment operates

reliably. List specifications (including tolerances) for all electrical, mechanical, and other applicable measurements and / or adjustments.

BB. Repair Procedures

Include in this section all data and step by step procedures necessary to isolate and repair failures or malfunctions, assuming the maintenance technicians are capable of analytical reasoning using the information provided in the section titled "Wiring Diagrams and Theory of Operation."

Describe accuracy, limits, and tolerances for all electrical, physical, or other applicable measurements. Include instructions for disassembly, overhaul, and reassembly, with shop specifications and performance requirements.

Give detailed instructions only where failure to follow special procedures would result in damage to equipment, improper operation, danger to operating or maintenance personnel, etc. Include such instructions and specifications only for maintenance that specialized technicians and engineers in a modern electromechanical shop would perform. Describe special test set up, component fabrication, and the use of special tools, jigs, and test equipment.

CC. Warranty

Ensure that the DMS system and equipment has a manufacturer's warranty covering defects for a minimum of five (5) years from the date of final acceptance by the Engineer.

5.3. CONSTRUCTION METODS

A. Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of DMS systems, auxiliary equipment and the construction of related structures.

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between DMS equipment and DMS sign housing and electric utilities that conform to NEC standards.

Provide stainless steel screws, nuts, and locking washers in all external locations. Do not use self-tapping screws unless specifically approved by the Engineer. Use parts made of corrosion resistant materials, such as plastic, stainless steel, brass, or aluminum. Use construction materials that resist fungus growth and moisture deterioration. Separate dissimilar metals by an inert dielectric material.

B. Layout

The Regional ITS engineer or Division Traffic Engineer will establish the actual location of each DMS assembly. It is the Contractor's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the Project Plans, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

C. Construction Submittal

When the work is complete, submit "as built" plans, inventory sheets, and any other data required by the Engineer to show the details of actual construction and installation and any modifications made during installation.

The "as built" plans will show: the DMS, controller, and service pole locations; DMS enclosure and controller cabinet wiring layouts; and wire and conduit routing. Show all underground conduits and cables dimensioned from fixed objects.

Include detailed drawings that identify the routing of all conductors in the system by cable type, color code, and function. Clearly label all equipment in the DMS system, controller cabinet, and DMS enclosure.

D. Conduit

Install the conduit system in accordance with Section 1715 of the Standard Specifications and NEC requirements for an approved watertight raceway.

Make bends in the conduit so as not to damage it or change its internal diameter. Install watertight and continuous conduit with as few couplings as standard lengths permit.

Clean conduit before, during, and after installation. Install conduit in such a manner that temperature changes will not cause elongation or contraction that might damage the system.

Attach the conduit system to and install along the structural components of the Sign structure assemblies with beam clamps or stainless-steel strapping or inside the structure if there is available space. Install strapping according to the strapping manufacturer's recommendations and according to NEC requirements. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

Flexible conduit will only be allowed when the conduits transition from the horizontal structure segment to the horizontal truss segment and from the horizontal truss segment to the rear entrance of the DMS when installing the DMS communications and feeder cables. The maximum length of flexible conduit allowed at each transition will be 5 feet.

Do not exceed the appropriate fill ratio on all cable installed in conduit as specified in the NEC.

E. Wiring Methods (Power)

Do not pull permanent wire through a conduit system until the system is complete and has been cleaned.

Color-code all conductors per the NEC. Use approved marking tape, paint, sleeves or continuous colored conductors for No.8 AWG and larger. Do not mark a white conductor in a cable assembly any other color.

Do not splice underground circuits unless specifically noted in the Project Plans.

F. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the Project Plans, in conformance with the dimensions shown. Install fasteners as recommended by the manufacturer and space them evenly. Use all mounting holes and attachment points for attaching DMS enclosures and controller cabinets to the structures.

Drill holes for expansion anchors of the size recommended by the manufacturer of the anchors and thoroughly clean them of all debris.

Provide cabinets with all strapping hardware and any other necessary mounting hardware in accordance with these Project Special Provisions and the Project Plans.

Seal all unused conduit installed in cabinets at both ends to prevent water and dirt from entering the conduit and cabinet with approved sealing material.

Install a ground bushing attached inside the cabinet on all metal conduits entering the cabinet. Connect these ground bushings to the cabinet ground bus.

Install a level concrete technician pad measuring a minimum 4 inches thick, 36 inches wide and 36 inches long at the front door of the DMS equipment cabinet as shown on the Typical Details sheet within the Project Plans.

G. Work Site Clean-Up

Clean the site of all debris, excess excavation, waste packing material, wire, etc. Clean and clear the work site at the end of each workday. Do not throw waste material in storm drains or sewers.

5.4. General Test Procedure

Test the DMS and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

5.5. Compatibility Tests

A. DMS System

Compatibility Tests are applicable to DMS that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Contractor is responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

5.6. Operational Field Test (On-Site Commissioning)

A. DMS System

Final DMS locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the DMS assembly field site in accordance with the test plans. The Contractor is responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the contractor shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the DMS and control cabinet,
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the DMS assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the DMS control address.

Central Operations Testing

- Interconnect the DMS's communication interface device with one of the following methods as depicted on the plans:
    - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.

    OR

    - to the DOT furnished cellular modem and verify a transmit/receive LED is functioning and that the DMS is fully operational at the TOC.
- Review DMS date and time and DMS controller information.
- Run DMS diagnostics and review results.
- Run DMS pixel test and review results.
- Run test message.
- Run test schedule.
- Program burn-in scenario.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

5.7. MEASUREMENT AND PAYMENT

Dynamic Message Sign (_____) will be measured and paid as the actual type and number of DMS furnished, installed, and accepted. Each DMS consists of a LED Dynamic Message Sign, spare display modules, warranty, strapping hardware, controller, UPS, controller cabinet, concrete technician pad, conduit, fittings, couplings, sweeps, conduit bodies, wire, flexible conduit, feeder conductors and communications cable between the controller cabinet and the DMS enclosure, connectors, circuit protection equipment, photo-electric sensors, tools, materials, all related testing, cost of labor, cost of transportation, incidentals, and all other equipment necessary to furnish and install the DMS system.

Payment will be made under:

Dynamic Message Sign (_____).....Each

6. NTCIP REQUIREMENTS

This section defines the NTCIP requirements for the DMSs covered by these Project Special Provisions and Project Plans.

6.1. References

A. Standards

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards.

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Abbreviated Number	Title
NTCIP 1201	*Global Object (GO) Definitions*
NTCIP 1203	*Object Definitions for Dynamic Message Signs*
NTCIP 2101	*SP-PMPP/232* *Subnet Profile for PMPP over RS-232*
NTCIP 2104	*SP-Ethernet* *Subnet Profile for Ethernet*
NTCIP 2201	*TP-Null* *Transport Profile*
NTCIP 2202	*Internet Transport Profile (TCP/IP and UDP/IP)*
NTCIP 2301	*AP for Simple Transportation Management Framework*

B. Features

Each DMS shall be required to support the following optional features, conformance groups and all functional requirements and objects that apply herein.

Feature	Reference
Time Management	NTCIP 1201 v3
Timebase Event Schedule	NTCIP 1201 v3
PMPP	NTCIP 1201 v3
Determine Sign Display Capabilities	NTCIP 1203 v03
Manage Fonts	NTCIP 1203 v03
Manage Graphics	NTCIP 1203 v03
Schedule Messages for Display	NTCIP 1203 v03

Change Message Display Based on and Internal Event	NTCIP 1203 v03
Control External Devices	NTCIP 1203 v03
Monitor Sign Environment	NTCIP 1203 v03
Monitor Door Status	NTCIP 1203 v03
Monitor Controller Software Operations	NTCIP 1203 v03
Monitor Automatic Blanking of Sign	NTCIP 1203 v03
Report	NTCIP 1103 v03

C. Objects

The following table represents objects that are considered optional in the NTCIP standards but are required by this specification. It also indicated modified objects value ranges for certain objects. Each DMS shall provide the full, standard object range support (FSORS) of all the objects required by these specifications unless otherwise stated below.

Object	Reference	Requirement
moduleTable	NTCIP 1201 – 2.2.3	Shall contain at least one row with moduleType equal to 3 (software) The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the moduleVersion indicates the model version number of the component.
maxTimeBaseScheduleEntries	NTCIP 1201 – 2.4.3.1.	Shall be at least 28
maxDayPlans	NTCIP 1201 – 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 – 2.4.4.2	Shall be at least 12
maxGroupAddresses	NTCIP 1201 – 2.7.1	Shall be at least 1
maxEventLogConfigs	NTCIP 1103 – A.7.4	Shall be at least 50
eventConfigMode	NTCIP 1103 – A.7.5.3	The DMS shall support the following Event Configurations: onChange, greaterThanValue, smallerThanValue
eventConfigLogOID	NTCIP 1103 – A.7.5.7	FSORS
eventConfigAction	NTCIP 1103 – A.7.5.8	FSORS
maxEventLogSize	NTCIP 1103 – A.7.6	Shall be at least 20
maxEventClasses	NCTIP 1103 – A.7.2	Shall be at least 16
eventClassDescription	NTCIP 1103 – A.7.3.4	FSORS
communityNamesMax	NTCIP 1103 – A.7.8	Shall be at least 3
numFonts	NTCIP 1203 – 5.4.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 – 5.4.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 – 5.5.3	The DMS shall support flash "on" times ranging from 0.1 to 9.9 seconds in 0.1 second increments

defaultFlashOnActive	NTCIP 1203 – 5.5.4	The DMS shall support flash "on" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 - 5.5.5	The DMS shall support flash "off" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlassOffActive	NTCIP 1203 – 5.5.6	The DMS shall support flash "off" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 – 5.5.2	The DMS shall support the black background color
defaultForegroundColor	NTCIP 1203 - 5.5.2	The DMS shall support the amber foreground color
defaultJustificationLine	NTCIP 1203 - 5.5.9	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 - 5.5.11	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 - 5.5.13	The DMS shall support page "on" times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 - 5.5.15	The DMS shall support page "off" times ranging from 0.0 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 - 5.5.21	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 - 5.6.3	Shall be at least 100.
dmsMessageMultiString	NTCIP 1203 - 5.6.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 - 5.7.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 - 5.7.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 - 5.7.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 - 5.7.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 - 5.7.9	FSORS
dmsShortPowerLossTime	NTCIP 1203 – 5.7.14	FSORS

dmsResetMessage	NTCIP 1203 - 5.7.11	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 - 5.7.12	FSORS
dmsTimeCommLoss	NTCIP 1203 - 5.7.13	FSORS
dmsEndDurationMessage	NTCIP 1203 - 5.7.15	FSORS
dmsMultiOtherErrorDescription	NTCIP 1203 - 5.7.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error
dmsIllumControl	NTCIP 1203 - 5.8.1	The DMS shall support the following illumination control modes: Photocell, and Manual
dmsIllumNumBrightLevels	NTCIP 1203 - 5.8.4	Shall be at least 100
dmsIllumLightOutputStatus	NTCIP 1203 - 5.8.9	FSORS
numActionTableEntries	NTCIP 1203 - 5.9.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 - 5.11.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 - 5.11.1.6	FSORS
fanFailures	NTCIP 1203 - 5.11.2.3.1	FSORS
fanTestActivation	NTCIP 1203 - 5.11.2.3.2	FSORS
tempMinCtrlCabinet	NTCIP 1203 - 5.11.4.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 - 5.11.4.2	FSORS
tempMinSignHousing	NTCIP 1203 - 5.11.4.5	FSORS
tempMaxSignHousing	NTCIP 1203 - 5.11.4.6	FSORS

D. MULTI Tags

Each DMS shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer specific MULTI tags.

Code	Feature
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 – day of month
f9	field 9 – month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year

Code	Feature
fl (and /fl)	flashing text on a line by line basis with flash rates controllable in 0.5 second increments.
fo	Font
jl2	Justification – line – left
jl3	Justification – line – center
jl4	Justification – line – right
jl5	Justification – line – full
jp2	Justification – page – top
jp3	Justification – page – middle
jp4	Justification – page – bottom
mv	moving text
nl	new line
np	new page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page)
pt	page times controllable in 0.5 second increments.

E. Documentation

Supply software with full documentation, including a CD-ROM containing ASCII versions of the following MIB files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. Name this file identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

Allow the use of any and all of this documentation by any party authorized by the Department for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

F. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by

the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

6.2. Measurement and Payment

There will be no direct payment for the work covered by this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for "Dynamic Message Sign ( )" and will be full compensation for all work listed above.

7. DMS PEDESTAL STRUCTURE

7.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structure, platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structure in accordance with the requirements of these Project Special Provisions and the Project Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Project Plans.

Provide pedestal DMS structures with a minimum of 25 feet clearance from the high point of the road to the bottom of the DMS enclosure.

Design the new DMS assemblies (including footings), DMS mounting assemblies, maintenance platforms, and access ladders and submit shop drawings for approval. A Professional Engineer that is registered in the state of North Carolina will prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 of the Standard Specifications apply to all work covered by this section.

The Standard Provisions SP09R005 and SP09R007 found at the link below apply to all work covered by this section.

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

It is the Contractor's responsibility to verify DMS S-dimension elevation drawings for the DMS locations and provide them with the DMS shop drawings for the Engineer's approval.

7.2. MATERIALS

Use materials that meet the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations*.

7.3. CONSTRUCTION METHODS

A. General

Construct DMS structures and assemblies in accordance with the requirements of:

- Section 906 of the *2018 Standard Specification for Roads and Structures*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations*.

B. DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid resistant surface and safety railing on the DMS assemblies for access to one of the DMS inspection doors as shown on the plans. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door. No gap is allowed between walkway and inspection door or along any part of the safety rails.

Ensure the design, fabrication and installation of the access platforms on new DMS structures complies with the following:

A. The top of the platform grading surface is vertically aligned with the bottom of the DMS door,

B. The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails,

C. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections,

D. Install a 4" x 4" safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform,

E. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

C. DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Furnish the lock to operate with a Corbin #2 key and furnish two keys per lock. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the finished ground. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

7.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure will be measured and paid as the actual number of dynamic message sign pedestal structure assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete relocated dynamic message sign assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

DMS Access Ladder will be measured and paid as the actual number of DMS access ladders, platform, walkway furnished, installed and accepted. Payment includes design, fabrication, transportation, attachment to the DMS assembly as described above, lock with two keys each, and concrete pad.

Overhead Footings will be measured and paid in cubic yards and will be full compensation for all materials and labor required in *Overhead and Dynamic Message Sign Foundations (SP09 R007) and Foundations and Anchor Rod Assemblies for Metal Poles* (PS09 R005) referred in the link above. Payment will be made according to PS09 R007

The contract unit price for Overhead Footings will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations, supplying and placing 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 *2018 Standard Specifications for Roads and Structures*.

Payment will be made under:

DMS Pedestal Structure ..... Each

DMS Access Ladder ..... Each

8. OBSERVATION PERIOD

8.1. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be considered part of work to be completed by the project completion date.

Upon successful completion of all project work the 30-day Observation Period may commence. Examples of project work includes but is not limited to:

- Installation of all project devices and communications infrastructure.
- Field Acceptance Testing of all devices.
- Central System Testing of all devices and network communications.
- Correction of all deficiencies and punch list items. (including minor construction items)

This observation consists of a 30-day period of normal, day-to-day operations of the field equipment in operation with new or existing central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the Plans and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct any failures within forty-eight (48) hours (includes time of notification). Any failure that affects a major system component as defined below

for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the Contractor is was notified that the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or a failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period for that system. The 30-day Observation Period will be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- CCTV Cameras and Central Operations
- Dynamic Message Sign (DMS) and Central equipment/Operations
- Portable Changeable Message Sign (PCMS)
- Communications infrastructure (examples: Fiber, Radios, Ethernet Switches, Core Switches, etc.)
- Any other ITS Devices not named above (examples: DSRC radios, Radar and Out-of-Street Detection, signals, etc.)

8.2. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The completed System will be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including as-built plans.

8.3. MEASUREMENT AND PAYMENT

There will be no payment for this item of work as it is incidental to the project as a whole and to the item of work in which it is associated.

9. ELECTRICAL SERVICE

9.1. DESCRIPTION

Install new or modify existing electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service poles and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

9.2. MATERIALS

A. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum of eight (8) spaces in the disconnect. Furnish a double pole 50A circuit breaker at DMS-3 location and a single pole 15A circuit breaker at

CCTV-3 location. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Furnish NEMA Type 3R combinational panels rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meet the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load and Neutral Terminals accept 4/0 AWG and smaller Copper/Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified

Furnish 1.5" watertight hub for threaded rigid conduit with meter base.

At the main service disconnect, furnish and install UL-approved lightning arrestors that meet the following requirements:

Type of Design	Silicon Oxide Varisto
Voltage	120/240 Single Phase, 3 wire
Maximum Current	100,000 amps
Maximum Energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground wire	Separate

B. Modify Existing Electrical Service Equipment

At locations shown in the Plans, modify the existing electrical service by furnishing and installing a double pole 50A circuit breaker. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure circuit breakers are listed as meeting UL-489.

C. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

D. 3-Wire Copper Service Entrance Conductors

Furnish 3-wire stranded copper service entrance conductors with THWN rating. Provide conductors with black, red, and white insulation that are intended for power circuits at 600 Volts or less and comply with the following

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 and B-787 standards

See the Plans for wire sizes and quantities.

E. 4-Wire Copper Feeder Conductors

Furnish 4-wire stranded copper service feeder conductors with THWN rating for supplying power to DMS field equipment cabinets. Provide conductors with black, red, white and green insulation that are intended for power circuits at 600 Volts or less and comply with the following

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 and B-787 standards

See the Plans for wire sizes and quantities.

F. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper service feeder conductors with THWN rating for supplying power to CCTV field equipment cabinets. Provide conductors with black or red, white and green insulation that are intended for power circuits at 600 Volts or less and comply with the following

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 and B-787 standards

See the Plans for wire sizes and quantities.

G. Grounding System

Furnish 5/8"x10" copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors, and irreversible compression crimp kits for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

9.3. CONSTRUCTION METHODS

A. General

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting any modifications.

Permanently label cables at all access points using nylon bags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediate upon installation. Use component name and labeling scheme approved by the Engineer.

B. Meter Base/Disconnect Combination Panel

Install meter base/disconnect combination panels with lightning arrestors as called for in the Plans. At all new DMS locations, route the feeder conductors form the meter base/disconnect to the DMS equipment cabinet in conduit. At all new CCTV locations, route the feeder conductors from the meter base/disconnect to the CCTV equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

C. Equipment Cabinet Disconnect

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting the modification. Measure the existing grounding system for ground resistance. If the ground resistance is greater than 20 ohms, abandon the existing grounding system and install a new grounding system as described in this section. Ensure the existing grounding electrode conductor is removed or disconnected from the system.

Install a new 50 AMP double pole breaker in the existing meter base/disconnect combo panels as shown in the Plans.

Install a new conduit system between the new service disconnect and the new cabinet or equipment cabinet disconnect as shown in the Plans. All above ground conduits, conduit bodies and fittings must be rigid galvanized steel. Underground conduits and fittings can be PVC. Transition from rigid galvanized steel to PVC using rigid galvanized steel sweeping elbows. Install stranded copper feeder conductors from the new service disconnect to the new cabinet or equipment cabinet disconnect sized as shown in the Plans.

D. Equipment Cabinet Disconnect

Install equipment cabinet disconnects and circuit breakers as called for in the Plans. Install THWN stranded copper feeder conductors as shown in Plans between the electrical service disconnect and the equipment cabinet disconnect. Route the conductors from the equipment cabinet disconnect to the equipment cabinet in rigid galvanized steel conduit. Bond the equipment cabinet disconnect in accordance with the NEC. Ensure that the grounding system complies with the grounding requirements of these Project Special Provisions, the Standard Specifications and the Plans.

E. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 inch rigid galvanized risers as shown in the plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

F. 4-Wire Copper Feeder Conductors

At locations shown in the Plans, install 4-wire THWN stranded copper feeder conductors to supply 240/120 VAC to the DMS field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

G. 3-Wire Copper Feeder Conductors

At locations shown in the Plans, install 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the CCTV field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

H. 3-Wire Copper Feeder Conductors

Install ground rods as indicated in the Plans. Connect the #4 AWG grounding conductor to ground rods using an irreversible compression crimp. Test the system to ensure a ground resistance of 20-ohms or less is achieved. Drive additional ground rods as necessary or as directed by the Engineer to achieve the proper ground resistance.

9.4. MEASUREMENT AND PAYMENT

Meter base/disconnect combination panel will be measured and paid as the actual number of complete and functional meter base/disconnect combination panel service locations furnished, installed and accepted. Breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, and any remaining hardware, fittings, and conduit bodies to connect the electrical service to the cabinet will be considered incidental to meter base/disconnect combination panels. All other required feeder conductors will be paid for separately.

Modify existing electrical service equipment will be measured and paid as the actual number of complete and functional modified existing electrical service equipment furnished, installed and accepted. New electrical service disconnect, breakers, lightning arresters, new conduit between the meter base and new service disconnect, new stranded copper conductors between the meter base and new service disconnect, above ground rigid galvanized steel conduit from the new service disconnect to below ground, ground rods, ground wire and any remaining hardware and conduit bodies to modify the existing service are considered incidental to modifying existing electrical service equipment.

Equipment cabinet disconnect will be measured and paid as the actual number of complete and functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed vertical conduit runs to the cabinet, ground rods, ground wire and any remaining hardware and conduit to connect the equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet subpanel.

3- Wire copper service entrance conductors will be incidental to furnish and installing the meter base/disconnect combination panel.

4- Wire copper feeder conductors will be measured and paid as the actual linear feet of 4-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all four conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

3- Wire copper feeder conductors will be measured and paid as the actual linear feet of 3-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

5/8" X 10' grounding electrode (ground rod) will be measured and paid as the actual number of 5/8" copper clad steel ground rods furnished, installed and accepted. No separate payment will be made for exothermic welding kit as they will be considered incidental to the installation of the ground rod.

#4 solid bare grounding conductor will be measured and paid as the actual linear feet of #4 AWG solid bare copper grounding conductor furnished, installed and accepted. Measurement will be along the approximate centerline from the base of the electrical service disconnect to the last grounding electrode.

Payment will be made under:

Meter Base/Disconnect Combination Panel ..... Each

Modify Existing Electrical Service Equipment ..... Each

Equipment Cabinet Disconnect ..... Each

4-Wire Copper Feeder Conductors ..... Linear Foot

3-Wire Copper Feeder Conductors ..... Linear Foot

5/8" X 10' Grounding Electrode ..... Each

#4 Solid Bare Grounding Conductor .....Linear Foot

10. EXISTING CCTV CAMERA REMOVAL

10.1. DESCRIPTION

At locations shown on plans, remove existing CCTV camera and all associated equipment. All equipment that is removed shall be returned to appropriate NCDOT Division Traffic Engineering office.

10.2. CONSTRUCTION METHODS

Consult with appropriate Division Traffic Engineering office prior to the removal of any existing CCTV equipment.

10.3. MEASUREMENT AND PAYMENT

Existing CCTV Camera Removal will be measured and paid as the actual number of existing CCTV cameras removed and transported to appropriate facility.

Payment will be made under:

Existing CCTV Camera Removal.....Each

11. REMOVE DMS AND STRUCTURE

11.1. DESCRIPTION

At locations shown on plans, remove existing DMS and structure and all associated equipment. All equipment that is removed shall be returned to appropriate NCDOT Division Traffic Engineering office or as directed by Engineer.

11.2. CONSTRUCTION METHODS

Consult with appropriate Division Traffic Engineering office prior to the removal of existing DMS and structure. Existing DMS and structure at locations noted on plans shall be removed in safe and efficient manner. Contractor shall utilize proper traffic control during removals.

11.3. MEASUREMENT AND PAYMENT

Remove DMS and Structure at (_____) will be measured and paid at the contract lump sum for each removal.

Payment will be made under:

Remove DMS and Structure at I-40 MM 324 .....Lump Sum

Remove DMS and Structure at I-40 MM 331 .....Lump Sum

Remove DMS and Structure at I-95 MM 78 .....Lump Sum

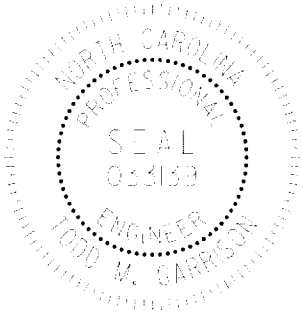
ST-1A

Project I-5986B **Harnett & Johnston Counties**

Project Special Provisions
Structures & Culvert

Table of Contents

For "MSE Retaining Walls", see Geotechnical Special Provisions.



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ST-2A

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURES AT STATIONS 28+39.21 -Y29- & 25+31.59 -Y18- **(8-13-04)**

1.0 GENERAL

Maintain traffic on I-95 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 17'-0" 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.

ST-3A

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

1.0 GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

2.0 MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, 4 inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers

with a middle section consisting of a rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway, and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow 8 inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 "Rigid Nonmetallic Conduit." Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states "Install Print Line Up" to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 "Rigid Nonmetallic Conduit."

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the Standard Specifications.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

3.0 INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the Standard Specifications.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others, and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

4.0 BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for "Electrical Conduit System for Signals at Station 28+39.21 -Y29-".

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Electrical Conduit System for Signals at Station 28+39.21 -Y29-	Lump Sum

ST-7A

STEEL REINFORCED ELASTOMERIC BEARINGS (6-22-16)

The 2018 Standard Specifications shall be revised as follows:
In **Section 1079-2(A) – Elastomeric Bearings** 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.

ST-8A

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the Thermal Sprayed Coatings (Metallization) Program and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The Thermal Sprayed Coatings (Metallization) Program is available on the Materials and Tests Unit website.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

3.0 MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the Thermal Sprayed Coatings (Metallization) Program. Apply TSC with the alloy to the thickness specified on the plans or as required by Thermal Sprayed Coatings (Metallization) Program.

5.0 INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

6.0 REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the Thermal Sprayed Coatings (Metallization) Program.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic zinc-rich coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

    1. Minor localized areas less than or equal to 0.1 ft^2 with exposed substrate shall be repaired as outlined above for marine and non-marine environments.

    2. Large localized areas greater than 0.1 ft^2 with exposed substrate shall require the Contractor to submit a detailed repair procedure to the Engineer for review and approval.

- Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

7.0 Twelve Month Observation Period

All TSC materials applied under the Thermal Sprayed Coatings (Metallization) Program shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

8.0 Basis of Payment

The contract price bid for the metal component to which the TSC is applied will be full compensation for the thermal sprayed coating.

ST-10A

ELASTOMERIC CONCRETE (2-11-19)

DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate. Provide an elastomeric concrete and binder system that is preapproved. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

MATERIALS

Provide materials that comply with the following minimum requirements at 14 days (or at the end of the specified curing time).

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi	ASTM D695	2000
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength, psi	ASTM D3967	625
Bond Strength to Concrete, psi	ASTM C882 (C882M)	450
Durometer Hardness	ASTM D2240	50

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D638	1000
Ultimate Elongation	ASTM D638	150%
Tear Resistance, lb/in	ASTM D624	200

In addition to the requirements above, the elastomeric concrete must be resistant to water, chemical, UV and ozone exposure and withstand temperature extremes. Elastomeric concrete systems requiring preheated aggregates are not allowed.

PREQUALIFICATION

Manufacturers of elastomeric concrete materials shall submit samples (including aggregate, primer and binder materials) and a Type 3 certification in accordance with Article 106-3 of the *Standard Specifications* for prequalification to:

ST-11A

North Carolina Department of Transportation
Materials and Tests Unit
1801 Blue Ridge Road
Raleigh, NC 27607

Prequalification will be determined for the system. Individual components will not be evaluated, nor will individual components of previously evaluated systems be deemed prequalified for use.

The submitted binder (a minimum volume of 1 gallon) and corresponding aggregate samples will be evaluated for compliance with the Materials requirements specified above. Systems satisfying all of the Materials requirements will be prequalified for a one year period. Before the end of this period new product samples shall be resubmitted for prequalification evaluation.

If, at any time, any formulation or component modifications are made to a prequalified system that system will no longer be approved for use.

INSTALLATION

The elastomeric concrete shall not be placed until the reinforced concrete deck slab has cured for seven (7) full days and reached a minimum strength of 3,000 psi.

Provide a manufacturer's representative at the bridge site during the installation of the elastomeric concrete to ensure that all steps being performed comply with all manufacturer installation requirements including, but not limited to weather conditions (ambient temperature, relative humidity, precipitation, wind, etc.), concrete deck surface preparation, binder and aggregate mixing, primer application, elastomeric concrete placement, curing conditions and minimum curing time before joint exposure to traffic. Do not place elastomeric concrete if the ambient air or surface temperature is below 45°F.

Prepare the concrete surface within 48 hours prior to placing the elastomeric concrete. Before placing the elastomeric concrete, all concrete surfaces shall be thoroughly cleaned and dry. Sandblast the concrete surface in the blockout and clear the surface of all loose debris. Do not place the elastomeric concrete until the surface preparation is completed and approved.

Prepare and apply a primer, as per manufacturer's recommendations, to all concrete faces to be in contact with elastomeric concrete, and to areas specified by the manufacturer.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within two (2) hours after applying the primer. Trowel the elastomeric concrete to a smooth finish.

The joint opening in the elastomeric concrete shall match the formed opening in the concrete deck prior to sawing the joint.

ST-12A

FIELD SAMPLING

Provide additional production material to allow freshly mixed elastomeric concrete to be sampled for acceptance. A minimum of six (6) 2-inch cube molds and three (3) 3-inch diameter x 6-inch cylinders will be taken by the Department for each day's production. Compression, splitting tensile, and durometer hardness testing will be performed by the Department to determine acceptance. Materials failing to meet the requirements listed above are subject to removal and replacement at no cost to the Department.

BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Foam Joint Seals" or "Preformed Silicone Expansion Joint Seal" will be full compensation for furnishing and placing the Elastomeric Concrete.

ST-13A

FOAM JOINT SEALS (9-27-12)

1.0 SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable, foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

Use seals manufactured with grooves 1/8"± wide by 1/8"± deep and spaced between 1/4" and 1/2" apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4". Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D3575-08, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft^2
Elongation at Break	ASTM D3575	180% - 210%
Tear Strength	ASTM D624 (D3575-08, Suffix G)	14 – 20 pli
Density	ASTM D3575-08, Suffix W, Method A	1.8 – 2.2 lb/ft^3
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint seals upon receipt to ensure that the marks are clearly visible before installation.

ST-14A

2.0 BONDING ADHESIVE

Use a two component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3000 psi (min.)
Compressive strength	ASTM D695	7000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

3.0 SAWING THE JOINT

The joint opening shall be initially formed to the width shown on the plans including the blockout for the elastomeric concrete.

The elastomeric concrete shall have sufficient time to cure such that no damage can occur to the elastomeric concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus 1/4" above the top of the seal plus approximately 1" below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

4.0 PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete shall cure a minimum of 24 hours prior to seal installation.

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

5.0 SEAL INSTALLATION

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

Before installing the joint seal, check the uninstalled seal length to insure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a teflon heating iron of 425-475°F for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. After opening both cans of the bonding agent, stir each can using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the elastomeric concrete as well as both sides of the joint seal, making certain to completely fill the grooves with epoxy. With gloved hands, compress the joint seal and

with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately 1/4" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval. Do not place pavement markings on top of foam joint seals.

6.0 BASIS OF PAYMENT

Payment for all foam joint seals will be at the lump sum contract price bid for "Foam Joint Seals". Prices and payment will be full compensation for furnishing all material, including elastomeric concrete, labor, tools and equipment necessary for installing these units in place and accepted.

ST-17A

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.

ST-21A

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.

ST-22A

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'-2 ½" 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.

ST-23A

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.

ST-24A

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.

ST-25A

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.

ST-28A

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

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. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

Submittals may also be made via email.

Send submittals to:

jlbolden@ncdot.gov (James Bolden)

Send an additional e-copy of the submittal to the following address:

eomile@ncdot.gov (Emmanuel Omile)

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. David Hering, L. G., 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. David Hering, L. G., 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

Via Email: EastGeotechnicalSubmittal@ncdot.gov

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail or 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

Via Email: WestGeotechnicalSubmittal@ncdot.gov

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's website, via the "Drawing Submittal Status" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "Geotechnical Construction Submittals" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: James Bolden (919) 707 – 6408
(919) 250 – 4082 facsimile
jlbolden@ncdot.gov

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
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"

ST-31A

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"
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

ST-32A

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.

ST-33A

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]	1 drawings, 1 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	1 drawings, 1 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), 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.

ST-34A

CRANE SAFETY (6-20-19)

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

ST-35A

GROUT FOR STRUCTURES (12-1-17)

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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

ST-36A

ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES (12-30-15)

1.0 INSPECTION FOR ASBESTOS CONTAINING MATERIAL

Prior to conducting bridge demolition or renovation activities, the Contractor shall thoroughly inspect the bridge or affected components for the presence of asbestos containing material (ACM) using a firm prequalified by NCDOT to perform asbestos surveys. The inspection must be performed by a N.C. accredited asbestos inspector with experience inspecting bridges or other industrial structures. The N.C. accredited asbestos inspector must conduct a thorough inspection, identifying all asbestos-containing material as required by the Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants (NESHAP) Code of Federal Regulations (CFR) 40 CFR, Part 61, Subpart M.

The Contractor shall submit an inspection report to the Engineer, which at a minimum must include information required in 40 CFR 763.85 (a)(4) vi)(A)-(E), as well as a project location map, photos of existing structure, the date of inspection and the name, N.C. accreditation number, and signature of the N.C. accredited asbestos inspector who performed the inspection and completed the report. The cover sheet of the report shall include project identification information. Place the following notes on the cover sheet of the report and check the appropriate box:

___ ACM was found
___ ACM was not found

2.0 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

If ACM is found, notify the Engineer. Compensation for removal and disposal of ACM is considered extra work in accordance with Article 104-7 of the Standard Specifications.

An Asbestos Removal Permit must be obtained from the Health Hazards Control Unit (HHCU) of the N.C. Department of Health & Human Services, Division of Public Health, if more than 35 cubic feet, 160 square feet, or 260 linear feet of regulated ACM (RACM) is to be removed from a structure and this work must be completed by a contractor prequalified by NCDOT to perform asbestos abatement. RACM is defined in 40 CFR, Part 61, Subpart M. Note: 40 CFR 763.85 (a)(4) vi)(D) defines ACM as surfacing, TSI and Miscellaneous which does not meet the NESHAP RACM.

3.0 DEMOLITION NOTIFICATION

Even if no ACM is found (or if quantities are less than those required for a permit), a Demolition Notification (DHHS-3768) must be submitted to the HHCU. Notifications and Asbestos Permit applications require an original signature and must be submitted to the HHCU 10 working days prior to beginning demolition activities. The 10 working day period starts based on the post-marked date or date of hand delivery. Demolition that does not begin as originally notified requires submission of a separate revision form HHCU

3768-R to HHCU. Reference the North Carolina Administrative Code, Chapter 10A, Subchapter 41C, Article .0605 for directives on revision submissions.

Contact Information
Health Hazards Control Unit (HHCU)
N.C. Department of Health and Human Services
1912 Mail Service Center
Raleigh, NC 27699-1912
Telephone: (919) 707-5950
Fax: (919) 870-4808

4.0 SPECIAL CONSIDERATIONS

Buncombe, Forsyth, and Mecklenburg counties also have asbestos permitting and NESHAP requirements must be followed. For projects involving permitted RACM removals, both the applicable county and the state (HHCU) must be notified.

For demolitions with no RACM, only the local environmental agencies must be notified. Contact information is as follows:

Buncombe County
WNC Regional Air Pollution Control Agency
49 Mt. Carmel Road
Asheville, NC 28806
(828) 250-6777

Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101
(336) 703-2440

Mecklenburg County
Land Use and Environmental Services Agency
Mecklenburg Air Quality
700 N. Tryon Street
Charlotte, NC 28202
(704) 336-5430

5.0 ADDITIONAL INFORMATION

Additional information may be found on N.C. asbestos rules, regulations, procedures and N.C. accredited inspectors, as well as associated forms for demolition notifications and asbestos permit applications at the N.C. Asbestos Hazard Management Program website:

https://epi.dph.ncdhhs.gov/asbestos/ahmp.html

ST-38A

6.0 BASIS OF PAYMENT

Payment for the work required in this provision will be at the lump sum contract unit price for "Asbestos Assessment". Such payment will be full compensation for all asbestos inspections, reports, permitting and notifications.

ST-39A

PAINTING EXISTING WEATHERING STEEL STRUCTURE (2-11-19)

DESCRIPTION

This work shall consist of furnishing all labor, equipment, and materials necessary to clean and paint the ends of the weathering steel girders, zones of excessive corrosion, bent diaphragms, all bearing plates, anchor bolts, nuts, and washers of the existing structure. Work includes: removal, containment and disposal of the existing paint system; preparation of the surface to be painted and applying the new paint system; a containment enclosure; and any incidentals necessary to complete the project as specified and shown on the plans.

TWELVE-MONTH OBSERVATION PERIOD

The Contractor maintains responsibility for the coating system for a 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 shall guarantee the coating system under the payment and performance bond (refer to Article 109-10 of the *Standard Specifications*). To complete successfully the observation period, the coating system shall meet the following requirements after 12 months service:

(A) No visible rust, contamination or application defect is observed in any coated area.

(B) Painted surfaces have a uniform color and gloss.

(C) Painted surfaces have an adhesion that meets an ASTM D3359, 3A rating.

Final acceptance is made only after the paint system meets the above requirements.

SUBMITTALS

Submit all of the following to the Engineer for review and approval before scheduling the pre-construction meeting. Allow at least two (2) weeks for the review process.

(A) The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The contractor shall be currently Society for Protective Coatings (SSPC) Quality Program (QP) 2, Category A certified, and have successfully completed lead paint removal and field painting on similar structures within 18 months prior to this bid. Lead abatement work completed within the 18 month period shall have been completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include, but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, personal protective equipment (PPE), etc.); and containment. This requirement is in addition to the contractor pre-qualification requirements covered by Article 102-2 of the *Standard Specifications*.

The apparent low bidder shall submit a list of projects for which QP 2 work was performed within the last 18 months including owner contact information and submit to the Engineer a "Lead Abatement Affidavit". This form may be downloaded from:

https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/leadabatementaffidavit.pdf

(B) Work schedule which shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner.

(C) Containment system plans and design calculations in accordance with SSPC Guide 6, Class 3A and other project requirements, signed and sealed by a Professional Engineer licensed by the State of North Carolina.

(D) Bridge wash water sampling and disposal plan.

(E) Subcontractor identification.

(F) Lighting plan for night work in accordance with Section 1413 of the *Standard Specifications*.

(G) Traffic control plan with NCDOT certified supervisors, flaggers and traffic control devices.

(H) Health and safety plan addressing at least the required topics as specified by the SSPC QP 1 and QP 2 program and including hazard communication, respiratory health, emergency procedures, and local hospital and treatment facilities with directions and phone numbers, disciplinary criteria for workers who violate the plan and accident investigation. The plan shall address the following: hazardous materials, personal protective equipment, general health and safety, occupational health and environmental controls, fire protection and prevention, signs signals, and barricades, materials handling, storage, use, and disposal, hand and power tools, welding and cutting, electrical, scaffolds, fall protection, cranes, derricks, hoists, elevators, and conveyors, ladders, toxic and hazardous substances, airless injection and high pressure water jet (HPWJ).

(I) Provide the Engineer a letter of certification that all employees performing work on the project have blood lead levels that are below the Occupational Safety and Health Administration (OSHA) action level.

(J) Provide the Engineer with Competent Person qualifications and summary of work experience.

(K) Environmental Compliance Plan.

(L) Quality Control Plan (Project Specific) with quality control qualifications and summary of work experience.

(M) Bridge and Public Protection Plan (Overspray, Utilities, etc. - Project/Task Specific).

(N) Abrasive Blast Media:

(1) Product Data Sheet.

(2) Blast Media Test Reports in accordance with Article 1080-12 of the *Standard Specification.*

(O) Coating Material:

(1) NCDOT HICAMS Test Reports (testing performed by NCDOT Materials and Tests Unit).

(2) Product Data Sheets.

(3) Material Safety Data Sheets.

(4) Product Specific Repair Procedures.

(5) Acceptance letters from paint manufacturer's for work practices that conflict with special provisions and/or paint manufactures product data sheets.

PRE-CONSTRUCTION MEETING

Submittals shall be reviewed and approved by the Engineer prior to scheduling the pre-construction meeting. Allow no less than two (2) weeks for a review process. When requesting a pre-construction meeting, contact the Engineer at least seven (7) working days in advance of the desired pre-construction date. The contractor's project supervisor, Competent Person, quality control personnel and certified traffic control supervisor shall be in attendance at the pre-construction meeting in order for the Contractor and NCDOT team to establish responsibilities for various personnel during project duration and to establish realistic timeframes for problem escalation.

CONTAINMENT SYSTEM

Prior to performing any construction or painting operations on the structure, the Contractor shall furnish the Engineer with plans and design calculations for a sufficiently designed containment system, which will provide access for any repairs on structural steel members, cleaning and surface preparations for structural steel members, and coating operations for structural steel members of the bridge. The containment system shall not be installed, and no work shall begin, until the Engineer has reviewed and approved, in writing, the submitted containment system plans and design calculations. Containment system plans and design calculations shall be prepared, sealed, and signed by a Professional Engineer licensed by the State of North Carolina. Allow a minimum of two (2) weeks for review of the containment plans and calculations.

The containment system shall meet or exceed the requirements of Class 3A containment in accordance with SSPC Guide 6. The Contractor shall determine the required capacity of the containment system, which, at a minimum, shall include loads due to wind, repair materials and repair operations, equipment, and tools; however, the capacity shall not be less than that required by Federal or State regulations. Design steel members to meet the requirements of the *American Institute of Steel Construction Manual*. Design timber members in accordance with the *National Design Specification for Stress-Grade Lumber and Its Fastenings* of the National Forest Products Association. The containment system shall be constructed of materials capable of withstanding damage from any of the work required on this project and shall provide a two (2) hour resistance to fire.

ST-42A

In the containment system plans, describe how debris is contained and collected. Describe the type of tarpaulin, bracing materials, and the maximum designed wind load. Design wind loads shall be in accordance with the Falsework and Formwork special provision. Describe the dust collection system and how a negative pressure of 0.03 inches of water column is maintained inside the enclosure, while blasting operations are being conducted. Describe how the airflow inside the containment structure is designed to meet all applicable OSHA Standards. Describe how water run-off from rain will be routed by or through the enclosure. Describe how wash water will be contained and paint chips separated. Describe what physical containment will be provided during painting application to protect the public and areas not to be painted.

Drilling holes in the superstructure for the purpose of attaching the containment system is prohibited.

The Contractor will be responsible for certifying the containment system has been constructed in accordance with the approved plans.

The containment system shall be cleaned after each workday.

Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

Protect non-metallic parts of bearings from blasting and painting (i.e.: Pot Bearings, Elastomeric Pads, and Disc Bearings).

WASH WATER SAMPLING AND DISPOSAL PLAN

All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to North Carolina Administrative Code 15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211(3), 15A NCAC 02T.0505(b)(1) and 15A NCAC 2T.0905(h). Depending on the test results, wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current Federal and State regulations. See link for NCDOT Guidelines for Managing Bridge Wash Water: https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/WashWater.pdf

WASTE HANDLING OF PAINT AND ABRASIVES

Comply with all Federal, State, and local regulations. Failure to comply with the regulations could result in fines and loss of qualified status with NCDOT.

Comply with the Resource Conservation and Recovery Act (RCRA - 40 CFR 261 - 265) and the Occupational Safety and Health Act (OSHA - 29 CFR 1910 - 1926) regulations for employee training, and for the handling, storage, labeling, recordkeeping, reporting, inspections and disposal of all hazardous waste generated during paint removal.

A summary of Generator Requirements is available at the above NCDOT web link, which cites the specific regulations for each Generator category. Quantities of waste by weight and dates of

waste generation shall be recorded. Waste stored at the project site shall be properly labeled. All waste, hazardous or non-hazardous, requires numbered shipping manifests.

The North Carolina Department of Environmental Quality (NCDEQ) have adopted RCRA as the North Carolina Hazardous Waste Management Rules and are responsible for enforcement. The *Hazardous Waste Generator Compliance Manual* is published by the Compliance Branch of the Division of Waste Management of NCDEQ, and can be found at: https://files.nc.gov/ncdeq/Waste%20Management/DWM/HW/Compliance/Generator%20Compliance%20Manual.pdf

Immediately after award of the contract, arrange for waste containers, sampling, testing, transportation, and disposal of all waste. No work shall begin until the Contractor furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste shall be pre-approved by the Engineer. Use an approved waste management company from the following link:
https://www.ebs.nc.gov/VendorDirectory/results.html?sap-params=cD0xJTIwJmN1cnJlbnRfc2VhcmNoX3BhZ2U9d2Mmc2VsZWN0aW9uX2Zpcm1fbmFtZT0mc2VsZWN0aW9uX2NlcnQ9JnNlbGVjdGlvbl9maXJtdHlwZT0meXNjX2Zpcm10eXBlPSZzZWxlY3Rpb25fd29ya2xvY2F0aW9uPSZ5c2Nfd29ya2xvY2F0aW9uPSZzZWxlY3Rpb25fYWRkcnN0YXRlPSZ5c2NfYWRkcnN0YXRlPSZzZWxlY3Rpb25fYWRkcmNvdW50eT0meXNjX2FkZHJjb3VudHk9JnNlbGVjdGlvbl93a2NvZGU9MDAzMDQwJnlzY193a2NvZGU9MDAzMDQwJTIwQ09OVEFNSU5BVEVEJTIwTUFURVJJQUxxTJTIwUkVNT1ZBTCZzZWxlY3Rpb25fZGlzYz0meXNjX2Rpc2M9JnNlbGVjdGlvbl9uYWljcz0meXNjX25haWNzPSZzZWxlY3Rpb25fY3R5cGU9MA%3d%3d

All removed paint and spent abrasive media shall be tested for lead following the SW-846 Toxicity Characteristic Leaching Procedure (TCLP) Method 1311 Extraction, as required in 40 CFR 261, Appendix 11, to determine whether it shall be disposed of as hazardous waste. Furnish the Engineer certified test reports showing TCLP results of the paint chips stored on site, with disposal in accordance with "Flowchart on Lead Waste Identification and Disposal" at:
https://ncdenr.s3.amazonaws.com/s3fs-public/document-library/Lead%20Disposal.pdf

All sampling shall be done in presence of the Engineer's representative.

The Competent Person shall obtain composite samples from each barrel of the wash water and waste generated by collecting two or more portions taken at regularly spaced intervals during accumulation. Composite the portions into one sample for testing purposes. Acquire samples after 10% or before 90% of the barrel has accumulated. The intent is to provide samples that are representative of widely separated portions, but not the beginning and end of wash water or waste accumulation.

Perform sampling by passing a receptacle completely through the discharge stream or by completely diverting the discharge into a sample container. If discharge of the wash water or waste is too rapid to divert the complete discharge stream, discharge into a container or transportation unit sufficiently large to accommodate the flow and then accomplish the sampling in the same manner as described above.

ST-44A

Comply with the NCDEQ *Hazardous Waste Compliance Generator Manual*. Record quantities of waste by weight and dates of waste generation. Until test results are received, store all waste, and label as "NCDOT Bridge Paint Removal Waste - Pending Analysis" and include the date generated and contact information for the Engineer. Store waste containers in an enclosed, sealed, and secured storage container protected from traffic from all directions. Obtain approval for the protection plan for these containers from the Engineer. If adequate protection cannot be obtained by use of existing guardrail, provide the necessary supplies and equipment to maintain adequate protection. Once test results are received and characterized, label waste as either "Hazardous Waste - Pending Disposal" or "Paint Waste - Pending Disposal".

Once the waste has been collected, and the quantities determined, prepare the appropriate shipping documents and manifests and present them to the Engineer. The Engineer will verify the type and quantity of waste and obtain a Provisional Environmental Protection Agency (EPA) ID number from:

Melodi Deaver
Division of Waste Management/Hazardous Waste Section
North Carolina Department of Environmental Quality
1646 Mail Service Center
Raleigh, NC 27699
Phone: (919) 707-8204, Email: melodi.deaver@ncdenr.gov

At the time of shipping, the Engineer will sign, date, and add the ID number in the appropriate section on the manifest. The maximum on-site storage time for collected waste shall be 90 calendar days. All waste whether hazardous or non-hazardous will require numbered shipping manifests. The cost for waste disposal (including lab and Provisional EPA ID number) is included in the bid price for this contract. Note NC Hazardous Waste Management Rules (15A NCAC 13A) for more information. Provisional EPA ID numbers may be obtained at:
https://deq.nc.gov/about/divisions/waste-management/hw/provisional-notification

Testing labs shall be certified in accordance with North Carolina State Laboratory Public Health Environmental Sciences. List of certified laboratories may be obtained at:
https://slphreporting.ncpublichealth.com/Certification/CertifiedLaboratory.asp

All test results shall be documented on the lab analysis as follows:

(A) For leachable lead:

(1) Soils/Solid/Liquid- EPA 1311/200.7/6010

Area sampling will be performed for the first two (2) days at each bridge location. The area sample will be located within five (5) feet of the containment and where the highest probability of leakage will occur (access door, etc.). Results from the area sampling will be given to the Engineer within 72 hours of sampling (excluding weekends). If the results of the samples exceed 20 $\mu g/m^3$ corrective measures shall be taken and monitoring shall be continued until two (2) consecutive sample results are less than 20 $\mu g/m^3$.

Time Weighted Average (TWA) may suspend the work if there are visible emissions outside the containment enclosure or pump monitoring results exceeding the level of 30 $\mu g/m^3$.

Where schools, housing and/or buildings are within 500 feet of the containment, the Contractor shall perform initial Total Suspended Monitoring (TSP) Lead monitoring for the first ten (10) days of the project during abrasive blasting, vacuuming and containment removal. Additional monitoring will be required during abrasive blasting two (2) days per month thereafter. Results of the TSP monitoring at any location shall not exceed 1.5 $\mu g/m^3$.

EQUIPMENT MOBILIZATION

The equipment used in any travel lanes and paved shoulder shall be mobile equipment on wheels that has the ability to move on/off the roadway in less than 30 minutes. All work conducted in travel lanes shall be from truck or trailer supported platforms and all equipment shall be self-propelled or attached to a tow vehicle at all times.

QUALITY CONTROL INSPECTOR

Provide a quality control (QC) inspector in accordance with the SSPC QP guidelines to ensure that all processes, preparation, blasting and coating application are in accordance with the requirements of the contract. The inspector shall have written authority to perform QC duties to include continuous improvement of all QC internal procedures. The presence of the engineer or inspector at the work site shall in no way lessen the contractor's responsibility for conformity with the contract.

QUALITY ASSURANCE INSPECTOR

The quality assurance inspector which may be a Department employee or a designated representative of the Department shall observe, document, assess, and report that the Contractor is complying with all of the requirements of the contract. Inspectors employed by the Department are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. Each stage in preparing the structure to be coated which includes but not limited to washing, blasting, coating testing and inspection shall be inspected and approved by the Engineer or an authorized representative.

SUBLETTING OF CONTRACT

Only contractors certified to meet SSPC QP 2, Category A, and have successfully completed lead paint removal and field painting on all similar structures within 18 months prior to this bid are qualified for this work. Work is only sublet by approval of the Engineer.

LIMITS OF ZONE PAINTING

If any girder has excessive corrosion along its bottom flange, beyond the distance of 1.5 times the depth of the beam or girder, at the bearing, the area of the affected girder indicated on the plans, and other girders as directed by the Engineer, shall be cleaned in accordance with the

requirements of System 5 painting system. The horizontal limits of zone painting shall extend 12" beyond the maximum horizontal extent of web/flange corrosion. The vertical limits of zone painting shall extend 3" beyond the maximum vertical extent of web corrosion.

Areas designated for zone coating shall be primed and coated in accordance with System 5 as outlined in Article 442-8 of the *Standard Specifications.*

System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint and over non-weathering steel surfaces cleaned to an SSPC SP-6 finish.

Painting shall be performed in accordance with Section 442 and Section 1080 of the *Standard Specifications,* and/ or these special provisions; the more restrictive requirement shall apply. Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material.

PREPARATION OF SURFACES

Before any other surface preparation is conducted, all surfaces shall be power washed to remove dust, salts, dirt, and other contaminants. All wash water shall be contained, collected, and tested in accordance with the requirements of NCDOT Guidelines for Managing Bridge Wash Water. Obtain approval of the Engineer and allow all cleaned surfaces to dry to the touch and without standing water before beginning surface preparation or painting activities.

Surface preparation is done with materials meeting Article 1080-12 of the *Standard Specifications*. No silica sand or other silica materials are permitted for use. The profile shall be between 1.0 and 3.0 mils when measured on a smooth steel surface. Conduct and document at least two (2) tests per beam/girder and two (2) tests per span of diaphragms/cross bracing.

Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive blasting as well as equipment and containers used to collect abrasive media. This requirement will be enforced during activity and inactivity of equipment.

Before the Contractor departs from the work site at the end of the workday, collect all debris generated during surface preparation and all dust collector hoses, tarps or other appurtenances containing blasting residue in approved containers.

Clean a 3" x 3" area at each structure to demonstrate the specified finish, and the inspector will preserve this area by covering it with tape, plastic or some other suitable means so that it can be retained as the Dry Film Thickness (DFT) gauge adjustment standard. An acceptable alternative is for the Contractor to provide a steel plate with similar properties and geometry as the substrate to be measured.

The contractor and or quality assurance representative shall notify the Engineer of any area of corroded steel that has lost more than 50% of its original thickness.

All parts of the bridges not to be painted and the travelling public shall be protected from overspray. Submit a plan to protect all parts of bridge that are not required to be painted and a plan

to protect the traveling public and surrounding environment while applying all coats of paint to a structure.

Ensure that chloride levels on the surfaces are 7 $\mu g/cm^2$ or lower using an acceptable sample method in accordance with SSPC Guide 15. The frequency of testing shall be two (2) tests per span after all surface preparation has been completed and immediately prior to painting. Select test areas representing the greatest amount of corrosion in the span as determined by the Engineers' representative. Additional testing may be required if significant amounts of chloride are detected.

All weld splatter, slag or other surface defects resulting in a raised surface above the final paint layer shall be removed prior to application of primer coat.

PAINTING OF STEEL

Paint System 5, as specified in these special provisions and Article 442-8 of the *Standard Specifications*, is to be used for this work. System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint over non-weathering steel surfaces blast-cleaned surfaces in accordance with SSPC-SP-6 (Commercial Blasting). Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material. The contractor is responsible for reporting quantities of thinner purchased as well the amounts used. No container with thinner shall be left uncovered, when not in use.

Apply 2" stripe coat, by brush or roller only, to all exposed edges of steel including fasteners before applying the finish coat. Locate the edge or corner in the approximate center of the paint stripe.

Any area where newly applied paint fails to meet the specifications shall be repaired or replaced by the Contractor, at no additional cost to the Department. The Engineer approves all repair processes before the repair is made. Repaired areas shall meet the *Standard Specifications*. The Contractor applies an additional finish coat of paint to areas where the tape adhesion test is conducted.

MATERIALS

Only paint suppliers that have a NCDOT qualified inorganic zinc primer may furnish paints for this project. All paints applied to a structure shall be from the same supplier. Before any paints are applied the Contractor shall provide the Engineer a manufacturer's certification that each batch of paint meets the requirements of the applicable Section 1080 of the *Standard Specifications*.

Color of the paint shall match that of the existing paint on the structure steel.

The inspector randomly collects a one pint sample of each paint product used on the project. Additional samples may be collected as needed to verify compliance to the specifications.

Do not expose paint materials to rain, excessive condensation, long periods of direct sunlight, or temperatures above 110°F or below 40°F. In addition, the Contractor shall place a device that records the high, low, and current temperatures inside the storage location. Follow the manufacturer's storage requirements if more restrictive than the above requirements.

ST-48A

INSPECTION

Surface Preparation for System 5 shall be in accordance with SSPC SP-6. Any area(s) not meeting the requirements of SSPC SP-6 shall be remediated prior to application of coating. Surface inspection is considered ready for inspection when all blast abrasive, residue and dust is removed from surfaces to be coated.

(A) Quality Assurance Inspection

The Contractor furnishes all necessary OSHA approved apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The contractor illuminates the surfaces to be inspected to a minimum of 50-foot candles of light. All access points shall be illuminated to a minimum of 20-foot candles of light.

NCDOT reserves the right for ongoing Quality Assurance (QA) inspection to include but not limited to surface contamination testing, adhesion pull testing, and DFT readings as necessary to assure quality.

Inform the Engineer and the Division Safety Engineer of all scheduled and unannounced inspections from SSPC, OSHA, EPA and/or others that come on site. Furnish the Engineer a copy of all inspection reports except for reports performed by a third party and or consultant on behalf of the Contractor.

(B) Inspection Instruments

At a minimum, furnish the following calibrated instruments and conduct the following quality control tests:

(1) Sling Psychrometer - ASTM E337 - bulb type

(2) Surface Temperature Thermometer

(3) Wind Speed Indicator

(4) Tape Profile Tester - ASTM D4417 Method C

(5) Surface Condition Standards - SSPC VIS-1 and VIS-3

(6) Wet Film Thickness Gage - ASTM D4414

(7) Dry Film Thickness Gage - SSPC-PA2 Modified

(8) Solvent Rub Test Kit - ASTM D4752

(9) Adhesion Test Kit - ASTM D3359 Method A (Tape Test)

(10) Adhesion Pull test - ASTM D4541

(11) Surface Contamination Analysis Kit or (Chloride Level Test Kit) SSPC Technology Guide 15

(C) Quality Control

Maintain a daily quality control record in accordance with Subarticle 442-12(D) of the *Standard Specifications* and make such records available at the job site for review by the inspector and submit to the Engineer as directed. In addition to the information required on Form M&T-610, submit all Dry Film Thickness (DFT) readings on a form equivalent to Form M&T-611. These forms can be found at:
https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM-03-02

(1) Measure DFT at each spot on the attached diagram and at the required number of locations as specified below:

(a) For span members less than 45 feet; three (3) random locations along each girder in each span.

(b) For span members greater than 45 feet; add one additional location for each additional ten (10) feet in span length.

DFT measurements for the prime coat shall not be taken for record until the zinc primer has cured in accordance with ASTM D4752 (MEK Rub Test) with no less than a four (4) resistance rating.

Stiffeners and other attachments to beams and or plate girders shall be measured at no less than five (5) random spots per span. Also, dry film thickness is measured at no less than six (6) random spots per span on diaphragms/cross frames.

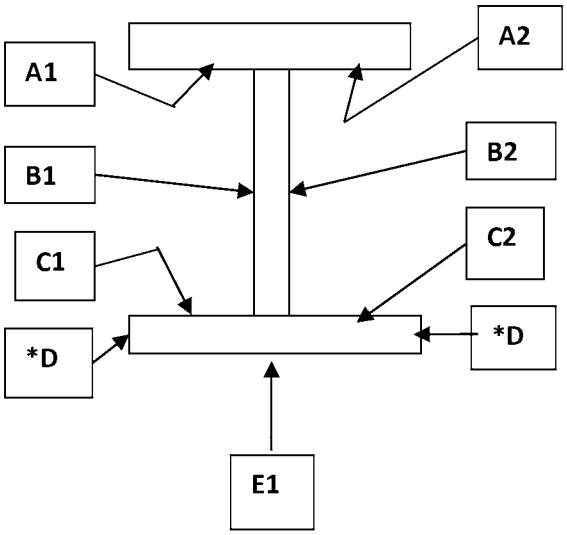
Each spot is an average of three (3) to five (5) individual gage readings as defined in SSPC PA-2. No spot average shall be less than 80% of minimum DFT for each layer applied; this does not apply to stripe coat application. Spot readings that are non-conforming shall be re-assessed by performing additional spot measurements not to exceed one-foot intervals on both sides of the low areas until acceptable spot averages are obtained. These non-conforming areas shall be corrected by the Contractor prior to applying successive coats.

ST-50A

Less than 36" in height and/or bottom flanges less than 16" in width.

7 Spot Areas

21 Individual DFT Readings

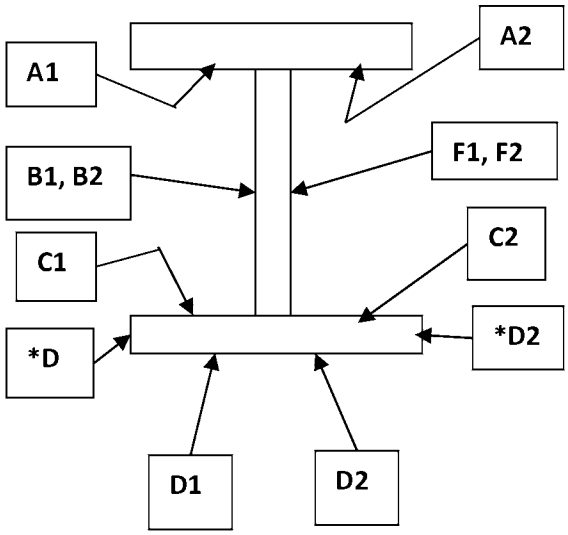


***D areas are only included when flange thickness is one inch (1") or greater.**

36" in height or greater and/or bottom flanges greater than 16" in width.

10 Spot Areas

30 Individual DFT Readings



***D areas are only included when flange thickness is one inch (1") or greater.**

(2) Two (2) random adhesion tests (1 test = 3 dollies) per span are conducted on interior surfaces in accordance with ASTM D4541 (Adhesion Pull Test) after the prime coat has been properly cured in accordance with ASTM D3363 (Pencil Hardness) with no less than 2H, and will be touched up by the Contractor. The required minimum average adhesion is 400 psi.

(3) Cure of the intermediate and stripe coats shall be accessed by using the thumb test in accordance with ASTM D1640 (Curing Formation Test) prior to the application of any successive layers of paint.

(4) One random Cut Tape adhesion test per span is conducted in accordance with ASTM D3359 (X-Cut Tape Test) on interior surface after the finish coat is cured. Repair areas shall be properly tapered and touched up by the Contractor.

ST-51A

ZONE PAINTING

If any girder has excessive corrosion along its bottom flange, beyond the distance of 1.5 times the depth of the beam or girder, at the bearing, the area of the affected girder indicated on the plans, and other girders as directed by the Engineer, shall be cleaned in accordance with the requirements of System 5 painting system. The horizontal limits of zone painting shall extend 12" beyond the maximum horizontal extent of web/flange corrosion. The vertical limits of zone painting shall extend 3" beyond the maximum vertical extent of web corrosion.

Areas designated for zone coating shall be primed and coated in accordance with System 5 as outlined in the *Structural Steel Shop Coatings Program.*

System 5 is one coat of primer, one intermediate acrylic coat, one stripe coat of paint, and one topcoat of paint and over non-weathering steel surfaces cleaned to an SSPC SP-6 finish.

Painting shall be performed in accordance with Section 442 and Section 1080 of the *Standard Specifications,* and/ or these special provisions; the more restrictive requirement shall apply. Perform all mixing operations over an impervious surface with provisions to prevent runoff to grade of any spilled material.

SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS

Personnel access boundaries are delineated for each work site using signs, tape, cones, or other approved means. Submit copies of safety and environmental compliance plans that comply with SSPC QP 2 Certification requirements.

HEALTH AND SAFETY RESPONSIBILITIES

This project may involve toxic metals such as arsenic, lead, cadmium and hexavalent chromium. It is the contractor's responsibility to test for toxic metals and if found, comply with the OSHA regulations, which may include medical testing.

Ensure a "Competent Person" as defined in OSHA 29 CFR 1926.62; one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them; is on site during all surface preparation activities and monitors the effectiveness of containment, dust collection systems and waste sampling. Before any work begins, provide a written summary of the Competent Person's safety training.

Comply with Subarticle 442-14(B) of the *Standard Specifications*.

Comply with Subarticle 442-14(D) of the *Standard Specifications*. Ensure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

An employee who has been removed with a blood level of 50 micrograms per deciliter or more shall have two (2) consecutive blood sampling tests spaced one week apart indicating that the employee's blood lead level is at or below 40 micrograms per deciliter before returning to work activities involving any lead exposure.

All OSHA recordable accidents that occur during the project duration are to be reported to the Engineer within twenty-four (24) hours of occurrence. In addition, for accidents that involve civilians or property damage that occurs within the work zone the Division Safety Engineer shall be notified immediately.

Prior to blasting operations, the Contractor shall have an operational OSHA approved hand wash station at each bridge location and a decontamination trailer at each bridge or between bridges unless the work is on the roadway, or the Contractor shall show reason why it is not feasible to do so and provide an alternative site as approved by the Engineer. The Contractor shall assure that all employees whose airborne exposure to lead is above the Permissible Exposure Limit (PEL) shall shower at the end of their work shift.

STORAGE OF PAINT AND EQUIPMENT

Provide a location for materials, equipment, and waste storage. Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive recycling and other waste handling equipment or containers. All land and or lease agreements that involve private property shall disclose to the property owner that heavy metals may be present on the Contractor's equipment. Prior to storing the Contractor's equipment on private property, provide a notarized written consent signed by the land owner received by the Engineer at least forty-eight (48) hours before using property. All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers' requirements. The more restrictive requirements will apply.

UTILITIES

Protect all utility lines or mains that may be supported on, under, or adjacent to bridge work sites from damage and paint overspray.

MEASUREMENT AND PAYMENT

The cost of inspection, surface preparation and repainting the existing structure is included in the lump sum price bid for *Cleaning and Painting Existing Weathering Steel for Bridge #500051.* This price is full compensation for furnishing all inspection equipment, all paint, cleaning abrasives, cleaning solvents and all other materials; preparing and cleaning surfaces to be painted; applying paint in the field; protecting work area, traffic and property; furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers, any other hand or power tools and any other equipment.

Pollution Control will be paid at the contract lump sum price which will be full compensation for all collection, handling, storage, air monitoring, and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements, and all equipment, material and labor necessary for the daily collection of the blast debris into specified containers; and any measures

necessary to ensure conformance to all safety and environmental regulations as directed by the Engineer.

Painting Containment for Bridge #500051 will be paid at the lump sum contract price and will be full compensation for the design, materials, installation, maintenance, and removal of the containment system.

Payment will be made under:

Pay Item	**Pay Unit**
Cleaning and Painting Existing Weathering Steel for Bridge #500051	Lump Sum
Pollution Control	Lump Sum
Painting Containment for Bridge #500051	Lump Sum

SCOPE OF WORK

Bridge #500051: This bridge was built in 2002 and carries NC 50 over I-95. The superstructure consists of 2 continuous spans with 9 lines of steel plate girders @ 2.800m (9'-2 1/4") spacing, except for the 1.220m (4'-0") girder spacing surrounding the staged-construction closure pour. The girders have steel cross frames. The girders have a 1850mm (72.835") web depth, a 300mm (11.811") top flange width, a 300mm (11.811") bottom flange width and 18mm (0.709") bottom flange thickness at End Bent 1, and a 350mm (13.780") bottom flange width and 18mm (0.709") bottom flange thickness at End Bent 2. The bridge has an overall length of 69.789m (228'-11 5/8") from fill face to fill face with a concrete deck and a 23.000m (75'-5 1/2") total deck width. The existing paint system is weathering steel. Each girder is to be cleaned and painted for a distance of 9'-3" from the girder end at End Bent 1 and 9'-3" from the girder end at End Bent 2. The estimated area to be cleaned and painted, including girder ends at each end bent, bearing stiffeners at each end bent, cross frame members and connector plates at each end bent, and pot bearing components at each end bent and interior bent, is **4,335** sq. ft.

ST-54A

45" PRESTRESSED CONCRETE FLORIDA I-BEAMS **(SPECIAL)**

The Contractor shall provide prestressed concrete beams in accordance with the plans and standard specifications.

Measurement and payment will be for the actual number of linear feet of prestressed concrete beams.

Payment will be made under:

45" Prestressed Concrete Florida I-Beams.....Linear Feet

ST-55A

SCOPE OF WORK FOR REHABILITATION OF EXISTING STRUCTURE AT STATION 25+31.59 -Y18- **(SPECIAL)**

This work shall consist of furnishing all labor, equipment, and materials necessary to perform the various bridge rehabilitation activities as directed in the plans. The work includes: removing existing joint seals; partially removing existing bridge deck concrete using scarification methods; performing repairs if necessary in scarified bridge deck area; removing existing sidewalks and Three Bar Metal Rails; removing asphalt pavement on approach slabs in proposed sidewalk areas and preparing approach slab surfaces for proposed sidewalk construction using shotblasting and other appropriate methods; constructing proposed parapets, Two Bar Metal Rails, and sidewalks; cleaning and preparing scarified bridge deck area using shotblasting and other appropriate methods; overlaying prepared bridge deck area with polymer concrete; reconstructing joints and installing backer rod and pourable silicone joint sealant at each joint; grooving polymer concrete bridge deck; applying pavement markings; cleaning and painting existing steel girder ends and steel bearing components; removing debris from and epoxy coating top surface of end bent caps; removing debris from and epoxy coating top surface and side faces of interior bent cap from each outside cap end to adjacent column face, as well as outside end faces; performing waste material disposal; seeding and mulching all grassed areas disturbed. The work also includes all incidental items necessary to complete the project as specified and shown on the plans.

Work will be performed on the existing bridge at the following location:

Johnston County Bridge No. 500051 – On NC 50 over I-95

The Contractor shall provide all necessary access, all traffic control, all staging areas, material storage, waste disposal, environmental controls to limit loss of materials from collection of hydro-demolition water, sawing equipment, chipping equipment, and all else necessary to complete the work.

The Contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated January 2018, except as otherwise specified herein.

ST-56A

REMOVAL OF EXISTING STRUCTURE AT STATION 25+31.59 -Y18- **(SPECIAL)**

Portions of the existing bridge to be removed during rehabilitation include the existing sidewalks, the existing aluminum three bar metal rail systems, and the existing joint seals. These portions of the bridge shall be removed in accordance with the Standard Specifications with the exception of the existing aluminum rail systems.

The existing aluminum rail systems shall be removed and salvaged for the Division of Highways as directed by the Division Bridge Maintenance Engineer. The salvaged aluminum rail systems shall be delivered by the Contractor to the Johnston County Bridge Maintenance Office located at 2861 US 70 West in Smithfield, North Carolina, 27577. Upon delivery NCDOT Bridge Maintenance forces will unload the material. Four days prior to delivery of the material, the Contractor shall notify Bridge Maintenance Supervisor Neil Godwin at (919) 223-3293. Furthermore, the Contractor shall schedule the delivery on a Monday through Thursday.

No separate measurement will be made for this work and the entire cost of this work shall be included in the lump sum contract price bid for "Removal of Existing Structure at Station 25+31.59 -Y18-".

ST-57A

EPOXY COATING AND DEBRIS REMOVAL (SPECIAL)

GENERAL

This work applies to all bents and end bents of all bridges throughout the project as noted in the plans. Pressure wash, clean and epoxy coat top of the all bent and end bent caps under open joints and at the expansion joints of steel girder spans after painting of all girders is concluded.

Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Use a Type 4A flexible and moisture insensitive epoxy coating in accordance with Section 1081 of the *Standard Specifications*. Provide a Type 3 material certification in accordance with Article 106-3 showing the proposed epoxy meets Type 4A requirements.

SURFACES

Apply the epoxy protective coating to the top surface area, including chamfer area of bent caps under open joints and expansion joints of the steel girder spans, excluding areas under elastomeric bearings.

Thoroughly clean all dust, dirt, grease, oil, laitance and other objectionable material from the concrete surfaces to be coated. Air blast all surfaces immediately before applying the protective coating.

Use only cleaning agents preapproved by the Engineer.

APPLICATION

Apply epoxy protective coating only when the air temperature is at least 40°F and rising, but less than 95°F and the surface temperature of the area to be coated is at least 40°F. Remove any excess or free-standing water from the surfaces before applying the coating. Apply one coat of epoxy protective coating at a rate such that it covers between 100 and 200 sf/gal.

Under certain combinations of circumstances, the cured epoxy protective coating may develop an oily condition on the surface due to amine blush. This condition is not detrimental to the applied system.

Apply the coating so the entire designated surface of the concrete is covered and all pores are filled. To provide a uniform appearance, use the exact same material on all visible surfaces.

BASIS OF PAYMENT

Epoxy Coating will be measured and paid for by the contract unit price per square foot and shall be full compensation for furnishing all material, labor, tools and equipment necessary for

ST-58A

cleaning and coating the tops of bent caps. Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Pay Item	Pay Unit
Epoxy Coating	Square Feet

ST-59A

POURABLE SILICONE JOINT SEALANT (SPECIAL)

SEALS

Provide and install a low modulus silicone sealant (non-sag or self-leveling) and backer rod which conforms to the *Standard Specifications* (Subsections 1028-3 and 1028-4, respectively) and this special provision. Use silicone approved for use on joint openings as indicated on project plans and provide a seal with a working range of minimum 50% compression and extension. Silicone joint seal product shall be designated as approved for use on the NCDOT Approved Products List. If non-sag and self-leveling sealants are to be in contact with each other, they shall be from the same manufacturer and shall be compatible for such use.

SAWING THE JOINT

Joint concrete material or joint concrete header material shall have sufficient time to cure such that no damage can occur to the concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved flowable, non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two (2) passes of the saw by placing and spacing two (2) metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus ¼ " above the top of the seal plus approximately 1" below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a ¼ " chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

PREPARATION OF FORMED OR SAWED JOINT FOR SEAL INSTALLATION

Joint concrete material or joint concrete header material shall cure a minimum of 24 hours prior to seal installation.

After forming or sawing the joint, the Engineer will thoroughly inspect the joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal, at no cost to the Department.

Clean the joints by sandblasting the joint opening to provide a firm, clean joint surface free of curing compound, loose material, and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the polyester polymer concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle, or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners. If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast-cleaned surface and remove any traces of oil, grease, or smudge deposited in the cleaning operations.

Apply recommended primer in accordance with the manufacturer's recommendations. Uniformly coat the entire surface. Over application may affect adhesion. Allow to thoroughly dry before installing backer rod and sealant.

Install a circular backer rod that is a minimum 25 percent oversized into the joint approximately 1 in. below the surface. The backer rod shall be sized according to the manufacturer's recommendation for the size of the joint to be sealed as measured by the Contractor. If two (2) pieces must be joined, abut the two (2) ends and tape them together to prevent sealant run down. The backer rod may be installed by hand, but roller device shall be used to insure a consistent, uniform placement at the proper depth below the top surface.

Install the backer rod and silicone sealant in the blast-cleaned opening on the same day the surface is blast cleaned.

SEAL INSTALLATION

Install the silicone joint sealant(s) as indicated on the plans, in accordance with the manufacturer's procedures and recommendations, and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project, to provide guidance for the proper installation of the silicone joint sealant(s).

The sealant must be recessed a minimum ½ in. below the pavement surface to prevent traffic abrasion or snow plow damage.

After a joint has been sealed, remove excess joint sealer on the pavement or bridge deck concrete as soon as possible.

The installed system shall be watertight and will be monitored until final inspection and approval.

Do not place pavement markings on top of pourable joint seals.

(A) Watertight Integrity Test

(1) Upon completion of each pourable silicone joint, 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 six (6) inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.

(2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of five (5) hours. At the conclusion of the test, the

underside of the joint is closely examined for leakage. The strip seal expansion joint 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 considered a sign of leakage.

(3) 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.

(4) 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 additional cost to the Department.

BASIS OF PAYMENT

Pourable Silicone Joint Sealant will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for furnishing all material, including backer rod, labor, tools, and equipment necessary for installing these seals in place and accepted.

Pay Item	Pay Unit
Pourable Silicone Joint Sealant	Linear Feet

ST-62A

POLYMER CONCRETE BRIDGE DECK OVERLAY (SPECIAL)

DESCRIPTION

This work consists of furnishing and placing a Polymer Concrete (PC) overlay system with a resin primer on concrete surfaces. The surface of the concrete shall be prepared and the PC overlay system shall be applied in accordance with this special provision in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans or as approved by the Engineer. Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

The Contractor shall select one of the PC overlay systems below:

(A) Polyester Polymer Concrete (PPC) with a High Molecular Weight Methacrylate (HMWM) resin primer.
(B) Epoxy Polymer Concrete (EPC) with an epoxy resin primer.

Work includes: placement of resin primer; placement of PC surface patching and/or overlay; and any incidentals necessary to complete the project as specified or as shown on the plans.

The System Provider is the manufacturer that will provide the PC system for the PC overlay. The System shall include the necessary and appropriate PC components, as well as the necessary and appropriate resin primer components. Contractor shall not change System Provider during project, without approval from the Engineer.

QUALIFICATIONS AND SUBMITTALS

The Contractor shall submit the following requested items and any other relevant documents at least two (2) weeks prior to the PC Overlay Pre-placement Conference. These submittals are for approval and shall be directed to the Engineer.

(A) Overlay System: The Contractor shall submit two (2) copies of the System Provider's material information, written installation instructions, safety data sheets, and independent test results for approval.

(B) System Provider Qualifications: The Contractor shall install an overlay system with all components provided through a single System Provider with documented experience successfully supplying at least five (5) PC overlay projects of similar size and scope installed within the past five (5) years. The Contractor shall submit documentation of the System Provider's project experience including the following:

(1) Project Location.
(2) Owner Agency.
(3) Project construction date.
(4) Overlay quantities.
(5) Reference name and contact information for owner representative.

(C) Contractor Qualifications: The Contractor shall submit documentation of successful North Carolina projects placing structural concrete bridge decks, modified concrete bridge deck overlays, or PC overlay systems to finished grade using similar equipment as specified herein within the past five (5) years. A minimum of two (2) employees on site must have the equivalent work experience qualifications of the Contractor The documentation of Contractors qualifications shall include the following:

(1) Project Location.
(2) Owner Agency.
(3) Project construction date.
(4) Overlay quantities.
(5) Reference name and contact information for owner representative.

(D) System Provider Technical Representative Qualifications: The System Provider Technical Representative shall be an employee of the PC overlay system manufacturer, have a minimum of five (5) years of experience with PC overlay systems, and be completely competent in all aspects of the work, including surface preparation, mixing, placement, curing, and testing of the PC overlay system. The Technical Representative shall have experience on a minimum of five (5) successful projects of similar size and scope. The Contractor shall submit documentation of the System Provider Technical Representative's experience including the following:

(1) Years of Experience with PC overlay systems
(2) Project location
(3) Project construction date
(4) Overlay quantities
(5) Reference name and contact information for owner representative

The Technical Representative shall be available on site, for a minimum of three (3) days per project, to give the installer advice and guidance on the installation of PC overlay systems. This includes, but is not limited to: deck concrete surface preparation, PC overlay materials, PC overlay application, PC overlay curing or any time there are questions or issues that may arise. The Technical Representative shall be on site for the first PC overlay placement and shall remain on site until the Engineer is satisfied with the PC overlay preparation, placement, and finishing operations.

(E) Overlay Placement Plan: The Contractor shall submit an Overlay Placement Plan that includes the following:

(1) Schedule of overlay work and testing for each bridge.
(2) Anticipated concrete deck repair locations and repair method.
(3) Staging plan describing overlay placement sequence including:
  (a) Construction joint locations. Longitudinal construction joints between passes shall be located along the centerline of travel lanes or edge of travel lanes.
  (b) Sequence of placement.
  (c) Placement widths.
  (d) Anticipated placement lengths.
  (e) Placement direction.
  (f) Joint locations.
  (g) Location of proposed trial overlay(s).
(4) Description of equipment used for:
  (a) Surface preparation including grinding and shotblasting.
  (b) Applying resin primer.
  (c) Measuring, mixing, placing, and finishing the PC overlay.
  (d) Applying surface finish sand.
(5) Method of protecting and finishing inlets and bridge drains.

(6) Method for isolating expansion joints.
(7) Method for measuring and maintaining overlay thickness and profile.
(8) Cure time for PC overlay.
(9) Storage and handling of resin primer and PC overlay components.
(10) Procedure for disposal of excess resin primer, PC overlay materials, and containers.
(11) Procedure for cleanup of mixing and placement equipment.

(F) Equipment: The Contractor shall submit documentation of current certification that mixing equipment has been calibrated (Caltrans California test CT 109 or similar accepted). The Contractor shall submit a documented history of the use of the placement equipment to successfully place PC overlays on bridge projects for review and approval by the Engineer.

MATERIALS

The Polymer Concrete shall consist of a resin binder and aggregate as specified below. It shall also include a compatible primer which when mixed with other specified ingredients and applied as specified herein, is capable of producing a Polymer Concrete meeting the requirements of this specification.

(1) Verification. The Contractor shall submit a Certified Test Report from independent labs for all of the materials associated with the PC overlay in accordance with this special provision.
(2) Packaging and Shipment. All components shall be shipped in strong, substantial containers, bearing the manufacturer's label specifying batch/lot number, brand name, and quantity. If bulk resin is to be used, the contractor shall notify the Engineer in writing ten (10) working days prior to the delivery of the bulk resin to the job site. Bulk resin is any resin that is stored in containers in excess of 55 gallons.
(3) Sampling. NCDOT reserves the right to retain and test samples of components of the PC overlay system. This includes requiring submittal of samples prior to the first installation or on-site sampling during construction.

Only use materials that are specified for the selected PC overlay system. Mixing materials from different PC overlay systems shall not be permitted.

(A) Polyester Polymer Concrete (PPC) materials shall consist of a polyester resin binder, a High Molecular Weight Methacrylate (HMWM) primer, and aggregate.

(1) Polyester Resin Binder: Polyester resin binder shall have the following properties:
(a) Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
(b) Contain at least 1 percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
(c) Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
(d) Meet the required values for the material properties shown in Table 1, below.

Accelerators or inhibitors may be required to achieve proper setting time of PPC. They shall be used as recommended by the overlay System Provider.

Table 1
POLYESTER RESIN BINDER PROPERTIES (PPC ONLY)
(Each lot sent to job shall be tested)

Property	Test Method	Requirement
Viscosity*	ASTM D 2196	75 – 200 cps (RVT No.1 Spindle, 20 RPM at 77 °F)
Specific Gravity*	ASTM D 1475	1.05 to 1.10 at 77 °F
Elongation	ASTM D 638	35 percent, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D 638	2,500 psi, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70
* Test shall be performed before adding initiator.		

(2) High Molecular Weight Methacrylate (HMWM) Primer: Primer for the substrate concrete surface shall be a wax-free, low odor, high molecular weight methacrylate primer, and consist of a resin, initiator, and promoter. The primer shall conform to requirements indicated in Table 2, below, and all components shall be supplied by the System Provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed with the peroxide directly; a VIOLENT EXOTHERMIC REACTION will occur. The containers and measuring devices shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 2
HMWM PRIMER PROPERTIES (PPC ONLY)
(Tested yearly)

Property	Test Method	Requirement
Viscosity**	ASTM D 2196	25 cps maximum (Brookfield RVT with UL adapter, 50 RPM at 77 °F)
Volatile Content**	ASTM D 2369	30 percent, maximum
Specific Gravity**	ASTM D 1475	0.90 minimum at 77 °F
Flash Point	ASTM D 3278	180 °F minimum
Vapor Pressure**	ASTM D 323	1.0 mm Hg, maximum at 77 °F
PCC Saturated Surface-Dry Bond Strength (Adhesive)	California Test 551, part 5	700 psi, minimum at 24 hours and 70 ± 1°F (with PPC at 12% resin content by weight of the dry aggregate), primed surface
**Test shall be performed before initiator is added		

(B) Epoxy Polymer Concrete (EPC) materials shall consist of an epoxy resin binder/primer and aggregate.

(1) Epoxy Resin Binder/Primer: Epoxy resin binder/primer shall have the following properties:
(a) Be a low viscosity epoxy resin. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
(b) Be 100% solids epoxy.
(c) Be a two-part, low modulus epoxy resin.
(d) Be moisture insensitive.
(e) Meet the required values for the material properties shown in Table 3, below.

Accelerators or inhibitors may not be used to achieve proper setting time of EPC.

Table 3
EPOXY RESIN BINDER/PRIMER PROPERTIES (EPC ONLY)
(Each lot sent to job shall be tested)

Property	Test Method	Requirement
Viscosity*	ASTM D 2196	75 – 150 cps (RVT No.1 Spindle, 20 RPM at 77 °F)
Specific Gravity*	ASTM D 1475	1.05 to 1.08 at 77 °F
Elongation	ASTM D 638	55 percent, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D 638	2,800 psi, minimum Type I specimen, thickness 0.25 ± 0.03" at Rate = 0.45 inch/minute.
	ASTM D 618	Sample Conditioning: 18/25/50+5/70

(C) Aggregates: PC overlay aggregate shall be used for PPC and EPC and have the following properties:
(1) No more than 45 percent crushed particles retained on the No. 8 sieve when tested in accordance with American Association of State Highway and Transportation Officials (AASHTO) Test Method T335.
(2) Fine aggregate consists of natural sand only.
(3) Weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85.
(4) At the time of mixing with resin, have moisture content of not more than one-half (½) of the weighted-average aggregate absorption when tested under AASHTO Test Method T255.
(5) Moh's hardness of seven (7) or greater.
(6) Comply with the requirements for the aggregate gradation indicated in Table 4, below:

Table 4
AGGREGATE GRADATION
(Tested yearly)

Sieve Size	Percent Passing
3/8"	100
No. 4	60-85
No. 8	55-65
No. 16	29-50
No. 30	16-36
No. 50	5-20
No. 100	0-7
No. 200	0-3

(D) Sand/Fine Aggregate: Sand or fine aggregate for an abrasive finish shall be used for PPC and EPC and have the following properties:

(1) Commercial-quality blast sand.
(2) Not less than 95 percent pass the No. 8 sieve and not less than 95 percent retained on the No. 20 sieve when tested under AASHTO Test Method T27.
(3) Shall be dry at the time of application.

(E) Composite system: The composite PC overlay system shall have the following properties indicated in Table 5, below:

Table 5
COMPOSITE PROPERTIES
(Tested every 2 years)

Property	Test Method	Requirement
PCC Saturated Surface Dry Bond Strength	CT 551	500 psi minimum at 24 hrs. and 70° F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen)
Abrasion Resistance	CT 550	< 2g weight loss (at 12% resin content by weight of the dry aggregate)
Modulus of Elasticity	ASTM C 469	1,000,000 psi to 2,000,000 psi (at 12% resin content by weight of the dry aggregate)

CONSTRUCTION REQUIREMENTS

(A) PC Overlay Pre-placement Conference: A Pre-placement Conference shall be held before any overlay operations begin. Attendees shall include representatives from all parties involved in the work. If necessary, teleconferencing of attendees may be approved by the Engineer.

(B) PC Overlay Placement Notice: Contractor shall provide a minimum 48 hours notice to the Engineer, prior to placement of PC overlay on any structure.

(C) Trial Application: Prior to constructing the overlay, one or more trial applications shall be placed on a previously constructed concrete base to demonstrate proper initial set time and the

effectiveness of the mixing, placing, and finishing equipment proposed. The set time can be determined as the time elapsed from resin catalyzation until the in-place PC trial application cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Each trial application shall be the planned paving width, at least ten (10) feet long, and have the same thickness as the specified overlay. Conditions during the construction of the trial application(s) and equipment used shall be similar to those to be used for construction of the overlay. The location of the trial application(s) shall be approved by the Engineer. Trial applications shall be properly disposed of off-site by the Contractor, if removal is necessary.

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency to perform the work. However, the installer or proposed equipment/techniques may be rejected if not shown to be acceptable after three (3) trials.

Overlay direct tension bond testing shall be performed in accordance with Section (F)(1) of this special provision. Acceptable test results shall be achieved on a trial application before the installation may proceed.

(D) Equipment: All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations, as approved by the Engineer prior to commencement of any work.

(1) Surface Preparation Equipment: Provide appropriate scarifying, shotblasting, sandblasting and other equipment to adequately prepare the bridge deck substrate, as required in the Overlay Surface Preparation for Polymer Concrete special provision.

(2) Mixing Equipment: A continuous automated mixer shall be used for all PC overlay applications. The continuous mixer shall:

(a) Employ an auger screw/chute device capable of sufficiently mixing catalyzed resin with dry aggregate.

(b) Employ a plural component pumping system capable of handling binder resin and catalyst while maintaining proper ratios to achieve set/cure times within the specified limits. Catalyzed resin shall flow through a static mix tube for sufficient duration to completely mix the liquid system.

(c) Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every five (5) minutes, including time and date. Submit recorded volumes at the end of the work shift to the Engineer.

(d) Have a visible readout gage that displays volumes of aggregate and resin being recorded.

(e) Produce a satisfactory mix consistently during the entire placement.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the System Provider and approved by the Engineer, may be used for all PC patching applications and for smaller area overlay applications if approved by the Engineer.

(3) Finishing Equipment: Finishing may be accomplished with a Self-Propelled Slip-Form Paving Machine or Vibratory Screed.

(a) Self-Propelled Slip-Form Paving Machine: A self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PC overlay in a manner

that meets the objectives and requirements of the project, may be used for PC overlay applications. The paving machine shall:

(i) Employ a vibrating pan to consolidate and finish the PC overlay.
(ii) Be fitted with hydraulically controlled grade automation to establish the finished profile. The automation shall be fitted with substrate grade averaging devices on both sides of the new placement; the device shall average 15 feet in front and behind the automation sensors; or the sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PC.
(iii) Be calibrated for the projects requirements, and calibrated periodically following the manufacturers recommendations.
(iv) Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.
(v) Be capable of both forward and reverse motion under its own power.

(b) Vibratory Screed: A vibratory screed may be used for finishing the PC overlay, but must be approved by the Engineer at least two (2) weeks prior to PC overlay placement.

(D) Concrete Deck Repairs and Surface Preparation: All areas that require removal of existing patches or unsound concrete shall be removed and prepared in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision. Placement of concrete for deck repair material shall be Polymer Concrete in accordance with this special provision. Prepare all concrete deck and repaired deck surfaces in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision.

(E) Application of Overlay: Methods indicated in this special provision are typical of general installations and may be modified per the System Provider's recommendations as approved by the Engineer. The application of the overlay shall not begin until the concrete deck is completely surface dry in accordance with ASTM D4263, with a wait time revised from 16 hours to two (2) hours, or as directed by the System Provider's Technical Representative. Prior to overlay application, the concrete surface temperature shall be within the specified temperature ranges below. Night work may be required when temperatures cannot be met during the day.

(a) For PPC overlays, the concrete surface temperature shall be between 40° and 100° F.
(b) For EPC overlays, the concrete surface temperature shall be between 60° and 90° F.

During overlay application, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer.

During overlay application, the Contractor shall provide suitable coverings (e.g. heavy duty drop cloths) as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from this application shall be cleaned and/or repaired to the Engineer's satisfaction at no additional cost to the Department.

(1) Primer Application: Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and are dry, primer shall be applied in accordance with the System Provider's recommendations. Primer shall be placed within five (5) minutes of mixing at approximately 90-100 ft^2/ gal or the rate acceptable to the Engineer.

Primer shall be applied by flooding and uniformly spread to completely cover surfaces to receive overlay. Care shall be taken to avoid heavy application that results in excess ponding. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas that appear dry prior to overlay placement.

Primer shall not be allowed to leak onto areas that have not received surface preparation.

(2) PC Overlay Application: The PC overlay shall be applied during the interval between 15 minutes and two (2) hours after the primer has been applied. The PC overlay shall be placed prior to gelling and within 15 minutes following addition of initiator, unless otherwise recommended by the System Provider's Technical Representative.

The resin binder shall be initiated and blended completely. Aggregate shall be added and mixed sufficiently when a portable mechanical mixer is used.

The set time can be determined in the field when the in-place PC application cannot be deformed by pressing with a finger, indicating that the resin binder is no longer in a liquid state.

(a) When using PPC, the initial set time shall be at least 30 minutes and at most 90 minutes. If the PPC initial set is not within 30 to 90 minutes, the material shall be removed and replaced.
(b) When using EPC, the initial set time shall be at least 30 minutes and at most 180 minutes. If the EPC initial set is not within 30 to 180 minutes, the material shall be removed and replaced.

The overlay shall be consolidated and finished to the required grade and cross-section using PC placement equipment as defined herein.

If a vibratory screed is used, prior to placing the PC overlay, place and fasten screed rails in position to ensure finishing the new surface to the required profile. Do not treat screed rails with parting compound to facilitate their removal. Prior to placing the overlay, attach a filler block to the bottom of the screed and pass it over the overlay area to check the thickness. The filler block thickness shall be equal to the design overlay thickness as shown in the plans. Remove all concrete that the block does not clear.

Place the PC overlay in one operation. Provide a minimum overlay thickness as shown in the plans.

Although the paver or screed may yield a finished or nearly finished surface, additional finishing may be necessary. The PC overlay shall be finished, as necessary, through traditional concrete finishing methods, producing a slight resin bleed indicating complete consolidation of aggregates.

Finishing of Polymer Concrete used as patching of an existing deck surface or overlay shall be completed and finished using traditional concrete hand finishing methods and hand concrete finishing tools. Such patches shall be placed flush with the top of the existing deck surface.

Resin content shall be as specified in the Materials section of this special provision and to yield a Polymer Concrete consistency that requires surface applied consolidation and finishing to consolidate aggregates and yield a slight sheen of bleed resin on top surface, yet does not yield excess bleed resin.

A surface friction sand finish of at least 2.2 lbs/ yd^2 shall be broadcast onto the glossy surface immediately after sufficient finishing and before resin gelling occurs. To ensure adequate pavement friction, the completed PC overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Any such surface defects shall be repaired by the Contractor in the manner recommended by the System Provider and approved by the Engineer at no additional cost to the Department.

All final edges of PC overlay not adjacent to barrier rail, parapet, or bridge deck joints shall be finished neat, straight, and square, unless otherwise noted on project plans or approved by the Engineer.

Unless otherwise indicated on the plans, groove the deck surface in accordance with Subarticle 420-14(B) of the *Standard Specifications*. Vehicular traffic may travel across a deck surface that has not been grooved; however, the entire deck area shall be grooved after the PC overlay achieves design strength and no later than seven (7) calendar days after completion of the overlay unless otherwise approved by the Engineer.

Before completion of the project, all deck joints shall be sawcut, prepared, and sealed according to the details in the plans.

After the PC material has set, if final sawcutting for joint seals will not be done within 12 hours, at minimum, a single sawcut shall be made at the approximate midpoint of each joint. The sawcut shall be made within 12 hours or prior to opening of PC placement to traffic, if traffic will be allowed within 12 hours. Two (2) saw cuts may be made, but final saw cutting for the joints shall be done in accordance with the special provisions for the installation of the joint seals.

Any surface that is scarified shall be covered with the PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer.

Upon approval by the Engineer, if traffic is to be returned to the site, but the overlay is not completed within the allowable lane closure time and is more than ¾ inch higher in elevation than the adjacent pavement, the PC overlay edges shall be tapered. The leading edge of the overlay shall be tapered at a 4:1 (horizontal: vertical) slope. Tapered edges longitudinal to the direction of traffic and tapered edges on the trailing edge of the overlay and shall be at a 45 degree slope. Tapers of 45 degrees may remain, and PC overlay may be placed adjacent. Tapers with a 4:1 (horizontal: vertical) slope shall be sawcut square to the overlay surface, prior to placing adjacent PC overlay.

The Contractor shall collect a ticket for each pass or portion of a pass that is provided by each mixer, and ensure that the following information is shown on each ticket:

(a) Project Number.
(b) Bridge Number.
(c) Date and Time.

(d) Location of Placement (Lane and Station Limits or location and length of placement along the length of the bridge).
(e) Aggregate Weight.
(f) Resin Binder Weight.

The tickets shall be available on site for Inspection personnel to use in tabulating quantities.

Curing: The Contractor shall allow the overlay to cure sufficiently before subjecting it to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures as well as initiator/accelerator levels.

The overlay shall be considered cured to a traffic ready state when a minimum reading of 25 on a properly calibrated Swiss hammer is achieved. Other rebound hammers may be use as approved by the Engineer.

(F) Acceptance Testing: Acceptance of the deck repairs, surface preparation, and PC overlay will be determined by the Engineer based on direct tension bond testing, and smoothness quality testing performed by the Engineer, assisted by the Contractor.

(1) Overlay Direct Tension Bond Testing: Direct tension bond (pull-off) tests shall be performed after 24 hours by the Contractor in accordance with ASTM C1583. At a minimum, three (3) direct tension bond tests shall be performed on each bridge overlay. For bridges with deck areas greater than 25,000 square feet, additional tests shall be performed at a frequency of one test per 25,000 square feet of additional deck area, rounded up. Additional testing may be required as directed by the Engineer.

The test result shall be the average of the tests for each structure. Test cores shall be drilled a minimum of ½" below the bond line.

The average minimum bond strength of the PC overlay system on normal weight concrete shall be 250 psi, with no individual test measured below 225 psi. An acceptable test will demonstrate that the overlay bond strength is sufficient, or by producing a concrete subsurface failure area greater than 50% of the test surface area. The Contractor shall repair all direct tension test locations with PC overlay in accordance with this special provision.

Direct tension bond testing shall be performed by an independent testing firm and shall be arranged by the Contractor. The Contractor may perform the direct tension bond testing with the approval of the Engineer. Testing shall be performed using a calibrated tensile loading device, in the presence of the Engineer. The tensile loading device shall be calibrated annually. The cost of direct tension bond testing shall be included in the bid price for *Placing and Finishing PC Overlay* item.

(2) Smoothness Quality Testing: As soon as practical after the PC overlay has hardened sufficiently, the Contractor shall test the finished surface with an approved rolling straightedge that is designed, constructed, and adjusted, so that it will accurately indicate or mark all deck areas which deviate from a plane surface by more than ⅛" in 10'. The Contractor shall remove all high areas in the hardened surface in excess of ⅛" in 10' with an approved grinding or cutting machine. Any fins or other protrusions remaining after grinding operations shall be removed to the satisfaction of the Engineer. Additionally, the final PC deck surface shall not deviate from the line and elevation indicated on the plans by more than 0.3" over any 50' length. If approved by the Engineer, correct low areas in an acceptable manner.

(G) Corrective Work

(1) Repair of Surface Defects: The repair materials and finishing methods for surface defects in the overlay shall be in accordance with those used for the application of the overlay. All surface defects shall be repaired to the satisfaction of the Engineer before acceptance of the work is made.

(2) Correction for Smoothness: Areas showing high spots of more than ⅛"in 10' shall be marked and ground until the high spot does not exceed ⅛"in 10'. Ground surface may be sawcut grooved to restore the texture if ordered by the Engineer. Areas showing low spots of more than ⅛"in 10' shall be marked and a proposed repair procedure shall be submitted to the Engineer. The use of the proposed repair procedure shall be as recommended by the System Provider and approved by the Engineer.

(3) Replacement of Defective Overlay: A defective overlay, or portion thereof, resulting in failing overlay pull bond test results shall be removed and replaced at the Contractor's expense. The Contractor shall submit a written corrective work proposal to the Engineer, which shall include the methods and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer. The Engineers approval shall not relieve the Contractor of the responsibility of producing work in conformity with the Contract.

(4) Repair of Cracking: After a one-week cure period, if cracks are in the overlay, the Contractor shall fill the cracks with properly catalyzed and mixed primer material at no cost to the Department. Care shall be taken to fill the cracks only and ensure minimal primer material is left on the finished surface of the overlay.

MEASUREMENT AND PAYMENT

Concrete Deck Repair for PC Overlay will be measured and paid for at the contract unit price bid per square yard and will be full compensation for placement of concrete deck repair material and shall include the cost of labor, tools, equipment and incidentals necessary to complete the work.

Placing and Finishing PC Overlay will be measured and paid for as the contract unit price bid per square yard of overlay placement and final surface finishing. Payment will be full compensation for all labor, equipment, and all incidentals necessary to complete the PC overlay placement. Construction and removal (if required) of trial application(s), including concrete base surfaces, will not be measured and paid for separately, but shall be incidental to complete the work. Tining of bridge deck, if used, will be incidental to this pay item.

Grooving Bridge Floors will be measured and paid in accordance with Article 420-21 of the *Standard Specifications.*

Only one of the following pay items shall be used for materials, dependent on the PC overlay system used.

(A) *Polyester Polymer Concrete Materials* will be measured as the actual volume of PPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of PPC produced, shall be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the

permanent overlay. *Polyester Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the PPC material, including HMWM primer, freight to the project site, receiving, storage, and disposal of any unused PPC overlay material. Payment by cubic foot will be based on a 135 lbs/ ft^3 unit weight and quantities recorded by calibrated mixer unit readouts.

(B) *Epoxy Polymer Concrete Materials* will be measured as the actual volume of EPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of EPC produced, shall be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the permanent overlay. *Epoxy Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the EPC material, including epoxy primer, freight to the project site, receiving, storage, and disposal of any unused EPC overlay material. Payment by cubic foot will be based on a 135 lbs/ ft^3 unit weight and quantities recorded by calibrated mixer unit readouts.

Payment will be made under:

Pay Item	**Pay Unit**
Concrete Deck Repair for PC Overlay	Square Yard
Placing & Finishing PC Overlay	Square Yard
Grooving Bridge Floors	Square Feet
Polyester Polymer Concrete Materials	Cubic Yard
Epoxy Polymer Concrete Materials	Cubic Yard

ST-75A

OVERLAY SURFACE PREPARATION FOR POLYMER CONCRETE (SPECIAL)

DESCRIPTION

This special provision addresses the surface preparation activities required prior to the placement of polymer concrete (PC). Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

Work includes: removal of unsound and sound bridge deck concrete and existing patches in deck repair areas; preparation of repair areas prior to placement of PC bridge deck repair material; bridge deck surface preparation prior to placement of PC overlay; and any incidentals necessary to prepare the bridge deck for placement of PC repair material or PC overlay, as specified or as shown on the plans.

DEFINITIONS

Scarification shall consist of the removal of any asphalt wearing surface and concrete surface to the uniform depth and limits shown on the plans.

Shotblasting shall consist of steel beads (or other materials as approved by the Engineer) "shot" out of a machine onto the bridge concrete deck concrete floor to remove soft or deteriorated concrete, and to clean the concrete deck surface for the application of the PC overlay. Contractor shall vary the speed of the shotblaster or make multiple passes, as necessary, to achieve the required surface preparation for the PC overlay. Areas inaccessible with shotblasting equipment may require surface preparation with sandblasting equipment and hand equipment.

EQUIPMENT

All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations, as approved by the Engineer prior to commencement of any work:

(A) Scarifying equipment that is a power-operated, mechanical grinder capable of removing a minimum depth of ¼" for each pass.

(B) Shotblasting and sandblasting equipment to adequately prepare the bridge deck substrate, as required in this special provision. Provide equipment to supply oil-free and moisture-free compressed air for final surface preparation.

(C) Equipment capable of sawing concrete to the specified plan depth.

(D) Power driven hand tools for removal of unsound concrete are required that meet the following requirements:

(1) Pneumatic hammers weighing a nominal 15 lbs. or less.

(2) Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width.

(E) Hand tools, such as hammers and chisels, for removal of final particles of unsound concrete.

(F) Self-propelled vacuum capable of picking up dust and other loose material from prepared deck surface.

(G) Equipment to supply oil-free and moisture-free compressed air for final surface preparation.

The equipment must operate at a noise level less than 90 decibels at a distance of 50 feet.

MANAGEMENT AND DISPOSAL OF CONCRETE DEBRIS

All concrete debris shall become the property of the Contractor. The contractor shall be responsible for disposing of all debris generated by scarification, shotblasting, sandblasting, and any other surface preparation operations, in compliance with applicable regulations concerning such disposal.

All costs associated with management and disposal of all debris shall be included in the payment of other items.

OSP PLAN SUBMITTAL

Prior to beginning surface preparation activities, the Contractor shall submit for review and approval the Overlay Surface Preparation (OSP) Plan. The OSP Plan shall detail the type of equipment that is intended to be used and the means by which the Contractor will achieve the following requirements:

(A) Estimate depth of reinforcing steel.

(B) Scarification of deck to depth required.

(C) Measure depth of scarification to show completed within limits.

(D) Measure depth of shotblasting to show completed within limits.

The OSP Plan shall also include a schedule showing lane closures with estimated amount of bridge deck to be scarified, anticipated areas of Class II/III to be repaired and PC to be placed within that lane closure time. The Contractor should assume that any surface that is scarified shall be covered with the proper PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer. The Contractor may propose traffic to be allowed on scarified bridge deck surfaces provided that the surface and joints are found to be structurally sound after scarification and a smooth transition is provided at the leading and trailing ends and throughout the bridge surface. The duration between bridge deck scarification and PC placement shall be specified by the Engineer. The number of bridges, if any, that can be scarified in advance of PC placement shall be specified by the Engineer. Any additional approach work required to provide a smooth transition to the scarified surface before opening to traffic is incidental to the other items of work. The OSP plan shall clearly show the Contractor's intended plan and order of scarifying and placing PC on all bridges with associated timeframes. The OSP plan and associated scarification timeframes must be approved by the Engineer prior to starting any surface preparation operations.

SURFACE PREPARATION

Prior to any construction, take the necessary precautions to ensure debris from bridge deck preparation and repairs is not allowed to fall below the bridge deck.

Remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete to the limits shown on the plans with the following requirements.

During surface preparation, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer. During surface preparation, the Contractor shall provide suitable

coverings, as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from surface preparation shall be repaired to the Engineer's satisfaction at no additional cost to the Department.

(A) Sealing of Bridge Deck: Seal all expansion joints subject to run-off water from the scarification, shotblasting, and PC placement process with material approved by the Engineer, prior to beginning any demolition. The expansion joints shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer. Take all steps necessary to eliminate the flow of water or materials through the expansion joints, and any other locations water or materials could leak from the deck.

All deck drains in the immediate work area and other sections of the bridge affected by the work being performed shall be sealed prior to beginning scarification. Drains shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer.

(B) Scarifying Bridge Deck: Remove any asphalt wearing surface from the bridge deck and scarify the concrete deck to remove the entire concrete surface of the deck to the uniform depth and limits shown on the plans.

It will be the Contractor's responsibility to determine amount of cover for the reinforcing steel. Use a pachometer or other approved device, as approved by Engineer, prior to scarification. Readings shall be read and recorded in the presence of the Engineer. Readings shall be recorded for each span at 1/5 points longitudinally and 1/3 points transversely. The cost for this work will be considered incidental to the cost of surface preparation of the bridge deck.

Estimated average cover to top mat:

Bridge Number 500051: 2½" +/- ½"

The above top mat cover dimensions are an estimate based on the best available information. Calibrate scarifying equipment in order to avoid damaging the reinforcing steel in the bridge floor or the approach slab. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel. If reinforcing bars or bridge drainage devices are pulled up or snagged during scarification operations, cease work and consult with the Engineer to determine any necessary adjustments to the roto-milling operation.

Remove and dispose of all concrete and asphalt, and thoroughly clean the scarified surface. In areas where reinforcing steel is located in the depth to be scarified, use another method with the Engineer's approval.

The Engineer will re-inspect after each removal and require additional removals until compliance with plans and specifications are met.

Regardless of the method of removal, the removal operation shall be stopped if it is determined that sound concrete is being removed to a depth greater than required by the plans.

(C) Class II Surface Preparation (Partial Depth): At locations specified on the plans or identified by the Engineer for Class II Surface Preparation, verify the depth of removal achieved by the scarification. Remove by additional scarification or chipping with hand tools all existing

patches and unsound concrete. No additional payment will be made for Class II Surface Preparation depths achieved by the initial scarification.

All patches shall be removed under Class II Surface Preparation. If any patch cannot be removed by means of scarification, the Contractor shall use hand tools to remove the patch. Areas indicated on the plans that require Class II Surface Preparation, including the locations of existing patches, are from the best information available. The Contractor shall verify prior to surface preparation the location of all existing patches.

Spalled or unsound areas of the deck not removed by scarification shall be removed to sound concrete at locations noted in the contract plans or as directed by the Engineer. Remove existing spalled or unsound areas of the bridge concrete deck by methods approved by the Engineer.

Provide a 1" deep saw cut around the perimeter of areas noted for bridge deck or patch removal. Remove, using the type of tools listed above, all concrete or patch material within the sawcut to a minimum depth of 1" and as necessary to remove unsound concrete. All loose and unsound concrete or patch material shall be removed.

Thoroughly clean the newly exposed surface to be free of all grease, oil, curing compounds, acids, dirt, or loose debris in accordance with this special provision.

Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft^2/ft length of bridge without overhang support is permitted unless the Engineer directs otherwise. Overhang support is required for areas removed greater than 0.60 ft^2/ft length of bridge. Submit details of overhang support to the Engineer for approval prior to beginning the work.

(D) Class III Surface Preparation (Full Depth): At locations specified on the plans or identified by the Engineer for Class III Surface Preparation, remove the concrete by chipping with hand tools the full depth of slab. Dispose of the removed concrete, clean, repair or replace damaged reinforcing steel and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

For areas of less than 3 ft^2, suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

Overhang support is required for full depth removal adjacent to bridge rails. Submit details of overhang support to the Engineer for approval prior to beginning the work.

(E) Preparation of Reinforcing Steel: Remove concrete without cutting or damaging existing steel unless otherwise noted in the plans. Clean, repair, or replace rusted or loose reinforcing steel. Damaged reinforcing steel, such as bars with nicks deeper than 20% of the bar diameter, shall be repaired or replaced. Reinforcing steel which has a cross section reduced to 75% or less shall be replaced with new reinforcing steel of similar cross section area. Replacement bars shall be Grade 60 and meet the material requirements of Section 1070 of the *Standard Specifications.*

Replacement bars shall be spliced to existing bars using either minimum 30 bar diameter lap splices to existing steel with 100% cross sectional area or approved mechanical connectors.

For reinforcing steel left unsupported by the concrete removal process, support and protect the exposed reinforcing steel against displacement and damage from loads, such as those caused by removal equipment and delivery buggies. All reinforcing steel damaged or dislodged by these operations shall be replaced with bars of the same size at the contractor's expense.

Reinforcing steel exposed and satisfactorily cleaned and prepared will not require additional cleaning, if encased in concrete within seven (7) days. Rebar exposed for more than seven (7) days shall be satisfactorily cleaned and prepared, prior to placement of the new concrete. The satisfactory cleanliness and preparation of the reinforcing steel shall be determined by the Engineer.

When large areas of the deck on composite bridges are removed resulting in the debonding of the primary reinforcing bars, the removal shall be performed in stages to comply with the construction sequence shown on the plans or as directed by the Engineer.

(F) Concrete Deck Repair: Repair and fill the Class II Surface Preparation areas of the existing bridge concrete deck prior to the final surface preparation and application of the PC overlay, at locations shown in the plans, or as determined by the Engineer, if necessary. Materials other than PC may be used for concrete deck repairs, but shall be approved by the PC System Provider's Technical Representative and shall be applied and prepared as required by the PC System Provider. For concrete deck repairs with PC:

(1) Removal and surface preparation of the repair area shall be in accordance with and shall be paid for under pay items in this special provision.

(2) Materials, equipment, placement, and finishing of PC used for concrete deck repairs shall meet the requirements of and shall be paid for under pay items in the Polymer Concrete Bridge Deck Overlay special provision.

PC repair material may be placed up to one (1) hour prior to overlay placement.

All repairs shall be placed and finished to match substrate deck grade prior to PC placement, in order to provide a uniform overlay thickness.

Concrete deck repairs with PC may be utilized as a stand-alone item where required on structures not to receive a PC overlay.

(G) Surface Cleaning: The surface of concrete substrate and repaired areas shall be prepared for application of the overlay by shotblasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, curing compound, rust, membrane, weak surface mortar, or any other contaminants that could interfere with the proper adhesion of the overlay system. The final prepared surface shall adhere to the following requirements:

(1) If expansion joints are not being replaced or have been replaced prior to shotblasting they shall be protected from damage from the shotblasting operation. Deck drains and areas of curb or railing above the proposed surface shall be protected from the shotblasting operation.

(2) The areas to receive overlay shall be cleaned by shotblasting, or abrasive sandblasting in the event that the shotblaster cannot access areas to be prepared. Do not begin shotblasting until all grinding or milling operations are completed. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shotblasting unit shall be adjusted, so as to result in all weak or loose surface mortar being removed, aggregates within the concrete being exposed, and open pores in the concrete exposed, as well as a visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the overlay, the Contractor shall shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer at no additional cost to the Department.

(3) Prior to the overlay placement, any loose particles shall be removed by magnets, oil free compressed air, and vacuuming, such that no trapped particles remain. Power washing will not be allowed.

(4) The areas to be overlaid shall be blown off with oil and moisture free compressed air just prior to placement of the primer and shall be completely dry.

(5) Cleaning methods other than those detailed by specification may be suggested by the PC System Provider and approved by the Engineer.

(6) All steel surfaces that will be in contact with the PC overlay shall be cleaned in accordance with Structural Steel Paint Council (SSPC) Surface Preparation (SP) No. 10, Near-White Blast Cleaning, except that wet blasting methods shall not be allowed.

(H) Safety: Provide a containment system for handling expected and unexpected blow through of the deck. The containment system shall retain runoff water and debris and protect the area under the bridge deck. The Contractor shall be responsible for any injury or damage caused by these operations. The containment system shall remain in place until the concrete has been cast and attained minimum strength.

Provide adequate lighting when performing deck preparation activities at night. Submit a lighting plan to the Engineer for approval prior to beginning work.

MEASUREMENT AND PAYMENT

Scarifying Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the milling of existing asphalt wearing surface from the bridge deck and approaches, milling of the entire concrete bridge deck, repairing or replacing any damaged reinforcing steel, and the cleaning and disposal of all waste material generated.

Shotblasting Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the shotblasting and necessary sandblasting and handwork to prepare the entire concrete bridge deck and approaches, and removal and disposal of all waste material generated.

Class II Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class II (partial depth) deck preparation where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete,

removal of all existing patches, cleaning, repairing, or replacing of reinforcing steel, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Class III Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class III (full depth) deck preparation and repair where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete, cleaning, repairing or replacing of reinforcing steel, under deck containment, placing and finishing concrete for full depth repair, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Reinforcing Steel that is required for the repairs will be in accordance with Section 425 of the *Standard Specifications.*

Payment will be made under:

Pay Item	**Pay Unit**
Scarifying Bridge Deck	Square Yard
Shotblasting Bridge Deck	Square Yard
Class II Surface Preparation	Square Yard
Class III Surface Preparation	Square Yard

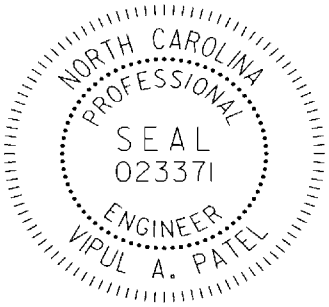
ST-1B

Project I-5883 **Harnett County**

Project Special Provisions
Structures & Culvert

Table of Contents

For "MSE Retaining Walls", see Geotechnical Special Provisions.



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ST-2B

PROJECT SPECIAL PROVISIONS
STRUCTURES AND CULVERT

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURES AT STATIONS 27+09.19 -Y16- & 26+80.73 -Y17- **(8-13-04)**

1.0 GENERAL

Maintain traffic on I-95 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 14'-2" 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.

ST-3B

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

1.0 GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

2.0 MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, 4 inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers

with a middle section consisting of a rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway, and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow 8 inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 "Rigid Nonmetallic Conduit." Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states "Install Print Line Up" to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 "Rigid Nonmetallic Conduit."

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the Standard Specifications.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

3.0 INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the Standard Specifications.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others, and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

4.0 BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for "Electrical Conduit System for Signals at stations 27+09.19 -Y16- & 26+80.73 -Y17-".

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Electrical Conduit System for Signals at stations 27+09.19 -Y16-	Lump Sum
Electrical Conduit System for Signals at stations 26+80.73 -Y17-	Lump Sum

ST-7B

STEEL REINFORCED ELASTOMERIC BEARINGS (6-22-16)

The 2018 Standard Specifications shall be revised as follows:
In **Section 1079-2(A) – Elastomeric Bearings** 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.

ST-8B

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the Thermal Sprayed Coatings (Metallization) Program and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The Thermal Sprayed Coatings (Metallization) Program is available on the Materials and Tests Unit website.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

3.0 MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the Thermal Sprayed Coatings (Metallization) Program. Apply TSC with the alloy to the thickness specified on the plans or as required by Thermal Sprayed Coatings (Metallization) Program.

5.0 INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

6.0 REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the Thermal Sprayed Coatings (Metallization) Program.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic zinc-rich coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

    1. Minor localized areas less than or equal to 0.1 ft^2 with exposed substrate shall be repaired as outlined above for marine and non-marine environments.

    2. Large localized areas greater than 0.1 ft^2 with exposed substrate shall require the Contractor to submit a detailed repair procedure to the Engineer for review and approval.

- Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

7.0 Twelve Month Observation Period

All TSC materials applied under the Thermal Sprayed Coatings (Metallization) Program shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

8.0 Basis of Payment

The contract price bid for the metal component to which the TSC 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.

ST-14B

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.

ST-15B

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'-2 ½" 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.

ST-16B

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.

ST-17B

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.

ST-18B

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.

ST-21B

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

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. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

Submittals may also be made via email.

Send submittals to:

jlbolden@ncdot.gov (James Bolden)

Send an additional e-copy of the submittal to the following address:

eomile@ncdot.gov (Emmanuel Omile)

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. David Hering, L. G., 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. David Hering, L. G., 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

Via Email: EastGeotechnicalSubmittal@ncdot.gov

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail or 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

Via Email: WestGeotechnicalSubmittal@ncdot.gov

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's website, via the "Drawing Submittal Status" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "Geotechnical Construction Submittals" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: James Bolden (919) 707 – 6408
(919) 250 – 4082 facsimile
jlbolden@ncdot.gov

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
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"

ST-24B

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"
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

ST-25B

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.

ST-26B

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]	1 drawings, 1 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	1 drawings, 1 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), 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.

ST-27B

CRANE SAFETY (6-20-19)

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

ST-28B

GROUT FOR STRUCTURES (12-1-17)

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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

ST-29B

ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES (12-30-15)

1.0 INSPECTION FOR ASBESTOS CONTAINING MATERIAL

Prior to conducting bridge demolition or renovation activities, the Contractor shall thoroughly inspect the bridge or affected components for the presence of asbestos containing material (ACM) using a firm prequalified by NCDOT to perform asbestos surveys. The inspection must be performed by a N.C. accredited asbestos inspector with experience inspecting bridges or other industrial structures. The N.C. accredited asbestos inspector must conduct a thorough inspection, identifying all asbestos-containing material as required by the Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants (NESHAP) Code of Federal Regulations (CFR) 40 CFR, Part 61, Subpart M.

The Contractor shall submit an inspection report to the Engineer, which at a minimum must include information required in 40 CFR 763.85 (a)(4) vi)(A)-(E), as well as a project location map, photos of existing structure, the date of inspection and the name, N.C. accreditation number, and signature of the N.C. accredited asbestos inspector who performed the inspection and completed the report. The cover sheet of the report shall include project identification information. Place the following notes on the cover sheet of the report and check the appropriate box:

___ ACM was found
___ ACM was not found

2.0 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

If ACM is found, notify the Engineer. Compensation for removal and disposal of ACM is considered extra work in accordance with Article 104-7 of the Standard Specifications.

An Asbestos Removal Permit must be obtained from the Health Hazards Control Unit (HHCU) of the N.C. Department of Health & Human Services, Division of Public Health, if more than 35 cubic feet, 160 square feet, or 260 linear feet of regulated ACM (RACM) is to be removed from a structure and this work must be completed by a contractor prequalified by NCDOT to perform asbestos abatement. RACM is defined in 40 CFR, Part 61, Subpart M. Note: 40 CFR 763.85 (a)(4) vi)(D) defines ACM as surfacing, TSI and Miscellaneous which does not meet the NESHAP RACM.

3.0 DEMOLITION NOTIFICATION

Even if no ACM is found (or if quantities are less than those required for a permit), a Demolition Notification (DHHS-3768) must be submitted to the HHCU. Notifications and Asbestos Permit applications require an original signature and must be submitted to the HHCU 10 working days prior to beginning demolition activities. The 10 working day period starts based on the post-marked date or date of hand delivery. Demolition that does not begin as originally notified requires submission of a separate revision form HHCU

3768-R to HHCU. Reference the North Carolina Administrative Code, Chapter 10A, Subchapter 41C, Article .0605 for directives on revision submissions.

Contact Information
Health Hazards Control Unit (HHCU)
N.C. Department of Health and Human Services
1912 Mail Service Center
Raleigh, NC 27699-1912
Telephone: (919) 707-5950
Fax: (919) 870-4808

4.0 SPECIAL CONSIDERATIONS

Buncombe, Forsyth, and Mecklenburg counties also have asbestos permitting and NESHAP requirements must be followed. For projects involving permitted RACM removals, both the applicable county and the state (HHCU) must be notified.

For demolitions with no RACM, only the local environmental agencies must be notified. Contact information is as follows:

Buncombe County
WNC Regional Air Pollution Control Agency
49 Mt. Carmel Road
Asheville, NC 28806
(828) 250-6777

Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101
(336) 703-2440

Mecklenburg County
Land Use and Environmental Services Agency
Mecklenburg Air Quality
700 N. Tryon Street
Charlotte, NC 28202
(704) 336-5430

5.0 ADDITIONAL INFORMATION

Additional information may be found on N.C. asbestos rules, regulations, procedures and N.C. accredited inspectors, as well as associated forms for demolition notifications and asbestos permit applications at the N.C. Asbestos Hazard Management Program website:

https://epi.dph.ncdhhs.gov/asbestos/ahmp.html

6.0 BASIS OF PAYMENT

Payment for the work required in this provision will be at the lump sum contract unit price for "Asbestos Assessment". Such payment will be full compensation for all asbestos inspections, reports, permitting and notifications.

ST-1C

Project I-5878 **Harnett County**

Project Special Provisions
Structures & Culverts

Table of Contents

For "MSE Retaining Walls", see Geotechnical Special Provisions.

DocuSigned by:
Vipul A Patel
AC3E8B7A79B544D...

4/27/2021

ST-2C

PROJECT SPECIAL PROVISIONS
STRUCTURES AND CULVERTS

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURES AT STATION 26+05.28 -Y14- & 1002+79.68 -LREV- **(8-13-04)**

1.0 GENERAL

Maintain traffic on I-95 and US 421 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 14'-2" over I-95 and 14'-1" over US 421 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.

ST-3C

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

1.0 GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

2.0 MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, 4 inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers

with a middle section consisting of a rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway, and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow 8 inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 "Rigid Nonmetallic Conduit." Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states "Install Print Line Up" to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 "Rigid Nonmetallic Conduit."

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the Standard Specifications.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

3.0 INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the Standard Specifications.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others, and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

4.0 BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for "Electrical Conduit System for Signals at station 26+05.28 -Y14-".

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Electrical Conduit System for Signals at station 26+05.28 -Y14-	Lump Sum

ST-7C

STEEL REINFORCED ELASTOMERIC BEARINGS (6-22-16)

The 2018 Standard Specifications shall be revised as follows:
In **Section 1079-2(A) – Elastomeric Bearings** 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.

ST-8C

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces in accordance with the Thermal Sprayed Coatings (Metallization) Program and as specified herein when called for on the plans or by other Special Provisions. Use only Arc Sprayed application methods to apply TSC. The Engineer must approve other methods of application.

The Thermal Sprayed Coatings (Metallization) Program is available on the Materials and Tests Unit website.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

3.0 MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Surface preparation of TSC surfaces shall meet the requirements of Section 8 of the Thermal Sprayed Coatings (Metallization) Program. Apply TSC with the alloy to the thickness specified on the plans or as required by Thermal Sprayed Coatings (Metallization) Program.

5.0 INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

6.0 REPAIRS

Perform all shop repairs in accordance with the procedures outlined in the Thermal Sprayed Coatings (Metallization) Program.

Repairs associated with field welding shall be made by removing the existing metallizing by blast or power tool cleaning. Affected areas shall be addressed as follows:

- For Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved epoxy mastic coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

- For Non-Marine Environments, incorporate a minimum surface preparation in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal) and require an approved organic zinc-rich coating applied in accordance with the manufacturer's recommendation. Apply a minimum of two (2) coats at a rate of 5-7 (WFT) per coat to the affected area.

    1. Minor localized areas less than or equal to 0.1 ft^2 with exposed substrate shall be repaired as outlined above for marine and non-marine environments.

    2. Large localized areas greater than 0.1 ft^2 with exposed substrate shall require the Contractor to submit a detailed repair procedure to the Engineer for review and approval.

- Repair methods for areas where the substrate has not been exposed shall be mutually agreed upon between the Contractor and TSC Contractor as approved by the Engineer.

7.0 Twelve Month Observation Period

All TSC materials applied under the Thermal Sprayed Coatings (Metallization) Program shall be evaluated twelve (12) months after project acceptance for defective materials and workmanship.

8.0 Basis of Payment

The contract price bid for the metal component to which the TSC is applied will be full compensation for the thermal sprayed coating.

ELASTOMERIC CONCRETE (2-11-19)

DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate. Provide an elastomeric concrete and binder system that is preapproved. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

MATERIALS

Provide materials that comply with the following minimum requirements at 14 days (or at the end of the specified curing time).

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi	ASTM D695	2000
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength, psi	ASTM D3967	625
Bond Strength to Concrete, psi	ASTM C882 (C882M)	450
Durometer Hardness	ASTM D2240	50

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D638	1000
Ultimate Elongation	ASTM D638	150%
Tear Resistance, lb/in	ASTM D624	200

In addition to the requirements above, the elastomeric concrete must be resistant to water, chemical, UV and ozone exposure and withstand temperature extremes. Elastomeric concrete systems requiring preheated aggregates are not allowed.

PREQUALIFICATION

Manufacturers of elastomeric concrete materials shall submit samples (including aggregate, primer and binder materials) and a Type 3 certification in accordance with Article 106-3 of the *Standard Specifications* for prequalification to:

North Carolina Department of Transportation
Materials and Tests Unit
1801 Blue Ridge Road
Raleigh, NC 27607

Prequalification will be determined for the system. Individual components will not be evaluated, nor will individual components of previously evaluated systems be deemed prequalified for use.

The submitted binder (a minimum volume of 1 gallon) and corresponding aggregate samples will be evaluated for compliance with the Materials requirements specified above. Systems satisfying all of the Materials requirements will be prequalified for a one year period. Before the end of this period new product samples shall be resubmitted for prequalification evaluation.

If, at any time, any formulation or component modifications are made to a prequalified system that system will no longer be approved for use.

INSTALLATION

The elastomeric concrete shall not be placed until the reinforced concrete deck slab has cured for seven (7) full days and reached a minimum strength of 3,000 psi.

Provide a manufacturer's representative at the bridge site during the installation of the elastomeric concrete to ensure that all steps being performed comply with all manufacturer installation requirements including, but not limited to weather conditions (ambient temperature, relative humidity, precipitation, wind, etc.), concrete deck surface preparation, binder and aggregate mixing, primer application, elastomeric concrete placement, curing conditions and minimum curing time before joint exposure to traffic. Do not place elastomeric concrete if the ambient air or surface temperature is below 45°F.

Prepare the concrete surface within 48 hours prior to placing the elastomeric concrete. Before placing the elastomeric concrete, all concrete surfaces shall be thoroughly cleaned and dry. Sandblast the concrete surface in the blockout and clear the surface of all loose debris. Do not place the elastomeric concrete until the surface preparation is completed and approved.

Prepare and apply a primer, as per manufacturer's recommendations, to all concrete faces to be in contact with elastomeric concrete, and to areas specified by the manufacturer.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within two (2) hours after applying the primer. Trowel the elastomeric concrete to a smooth finish.

The joint opening in the elastomeric concrete shall match the formed opening in the concrete deck prior to sawing the joint.

ST-12C

FIELD SAMPLING

Provide additional production material to allow freshly mixed elastomeric concrete to be sampled for acceptance. A minimum of six (6) 2-inch cube molds and three (3) 3-inch diameter x 6-inch cylinders will be taken by the Department for each day's production. Compression, splitting tensile, and durometer hardness testing will be performed by the Department to determine acceptance. Materials failing to meet the requirements listed above are subject to removal and replacement at no cost to the Department.

BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Foam Joint Seals" or "Preformed Silicone Expansion Joint Seal" will be full compensation for furnishing and placing the Elastomeric Concrete.

FOAM JOINT SEALS (9-27-12)

1.0 SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable, foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

Use seals manufactured with grooves 1/8"± wide by 1/8"± deep and spaced between 1/4" and 1/2" apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4". Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D3575-08, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft^2
Elongation at Break	ASTM D3575	180% - 210%
Tear Strength	ASTM D624 (D3575-08, Suffix G)	14 – 20 pli
Density	ASTM D3575-08, Suffix W, Method A	1.8 – 2.2 lb/ft^3
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint seals upon receipt to ensure that the marks are clearly visible before installation.

2.0 BONDING ADHESIVE

Use a two component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3000 psi (min.)
Compressive strength	ASTM D695	7000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

3.0 SAWING THE JOINT

The joint opening shall be initially formed to the width shown on the plans including the blockout for the elastomeric concrete.

The elastomeric concrete shall have sufficient time to cure such that no damage can occur to the elastomeric concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus 1/4" above the top of the seal plus approximately 1" below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

4.0 PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete shall cure a minimum of 24 hours prior to seal installation.

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

5.0 SEAL INSTALLATION

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

Before installing the joint seal, check the uninstalled seal length to insure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a teflon heating iron of 425-475°F for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. After opening both cans of the bonding agent, stir each can using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the elastomeric concrete as well as both sides of the joint seal, making certain to completely fill the grooves with epoxy. With gloved hands, compress the joint seal and

with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately 1/4" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval. Do not place pavement markings on top of foam joint seals.

6.0 BASIS OF PAYMENT

Payment for all foam joint seals will be at the lump sum contract price bid for "Foam Joint Seals". Prices and payment will be full compensation for furnishing all material, including elastomeric concrete, labor, tools and equipment necessary for installing these units in place and accepted.

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.

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.

ST-22C

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'-2 ½" 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.

ST-23C

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.

ST-28C

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

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. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

Submittals may also be made via email.

Send submittals to:

jlbolden@ncdot.gov (James Bolden)

Send an additional e-copy of the submittal to the following address:

eomile@ncdot.gov (Emmanuel Omile)

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. David Hering, L. G., 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. David Hering, L. G., 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

Via Email: EastGeotechnicalSubmittal@ncdot.gov

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail or 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

Via Email: WestGeotechnicalSubmittal@ncdot.gov

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's website, via the "Drawing Submittal Status" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "Geotechnical Construction Submittals" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: James Bolden (919) 707 – 6408
(919) 250 – 4082 facsimile
jlbolden@ncdot.gov

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
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"

ST-31C

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"
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

ST-32C

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.

ST-33C

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]	1 drawings, 1 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	1 drawings, 1 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), 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.

ST-34C

CRANE SAFETY (6-20-19)

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

ST-35C

GROUT FOR STRUCTURES (12-1-17)

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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES (12-30-15)

1.0 INSPECTION FOR ASBESTOS CONTAINING MATERIAL

Prior to conducting bridge demolition or renovation activities, the Contractor shall thoroughly inspect the bridge or affected components for the presence of asbestos containing material (ACM) using a firm prequalified by NCDOT to perform asbestos surveys. The inspection must be performed by a N.C. accredited asbestos inspector with experience inspecting bridges or other industrial structures. The N.C. accredited asbestos inspector must conduct a thorough inspection, identifying all asbestos-containing material as required by the Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants (NESHAP) Code of Federal Regulations (CFR) 40 CFR, Part 61, Subpart M.

The Contractor shall submit an inspection report to the Engineer, which at a minimum must include information required in 40 CFR 763.85 (a)(4) vi)(A)-(E), as well as a project location map, photos of existing structure, the date of inspection and the name, N.C. accreditation number, and signature of the N.C. accredited asbestos inspector who performed the inspection and completed the report. The cover sheet of the report shall include project identification information. Place the following notes on the cover sheet of the report and check the appropriate box:

___ ACM was found
___ ACM was not found

2.0 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

If ACM is found, notify the Engineer. Compensation for removal and disposal of ACM is considered extra work in accordance with Article 104-7 of the Standard Specifications.

An Asbestos Removal Permit must be obtained from the Health Hazards Control Unit (HHCU) of the N.C. Department of Health & Human Services, Division of Public Health, if more than 35 cubic feet, 160 square feet, or 260 linear feet of regulated ACM (RACM) is to be removed from a structure and this work must be completed by a contractor prequalified by NCDOT to perform asbestos abatement. RACM is defined in 40 CFR, Part 61, Subpart M. Note: 40 CFR 763.85 (a)(4) vi)(D) defines ACM as surfacing, TSI and Miscellaneous which does not meet the NESHAP RACM.

3.0 DEMOLITION NOTIFICATION

Even if no ACM is found (or if quantities are less than those required for a permit), a Demolition Notification (DHHS-3768) must be submitted to the HHCU. Notifications and Asbestos Permit applications require an original signature and must be submitted to the HHCU 10 working days prior to beginning demolition activities. The 10 working day period starts based on the post-marked date or date of hand delivery. Demolition that does not begin as originally notified requires submission of a separate revision form HHCU

3768-R to HHCU. Reference the North Carolina Administrative Code, Chapter 10A, Subchapter 41C, Article .0605 for directives on revision submissions.

Contact Information
Health Hazards Control Unit (HHCU)
N.C. Department of Health and Human Services
1912 Mail Service Center
Raleigh, NC 27699-1912
Telephone: (919) 707-5950
Fax: (919) 870-4808

4.0 SPECIAL CONSIDERATIONS

Buncombe, Forsyth, and Mecklenburg counties also have asbestos permitting and NESHAP requirements must be followed. For projects involving permitted RACM removals, both the applicable county and the state (HHCU) must be notified.

For demolitions with no RACM, only the local environmental agencies must be notified. Contact information is as follows:

Buncombe County
WNC Regional Air Pollution Control Agency
49 Mt. Carmel Road
Asheville, NC 28806
(828) 250-6777

Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101
(336) 703-2440

Mecklenburg County
Land Use and Environmental Services Agency
Mecklenburg Air Quality
700 N. Tryon Street
Charlotte, NC 28202
(704) 336-5430

5.0 ADDITIONAL INFORMATION

Additional information may be found on N.C. asbestos rules, regulations, procedures and N.C. accredited inspectors, as well as associated forms for demolition notifications and asbestos permit applications at the N.C. Asbestos Hazard Management Program website:

https://epi.dph.ncdhhs.gov/asbestos/ahmp.html

6.0 BASIS OF PAYMENT

Payment for the work required in this provision will be at the lump sum contract unit price for "Asbestos Assessment". Such payment will be full compensation for all asbestos inspections, reports, permitting and notifications.

ST-39C

45" Prestressed Concrte Florida I-Beam **(SPECIAL)**

The Contractor shall provide girders in accordance with the plans and standard specifications.

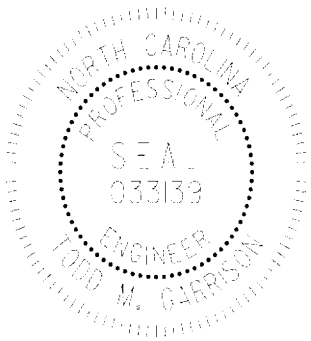
Measurement and payment will be for the actual number of linear feet of prestressed concrete girders.

Payment will be made under:

45" Prestressed Concrete Florida I-Beam.....Linear Feet

SBW-1A

Project I-5986B **Harnett & Johnston Counties**



Project Special Provisions

Structures

SOUND BARRIER WALL **(8-29-19)**

1.0 DESCRIPTION

This work consists of furnishing precast panels with an architectural surface treatment, structural steel, concrete, handling, transporting, fabricating, galvanizing, storing materials, furnishing erection drawings, pile excavation, backfilling, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision.

Precast panels with an architectural surface treatment shall be constructed using form lining materials and patterns to match the appearance (size, shape, color, texture, pattern, and relief) of the textured finish as specified on the plans and approved by the Engineer.

The contractor is required to use the same form liner and coloration contractor to construct the precast panels with an architectural surface treatment.

The Standard Plans allow pile spacing of 10, 15 or 20 feet. Pile spacing greater than 15 feet will not be allowed for the precast concrete panels detailed in the standard plans. Provide consistent pile spacing for the entire length of the wall. Use odd pile spacing, if necessary, only at the ends of the wall and at turning points as approved by the Engineer. Architectural surface treatment shall not be applied to piles. Piles shall have a smooth, non-textured finish, and remain unstained in their natural color.

A maximum one foot drop or rise in elevation between wall sections is permitted. Elevation changes greater than one foot, if necessary, will be allowed only at the end of the wall. Top of wall elevation changes that result in a jagged appearance will not be allowed.

2.0 QUALIFICATIONS

Prior to beginning work the contractor shall submit the following qualifications to the Engineer for approval:

A. Architectural Surface Treatment Construction

The Contractor shall have a minimum of three years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 3 references who were responsible for supervision of similar projects. Include name, address, telephone number, and specific type of application.

B. Form Liners and Coloring System

The manufacturer of form liners for the standard textured finishes and coloring system shall have at least five years of experience making molds and color stains to create formed concrete surfaces to match the specified textured finish and colors. The Contractor shall schedule a pre-installation conference with a form liner manufacturer representative and the Engineer to assure understanding of simulated textured finish form liner use, color application, requirements for construction of sample panel(s), and to coordinate the work. The Contractor shall be required to disclose their source of form liner manufacturer and final coloration contractor prior to the Preconstruction Conference.

3.0 ALTERNATE PILE SPACING FOR STANDARD PRECAST PANELS

As an alternate, the Contractor may submit plans for pile spacings greater than 10 feet and less than 15 feet for review and approval. The pile excavation diameter, excavation depth and reinforcing steel shall be equal to the amount shown on the existing plans for the 15 feet pile spacing. A variance in the reinforcing steel will be allowed for the length of horizontal and number of vertical reinforcement bars in the precast panel for the alternate pile spacing.

Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of required reinforcement necessary to fabricate the precast panels. Have a North Carolina registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

4.0 ALTERNATE WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for substitution to the detailed Standard

Sound Barrier Wall only when noted on the plans. Alternate wall types, piles and pile spacing must meet the design and construction requirements of the project. Pile spacing greater than 20 feet will not be permitted. Alternate pile and wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications.

Prior to submittal of Working Drawings, as described herein, submit a copy of the signed NCDOT Product Status Notification Letter and two sets of preliminary plans for review and approval. Include material specifications for all components. Once preliminary plans are approved, submit Working Drawings in accordance with all applicable portions of the requirements herein, including details necessary to fabricate and construct the proposed alternate.

Have a North Carolina registered Professional Engineer check, seal and date the plans and, when requested, provide calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

5.0 WORKING DRAWINGS

Submit precast panel casting drawings in accordance with Article 1077-2 of the Standard Specifications prior to casting. Show the inserts, method of handling, and support details used for transportation on the casting drawings. Submit fabrication drawings for approval prior to fabrication of wall components. Submit an erection plan and precast panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of forms. Submit five sets of detail drawings on 22" x 34" sheets.

Submit for review and acceptance, wall plan and elevation views and details showing overall simulated textured pattern, joint locations, and end, edge or other special conditions. The drawings should include typical cross sections of precast panels, joints, corners, texture relief, texture size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the working drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Working drawings should be of sufficient scale to show the detail of all textured finishes and joint patterns. Shop drawings shall be reviewed and approved prior to fabrication of form liners.

6.0 MATERIALS AND FABRICATION OF STANDARD PRECAST PANELS

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures. Provide precast panels 4 inches ± ¼ inch thick, excluding relief for a textured finish. Architectural surface treatment shall consist of a standard textured finish and a single color of stain applied to both faces of the precast panels as specified on the plans and approved by the Engineer. Relief of any texture is not to exceed an average depth of 1 inch. No textured finish or stain shall be applied on the uppermost foot of each wall segment and along the vertical edges of the panels. These areas shall have a smooth, non-textured finish, and remain in its natural concrete color.

SBW-4A

Furnish three 12" x 12" samples for approval which establish the acceptable variations in color, texture, and uniformity. After the color, texture, and uniformity of the furnished samples are approved, produce a full scale panel unit meeting design requirements. This mock-up and the furnished samples establish the standard quality for determining acceptance of the panels. When producing the final installed panels, use fine and coarse aggregate, retarder, and cement from the same source as those used in the approved sample panels.

The standard textured finish shall be constructed using form lining materials. The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall conceal construction joint lines.

Prior to each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be accepted by the Engineer before being used. Form liner panels that do not perform as intended or are no longer repairable shall be replaced.

Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼ inch seam. Blend form liner butt joints into the textured surface pattern and finish off the final concrete surface. Create no visible vertical or horizontal seams or conspicuous form liner butt joint marks. At locations where the form liners are joined, carefully blend to match the balance of the textured finish.

Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects.

When the approved textured finish requires simulated grout pattern joints, construct grout pattern joints to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

The Contractor shall have a technical representative from the form liner manufacturer on site for technical supervision during the installation and removal of form liners. Unless directed by the Engineer, installation and removal of form liners shall not be permitted if the technical representative is not present.

Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product and shall be applied in accordance with the manufacturer's recommendations. The form release agent shall be compatible with the form liner material, the concrete coloring system, any special surface finish and in

accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

All form defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal. Use patching materials and procedures in accordance with the manufacturer's recommendations.

Precast concrete shall be finished in accordance with the Standard Specifications, except that curing of concrete should been done to accommodate the application of coloring and surface finish treatment.

7.0 SURFACE COLORING

All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces to be accomplished by pressure washing with water set at 3,000 psi to remove laitance. The fan nozzle shall be held perpendicular to the surface at a distance of 1 to 2 feet. Sandblasting will not be permitted.

Surface coloring shall be achieved using an approved stain suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color system shall be a single color of stain in brown or gray tones as specified on the plans and approved by the Engineer. The approved sample panel shall be the basis for determining the appropriate stain application.

The coloring agent shall be a penetrating stain mix or other approved coloring system designed for exterior application on old or new concrete with field evidence of resistance to moisture, acid or alkali, mildew, mold or fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission. Final coloring system and color of stain are subject to approval by the Engineer.

Application of coloring/staining agent to finished precast concrete and patches shall occur at a minimum of 30 days after form liners are removed. Maintain the concrete temperature between 40°F and 85°F during color/stain application and for 48 hours after color/stain application. Consult the manufacturer's recommendations for preparation, application, curing, and storage of coloring agents/stains. The contractor shall provide a Color Application Artist who is experienced in producing realistic surface appearances. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption. Linear butt joints shall be carefully blended into the approved pattern and finished off the final concrete surface. No visible vertical or horizontal seams or conspicuous form marks created by butt joining will be permitted.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

8.0 CONSTRUCTION METHODS

Complete the final survey of existing ground profile after clearing the wall area but prior to submitting any working drawings. Submit the final groundline survey with the working drawings.

If the Department is responsible for the survey, the Engineer field verifies the existing ground profile along the sound barrier wall. Contact the Engineer to obtain the survey information. Otherwise, complete the existing ground survey prior to submittal of working drawings.

Excavate holes with the diameters shown on the plans. Perform pile excavation to the depths shown on the plans and install piles as shown on the plans or in the accepted submittals with a tolerance of ½ inch per foot from vertical. Backfill excavations with concrete after placing piles.

A. Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance the excavation. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the Standard Specifications and as directed by the Engineer. Drilling spoils consist of all excavated material including water removed from the excavation either by pumping or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize excavations with either slurry or steel casing. When using slurry, submit slurry details including product information, manufacturer's recommendations for use, slurry equipment information and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casing, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼ inch.

B. Concrete Placement

Before placing concrete, center and support the pile in the excavation and check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6 inches per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6 inches per half hour, propose a concrete placement procedure to the Engineer. The Engineer shall approve the concrete placement procedure before placing concrete.

Fill the excavation with Class A concrete in accordance with Section 1000 of the Standard Specifications except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner and remove all casings.

9.0 METHOD OF MEASUREMENT

The quantity of form liner textured finish and coloring stain to be paid for will be the actual square feet of architectural surface treatment that has been incorporated into the completed and accepted work. The area of architectural surface treatment will be measured by the area of treated panels. Do not include the uppermost foot of each wall segment, panel vertical edges without architectural surface treatment, or piles in the measurement. Area of sample panels shall not be included in the measurement of architectural surface treatment.

The quantity of sound barrier wall to be paid for will be the actual square feet of completed and accepted wall. In any individual section of sound barrier wall or in comparably dimensioned sections, the wall height is from the bottom of the bottom panel to the top of the top panel and the width is the distance between the centerline of the piles at the ends of the section. Include the full width of the piles at the ends of the wall.

10.0 BASIS OF PAYMENT

The quantity of sound barrier wall and architectural surface treatment, measured as provided above, will be paid for at the contract unit price bid per square foot.

The unit price bid per square foot for "Sound Barrier Wall" will be full compensation for work covered by this Special Provision including, but not limited to, furnishing precast panels, steel or concrete piles, miscellaneous structural steel, concrete, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, backfilling, pile excavation including any casing or slurry, and erecting and installing the sound barrier wall members.

The unit price bid per square foot for "Architectural Surface Treatment" will be full compensation for the architectural treatment covered by this Special Provision including, but not limited to, furnishing architectural detail drawings, sample panels; the construction, finishing, and removal of all equipment, materials, labor, and incidentals necessary for furnishing and use of all form liners to produce approved textured finish and application of approved surface coloring.

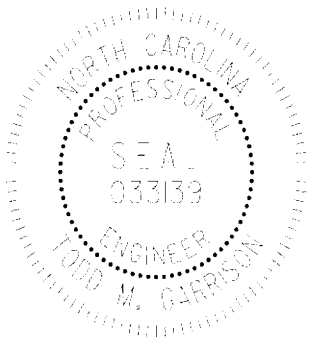
Payment will be made under:

Sound Barrier Wall No. _____ ..... Square Foot

Architectural Surface Treatment (Sound Barrier Wall) ..... Square Foot

SBW-1B

Project I-5883 **Harnett County**



DocuSigned by:
Todd M. Garrison
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5/17/2021

Project Special Provisions

Structures

SOUND BARRIER WALL **(8-29-19)**

1.0 DESCRIPTION

This work consists of furnishing precast panels with an architectural surface treatment, structural steel, concrete, handling, transporting, fabricating, galvanizing, storing materials, furnishing erection drawings, pile excavation, backfilling, erecting and installing the sound barrier wall members and all other materials as required by the plans, Standard Specifications and this Special Provision.

Precast panels with an architectural surface treatment shall be constructed using form lining materials and patterns to match the appearance (size, shape, color, texture, pattern, and relief) of the textured finish as specified on the plans and approved by the Engineer.

The contractor is required to use the same form liner and coloration contractor to construct the precast panels with an architectural surface treatment.

The Standard Plans allow pile spacing of 10, 15 or 20 feet. Pile spacing greater than 15 feet will not be allowed for the precast concrete panels detailed in the standard plans. Provide consistent pile spacing for the entire length of the wall. Use odd pile spacing, if necessary, only at the ends of the wall and at turning points as approved by the Engineer. Architectural surface treatment shall not be applied to piles. Piles shall have a smooth, non-textured finish, and remain unstained in their natural color.

A maximum one foot drop or rise in elevation between wall sections is permitted. Elevation changes greater than one foot, if necessary, will be allowed only at the end of the wall. Top of wall elevation changes that result in a jagged appearance will not be allowed.

2.0 QUALIFICATIONS

Prior to beginning work the contractor shall submit the following qualifications to the Engineer for approval:

A. Architectural Surface Treatment Construction

The Contractor shall have a minimum of three years of experience in architectural concrete surface treatment construction on similar types of projects. The Contractor shall furnish to the Engineer 3 references who were responsible for supervision of similar projects. Include name, address, telephone number, and specific type of application.

B. Form Liners and Coloring System

The manufacturer of form liners for the standard textured finishes and coloring system shall have at least five years of experience making molds and color stains to create formed concrete surfaces to match the specified textured finish and colors. The Contractor shall schedule a pre-installation conference with a form liner manufacturer representative and the Engineer to assure understanding of simulated textured finish form liner use, color application, requirements for construction of sample panel(s), and to coordinate the work. The Contractor shall be required to disclose their source of form liner manufacturer and final coloration contractor prior to the Preconstruction Conference.

3.0 ALTERNATE PILE SPACING FOR STANDARD PRECAST PANELS

As an alternate, the Contractor may submit plans for pile spacings greater than 10 feet and less than 15 feet for review and approval. The pile excavation diameter, excavation depth and reinforcing steel shall be equal to the amount shown on the existing plans for the 15 feet pile spacing. A variance in the reinforcing steel will be allowed for the length of horizontal and number of vertical reinforcement bars in the precast panel for the alternate pile spacing.

Submit two sets of detailed plans for review. Include all details in the plans, including the size and spacing of required reinforcement necessary to fabricate the precast panels. Have a North Carolina registered Professional Engineer check, seal and date the plans. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

4.0 ALTERNATE WALL TYPE

Walls that have been assigned "Approved" or "Approved for Provisional Use" status by the Product Evaluation Program will be considered for substitution to the detailed Standard

Sound Barrier Wall only when noted on the plans. Alternate wall types, piles and pile spacing must meet the design and construction requirements of the project. Pile spacing greater than 20 feet will not be permitted. Alternate pile and wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications.

Prior to submittal of Working Drawings, as described herein, submit a copy of the signed NCDOT Product Status Notification Letter and two sets of preliminary plans for review and approval. Include material specifications for all components. Once preliminary plans are approved, submit Working Drawings in accordance with all applicable portions of the requirements herein, including details necessary to fabricate and construct the proposed alternate.

Have a North Carolina registered Professional Engineer check, seal and date the plans and, when requested, provide calculations. After the plans are reviewed and, if necessary, corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the contract plans.

5.0 WORKING DRAWINGS

Submit precast panel casting drawings in accordance with Article 1077-2 of the Standard Specifications prior to casting. Show the inserts, method of handling, and support details used for transportation on the casting drawings. Submit fabrication drawings for approval prior to fabrication of wall components. Submit an erection plan and precast panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of forms. Submit five sets of detail drawings on 22" x 34" sheets.

Submit for review and acceptance, wall plan and elevation views and details showing overall simulated textured pattern, joint locations, and end, edge or other special conditions. The drawings should include typical cross sections of precast panels, joints, corners, texture relief, texture size, pitch/working line, mortar joint and bed depths. If necessary, the Contractor shall revise the working drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Working drawings should be of sufficient scale to show the detail of all textured finishes and joint patterns. Shop drawings shall be reviewed and approved prior to fabrication of form liners.

6.0 MATERIALS AND FABRICATION OF STANDARD PRECAST PANELS

Provide materials and fabricate members in accordance with the requirements of Division 10 of the Standard Specifications for Roads and Structures. Provide precast panels 4 inches ± ¼ inch thick, excluding relief for a textured finish. Architectural surface treatment shall consist of a standard textured finish and a single color of stain applied to both faces of the precast panels as specified on the plans and approved by the Engineer. Relief of any texture is not to exceed an average depth of 1 inch. No textured finish or stain shall be applied on the uppermost foot of each wall segment and along the vertical edges of the panels. These areas shall have a smooth, non-textured finish, and remain in its natural concrete color.

SBW-4B

Furnish three 12" x 12" samples for approval which establish the acceptable variations in color, texture, and uniformity. After the color, texture, and uniformity of the furnished samples are approved, produce a full scale panel unit meeting design requirements. This mock-up and the furnished samples establish the standard quality for determining acceptance of the panels. When producing the final installed panels, use fine and coarse aggregate, retarder, and cement from the same source as those used in the approved sample panels.

The standard textured finish shall be constructed using form lining materials. The form liner shall be a high quality, re-useable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system, and shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall conceal construction joint lines.

Prior to each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be accepted by the Engineer before being used. Form liner panels that do not perform as intended or are no longer repairable shall be replaced.

Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼ inch seam. Blend form liner butt joints into the textured surface pattern and finish off the final concrete surface. Create no visible vertical or horizontal seams or conspicuous form liner butt joint marks. At locations where the form liners are joined, carefully blend to match the balance of the textured finish.

Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects.

When the approved textured finish requires simulated grout pattern joints, construct grout pattern joints to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

The Contractor shall have a technical representative from the form liner manufacturer on site for technical supervision during the installation and removal of form liners. Unless directed by the Engineer, installation and removal of form liners shall not be permitted if the technical representative is not present.

Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product and shall be applied in accordance with the manufacturer's recommendations. The form release agent shall be compatible with the form liner material, the concrete coloring system, any special surface finish and in

accordance with this Special Provision. Form release agent should be worked into all areas, especially pattern recesses.

All form defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal. Use patching materials and procedures in accordance with the manufacturer's recommendations.

Precast concrete shall be finished in accordance with the Standard Specifications, except that curing of concrete should been done to accommodate the application of coloring and surface finish treatment.

7.0 SURFACE COLORING

All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces to be accomplished by pressure washing with water set at 3,000 psi to remove laitance. The fan nozzle shall be held perpendicular to the surface at a distance of 1 to 2 feet. Sandblasting will not be permitted.

Surface coloring shall be achieved using an approved stain suitable for the purpose intended and applied in a manner consistent with the design intent of the project. Color system shall be a single color of stain in brown or gray tones as specified on the plans and approved by the Engineer. The approved sample panel shall be the basis for determining the appropriate stain application.

The coloring agent shall be a penetrating stain mix or other approved coloring system designed for exterior application on old or new concrete with field evidence of resistance to moisture, acid or alkali, mildew, mold or fungus discoloration or degradation. The coloring agent shall be breathable, allowing moisture and vapor transmission. Final coloring system and color of stain are subject to approval by the Engineer.

Application of coloring/staining agent to finished precast concrete and patches shall occur at a minimum of 30 days after form liners are removed. Maintain the concrete temperature between 40°F and 85°F during color/stain application and for 48 hours after color/stain application. Consult the manufacturer's recommendations for preparation, application, curing, and storage of coloring agents/stains. The contractor shall provide a Color Application Artist who is experienced in producing realistic surface appearances. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns should be continuous without visual disruption. Linear butt joints shall be carefully blended into the approved pattern and finished off the final concrete surface. No visible vertical or horizontal seams or conspicuous form marks created by butt joining will be permitted.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces as directed by the Engineer.

8.0 CONSTRUCTION METHODS

Complete the final survey of existing ground profile after clearing the wall area but prior to submitting any working drawings. Submit the final groundline survey with the working drawings.

If the Department is responsible for the survey, the Engineer field verifies the existing ground profile along the sound barrier wall. Contact the Engineer to obtain the survey information. Otherwise, complete the existing ground survey prior to submittal of working drawings.

Excavate holes with the diameters shown on the plans. Perform pile excavation to the depths shown on the plans and install piles as shown on the plans or in the accepted submittals with a tolerance of ½ inch per foot from vertical. Backfill excavations with concrete after placing piles.

A. Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting is not permitted to advance the excavation. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the Standard Specifications and as directed by the Engineer. Drilling spoils consist of all excavated material including water removed from the excavation either by pumping or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize excavations with either slurry or steel casing. When using slurry, submit slurry details including product information, manufacturer's recommendations for use, slurry equipment information and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casing, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼ inch.

B. Concrete Placement

Before placing concrete, center and support the pile in the excavation and check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6 inches per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than 6 inches per half hour, propose a concrete placement procedure to the Engineer. The Engineer shall approve the concrete placement procedure before placing concrete.

Fill the excavation with Class A concrete in accordance with Section 1000 of the Standard Specifications except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner and remove all casings.

9.0 METHOD OF MEASUREMENT

The quantity of form liner textured finish and coloring stain to be paid for will be the actual square feet of architectural surface treatment that has been incorporated into the completed and accepted work. The area of architectural surface treatment will be measured by the area of treated panels. Do not include the uppermost foot of each wall segment, panel vertical edges without architectural surface treatment, or piles in the measurement. Area of sample panels shall not be included in the measurement of architectural surface treatment.

The quantity of sound barrier wall to be paid for will be the actual square feet of completed and accepted wall. In any individual section of sound barrier wall or in comparably dimensioned sections, the wall height is from the bottom of the bottom panel to the top of the top panel and the width is the distance between the centerline of the piles at the ends of the section. Include the full width of the piles at the ends of the wall.

10.0 BASIS OF PAYMENT

The quantity of sound barrier wall and architectural surface treatment, measured as provided above, will be paid for at the contract unit price bid per square foot.

The unit price bid per square foot for "Sound Barrier Wall" will be full compensation for work covered by this Special Provision including, but not limited to, furnishing precast panels, steel or concrete piles, miscellaneous structural steel, concrete, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials; furnishing erection drawings, backfilling, pile excavation including any casing or slurry, and erecting and installing the sound barrier wall members.

The unit price bid per square foot for "Architectural Surface Treatment" will be full compensation for the architectural treatment covered by this Special Provision including, but not limited to, furnishing architectural detail drawings, sample panels; the construction, finishing, and removal of all equipment, materials, labor, and incidentals necessary for furnishing and use of all form liners to produce approved textured finish and application of approved surface coloring.

Payment will be made under:

Sound Barrier Wall No. _____ ..... Square Foot

Architectural Surface Treatment (Sound Barrier Wall) ..... Square Foot

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 3-21-17) Z-1a

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, DEQ State of North Carolina
Buffer Certification	Division of Environmental Management, DEQ 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 *2018 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 restricted waters, wetlands or buffer zones, provided that activities outside those areas is done in such a manner as to not affect the restricted waters, wetlands or buffer zones.

DEPARTMENT OF THE ARMY PERMIT

Permittee: NORTH CAROLINA DEPARTMENT OF TRANSPORTATION – DIV. 4 (NCDOT)
ATTN: MR. JAMES RERKO, PWS

Permit No.: SAW-2018-02276

Issuing Office: CESAW-RG-L

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 that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Widen an approximate 26-mile portion of existing Interstate 95 to an eight-lane median-divided facility on existing location through Cumberland, Harnett and Johnston Counties, North Carolina. This is a phased permit, therefore Special Conditions detail the requirements for construction authorization for any specific section.

Project Location: The project begins approximately a half-mile south of SR 1832/Murphy Road (Exit 55) where 4-lane I-95 would taper to 8-lanes at Murphy Road (Exit 55) near Fayetteville, in Cumberland County and extends north through Harnett County and into Johnston County to the Interstate 40 interchange (Exit 81), north of the City of Benson.

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2024. 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 Condition 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 is 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.

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 made 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.

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

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 33 CFR 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 measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the aetivity 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, thc 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.

(PERMITTEE) NC DEPARTMENT OF TRANSPORTATION
ATTN: MR. JAMES RERKO, PWS

07/09/19
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT COMMANDER) ROBERT J. CLARK, COLONEL

09 July 2019
(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)

*U.S. GOVERNMENT PRINTING OFFICE: 1986 - 717-425

SPECIAL CONDITIONS
ACTION ID. SAW-2018-02276
NC DEPARTMENT OF TRANSPORATION
PROPOSED IMPROVEMENTS TO WIDEN I-95 TO EIGHT LANES FROM MURPHY ROAD (SR 1832/EXIT 55) TO I-40 (EXIT 81)
TIP NO. I-5986

1. WORK LIMITS: All work authorized by this permit shall be performed in strict compliance with the attached permit plans dated February 7, 2019 and revised May 23, 2019, which are a part of this permit. The Permittee shall ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Any modification to the attached permit plans must be approved by the U.S. Army Corps of Engineers (Corps) prior to any active construction in waters or wetlands.

2. UNAUTHORIZED DREDGE OR FILL: Except as authorized by this permit or any U.S. Army Corps of Engineers 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 permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and waste 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.

3. 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 and drawings shall be available at the project site during construction and maintenance of this project.

4. PRECONSTRUCTION MEETING: The Permittee shall conduct an onsite preconstruction meeting between its representatives, the contractor's representatives and the appropriate Corps of Engineers Project Manager prior to undertaking any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all terms and conditions contained within the Department of the Army permit. The Permittee shall schedule the preconstruction meeting for a time frame when the Corps, and NCDWQ Project Managers can attend. The Permittee shall invite the Corps, and NCDWQ 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. The thirty (30) day requirement can be waived with the concurrence of the Corps.

5. NOTIFICATION OF CONSTRUCTION COMMENCEMENT AND COMPLETION: The Permittee shall notify the U.S. Army Corps of Engineers in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

6. 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, Wilmington Regulatory Field Office, Attn: Ms. Liz Hair, 69 Darlington Avenue,

SPECIAL CONDITIONS
ACTION ID. SAW-2018-02276
NC DEPARTMENT OF TRANSPORATION
PROPOSED IMPROVEMENTS TO WIDEN I-95 TO EIGHT LANES FROM MURPHY ROAD (SR 1832/EXIT 55) TO I-40 (EXIT 81)
TIP NO. I-5986

Wilmington North Carolina, 28403, or sarah.e.hair@usace.army.mil. The Permittee shall reference the following permit number, SAW-2018-02276, on all submittals.

7. 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.

8. REPORTING VIOLATIONS: Violation of these permit conditions or violation of Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act shall be reported to the Corps in writing and by telephone at: 910-251-4049 within 24 hours of the Permittee's discovery of the violation.

9. ENDANGERED SPECIES ACT: The U.S. Fish and Wildlife Service's (USFWS's) Programmatic Biological Opinion (BO) titled "Northern Long-eared Bat (NLEB) Programmatic Biological Opinion for North Carolina Department of Transportation (NCDOT) Activities in Eastern North Carolina (Divisions 1-8)," dated March 25, 2015, and adopted on April 10, 2015, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that are specified in the BO. Your authorization under this Department of the Army permit is conditional upon your compliance with all the mandatory terms and conditions associated with incidental take of the BO, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the BO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Department of the Army permit. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its BO, and with the ESA.

10. 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.

11. SEDIMENT EROSION CONTROL:
1. During the clearing phase of the project, heavy equipment shall 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.

2. No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the plan drawings and specifically authorized by this permit. This includes, but is not limited to, sediment control fences and other barriers intended to catch sediment losses.

3. The Permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades on those areas, prior to project completion.

4. 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 ensure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices shall be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to ensure compliance with the appropriate turbidity water quality standards. 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 shall 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 shall be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures shall be inspected and maintained regularly, especially following rainfall events. All fill material shall be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

12. CLEAN FILL: The Permittee shall use only clean fill material for this project. The fill material shall be free from items such as trash, construction debris, metal and plastic products, and concrete block with exposed reinforcement bars. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act. Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source.

13. WATER CONTAMINATION: All mechanized equipment shall be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids,

SPECIAL CONDITIONS
ACTION ID. SAW-2018-02276
NC DEPARTMENT OF TRANSPORATION
PROPOSED IMPROVEMENTS TO WIDEN I-95 TO EIGHT LANES FROM
MURPHY ROAD (SR 1832/EXIT 55) TO I-40 (EXIT 81)
TIP NO. I-5986

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 Quality at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act shall be followed.

14. CULVERTS:

1. Unless otherwise requested in the application and depicted on the approved permit plans, culverts greater than 48 inches in diameter shall 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 shall be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Culverts shall be designed and constructed in a manner that minimizes destabilization and head cutting.

2. Measures shall 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 shall 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 shall 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.

3. The Permittee shall implement all reasonable and practicable measures to ensure that equipment, structures, fill pads, work, and operations associated with this project do not adversely affect upstream and/or downstream reaches. Adverse effects include, but are not limited to, channel instability, flooding, and/or stream bank erosion. The Permittee shall routinely monitor for these effects, cease all work when detected, take initial corrective measures to correct actively eroding areas, and notify this office immediately. Permanent corrective measures may require additional authorization by the U.S. Army Corps of Engineers.

* **15. MITIGATION:** 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.

SPECIAL CONDITIONS
ACTION ID. SAW-2018-02276
NC DEPARTMENT OF TRANSPORATION
PROPOSED IMPROVEMENTS TO WIDEN I-95 TO EIGHT LANES FROM MURPHY ROAD (SR 1832/EXIT 55) TO I-40 (EXIT 81)
TIP NO. I-5986

16. TEMPORARY IMPACTS RESTORATION MEASURES: Within 30 days of the date of completing the authorized work, the Permittee shall remove all temporary fills in waters of the United States and restore the affected areas to pre-construction contours and elevations. The affected areas shall be re- vegetated with native, non-invasive vegetation as necessary to minimize erosion and ensure site stability. In wetland areas where pipeline installation via trenching is authorized, wetland topsoil shall be segregated from the underlying subsoil, and the top 6 to 12 inches of the trench shall be backfilled with topsoil from the trench.

17. SILT FENCE: Prior to construction within any jurisdictional areas, the Permittee shall correctly install silt fencing (with or without safety fencing) parallel with the utility line corridor, on both sides of the jurisdictional crossing. This barrier is to serve both as an erosion control measure and a visual identifier of the limits of construction within any jurisdictional area. The Permittee shall maintain the fencing, at minimum, until the wetlands have re-vegetated and stabilized.

18. PHASED PERMITTING: This permit only authorizes work on I-5986 B Section 1 of TIP I-5986. Construction on Sections 2, 3, and 4 of TIP I-5986 B and I-5986 A shall not commence until all the following occur: (a) final design has been completed for those sections and submitted to the U.S. Army Corps of Engineers (Corps); (b) the Permittee has minimized impacts to waters and wetlands to the maximum extent practicable and the Corps concurs with this assessment; (c) any modification to the plans have been approved by the Corps in writing; and (d) a final compensatory mitigation plan has been submitted by the Permittee and approved by the Corps.

19. BORROW AND WASTE: To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent waters and wetlands, except as authorized by this permit, the Permittee shall require its contractors and/or agents to identify all areas to be used as borrow and/or waste sites associated with this project. The Permittee shall provide the U.S. Army Corps of Engineers with appropriate maps indicating the locations of proposed borrow and/or waste sites as soon as such information is available. The Permittee shall submit to the Corps site-specific information needed to ensure that borrow and/or waste sites comply with all applicable Federal requirements, to include compliance with the Endangered Species Act and the National Historic Preservation Act, such as surveys or correspondence with agencies (e.g., the USFWS, the NC-HPO, etc.). The required information shall also include the location of all aquatic features, if any, out to a distance of 400 feet beyond the nearest boundary of the site. The Permittee shall not approve any borrow and/or waste sites before receiving written confirmation from the Corps that the

SPECIAL CONDITIONS
ACTION ID. SAW-2018-02276
NC DEPARTMENT OF TRANSPORATION
PROPOSED IMPROVEMENTS TO WIDEN I-95 TO EIGHT LANES FROM
MURPHY ROAD (SR 1832/EXIT 55) TO I-40 (EXIT 81)
TIP NO. I-5986

proposed site meets all Federal requirements, whether or not waters of the U.S., including wetlands, are located in the proposed borrow and/or waste site. All delineations of aquatic sites on borrow and/or waste sites shall be verified by the U.S. Army Corps of Engineers and shown on the approved reclamation plans. The Permittee shall ensure that all borrow and/or waste sites comply with Special Condition #2 of this permit. Additionally, the Permittee shall produce and maintain documentation of all borrow and waste sites associated with this project. This documentation will include data regarding soils, vegetation, hydrology, any delineation(s) of aquatic sites, and any jurisdictional determinations made by the Corps to clearly demonstrate compliance with Special Condition #2. All information will be available to the U.S. Army Corps of Engineers upon request. The Permittee shall require its contractors to complete and execute reclamation plans for each borrow and/or waste site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the U.S. Army Corps of Engineers within 30 days of the completion of the reclamation work.

Revised Mussel Programmatic Biological Opinion summary of *Conservation Measures (Section 2.5), RPM 2 of the Reasonable and Prudent Measures (Section 9.2), as well as T&C 2 of the Terms and Conditions (Section 9.3).*

Design Standards in Sensitive Watersheds will be incorporated into the plans. Design Standards in Sensitive Watersheds are erosion control measures that exceed the standard BMPs (e.g. measures are designed to provide protection from runoff of 25-year storm event). *Environmentally Sensitive Areas* shall also be designated and defined as a 50-foot buffer zone on both sides of the stream measured from top of streambank. Within *Environmentally Sensitive Areas* the following shall apply:

- The contractor may perform clearing operations but not grubbing operations until immediately prior to beginning grading operations.
- Once grading operations begin in identified *Environmentally Sensitive Areas*, work shall progress in a continuous manner until complete.
- Erosion control devices shall be installed immediately following the clearing operation.
- Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment.
- 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 two acres in area, whichever is less.
- No heavy equipment will be placed in the streams.
- BMPs for bridge demolition and removal will be implemented (NCDOT 2003, NCDOT 2014a, or newer).
- Bridges will be removed from the top down, first removing the asphalt with containment measures in place to prevent asphalt from dropping into the stream. The method of containment will be proposed by the contractor and approved by the project engineer. This will be followed by removal of the decking, girders, and finally the piles/shafts/columns.
- No new bents will be placed in the channel (unless justification is provided and then accepted by the Service).
- Existing abutments will be completely removed unless removal would result in destabilization of banks or increase adverse effects to listed mussels.
- Deck drains will not be allowed to discharge directly into the stream.
- Special sediment control fence (NCDOT Standard No. 1606.01) or a combination of special sediment control fence and standard silt fence will be installed between the top of the stream bank and bridge embankment. Once the disturbed areas of the project draining to these areas have been stabilized, the special sediment control fence and/or silt fence and all built up sediment adjacent to these devices will be removed to natural ground and stabilized with a native grass mix.
- All appropriate sedimentation and erosion control measures, throughout the project limits, will be cleaned out when half full to ensure proper function of the measures.
- Coir fiber matting or clean riprap (underlain with geotextile) will be installed on the footprint of unclassified structure excavation near the streambanks.
- Embankment construction and grading shall be managed in such a manner as to prevent surface runoff/drainage from discharging untreated into the riparian buffer. All interim surfaces will be graded to drain to temporary erosion control devices. Temporary berms, ditches, etc. will be incorporated, as necessary, to treat runoff before discharging into the riparian buffer (as specified in NCDOT BMP manuals).
- Utility relocations necessitated by bridge or culvert replacements must minimize sedimentation effects to mussels and their habitat. Unless technically unfeasible, NCDOT must require utility relocations through streams to utilize directional (horizontal) boring instead of open trench cut.

- Report Number of Automatic Concurrences. Although Project Submittal Forms are not required for MA-NLAA conclusions, NCDOT must annually, via email, provide a total number of projects (cumulatively) with such conclusions that utilize the automatic advance concurrence for one or more of the species addressed in this BO/CO as described in Section 3.

- Erosion Control Measures Failure. In the event of any visible sediment loss from any individual project site, a review of turbidity levels will be made upstream and downstream 400 meters (0.25 mile) to determine if sedimentation effects are occurring beyond 400 meters downstream. If visual observation of turbidity levels downstream appear to be elevated beyond upstream observations, the project inspector will contact the Division Environmental Officer. If determined that project-related sedimentation is occurring beyond 400 meters, the Service must be contacted immediately to discuss potential remediation.

The full PBO can be found here: Programmatic Biological Opinion Bridge and Culvert Replacement/Repairs/ Rehabilitations in Eastern North Carolina, NCDOT Divisions 1-8

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

May 18, 2021

Regulatory Division

Action ID. SAW-2018-02276
NC DOT TIP No.: I-5986 (B; Sections 2, 3, and 4)
Corps Modification # 2

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head-PDEA
N.C. Department of Transportation
1598 Mail Service Center
Raleigh, NC 27699-1598

Dear Mr. Harris:

Reference the Department of the Army (DA) permit issued on July 9, 2019, for the discharge of fill material into waters and wetlands adjacent to various creeks, and their tributaries in order to widen 26 miles of existing I-95 to an eight-lane median divided facility, on existing location from Murphy Road (exit 55) north to Interstate 40 (exit 81) in Cumberland, Harnett, and Johnston Counties, North Carolina. Reference is also made to your I-5986 B (Sections 2, 3, and 4) permit modification request dated February 1, 2021. This modification request is based on the completion of final design, avoidance and minimization of aquatic impacts, and the submittal of a final compensatory mitigation plan. The total revised permanent impacts associated with the I-5986 B Sections 2, 3, and 4 portion of the I-5986 project are 4.79 acres of wetland, 2,850 linear feet of stream channel, and 4.60 acres of open water associated with permanent fill, excavation, mechanized land clearing. Temporary impacts total 0.99-acre wetland and 612 linear feet of stream channels.

Following the evaluation of information submitted in the modification request, the U.S. Army Corps of Engineers (Corps) has determined that the request is appropriate and reasonable, is not contrary to the public interest, is consistent with the 404 (B) (1) Guidelines, and will not require a Public Notice. Therefore, the DA permit is hereby modified as requested for I-5986 B; Sections 2, 3, and 4 with three revised special conditions hereby incorporated into the permit.

Revised Special Conditions:

Revised condition #1. Work Limits: All work authorized by this permit shall be performed in strict compliance with the permit plans dated February 7, 2019, revised May 23, 2019, revised August 20, 2020, and the attached plans revised under this modification dated March 13, 2020, April 2, 2020, April 8, 2020, and December 28, 2020, all of which are now a part of this permit. The Permittee shall ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Any modification to the attached permit plans must be approved by the Corps prior to any active construction in waters or wetlands.

Revised condition #9. Endangered Species Act: The U.S. Fish and Wildlife Service's (USFWS's) Programmatic Biological Opinion (PBO) titled, "NCDOT Program Effects on the Northern Long-eared Bat in Divisions 1-8", dated November 6, 2020, contains agreed upon conservation measures for the NLEB. As noted in the PBO, applicability of these conservation measures varies depending on the location of the project. Your authorization under this Department of the Army permit is conditional upon your compliance with all applicable conservation measures in the PBO, which are incorporated by reference in this permit. Failure to comply with the applicable conservation measures would constitute non-compliance with your Department of the Army permit. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its PBO, and with the ESA.

* Revised condition #15. Mitigation: 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.

All other conditions of the original permit remain applicable including the permit expiration date of December 31, 2024. This approved modification should be attached to the original permit and will be utilized for future compliance reviews of the project. If you have questions, please contact Liz Hair of the Wilmington Regulatory Field Office, at telephone (910) 251-4049 or by email at sarah.e.hair@usace.army.mil.

FOR THE DISTRICT ENGINEER

Monte Matthews Date: 2021.05.18 08:47:08 -04'00'

Monte K. Matthews
Lead Project Manager
Wilmington Regulatory Division

Enclosures:

1) 401 Water Quality Certification Modification dated April 30, 2021

2) Wetland and Surface Water Impact Permit and Utility Drawings identified below:
   I-5986B Section 2 (I-5878)– March 13, 2020
   I-5986B Section 3 (I-5883)– April 8, 2020
   I-5986B Section 3 (I-5883)– April 2, 2020
   I-5986B Section 4 (North) – April 8, 2020
   I-5986B Section 4 (North)-December 28, 2020

3) Buffer Permit Drawings:
   I-5986B Section 4 (North)– April 8, 2020
   I-5986B Section 4 (North)– December 28, 2020

4) Mitigation Responsibility Transfer Forms (3) signed May 18, 2021

Copies Furnished (electronic):

Ms. Amy Chapman/Mr. Robert Patterson, NCDEQ-DWR
Mr. Chris Rivenbark/Ms. Deanna Riffey, NCDOT
Mr. Jim Rerko/Mr. Greg Price NCDOT
Ms. Amanetta Somerville, EPA
Mr. Gary Jordan, USFWS

Mr. Travis Wilson, NC WRC
Ms. Beth Harmon, NC DMS

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director

NORTH CAROLINA
Environmental Quality

July 8, 2019

Jim Rerko, Project Development and Environmental Analysis Engineer
Division 6
1000 Transportation Drive
Fayetteville, NC 28302

Subject:401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and Neuse Buffer Permit with ADDITIONAL CONDITIONS for Proposed improvements to widen I-95 to eight lanes from Murphy Road (SR 1832/Exit 55) to I-40 (Exit 81) in Cumberland, Harnett and Johnston Counties, State Project No. WBS 47532.1.2 and 47532.1.3, STIP No. I-5986.
NCDWR Project No. 20190214

Dear Mr. Rerko:

Attached hereto is a copy of revised Certification No. WQC004187 issued to The North Carolina Department of Transportation (NCDOT) dated July 8, 2019.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

DocuSigned by:
Amy Chapman
9C9886312DCD474...
Linda Culpepper, Director
Division of Water Resources

Attachment

Electronic copy only distribution:
Liz Hair, US Army Corps of Engineers, Wilmington Field Office
Greg Price, Division 6 Environmental Officer
Chris Rivenbark, NC Department of Transportation
Chris Militscher, US Environmental Protection Agency
Gary Jordan, US Fish and Wildlife Service
Travis Wilson, NC Wildlife Resources Commission
Beth Harmon, Division of Mitigation Services
Joanne Steenhuis, NC Division of Water Resources Wilmington Regional Office
File Copy

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and Neuse Buffer rules, with ADDITIONAL CONDITIONS

THIS CERTIFICATION rescinds the previous issued certification dated June 30, 2019 and reissues the certification 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 .0500 and 15A NCAC 2B .0233. This certification authorizes the NCDOT to impact 16.590 acres of jurisdictional wetlands, 6,283 linear feet of jurisdictional streams in Cumberland, Harnett and Johnston Counties and 90,270 square feet of protected riparian buffers in Johnston County. The project shall be constructed pursuant to the application dated received February 19, 2019. The authorized impacts are as described below:

SECTION 1 (I-5877) **Stream Impacts in the Cape Fear River Basin**

Site	Station	NRTR Label	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	800+95 to 801+38-L-RT Drainage Ditch	SC				44	44	N/A
3	801+10 to 803+74-L 42" Pipe	SI			121	19	140	N/A
5	816+14 to 816+28-L-RT 54" Pipe	SA	8	10			18	N/A
	Outlet Channel	SA	23				23	N/A
5A	11+04 to 11+40 SR7-LT Roadway Fill	SA	24				24	N/A
6	18+84 to 18+94-Y22-RT Bank Stabilization	SC			10		10	N/A
7	20+15 to 20+39-Y22-RT Drainage Ditch	SB	18	18			36	N/A
7A	46+22 to 47+34-Y12 60" Pipe	SB	44				44	N/A
	Inlet Bank Stabilization	SB	20	10			30	N/A
	Outlet Channel	SB	36	17			53	N/A
7B	1+84 to 13+35-Y1RPD-RT Roadway Fill	SB	113	11			124	N/A
8	844+71 to 845+24-L-RT Pipe Removal	SD		33			33	N/A
8A	849+47 to 849+75-L-RT Pipe Removal/Ditch	SD		9			9	N/A
	Outlet Channel	SD	22				22	N/A

Site	Station	NRTR Label	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
8B	38+92 to 39+04-SR7 Pipe Removal/Ditch	SD	18	16			34	N/A
	Channel Realignment	SD	14				14	N/A
9	855+32 to 859+66-L 9' x 8' RCBC	SC			98	44	142	98
	Inlet Channel	SC			56	19	75	56
	Outlet Channel	SC			185	25	210	185
10	875+41 to 875+82-L 60" Pipe	SE			105	47	152	N/A
	Inlet Channel	SE			41		41	N/A
	Outlet Channel	SE			34	13	47	N/A
10A	4+58 to 15+95 Y13RPB-L 36" Pipe	SE			47		47	N/A
	Outlet Channel	SE			20	20	40	N/A
	Utility	SE				59	59	N/A
10B	21+71 to 22+25-DR5-RT Roadway Fill	SE				40	40	N/A
	Channel Realignment	SE			15		15	N/A
11	22+10 to 22+55 DR5 9' x 8' RCBC	SF			39		39	N/A
	Inlet Channel	SF			38	29	67	N/A
	Outlet Channel	SF			29	10	39	N/A
11A	19+83 to 21+03-Y13 8' x 7' RCBC	SF			8		8	N/A
	Inlet Channel	SF			40	12	52	N/A
	Outlet Channel	SF			42	10	52	N/A
	Utility	SF				22	22	N/A
11B	898+13 to 899+23-L 60" Pipe	SF			34		34	N/A
	Inlet Channel	SF			20	13	33	N/A

Site	Station	NRTR Label	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
	Outlet Channel	SF			25	12	37	N/A
20	14+00 to 14+95-SR9 72" Pipe	SH	72				72	N/A
	Inlet Channel	SH	21	11			32	N/A
	Outlet Channel	SH	25	13			38	N/A
Total			**458**	**148**	**1007**	**438**	**2051**	**339**

SECTION 1 Total Stream Impact for Project: 2051 linear feet

SECTION 1 (I-5877) Wetland Impacts in the Cape Fear River Basin

	Station	NRTR Label	Fill (Perm) (ac)	Fill (Temp) (ac)	Excav -ation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
2	795+73 to 796+99- L-LT Roadway Fill	WD	0.111		0.051				0.162
4	811+37 to 814+11 -LT-RT Roadway Fill	WE	0.046			0.048			0.094
11	22+10 to 22+55-DR5 Inlet Channel	WF			0.001	0.012			0.013
12	22+75 to 30+68- DR5 Roadway Fill	WF	0.619		0.089	0.218			0.926
14	36+49 to 37+33- SR9-LT Roadway Fill	WB	0.004		0.005	0.019			0.028
	Utility						0.026		N/A
16	17+24 to 17+95- Y24-RT Roadway Fill	WC				0.008			0.008
	Utility						0.018		N/A
20	14+00 to 14+95- SR9 72" Pipe	WA	0.080		0.010	0.041			0.131
	Total		**0.860**		**0.156**	**0.346**	**0.044**		**1.362**

SECTION 1 Total Wetland Impact for Project: 1.362 acres.

SECTION 1 (I-5877) Open Water Impacts in the Cape Fear River Basin

Site	Station	NRTR Label	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
5A	11+04 to 11+40 SR7-LT Pond	PA	0.182		0.182
10C	14+54 to 15+23-SR8-LT 30" Pipe	OWD		0.003	0.003
	48" Pipe	OWD	0.003		0.003
	Outlet Channel	OWD	0.001		0.001
15	16+32 to 16+62- Y24-RT Outlet channel	OWA	0.006	0.002	0.008
17	913+16 to 919+91 -L-RT Roadway fill	OWB	0.101		0.101
18	23+67 to 24+00 Y24-RT Roadway fill	OWB	0.003	0.001	0.004
	Utility	OWB		0.001	0.001
19	15+51 to 19+93 Y13-LT 66" Pipe	OWE	0.010	0.002	0.012
	Bank Stabilization	OWE	0.004		0.004
	Channel Realignment	OWE	0.051		0.051
Total			**0.361**	**0.009**	**0.370**

SECTION 1 Total Open Water Impact for Project: 0.370 acres.

SECTION 2 (I-5878) Stream Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type impact)	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermitten t Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	SB	21+77 to 22+34-Y14RPB Roadway Fill			140		**140**	N/A
1A	SB	15+48-NBCD Roadway Fill			157		**157**	N/A
1B	SA	21+04 to 22+11-Y14RPB Roadway fill	35				**35**	N/A
2	SD	1035+24 to 1036+18-L-LT Roadway Fill			101		**101**	N/A
5	Stoney Run	1041+00 to 1043+91 -L			208		**208**	N/A
Total			**35**		**606**		**641**	

Total Stream Impact for Project: 641 linear feet

SECTION 2 (I-5878) Wetland Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (Temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
3	WBH	1038+02 to 1045 - 46-L-RT Roadway Fill	0.564						0.564
4	WBG	1038+70 to 1045+26 -L-RT Roadway Fill	0.749						0.749
6	WB	17+58 to 19+60- SR9A Roadway Fill	0.498						0.498
Total			**1.811**						**1.811**

Total Wetland Impact for Project: 1.811 acres.

SECTION 3 (I-5883) Stream Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type Impact)	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	SB	1075+84 to 1077+41-L-LT Roadway Fill			65		65	N/A
2	SC	44+86 to 48+09-SR13 Roadway Fill	329				329	N/A
3	SA	22+04 to 27+47-Y16RPC Roadway Fill			582		582	582
5	SG	32+96 to 33+11-SR15-RT Roadway Fill			12		12	N/A
6	SG	34+52 to 35+60-SR15RT Roadway Fill			111		111	N/A
7	SH	37+43 to 37+61-SR15-RT Roadway Fill			29		29	N/A
8	SK	85+45 to 88+88-SR15-RT Roadway Fill			38		38	N/A
10	SI	69+06 to 69+34-SR16 Roadway Fill	106				106	N/A
12	SI	10+37 to 12+14-Y17RPA-RT Roadway Fill			100		100	N/A
13	SE	53+57 to 54+92-SR13 Roadway Fill	167				167	N/A
Total			**602**		**937**		**1539**	**582**

Total Stream Impact for Project: 1539 linear feet

SECTION 3 (I-5883) Wetland Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (temporary) (ac)	Excava -tion (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
1	WB	1075+84 to 1077+41-L-LT Roadway Fill	0.045						0.045
4	WA	24+21 to 24+83-Y16RPC-LT Roadway Fill	0.017						0.017
8	WK	85+45 to 88+88-SR15-RT Roadway Fill	0.223						0.223
9	WG	52+29 to 55+07-SR16-LT Roadway Fill	0.263						0.263
11	WE	17+23 to 19+17-Y17RPC-RT Roadway Fill	0.087						0.087
12	WI	10+37 to 12+14-Y17RPA-RT Roadway Fill	0.094						0.094
14	WJ	12+67 to 13+62-Y26-RT Roadway Fill	0.051						0.051
15	WK	12+67 to 13+62-Y26-LT Roadway Fill	0.126						0.126
16	WD	24+28 to 24+55-Y17RPB-LT Roadway Fill	0.009						0.009
Total			**0.915**						**0.915**

Total Wetland Impact for Project: 0.915 acres.

SECTION 4 (I-5986B) Stream Impacts in the Cape Fear and Neuse River Basins

Site	NRTR Label	Station (Type Impact)	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
2	Mingo Swamp	1252+25 to 1263+87-L-RT Roadway Fill			186		186	N/A
4	SM	1284+24 to 1285+34-L-RT Roadway Fill			48		48	N/A
5*	Hannah Creek	1316+85 to 1317+00-L-RT Roadway Fill	64				64	N/A
6*	SO	1344+69 to 1346+45-L-LT Roadway Fill			192		192	192
6A*	SO	1347+18 to 1349+60-L-RT Roadway Fill			174		174	174
6B*	SO	16+70 to 17+70-Y18RPD-LT Roadway Fill			28		28	28
8*	Driving Branch	1387+79 to 1391+45-L0LT Roadway Fill			69		69	N/A
11*	SQ	1387+71 to 1380+96-L-LT Roadway Fill			162		162	N/A
Total			**64**		**859**		**923**	**394**

SECTION 4 Total Stream Impact for Project: 923 linear feet (Cape Fear 234; Neuse 689)
***Indicates Neuse River Basin**

SECTION 4 (I-5986B) Wetland Impacts in the Cape Fear and Neuse River Basins

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (temporary) (ac)	Excava -tion (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
1	WBK	1252+48 to 1265+96-L-LT Roadway Fill	1.501						1.501
3	WBJ	1260+08 to 1260+65-L Roadway Fill	0.778						0.778
4	WBL	1284+24 to 1285+34-L-RT Roadway Fill	0.010						0.010
7*	WBP	1375+48 to 1376+00-L-RT Roadway Fill	0.003						0.003
9*	WBS	1387+79 to 1391+45-L0LT Roadway Fill	0.096						0.096
10*	WBR	1391+47 to 1392+78-L-RT Roadway Fill	0.056						0.056
Total			2.444						2.444

SECTION 4 Total Wetland Impact for Project: 2.444 acres. (Cape Fear 2.289; Neuse 0.155)

*Indicates Neuse River Basin

SECTION 4 (I-5986B) Neuse Riparian Buffer Impacts

Site	Station) (Type Impact)	Zone 1 Impact (sq ft)	*minus* Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Mitigation Required (using 3:1 ratio)	Zone 2 Impact (sq ft)	*minus* Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Mitigation Required (using 1.5:1 ratio)
5**	1316+27 to 1317+54-L Roadway Fill	4,419	N/A	4,419	N/A	5,255	N/A	5,255	*N/A
6	1344+24 to 1346+94-L-LT Roadway Fill	14,343	N/A	14,343	43,029	12,530	N/A	12,530	18,795
6A	1347+68 to 1350+09-L-RT Roadway Fill	13,546	N/A	13,546	40,638	10,120	N/A	10,120	15,180
6B	16+61 to 17+96-Y18RPD-LT Roadway Fill	3,684	1,638	2,046	11,052	2,921	899	2,022	4381.5
7**	1375+82 to 1376+60-L-RT Roadway Fill	N/A			N/A	688	N/A	688	*N/A
8**	1389+73 to 1391+85-L Roadway Fill	6,599	4,428	2,171*	*N/A	3,531	1,302	2,229	*N/A
11**	1387+21 to 1389+73-L-LT Roadway Fill	8,639	77	8,562	*N/A	3,995	N/A	3,995	*N/A
Total		**51,230**			**94,719**	**39,040**			**38,356.5**

Total Buffer Impacts for Project: Zone 1 94,719 square feet; Zone 2 38,356.5 square feet.
* n/a = Total for Site is less than 1/3 acre and 150 linear feet of impact, no mitigation required
** Allowable Buffer Impacts

(I-5986 A) Stream Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type Impact)	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
3	SB	94+37 to 100+20-L-RT Roadway Fill	38				38	N/A
10	Baker Swamp	198+56 to 203+79-L-RT Roadway Fill			70		70	N/A
11	Baker Swamp	11+89 to 23+93-Y5RPC-RT Roadway Fill			63		63	N/A
13	SC	251+91 to 253+32-L Roadway Fill			116		116	N/A
15	SD	301+32 to 304+90-L Roadway Fill			138		138	N/A
18	SE	354+73 to 354+90-L Roadway Fill	130				130	N/A
23	SF	423+14 to 423+31-L-LT Roadway Fill			40		40	N/A
27	SG	539+19 to 540+76-L Roadway Fill			114		114	N/A
29	SH	574+35 to 574+56-L Roadway Fill			106		106	N/A
33	SI	625+60 to 626+52-L Roadway Fill			101		101	N/A
36	SJ	642+58 to 643+31-L Roadway Fill	67				67	N/A
38	Black River	665+70 to 684+31-L Roadway Fill			60		60	N/A
42	SK	761+05-L Roadway Fill	86				86	N/A
Total			**321**		**808**		**1129**	

Total Stream Impact for Project: 1129 linear feet

(I-5986 A) Wetland Impacts in the Cape Fear River Basin

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (temporary) (ac)	Excava-tion (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
1	WE	90+87 to 92+10-L-RT Roadway Fill	0.024						0.024
2	WH	91+98 to 110+06-L-LT Roadway Fill	0.233						0.233
3	WF	94+37 to 100+20-L-RT Roadway Fill	0.156						0.156
4	WI	108+26 to 114+34-L-LT Roadway Fill	0.076						0.076
5	WJ	118+98 to 133+53-L-LT Roadway Fill	0.536						0.536
6	WK	122+19 to 124+94-L-LT Roadway Fill	0.073						0.073
7	WL	121+32 to 127+68-L-RT Roadway Fill	0.648						0.648
8	WR	186+19 to 193+09-L-LT Roadway Fill	0.170				0.165		0.170
9	WQ	199+16 to 202+54-L-LT Roadway Fill	0.183						0.183
10	WP	198+56 to 203+79-L-RT Roadway Fill	0.371						0.371
11	WO	11+89 to 23+93-Y5RPC-RT Roadway Fill	1.352						1.352
12	WX	213+68 to 222+17-L-RT Roadway Fill	1.659						1.659
14	WZ	300+64 to 306+99-L-LT Roadway Fill	0.133						0.133
16	WY	302+03 to 307+02-L-RT Roadway Fill	0.178						0.178
17	WAA	351+49 to 351+95-L-RT Roadway Fill	0.005						0.005
19	WAB	354+90 to 357+78-L-RT Roadway Fill	0.024						0.024
20	WAF	384+05 to 292+99-L-LT Roadway Fill	0.284						0.284

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (temporary) (ac)	Excava-tion (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
21	WAH	405+58 to 405+78-L-LT Roadway Fill	0.005						0.005
22	WAK	422+17 to 437+17-L-LT Roadway Fill	0.672						0.672
24	WAI	418+39 to 437+17-L-RT Roadway Fill	0.761						0.761
25	WAM	508+34 to 509+39-L-LT Roadway Fill	0.087						0.087
26	WAN	522+79 to 528+98-L-LT Roadway Fill	0.364						0.364
28	WAS	573+52 to 575+47-L Roadway Fill	0.035						0.035
30	WAT	600+13 to 606+75-L-LT Roadway Fill	0.305						0.305
31	WAU	618+08 to 618+41-L-RT Roadway Fill	0.004						0.004
32	WAW	622+48 to 626+94-L-LT Roadway Fill	0.480						0.480
34	WAV	625+67 to 627+43-L-RT Roadway Fill	0.139						0.139
35	WAX	640+37 to 642+41-L-RT Roadway Fill	0.021						0.021
37	WAY	660+09 to 660+50-L-RT Roadway Fill	0.003						0.003
38	WAZ	665+70 to 684+31-L Roadway Fill	0.516						0.516
	WAZ	Bridge					0.080		N/A
38A	WAZ	690+67 to 694+59-L Roadway Fill	0.129						0.129
39	WBA	725+12 to 725+92-L-LT Roadway Fill	0.012						0.012
40	WBB	729+82 to 731+51-L-LT Roadway Fill	0.054						0.054
41	WBC	735+67 to 739+95-L-LT Roadway Fill	0.194						0.194

Site	NRTR Label	Station (Type Impact)	Fill (ac)	Fill (temporary) (ac)	Excava-tion (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
43	WU	30+59 to 33+43-Y5LPDA-RT Roadway Fill	0.172						0.172
Total			**10.058**				**0.245**		**10.058**

Total Wetland Impact for Project: 10.058 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear and Neuse River Basins 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 received February 19, 2019 and subsequent information received on May 3rd and 23rd, 2019. 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 300 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). Additional buffer impacts may require compensatory mitigation as described in 15A NCAC 2B .0233. 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.

Conditions of Certification:

Project Specific Conditions

1. 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 the potential issues with wetlands, streams and pipe alignments for the permitted sites. NCDWR staff shall be invited to the pre-construction meeting. [15A NCAC 02H.0506(b)(2) and (b)(3)

2. At locations where ponds will be drained, proper measures will be taken to drain the pond with limited impact to upstream and downstream channel stability as well as to native aquatic species. Proper measures will be taken to avoid sediment release and/or sediment accumulation downstream as a result of pond draining. If typical pond draining techniques will create significant disturbance to native aquatic species, additional measures such as collection and relocation may be necessary to prevent a significant fish kill. NCDOT shall consult with NC Wildlife Resources staff to determine if there are any sensitive species, and the most appropriate measures to limit impacts to these species. The permittee shall observe any natural channel re-establishment, or utilize natural channel construction techniques, to ensure that the jurisdictional stream channel above and below the drained pond remain stable, and that no additional impacts occur within the natural stream channel as a result of draining the pond. [15A NCAC 2H.0506(b)(3)

3. As a condition of this 401 Water Quality Certification, any bridge demolition and construction must be accomplished in strict compliance with the most recent version of NCDOT's Best Management Practices

for Construction and Maintenance Activities. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]

4. 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 NCS0000250, please refer to the most recent version of the *North Carolina Department of Transportation Stormwater Best Management Practices Toolbox* manual for approved measures. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]

5. 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. [15A NCAC 02H.0506(b)(2)]

6. 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. [15A NCAC 02H .0506(b)(3)

7. A turbidity curtain will be installed in any stream if driving or drilling activities occur within the stream channel, on the stream bank, or within 5 feet of the top of bank. This condition can be waived with prior approval from the NCDWR. [15A NCAC 02H .0506(b)(3)

8. All bridge construction shall be performed from the existing bridge, temporary work bridges, temporary causeways, or floating or sunken barges. If work conditions require barges, they shall be floated into position and then sunk. The barges shall not be sunk and then dragged into position. Under no circumstances should barges be dragged along the bottom of the surface water. [15A NCAC 02H

9. 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. [15A NCAC 02H.0506(b)(2)]

10. 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. [15A NCAC 02H.0506(b)(2)]

11. Pipes and culverts used exclusively to maintain equilibrium in wetlands, where aquatic life passage is not a concern, shall not be buried. These pipes shall be installed at natural ground elevation. [15A NCAC 02H.0506(b)(2) and (b)(3)]
12. Turbidity curtains shall be used to isolate all work areas from streams, including pile or casement installation, placement of riprap, excavation or filling. Strict adherence to the Construction and Maintenance Best Management Practices will be required. [15A NCAC 02H .0506 (b)(3) and (c)(3)]

13. Erosion control matting in riparian areas shall not contain a nylon mesh grid which can impinge and entrap small animals. Matting should be secured in place by staples, stakes, or wherever possible live stakes of native trees. Riparian areas are defined as a distance 25 feet from top of stream bank. [15A NCAC 02B.0224, .0225]

14. NCDOT shall be in compliance with the NCS00250 issued to the NCDOT, including the applicable requirements of the NCG01000.

Mitigation

* 15. Compensatory mitigation for 1315 linear feet of impact to streams (921 in the Cape Fear Basin and 394 in the Neuse Basin) and 16.590 acres of wetlands (16.435 acres in the Cape Fear Basin and 0.155 acres in the Neuse Basin) is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Division of Mitigation Service (DMS) (formerly NCEEP),

and that the DMS has agreed to implement the mitigation for the project. The DMS has indicated in letters dated June 5, 2019 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the DMS Mitigation Banking Instrument signed July 28, 2010.

* 16. Compensatory mitigation for impacts to 94,719 square feet of protected riparian buffers in Zone 1 and 38,356.5 square feet of protected riparian buffers in Zone 2 shall be required. We understand that you have chosen to perform compensatory mitigation for impacts to protected buffers through use of the North Carolina Division of Mitigation Services (DMS) (formerly NCEEP). Mitigation for unavoidable impacts to the Neuse Riparian Buffers shall be provided in the Neuse River Basin and done in accordance with 15A NCAC .02B .0295. The DMS has indicated in a letter dated June 5, 2019 that they will assume responsibility for satisfying the compensatory mitigation requirements for the above-referenced project, in accordance with DMS's Mitigation Banking Instrument signed June 14, 2016.

General Conditions

17. 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. [15A NCAC 02H.0506(b)(2)]

18. 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. [15A NCAC 02B.0200]

19. 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. [15A NCAC 02H.0506(b)(2)]

20. The dimension, pattern and profile of the stream above and below the crossings shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions. [15A NCAC 02H.0506(b)(2)]

21. 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. [15A NCAC 02H.0506(b)(2)]

* 22. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

23. 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. [15A NCAC 02H.0506(b)(3) and (c)(3)]

24. 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. [15A NCAC 02H.0506(b)(3)]

25. 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. [15A NCAC 02H.0506(b)(3)]

26. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification. [15A NCAC 02H.0506(b)(3)]

27. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]

28. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur. [15A NCAC 02H .0506{b)(3) and (c)(3) and 15A NCAC 02B .0200]

29. Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual,* or for linear transportation projects, the *NCDOT Sediment and Erosion Control Manual.*

30. All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

31. For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual.* Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

32. If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-1, WS-11, High Quality Waters (HQW), or Outstanding Resource Waters (ORW), then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watershed.* [15A NCAC 02H.0506(b)(3) and (c)(3); GC 4135]

33. All sediment and erosion control devices shall be removed and the natural grade restored within two (2) months of the date that the NC DOT Roadside, Division of Energy, Mining and Land Resources (DEMLR) or locally delegated program has released the specific area within the project. [15A NCAC 02H.0506(b)(3) and (c)(3)]

34. 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. [15A NCAC 02B.0200]

35. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification. [15A NCAC 02H.0506(b)(2)]

36. 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. [15A NCAC 02H .0507(c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

37. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization, including all non-commercial borrow and waste sites associated with the project, 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. [15A NCAC 02H.0501 and .0502]

38. 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.

39. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery. [15A NCAC 02B.0506(b)(2)]

* 40. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" (or electronic form) to notify the NCDWR when all work included in the 401 Certification has been completed. [15A NCAC 02H.0502(f)]

41. 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. [15A NCAC 02B.0506(b)(2)]

42. 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. [15A NCAC 02H.0506(b)(3) and (c)(3)

43. 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 [15A NCAC 02H.0506(b)(3) and (c)(3):

    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.

44. Sediment and erosion control measures shall not be placed in wetlands or surface waters, or within 5 feet of the top of bank, without prior approval from DWR. [15A NCAC 02H.0506(b)(3) and (c)(3)]

45. Pursuant to 15A NCAC 2B .0233(6), sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by the NCDWR. At this time, the NCDWR has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.

46. All stormwater runoff shall be directed as sheetflow through stream buffers at non-erosive velocities, unless otherwise approved by this certification. [15ANCAC 02B.0233(5)(a)]

47. Due to the possibility that compaction and/or other site alterations might prevent the temporary wetland impact areas from re-attaining jurisdictional wetland status; the permittee shall provide an updates on the wetland areas temporarily impacted as the impacts are removed. This update shall be conducted through two growing seasons after completion of the work at the sites and shall consist of photographs and a brief report on the progress of the areas in re-attaining wetland jurisdictional status. Upon submission of these updates to the NCDWR, the permittee shall schedule an agency field meeting with the NCDWR to determine if the wetland areas temporarily impacted by this project have re-attained jurisdictional wetland status. If the wetland areas temporarily impacted by this project have not re-attained jurisdictional wetland status, the NCDWR shall determine if compensatory wetland mitigation is be required.

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 DEQ as follows:

Mr. Bill F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699

This the 8th day of July 2019

DIVISION OF WATER RESOURCES

DocuSigned by:
Amy Chapman
9C9886312DCD474...
Linda Culpepper, Director

WQC No. 004187

ROY COOPER
Governor
DIONNE DELLI-GATTI
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

April 30, 2021

Mr. Philip S. Harris, III, P.E., CPM
Environment Analysis Unit Head
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and Neuse Buffer Rules with ADDITIONAL CONDITIONS for Proposed widening of I-95 to eight lanes from I-95 Business Route (Exit 56) to I-40 (Exit 81), in Cumberland, Harnett and Johnston Counties, STIP I-5986B.
NCDWR Project No.20190214V3

Dear Mr. Harris:

Attached hereto is a modification of Certification No.WQC004187 issued to The North Carolina Department of Transportation (NCDOT) dated May 30, 2019 and modified on November 6, 2020.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,
DocuSigned by:
Amy Chapman
9C9886312DCD474...
S. Daniel Smith, Director
Division of Water Resources

Attachments

Electronic copy only distribution:
Liz Hair, US Army Corps of Engineers, Wilmington Field Office
Greg Price, Division 6 Environmental Officer
Chris Rivenbark, NC Department of Transportation
Amanetta Somerville, US Environmental Protection Agency
Gary Jordan, US Fish and Wildlife Service
Travis Wilson, NC Wildlife Resources Commission
Beth Harmon, Division of Mitigation Services
Robert Paterson, NC Division of Water Resources Wilmington Regional Office
File Copy

Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE BUFFER RULES 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 .0500 and 15A NCAC 2B**.0233.** This certification authorizes the NCDOT to impact an additional 4.756 acres of jurisdictional wetlands, 642 linear feet of jurisdictional streams and 88,929 square feet of protected riparian buffers in Cumberland, Johnston and Harnett Counties. The project shall be constructed pursuant to the modification dated received April 28, 2021. The authorized impacts are as described below:

Stream Impacts in the Cape Fear River Basin I-5986 Section 2

Site	Structure/Station	NRTR Label	Perm Fill in Intermit-tent Stream (linear ft)	Temp Fill in Intermit -tent Stream (linear ft)	Perm Fill in Perennial Stream (linear ft)	Temp Fill in Perennial Stream (linear ft)	Bank Stabiliz ation	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	2 @ 60" welded steel 21+71 to 22+33 Y14RPB	SB			108			108	108
	Inlet Channel 21+71 to 22+33 Y14RPB	SB			24	12		36	24
1A	1 @ 8'X8' RCBC 15+47 to NBCD	SB			83			83	83
	Inlet Channel 15+47 to NBCD-LT	SB			28			28	28
	Outlet Channel 15+47 to NBCD-RT	SB			92	16		108	92
1B	Roadway Fill 21+71 to 22+10 Y14PRB-LT	SA	35					35	N/A
2	Roadway Fill 1035+67 to 1036+76 L-LT	SD				94		94	N/A
5	3 @ 8'X9' RCBC 1042+09 L	Stony Run			86			86	N/A
	Inlet Channel 1042+09 L-LT	Stony Run			16	12		28	N/A
	Outlet Channel 1042+09 L-RT	Stony Run			39	11		50	N/A

Total			**35**		**476**	**145**		**656**	**335**

Total Stream Impact for Project: 656 linear feet

Wetland Impacts in the Cape Fear River Basin I-5986 Section 2

Site	Structure	NRTR Label	Fill (Perm) (ac)	Fill (temp) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
3	Roadway Fill 1038+79+1041+14 L-LT	WBH	0.165			0.027			0.192
	Roadway Fill 1041+96 to 1045+30 L-LT	WBH	0.123			0.039			0.162
4	Roadway Fill 1042+86 to 1044+16 L-RT	WBG	0.018		0.031	0.020			0.069
	Roadway Fill 1044+41 to 1045+26 L-RT	WBG	0.402			0.090			0.492
6	Roadway Fill 17+51 to 19+89 SR9A	WB	0.273			0.050			0.323
Total			0.981		0.031	0.226			1.238

Total Wetland Impact for Project:1.238 acres.

Open Water Impacts in the Cape Fear River Basin I-5986 Section 2

Site	Structure	NRTR Label	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
3	Roadway Fill 1041+96 to 1045+30 L-LT	Stony Run	0.018	0.021	0.039
Total			**0.018**	**0.021**	**0.039**

Total Open Water Impact for Project: 0.039 acres.

Stream Impacts in the Cape Fear River Basin **I-5986 Section 3**

Site	Structure/Station	NRTR Label	Perm Fill in Intermit-tent Stream (linear ft)	Temp Fill in Intermi t-tent Stream (linear ft)	Perm Fill in Perennial Stream (linear ft)	Temp Fill in Perennial Stream (linear ft)	Bank Stabiliz ation	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
1	2 @ 48" Pipes 1075+91 to 1076+34 L-LT	SB			43	15		58	N/A
4	Roadway Fill 44+86 to 48+09 SR13	SC	321	8				329	321
5	Roadway Fill 21+85 to 22+21 Y16RPC	SA			248			248	N/A
	Outlet Channel 22+21 to 24+03 Y16RPC-RT	SA			27	21		48	N/A
8	Roadway Fill 1128+33 L-RT	SG			12	14		26	N/A
	Roadway Fill 1129+35 to 1130+03 L-RT	SG			53			53	N/A
9	Roadway Fill 1132+67 to 1132+90 L-RT	SH			41			41	N/A
10	Outlet Channel 1183+40 to 1183+72 L-RT	SK	20	10				30	N/A
12	54" Pipe 64+09 to 64+34 SR16	SI			69			69	N/A
	Outlet Channel 64+09 to 64+34 SR16	SI			16	12		28	N/A
18	2@ 7'X6' RCBC 1220+34 L	SJ			37			37	N/A
	Inlet Channel 1219+97 to 1220+81 L-LT	SJ			26			26	N/A
	Outlet Channel 1220+35 to 1220+55 L-RT	SJ			31	15		46	N/A
19	54" Pipe	SE			100	22		122	N/A

	53+56 to 54+86 SR13								
	Outlet Channel 53+56 to 53+89 SR13-LT	SE			18	16		34	N/A
Total			**341**	**18**	**721**	**115**		**1195**	**321**

Total Stream Impact for Project: 1195 linear feet

Wetland Impacts in the Cape Fear River Basin I-5986 Section 3

Site	Structure/Station	NRTR Label	Fill (Perm) (ac)	Fill (temp) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
1	2 @ 48" Pipes 1075+92 to 1076+34 L-LT	WB	0.001		0.003	0.007			0.011
1A	Drainage Ditch 1076+60 to 1077+41 L-LT	WB	0.020		0.006	0.001			0.027
3	Drainage Ditch 41+32 to 44+84 SR14-RT	WAC			0.060	0.050			0.110
6	Roadway Fill 24+21+85 to 22+21 Y116RPC	WA	0.020						0.020
10	2 @ 48" Pipes 1180+80 to 1182+98 L-RT	WK	0.040			0.070			0.110
	Outlet Channel 1183+35 to 1183+72 L-RT	WK			0.070				0.070
11	2 @ 48" Pipes 1182+35 to 1185+15 L-LT	WG	0.110			0.060			0.170
13	42" Pipe 17+23 to 19+17 Y17RPC-RT	WE	0.002		0.040	0.040			0.082
14	Roadway Fill 24+28 to 24+55 Y1RPB-LT	WD	0.008						0.008
18	Inlet Channel 1219+97 to 1220+81 L-LT	WI	0.094						0.094
20	2 @ 42" Pipes 12+67 to 13+62 Y26-RT	WJ	0.030			0.011			0.041
21	2 @ 42" Pipes 12+72 to 13+54 Y26	WK	0.040		0.010				0.050

	Outlet Channel 13+05 to 13+18 Y26-LT	WK			0.008	0.033			0.041
	Drainage Ditch 12+72 to 13+54 Y26-LT	WK			0.020				0.020
Total			**0.365**		**0.217**	**0.272**			**0.854**

Total Wetland Impact for Project:0.854 acres.

Open Water Impacts in the Cape Fear River Basin I-5986 Section 2

Site	Structure/Station	NRTR Label	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
2	Pond 1075+92 to 1081+72 L-LT	PA	2.950		2.950
7	Pond 1127+08 to 1129+43 L-LT	PC	0.200		0.200
	1@ 66" Pipe 1127+08 to 1129+43 L-LT	PC	0.100		0.100
15	Pond 30+73to 33+56 SR17	PF	0.760		0.760
16	Rock fill in Pond 34+02 to 34+89 SR17 RT	PE	0.100		0.100
17	Pond 10+45 to11+82 Y17RPA-RT	OWC	0.490		0.490
Total			**4.6**		**4.6**

Total Open Water Impact for Project: 4.6 acres.

Wetland Impacts in the Cape Fear River Basin I-5986 Section 3 Utility Impacts

Site	Structure	NRTR Label	Fill (Perm) (ac)	Fill (temp) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
3	Utility	WAC					0.181		0.181
9	Utility	WC					0.102		0.102
10	Utility	WK					0.190		0.190
13	Utility	WE					0.301		0.301
22	Utility	WAA					0.094		0.094
Total							**0.868**		**0.868**

Total Wetland Impact for Project:0.868 acres.

Stream Impacts in the Cape Fear River Basin I-5986 Section 3 Utility Impacts

Site	Structure	NRTR Label	Perm Fill in Intermit-tent Stream (linear ft)	Temp Fill in Intermit-tent Stream (linear ft)	Perm Fill in Perennial Stream (linear ft)	Temp Fill in Perennial Stream (linear ft)	Bank Stabilization	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
5	Utility	SA				40		40	N/A
9	Utility	SG				31		31	N/A
10	Utility	SK		14				14	N/A
16	Utility	PE				19		19	N/A
18	Utility	SJ				19		19	N/A
22	Utility	OW1				23		23	N/A
Total				**14**		**132**		**146**	**N/A**

Total Stream Impact for Project: 146 linear feet

Wetland Impacts in the *Neuse and Cape Fear River Basins I-5986 Section 4

Site	Structure	NRTR Label	Fill (Perm) (ac)	Fill (temp) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
1	Roadway Fill 1253+2 to 1265+83 L-LT	WBK	0.656			0.232			0.888
2	Bridge 1259+49 to 1261+57 L	WBK	0.018		0.002	0.209			0.229
	Bridge	WBJ				0.049			0.049
3	Roadway Fill 1252+49 to 1262+32 L-RT	WBJ	0.256			0.153			0.409
6*	84" RCP Outlet Channel 18+16 to 19+12 YRPD-LT	WBO			0.050	0.020			0.070
7*	36" RCP Outlet Channel 18+82 to 20+22 Y33-LT	WBP	0.041		0.048	0.013			0.102
8*	Bridge 1390+32 to 1391+00 l-lt	WBS	0.001		0.010	0.068			0.079
	Inlet Channel 35=50 TO 35+93 y33-LT	WBS			0.003				0.003
	Outlet Channel 35+78 to 37+86 Y33-RT	WBR	0.243						0.243
9*	Roadway Fill 1390+91 to 1391+43 L-LT	WBS	0.004			0.011			0.015
10*	Roadway Fill 32+25 to 33+76 Y33	WBQ	0.090		0.050				0.140
12*	Roadway Fill 33+94 to 38+21 Y33	WBR	0.332		0.080	0.025			0.437
Total			**1.641**		**0.243**	**0.78**			**2.664**

Total Wetland Impact for Project: 2.664 acres.

Wetland Impacts in the *Neuse and Cape Fear River Basins I-5986 Section 4 Utility Impacts

Site	Structure	NRTR Label	Fill (Perm) (ac)	Fill (temp) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Area under Bridge (ac)	Total Wetland Impact (ac)
7*	Utility	WBP		0.013					0.013
12*	Utility	WBR	0.043	0.109					0.152
Total			**0.043**	**0.122**					**0.165**

Total Wetland Impact for Project:0.165 acres.

Stream Impacts in the *Neuse and Cape Fear River Basins I-5986 Section 4 Utility Impacts

Site	Structure	NRTR Label	Perm Fill in Intermit-tent Stream (linear ft)	Temp Fill in Intermit-tent Stream (linear ft)	Perm Fill in Perennial Stream (linear ft)	Temp Fill in Perennial Stream (linear ft)	Bank Stabilization	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
7	Utility	SP				10		10	N/A
Total						**10**		**10**	**N/A**

Total Stream Impact for Project: 10 linear feet

Neuse Riparian Buffer Impacts I-5986 Section 4

Site	Zone 1 Impact (sq ft)	*minus* Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Mitigation Required (using 3:1 ratio)		Zone 2 Impact (sq ft)	*minus* Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Mitigation Required (using 1.5:1 ratio)
5	8,305	0	8,305	24,915		7,395	0	7,395	11,092.5
6	10,843	3,034	7,809	23,427		6,639	3,224	3,415	5,122.5
8	6,408	2,040	4,368	13,104		3,708	66	3,642	5,463(N/A)
	15,346	13,411	1,935	5,805		6,199	6,810	-691(N/A)	N/A
Totals	40,902	18,485	22,417	67,251		23,941	10,100	14,452	21,678

Total Buffer Impact for Project: 88,929 square feet.

* n/a = Total for Site is less than 1/3 acre and 150 linear feet of impact, no mitigation required

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear and Neuse River Basins 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 modified application dated received April 28, 2021. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated May 30, 2019 and modified on November 6, 2020 still apply except where superseded by this certification. 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). Additional buffer impacts may require compensatory mitigation as described in 15A NCAC 2B .0233. 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.

Conditions of Certification:

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions of certification associated with the original Water Quality Certification dated May 30, 2019 and modified on November 6, 2020 still apply except where superseded by this certification.
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 the potential issues with stream and pipe alignment at the permitted site. NCDWR staff shall be invited to the pre-construction meeting. [15A NCAC 02H.0506(b)(2) and (b)(3)

* *3.* Compensatory mitigation for impacts to 4.756 acres of wetlands is required. Section 2 wetland impacts in the Cape Fear HUC 03030006 1.238 acres and stream impacts of 335 linear feet. For section 3 wetland impacts in the Cape Fear HUC 0300006 0.854 acres and stream impacts of 321 linear feet, and Section 4 in the Cape Fear HUC 03030006 impacts of 1.575 acres and in the Neuse HUC 03020201 wetlands impacts of 1.089 acres and Buffer mitigation for Zone 1 of 67,251 and Zone 2 of 21,678 (Total). We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Division of Mitigation Services (DMS) (formerly NCEEP), and that the DMS has agreed to implement the mitigation for the project. DMS has indicated in a letters dated January 29, 2021 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with DMS's Mitigation Banking Instrument signed July 28, 2010.

4. Turbidity curtains or other suitable measures shall be used to isolate all work areas from streams, including pile or casement installation, placement of riprap, excavation or filling. Strict adherence to the Construction and Maintenance Best Management Practices will be required. 15A NCAC 02H .0506 (b)(3) and (c)(3)

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 DEQ as follows:

Mr. William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NCm27699-1601

This the 30th day of April 2021

DIVISION OF WATER RESOURCES

DocuSigned by:
Amy Chapman
9C9886312DCD474...

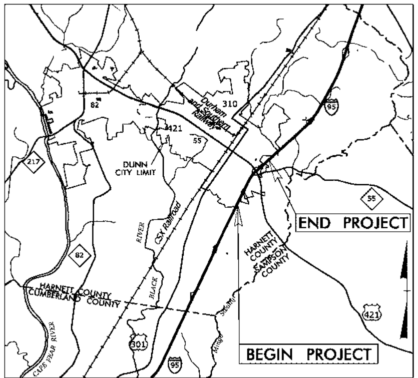
S. Daniel Smith, Director

WQC No.004187

CONTRACT:

TIP PROJECT: I-5878

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols



VICINITY MAP
(Not to Scale)

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HARNETT COUNTY

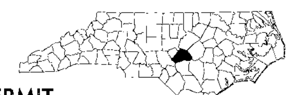
LOCATION: IMPROVE I-95 INTERCHANGES AND WIDEN TO EIGHT LANES SR 1793 (SPRING BRANCH ROAD /POPE ROAD) (EXIT 72) TO US 421 (EXIT 73)

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS, CULVERT AND STRUCTURES

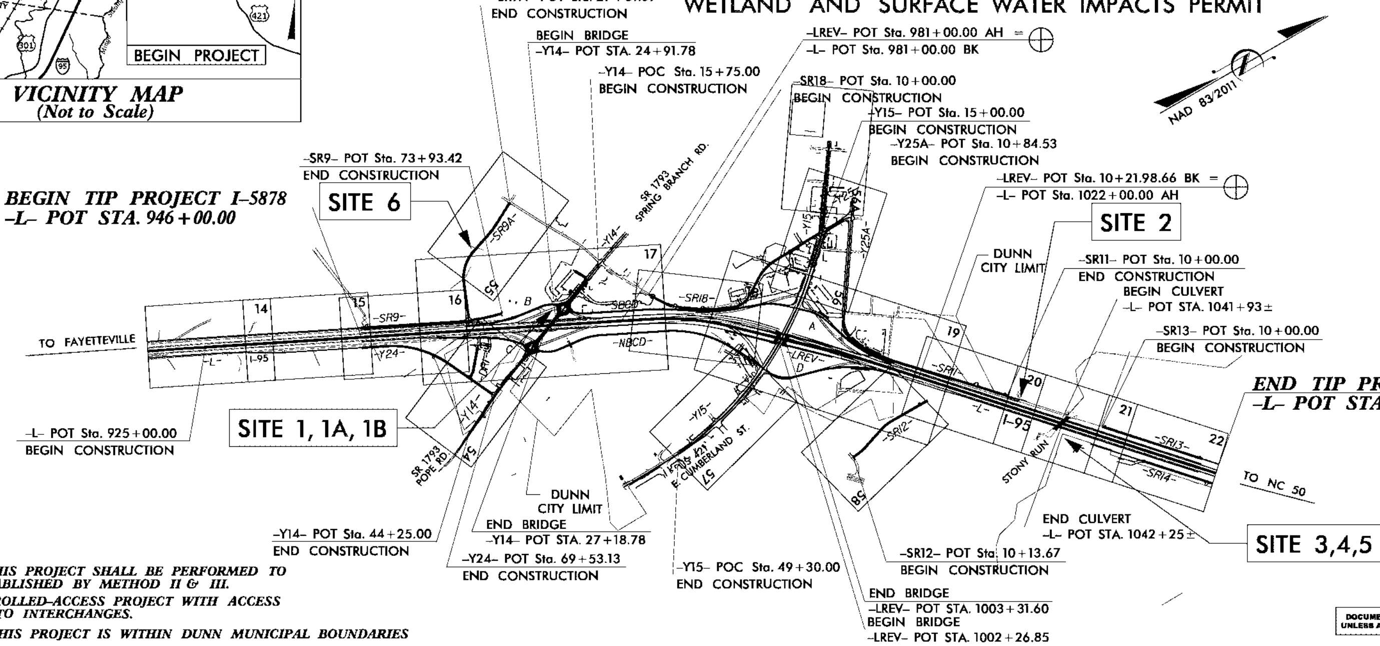
PERMIT DRAWING
SHEET 1 OF 18

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5878	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
53078.1.1	NHP-0095(007)73	PE	
53078.1.2		PE	
53078.2.2	NHP-0095(017)73	RW & UTIL.	

I-5878
FINAL RIGHT OF WAY PLANS



WETLAND AND SURFACE WATER IMPACTS PERMIT



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

A PORTION OF THIS PROJECT IS WITHIN DUNN MUNICIPAL BOUNDARIES

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2020 = 61,400
ADT 2040 = 83,400
K = 7 %
D = 55 %
T = 18 % *
V = 70 MPH
* (13% TTST + 5% DUALS)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5878 .... 2.190 MILES
LENGTH STRUCTURE TIP PROJECT I-5878 .... 0.026 MILES
TOTAL LENGTH OF TIP PROJECT I-5878 .... 2.216 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 800
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
PHASE I:
MARCH 29, 2018
FINAL:
AUGUST 2, 2019

LETTING DATE:
JULY 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

RICK STATON
PROJECT DESIGN ENGINEER

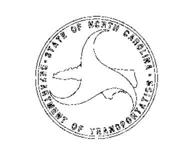
STEVE D. KENDALL, P.E.
NCDOT CONTACT

HYDRAULICS ENGINEER

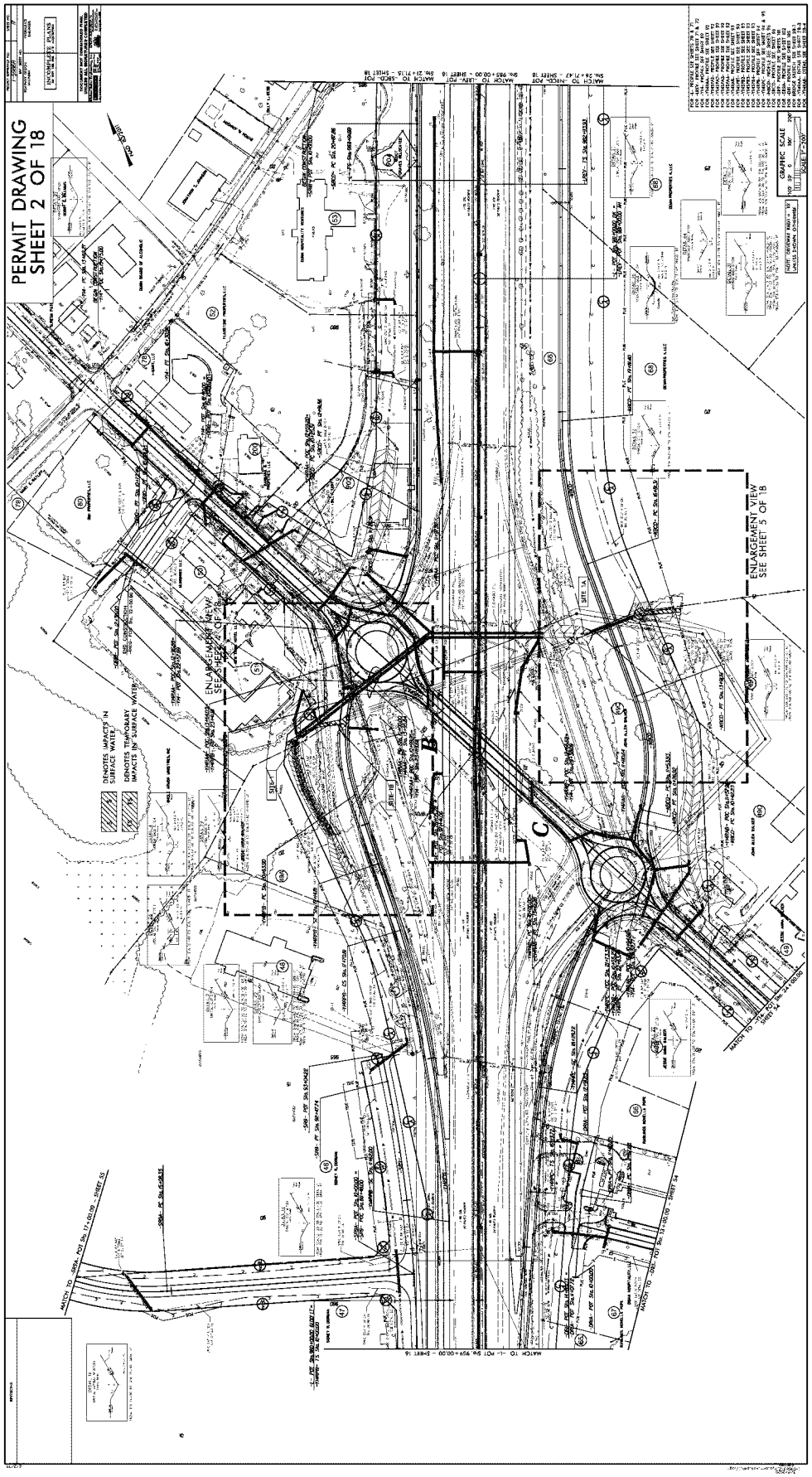
P.E.
SIGNATURE:

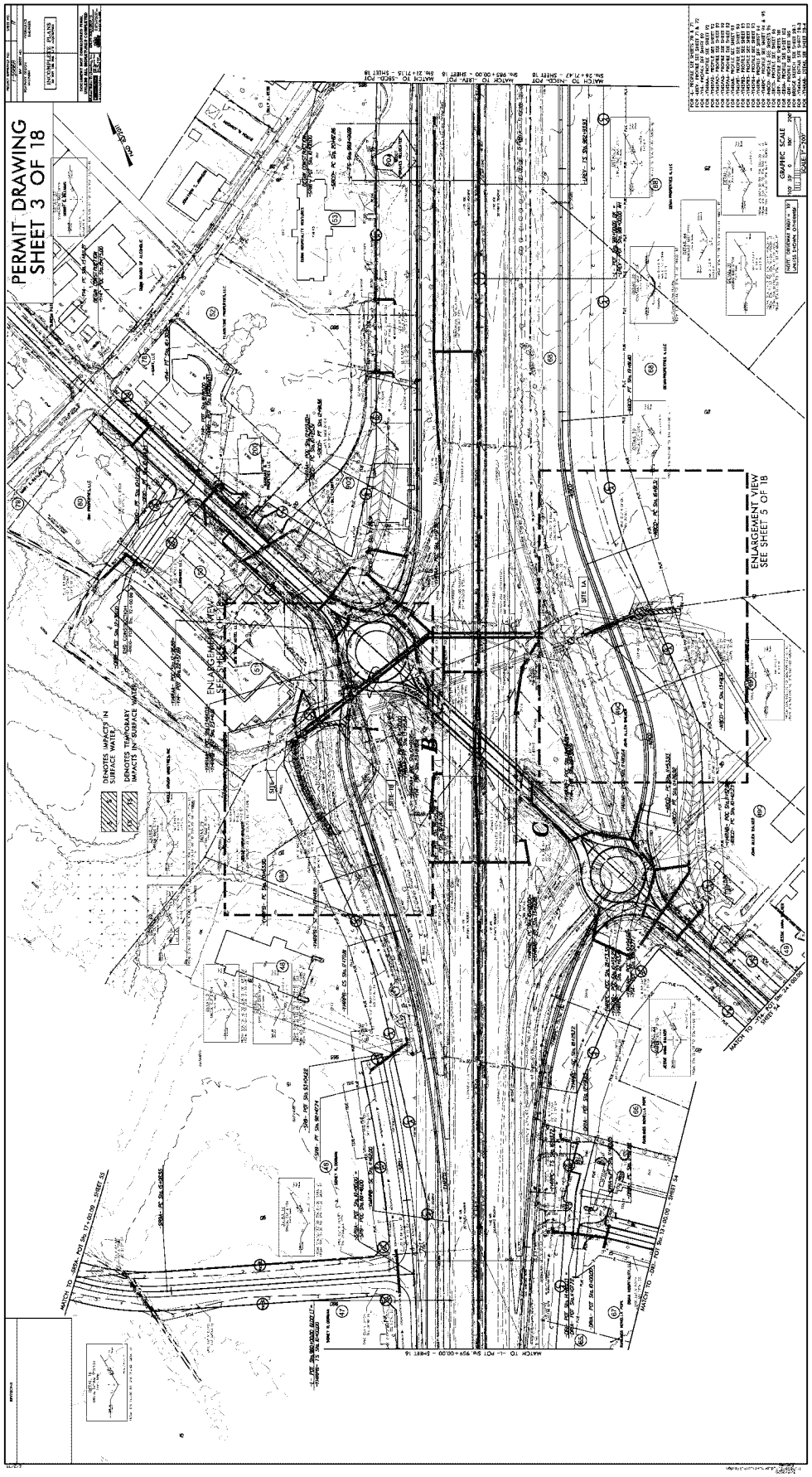
ROADWAY DESIGN ENGINEER

P.E.
SIGNATURE:

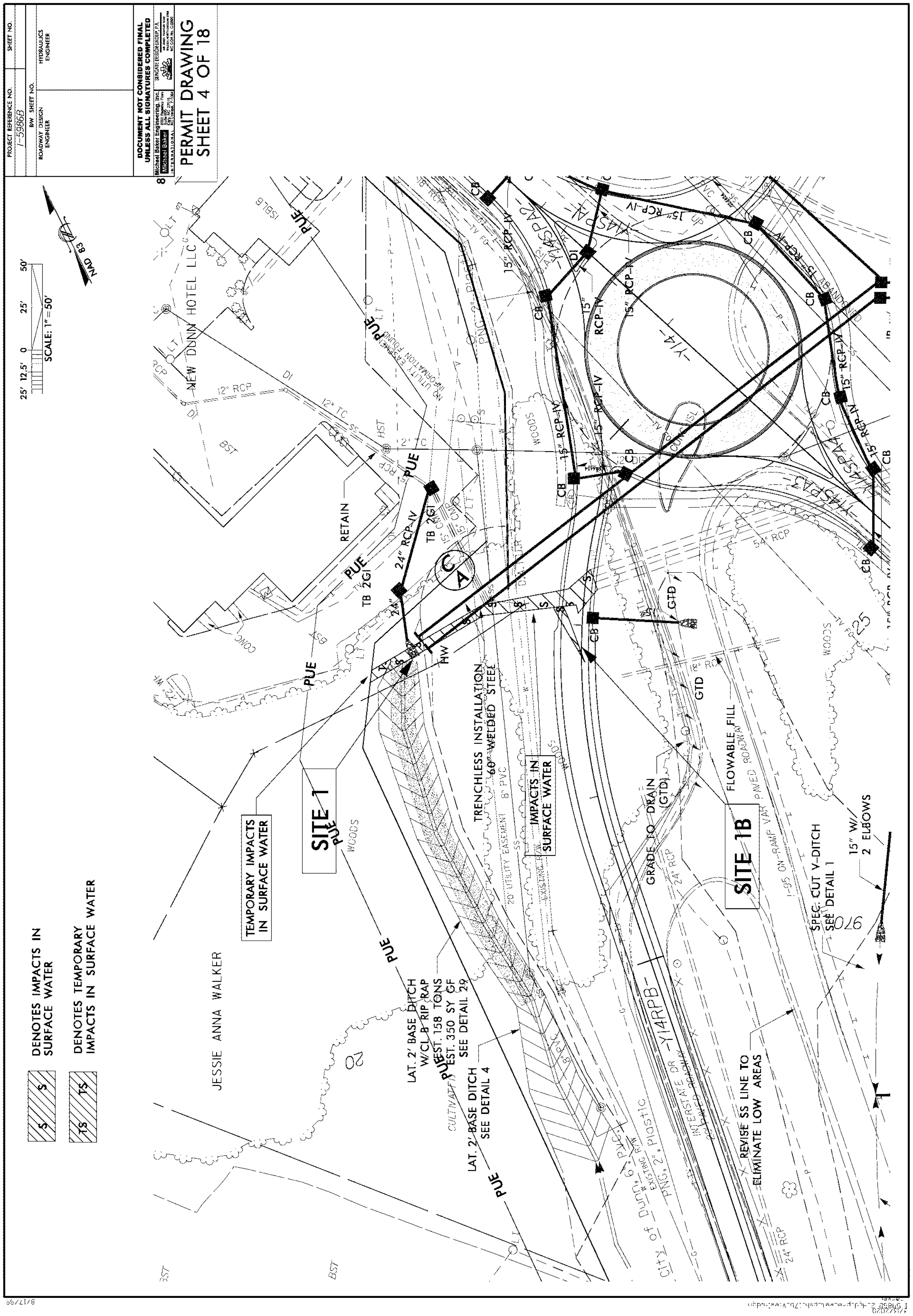


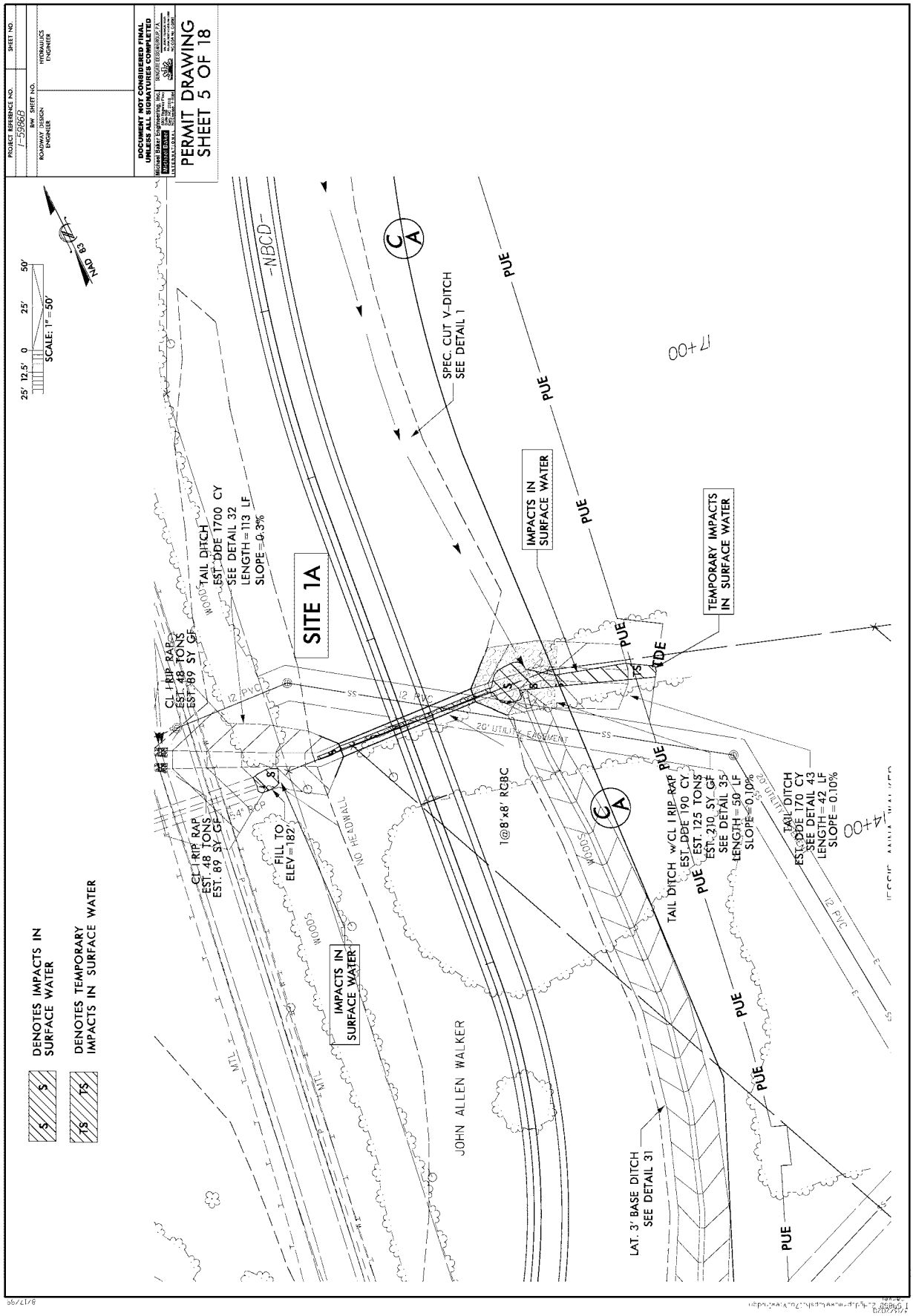
3/13/2020
I-5963-2_Hyd_prm_wet_psh_01.dgn
harvey


PERMIT DRAWING
SHEET 2 OF 18
ENLARGEMENT VIEW
SEE SHEET 5 OF 18
ENLARGEMENT VIEW
SEE SHEET 5 OF 18
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SCALE 1"=200'


PERMIT DRAWING
SHEET 3 OF 18
ENLARGEMENT VIEW
SEE SHEET 5 OF 18
ENLARGEMENT VIEW
SEE SHEET 5 OF 18
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SCALE 1"=200'

P-50


PROJECT REFERENCE NO.
I-5986B
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
PERMIT DRAWING
SHEET 4 OF 18
SCALE: 1" = 50'
NAD 83
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
JESSIE ANNA WALKER
NEW DUNN HOTEL LLC
TEMPORARY IMPACTS IN SURFACE WATER
SITE 1
IMPACTS IN SURFACE WATER
TRENCHLESS INSTALLATION 60" WELDED STEEL
SITE 1B
FLOWABLE FILL
GRADE TO DRAIN (GTD)
LAT. 2' BASE DITCH W/CL B RIP RAP EST. 158 TONS EST. 350 SY GF SEE DETAIL 29
LAT. 2' BASE DITCH SEE DETAIL 4
REVISE SS LINE TO ELIMINATE LOW AREAS
SPEC. CUT V-DITCH SEE DETAIL 1
15" W/ 2 ELBOWS
RETAIN
24" RCP-IV
TB 2GI
I-95 ON-RAMP
-Y14RPB-
-Y14-
City of Dunn

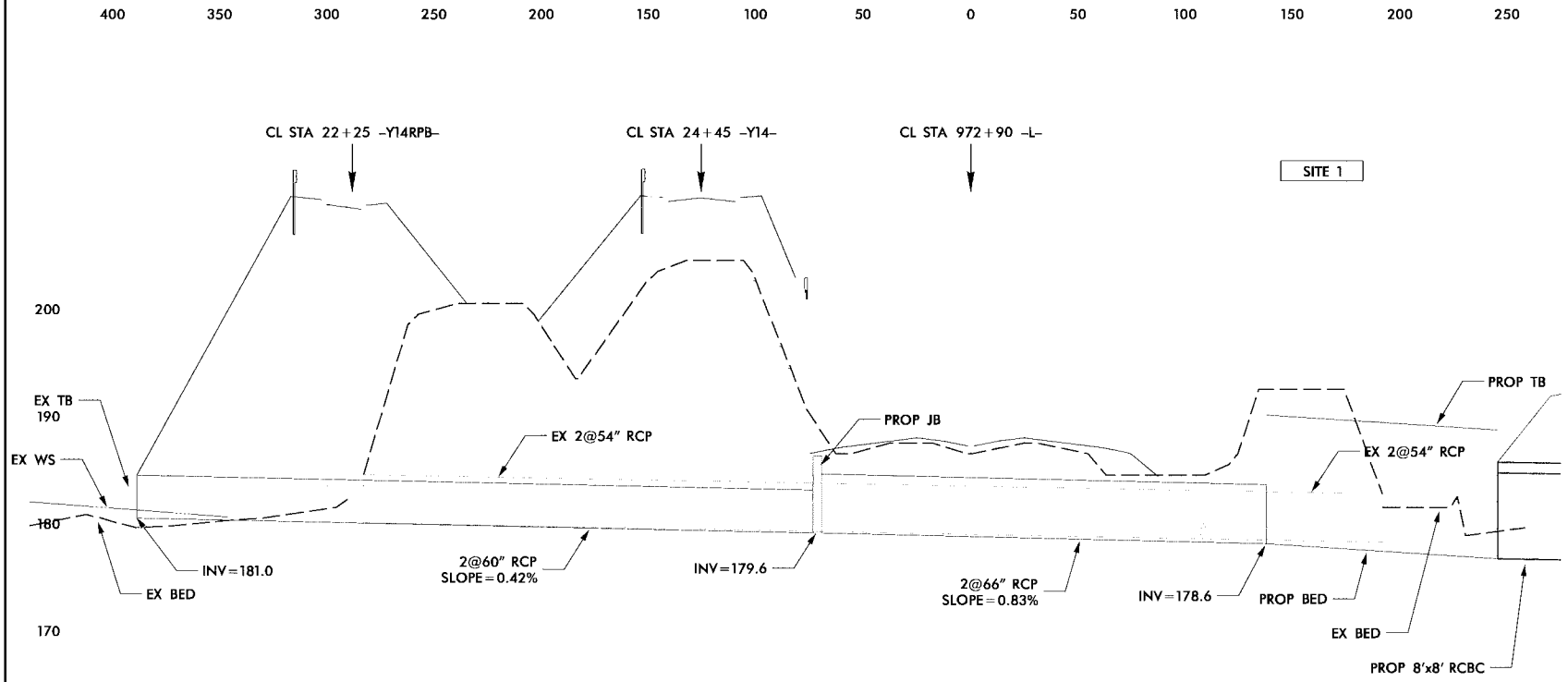

PROJECT REFERENCE NO.
7-5986
SHEET NO.
BW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 5 OF 18
SCALE: 1" = 50'
NAD 83
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 1A
-NBCD-
SPEC. CUT V-DITCH
SEE DETAIL 1
TAIL DITCH
EST. DDE 1700 CY
SEE DETAIL 32
LENGTH = 113 LF
SLOPE = 0.3%
CL I RIP RAP
EST. 48 TONS
EST. 89 SY GF
FILL TO
ELEV = 182'
NO HEADWALL
IMPACTS IN
SURFACE WATER
1@8'x8' RCBC
JOHN ALLEN WALKER
TAIL DITCH w/CL I RIP RAP
EST. DDE 190 CY
EST. 125 TONS
EST. 210 SY GF
SEE DETAIL 35
LENGTH = 50' LF
SLOPE = 0.10%
TAIL DITCH
EST. DDE 170 CY
SEE DETAIL 43
LENGTH = 42 LF
SLOPE = 0.10%
LAT. 3' BASE DITCH
SEE DETAIL 31
TEMPORARY IMPACTS
IN SURFACE WATER
20' UTILITY EASEMENT
PUE
17+00
14+00

PROJECT REFERENCE NO.	SHEET NO.
I-5877	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 6 OF 18



P-52

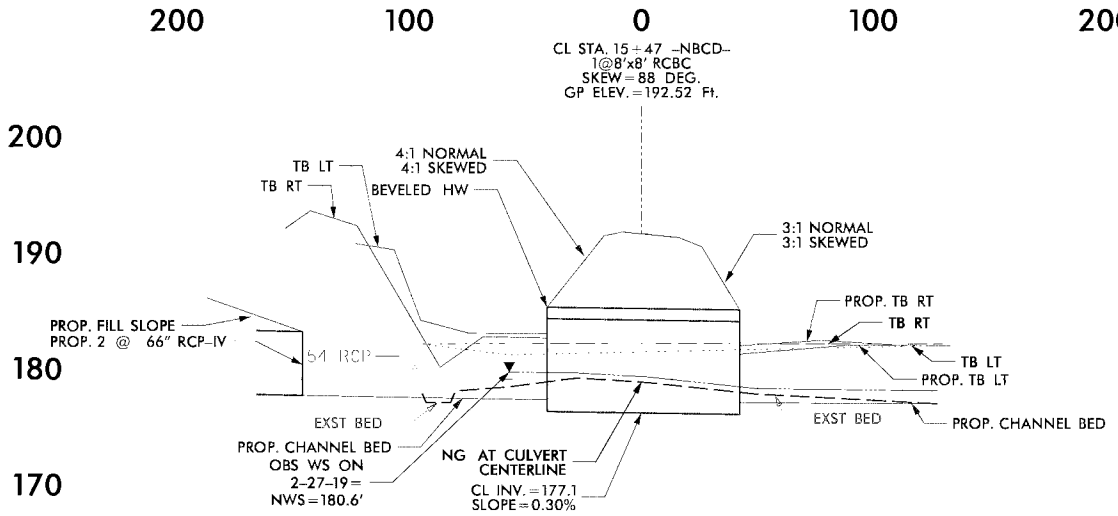
PROJECT REFERENCE NO.	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

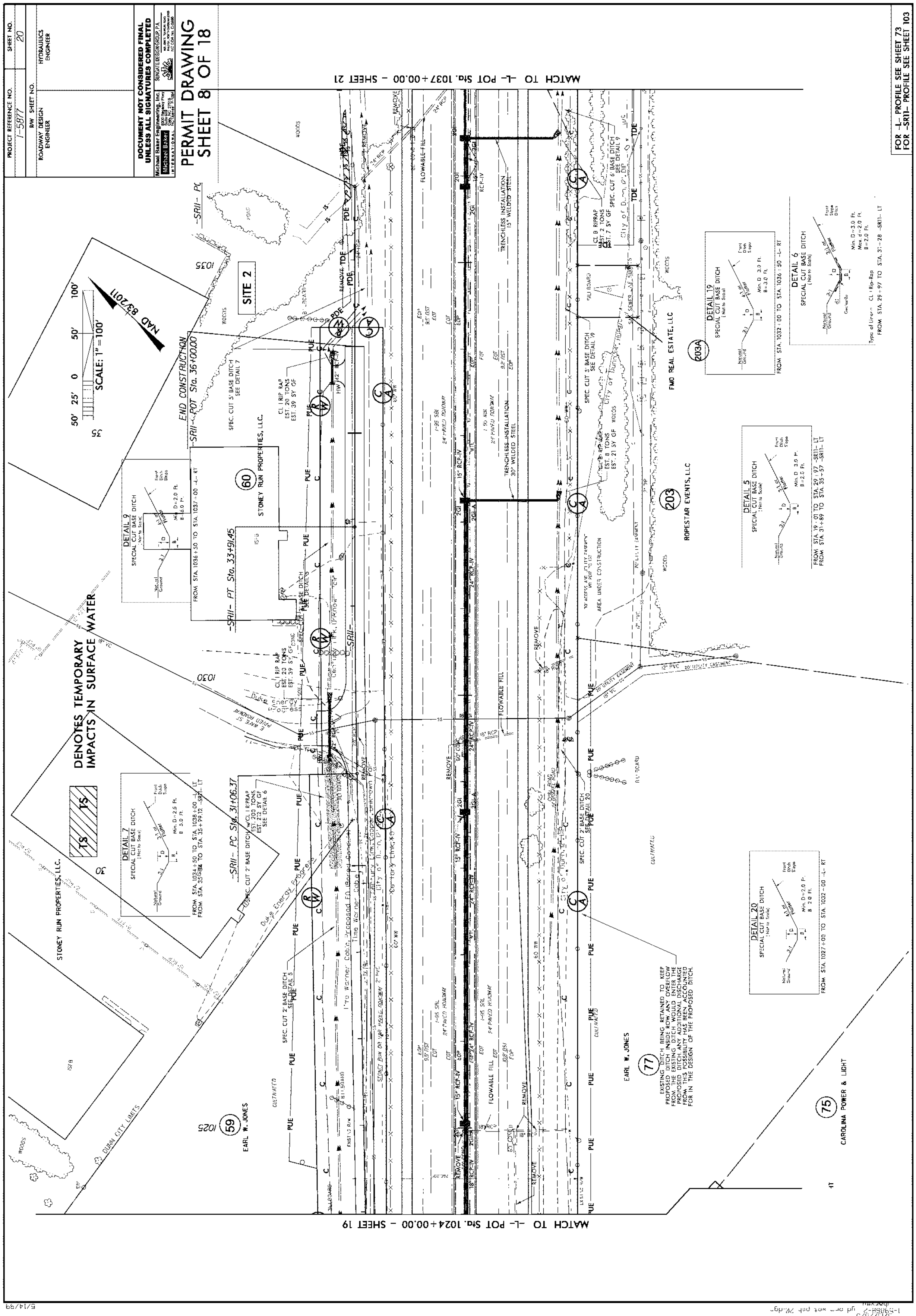
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

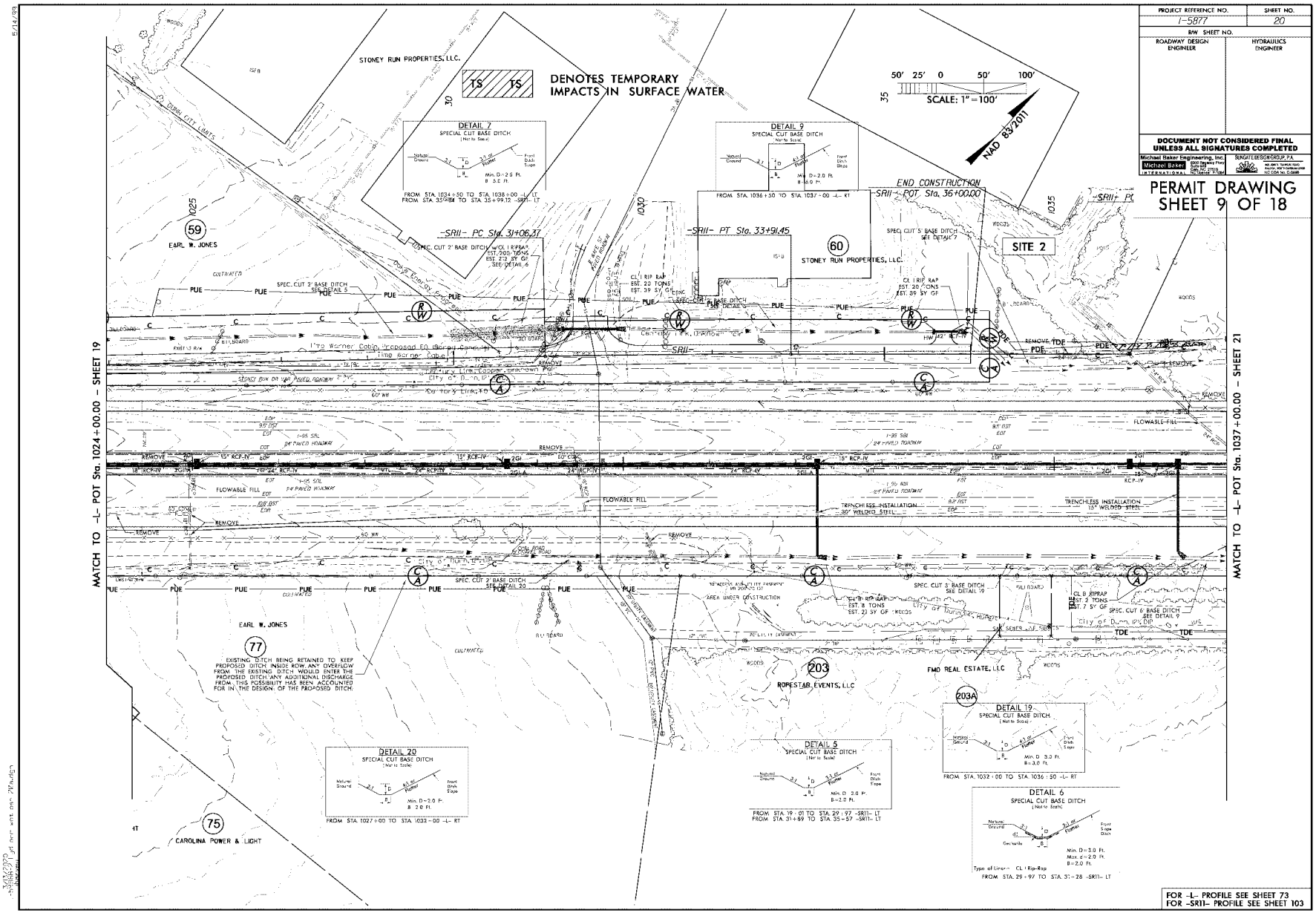
PERMIT DRAWING
SHEET 7 OF 18

SITE 1

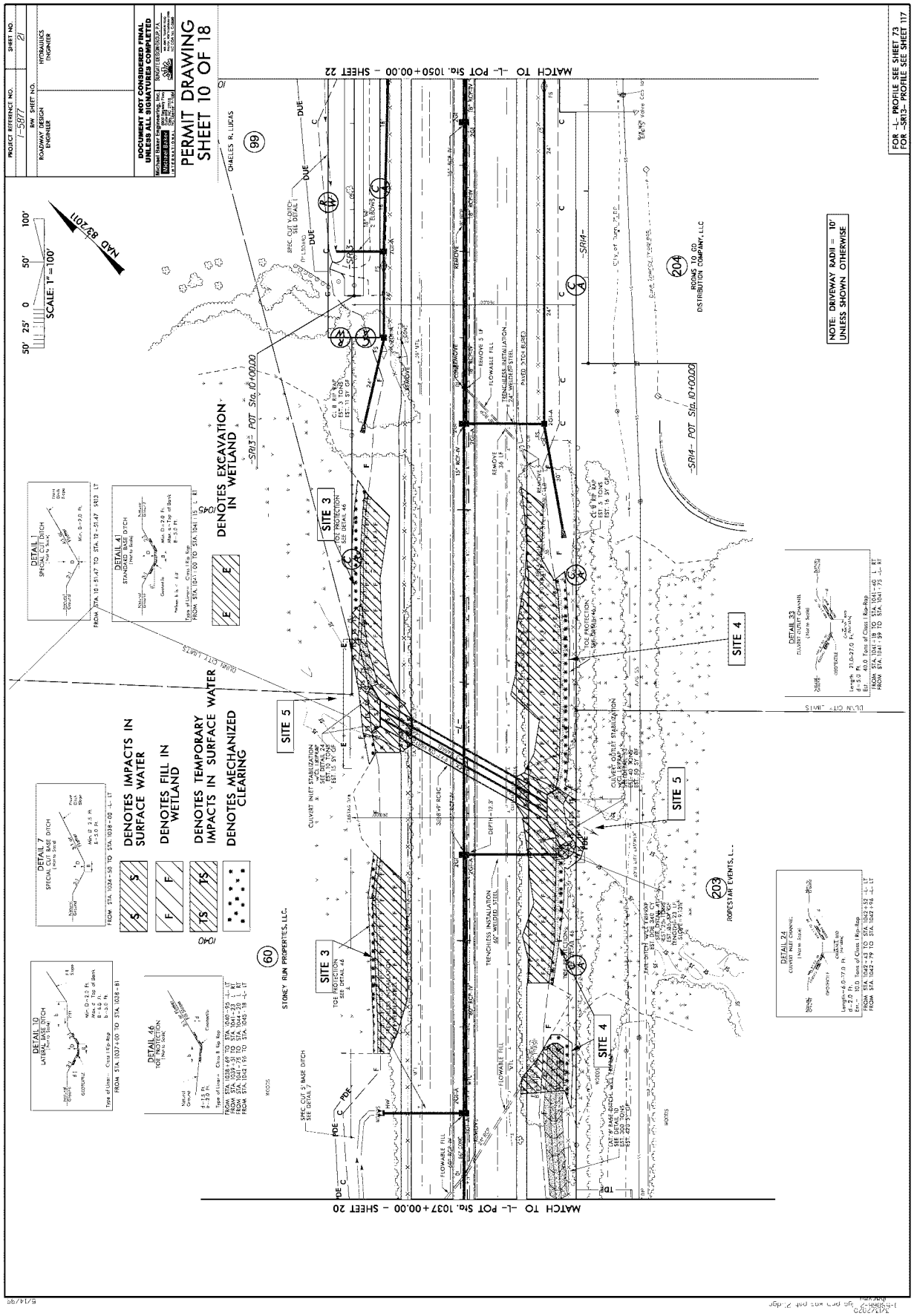


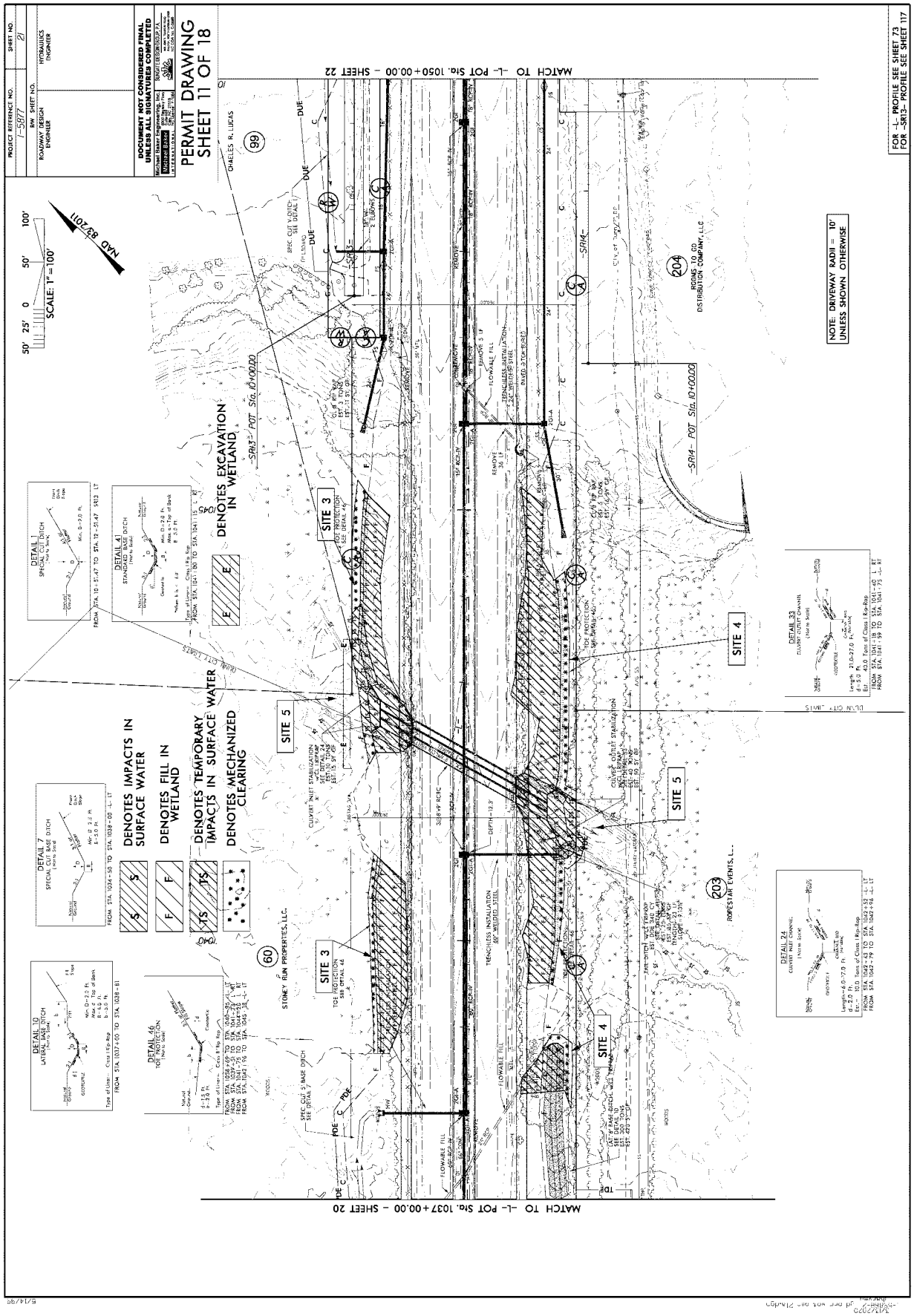
P-53

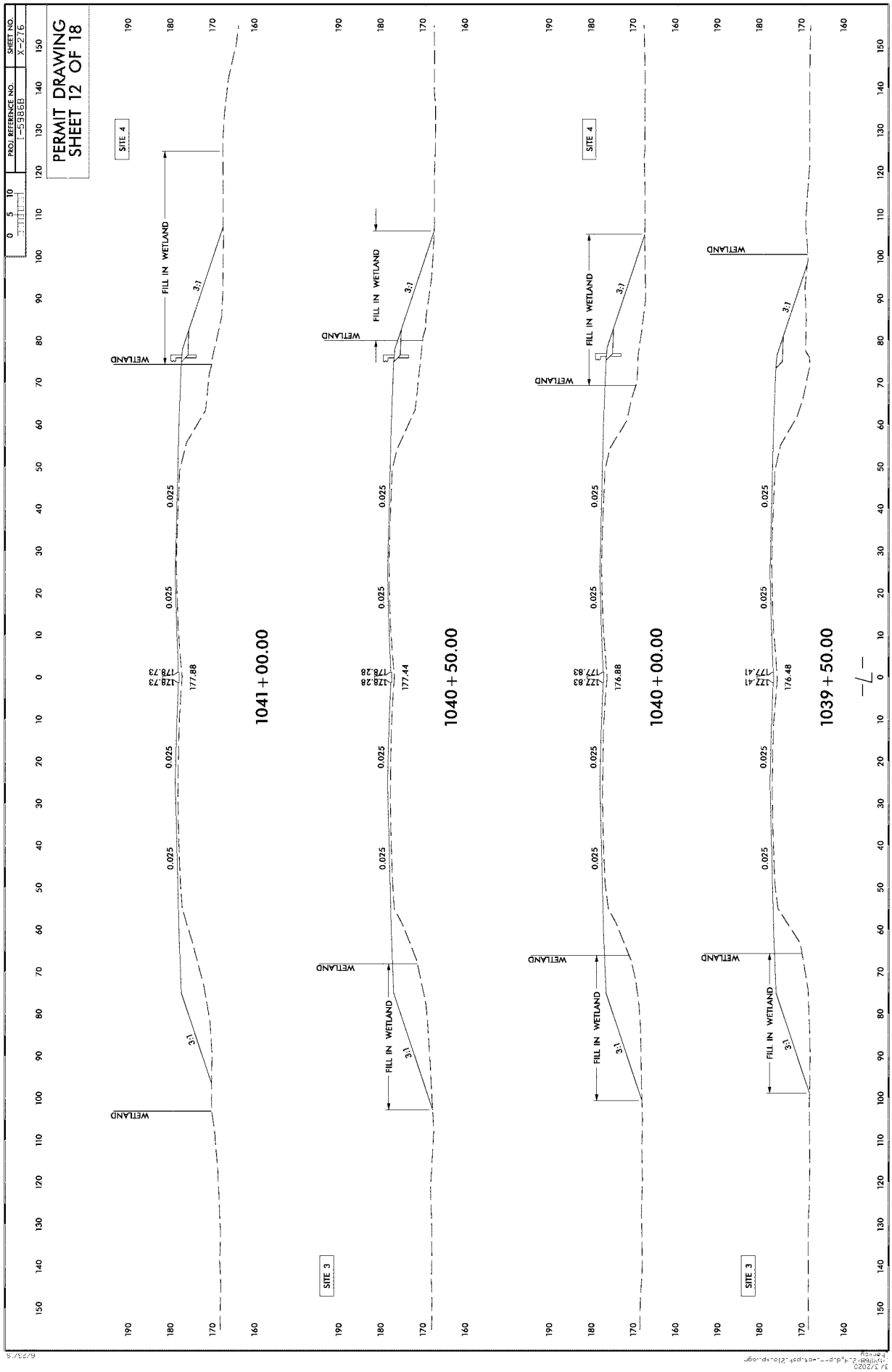

PERMIT DRAWING
SHEET 8 OF 18
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5877
SHEET NO. 20
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
MATCH TO -L- POT Sta. 1037+00.00 - SHEET 21
MATCH TO -L- POT Sta. 1024+00.00 - SHEET 19
FOR -L- PROFILE SEE SHEET 73
FOR -SRII- PROFILE SEE SHEET 103
NAD 83/2011
SCALE: 1"=100'
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 2
END CONSTRUCTION -SRII-/-POT Sta. 36+00.00
-SRII- PT Sta. 33+91.45
-SRII- PC Sta. 31+06.37
STONEY RUN PROPERTIES, LLC.
EARL W. JONES
FMO REAL ESTATE, LLC
ROPESTAR EVENTS, LLC
CAROLINA POWER & LIGHT
TRENCHLESS INSTALLATION 15" WELDED STEEL
TRENCHLESS INSTALLATION 30" WELDED STEEL
FLOWABLE FILL
DETAIL 5 SPECIAL CUT BASE DITCH
DETAIL 6 SPECIAL CUT BASE DITCH
DETAIL 7 SPECIAL CUT BASE DITCH
DETAIL 9 SPECIAL CUT BASE DITCH
DETAIL 19 SPECIAL CUT BASE DITCH
DETAIL 20 SPECIAL CUT BASE DITCH
EXISTING DITCH BEING RETAINED TO KEEP PROPOSED DITCH INSIDE ROW ANY OVERFLOW FROM THE EXISTING DITCH WOULD ENTER THE PROPOSED DITCH. ANY ADDITIONAL DISCHARGE FROM THIS POSSIBILITY HAS BEEN ACCOUNTED FOR IN THE DESIGN OF THE PROPOSED DITCH.
5/14/99

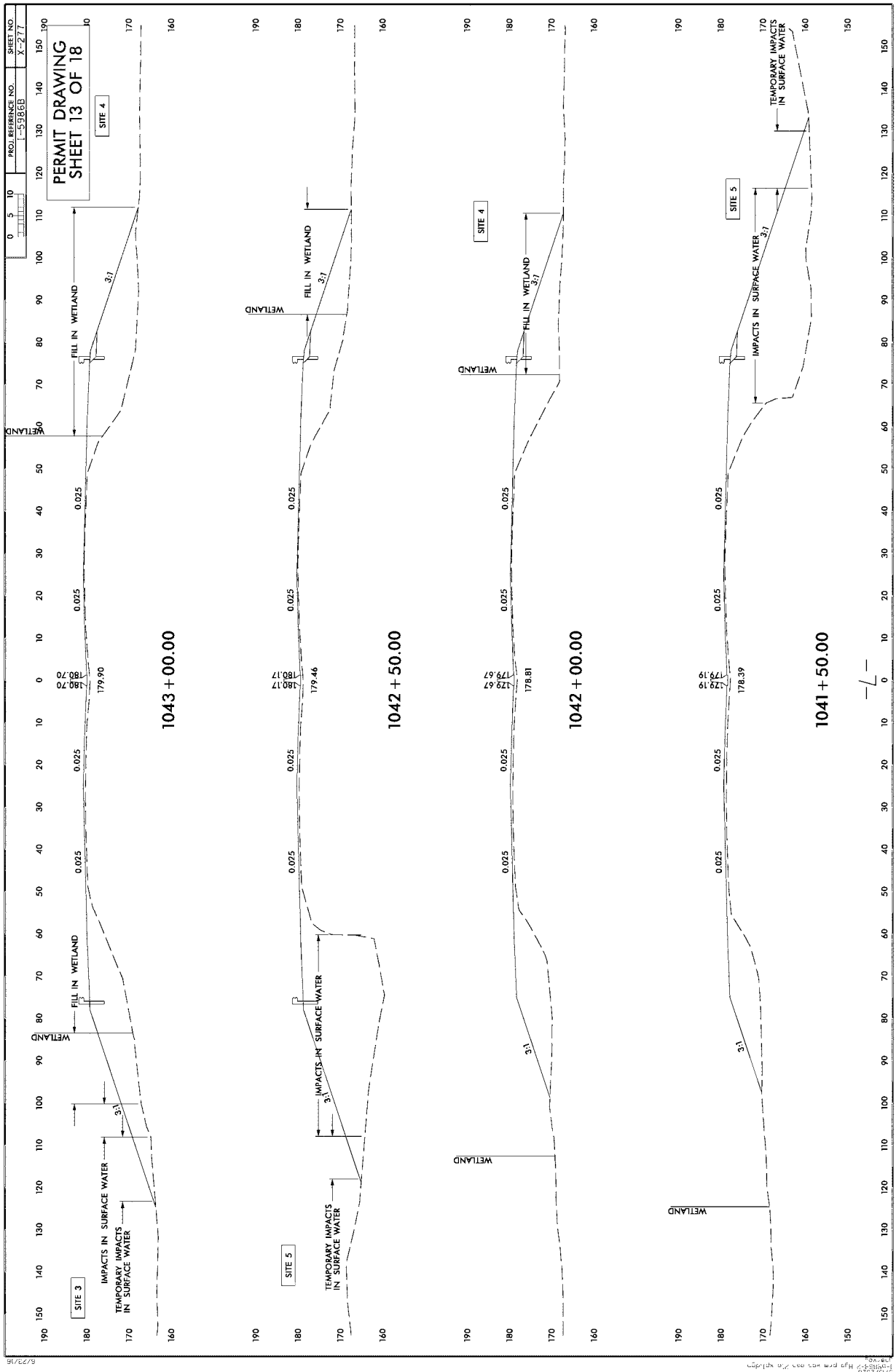

PROJECT REFERENCE NO.
I-5877
SHEET NO.
20
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker INTERNATIONAL
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 9 OF 18
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SCALE: 1" = 100'
NAD 83/2011
STONEY RUN PROPERTIES, LLC.
DOWN CITY LIMITS
-SRII- PC Sta. 31+06.37
-SRII- PT Sta. 33+91.45
END CONSTRUCTION
-SRII- POT Sta. 36+00.00
SITE 2
EARL W. JONES
STONEY RUN PROPERTIES, LLC
CAROLINA POWER & LIGHT
FMO REAL ESTATE, LLC
ROPESTAR EVENTS, LLC
DETAIL 7
DETAIL 9
DETAIL 20
DETAIL 5
DETAIL 19
DETAIL 6
MATCH TO -L- POT Sta. 1024+00.00 – SHEET 19
MATCH TO -L- POT Sta. 1037+00.00 – SHEET 21
FOR -L- PROFILE SEE SHEET 73
FOR -SRII- PROFILE SEE SHEET 103

P-55


PERMIT DRAWING
SHEET 10 OF 18
PROJECT REFERENCE NO. 7-5877
SHEET NO. 21
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SCALE: 1" = 100'
NAD 83/2011
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
MATCH TO -L- POT Sta. 1037+00.00 - SHEET 20
MATCH TO -L- POT Sta. 1050+00.00 - SHEET 22
-SR13- POT Sta. 10+00.00
-SR14- POT Sta. 10+00.00
SITE 3
SITE 4
SITE 5
STONEY RUN PROPERTIES, LLC.
ROPESTAR EVENTS, L...
BROWN TO GO DISTRIBUTION COMPANY, LLC
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 73
FOR -SR13- PROFILE SEE SHEET 117


PERMIT DRAWING
SHEET 11 OF 18
PROJECT REFERENCE NO. 7-5877
SHEET NO. 21
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SCALE: 1" = 100'
NAD 83/2011
DENOTES IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
MATCH TO -L- POT Sta. 1037+00.00 - SHEET 20
MATCH TO -L- POT Sta. 1050+00.00 - SHEET 22
STONEY RUN PROPERTIES, LLC.
ROPESTAR EVENTS, L...
CHARLES R. LUCAS
DUKE ENERGY DISTRIBUTION COMPANY, LLC
SITE 3
SITE 4
SITE 5
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 73
FOR -SR13- PROFILE SEE SHEET 117


PERMIT DRAWING
SHEET 12 OF 18
PROJ REFERENCE NO.
I-5986B
SHEET NO.
X-276
SITE 4
SITE 3
WETLAND
FILL IN WETLAND
3:1
0.025
178.73
177.88
178.28
177.44
177.83
176.88
177.41
176.48
1041+00.00
1040+50.00
1040+00.00
1039+50.00

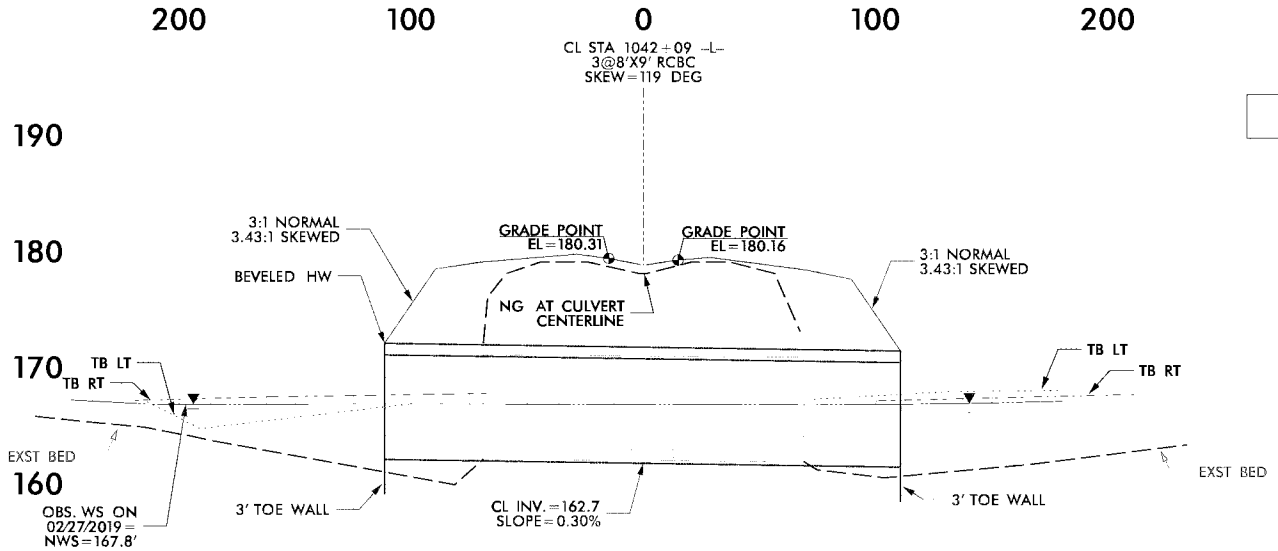

PERMIT DRAWING
SHEET 13 OF 18
PROJ. REFERENCE NO.
-5986B
SHEET NO.
X-277
SITE 3
SITE 4
SITE 5
WETLAND
FILL IN WETLAND
IMPACTS IN SURFACE WATER
TEMPORARY IMPACTS IN SURFACE WATER
3:1
0.025
179.90
180.70
179.46
180.17
178.81
179.67
178.39
179.19
1043+00.00
1042+50.00
1042+00.00
1041+50.00

PROJECT REFERENCE NO.	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

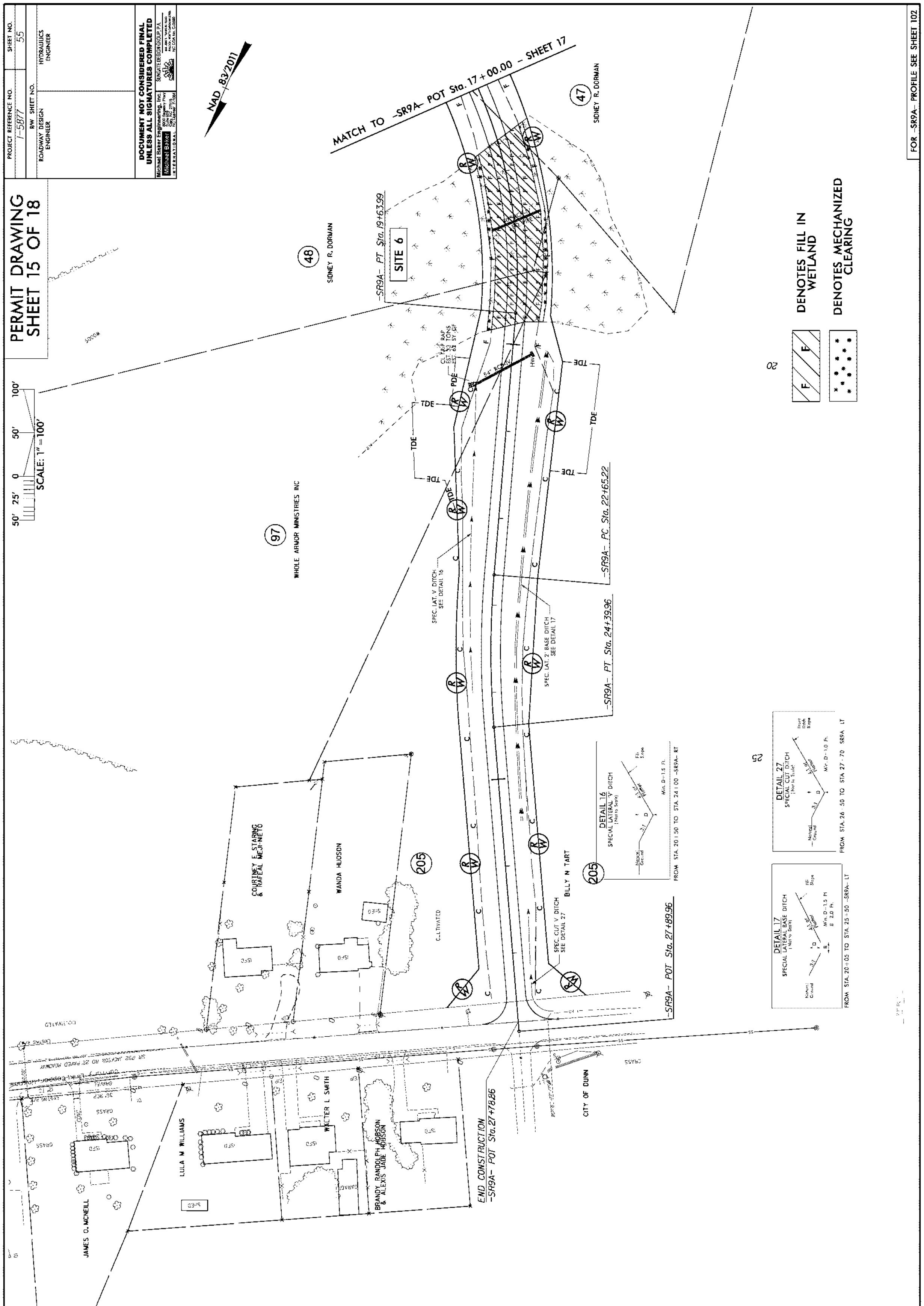
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

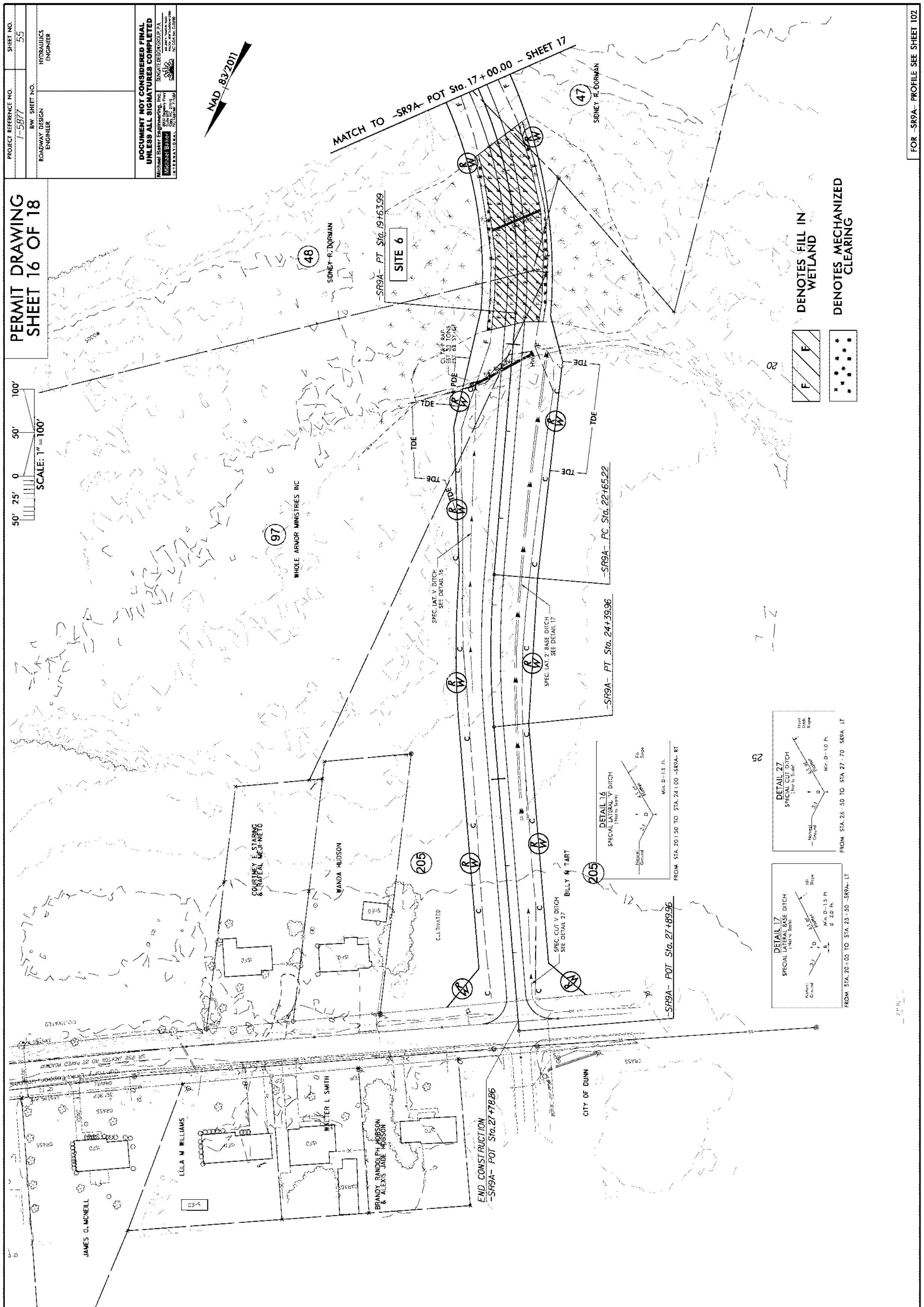
PERMIT DRAWING
SHEET 14 OF 18

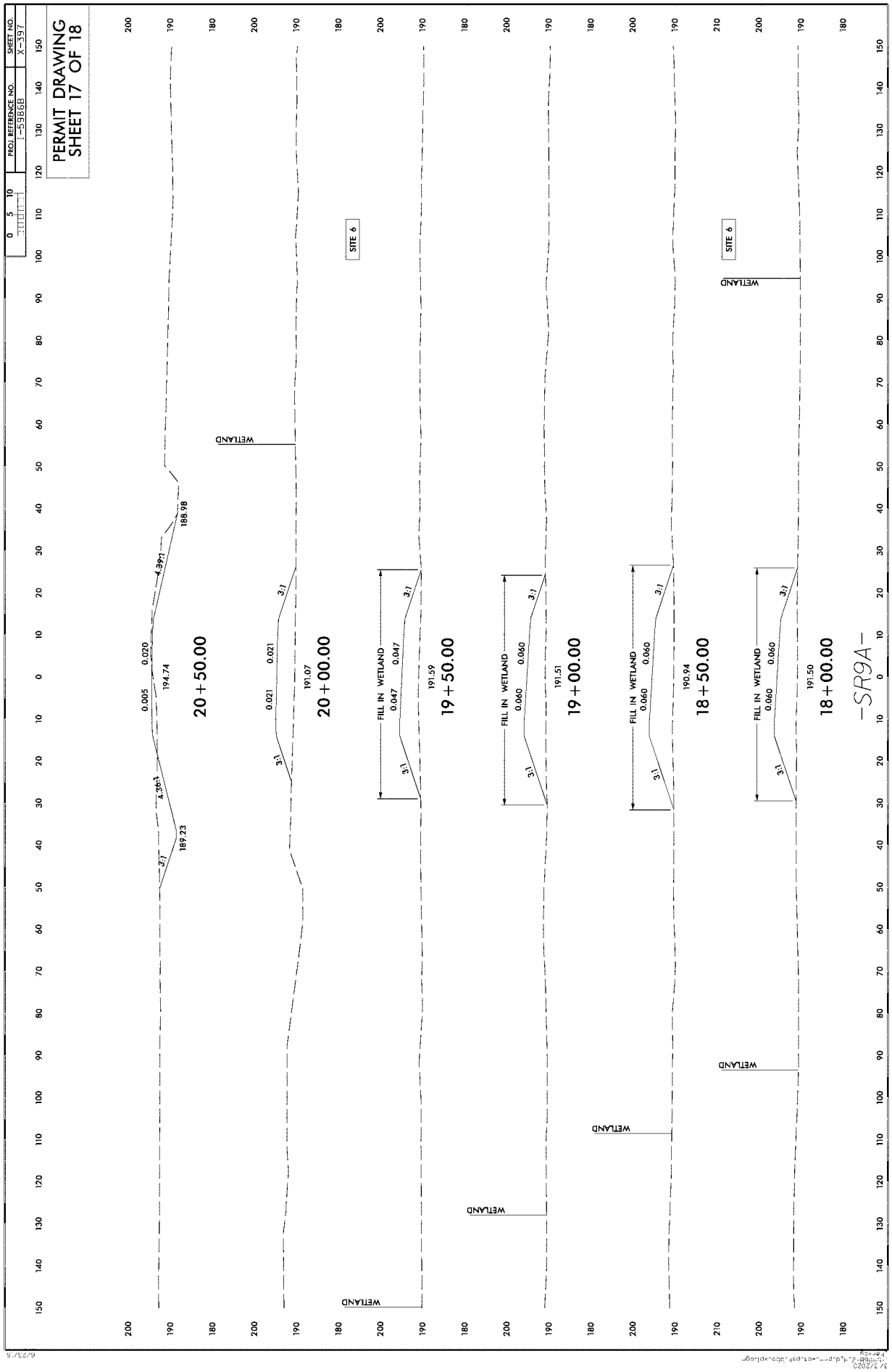


SITE 5

P-60


PERMIT DRAWING
SHEET 15 OF 18
PROJECT REFERENCE NO. I-5877
SHEET NO. 55
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -SR9A- POT Sta. 17+00.00 - SHEET 17
-SR9A- PT Sta. 19+63.99
SITE 6
SIDNEY R. DORMAN
WHOLE ARMOR MINISTRIES INC
-SR9A- PC Sta. 22+65.22
-SR9A- PT Sta. 24+39.96
-SR9A- POT Sta. 27+89.96
COURTNEY E. STARING & RAFEAL MEJI-NETO
WANDA HUDSON
BILLY N TART
LULA M WILLIAMS
JAMES O. MCNEILL
WALTER L SMITH
BRANDY RANDOLPH HOBSON & ALEXIS JADE HUDSON
CITY OF DUNN
END CONSTRUCTION -SR9A- POT Sta. 27+78.86
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
FOR -SR9A- PROFILE SEE SHEET 102


PERMIT DRAWING
SHEET 16 OF 18
SCALE: 1" = 100'
PROJECT REFERENCE NO. I-5877
SHEET NO. 55
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
NAD 83/2011
MATCH TO -SR9A- POT Sta. 17+00.00 - SHEET 17
SIDNEY R. DORMAN
SITE 6
-SR9A- PT Sta. 19+63.99
WHOLE ARMOR MINISTRIES INC
-SR9A- PC Sta. 22+65.22
-SR9A- PT Sta. 24+39.96
-SR9A- POT Sta. 27+89.96
END CONSTRUCTION
-SR9A- POT Sta. 27+78.86
COURTNEY E. STARING & RAFEAL MEJI-NIETO
WANDA HUDSON
BILLY N. TART
CULTIVATED
LULA M WILLIAMS
WALTER L SMITH
BRANDY RANDOLPH HOBSON & ALEXIS JADE HOBSON
JAMES O. MCNEILL
CITY OF DUNN
DETAIL 16
SPECIAL LATERAL "V" DITCH
DETAIL 17
SPECIAL LATERAL BASE DITCH
DETAIL 27
SPECIAL CUT DITCH
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
FOR -SR9A- PROFILE SEE SHEET 102


PERMIT DRAWING
SHEET 17 OF 18
PROJ. REFERENCE NO.
R-5986B
SHEET NO.
X-397
0 5 10
SCALE: 1"=10'
20+50.00
20+00.00
19+50.00
19+00.00
18+50.00
18+00.00
WETLAND
SITE 6
FILL IN WETLAND
194.74
188.98
189.23
191.07
191.59
191.51
190.94
191.50
0.005
0.020
0.021
0.047
0.060
4.36:1
3:1
-SR9A-

WETLAND AND SURACE WATER IMPACTS 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)
1	21+71 to 22+33-Y14RPB-	2 AT 60" WELDED STEEL						0.020		108		
		INLET CHANNEL						0.003	0.002	24	12	
1A	15+47-NBCD-	1 AT 8'x8' RCBC						0.004		83		
	15+47-NBCD-LT	INLET CHANNEL						0.030		28		
	15+47-NBCD-RT	OUTLET CHANNEL						0.020	0.003	92	16	
1B	21+71 to 22+10-Y14PRB-LT	ROADWAY FILL						0.003		35		
2	1035+67 to 1036+76-L-LT	ROADWAY FILL							0.014		94	
3	1038+79 to 1041+14-L-LT	ROADWAY FILL	0.165			0.027						
	1041+96 to 1045+30-L-LT	ROADWAY FILL	0.123			0.039		0.018	0.021			
4	1042+86 to 1044+16-L-RT	ROADWAY FILL	0.018		0.031	0.020						
	1044+41 to 1045+26-L-RT	ROADWAY FILL	0.402			0.090						
5	1042+09-L-	3 AT 8'x9' RCBC						0.103		86		
	1042+09-L-LT	INLET CHANNEL						0.013	0.013	16	12	
	1042+09-L-RT	OUTLET CHANNEL						0.030	0.018	39	11	
6	17+51 to 19+89-SR9A-	ROADWAY FILL	0.273			0.050						
TOTALS*:			**0.981**	**0.000**	**0.031**	**0.226**	**0.000**	**0.244**	**0.071**	**511**	**145**	**0**

*Rounded totals are sum of actual impacts

NOTES:

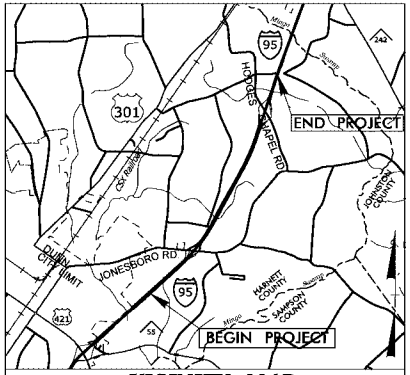
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-5-2020
HARNETT COUNTY
I-5878
53078.1.2
SHEET 18 OF 18

Revised 2018 Feb

CONTRACT:

TIP PROJECT: I-5883

See Sheet 1A I or Index of Sheets
See Sheet 1B I or Conventional Symbols



VICINITY MAP
(Not to Scale)

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HARNETT COUNTY

PERMIT DRAWING
SHEET 1 OF 38

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5883	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
53083.1.1	NHPP-0095(033)74	P.E.	
53083.2.2	NHPP-0095(033)74	R/W & UTIL.	

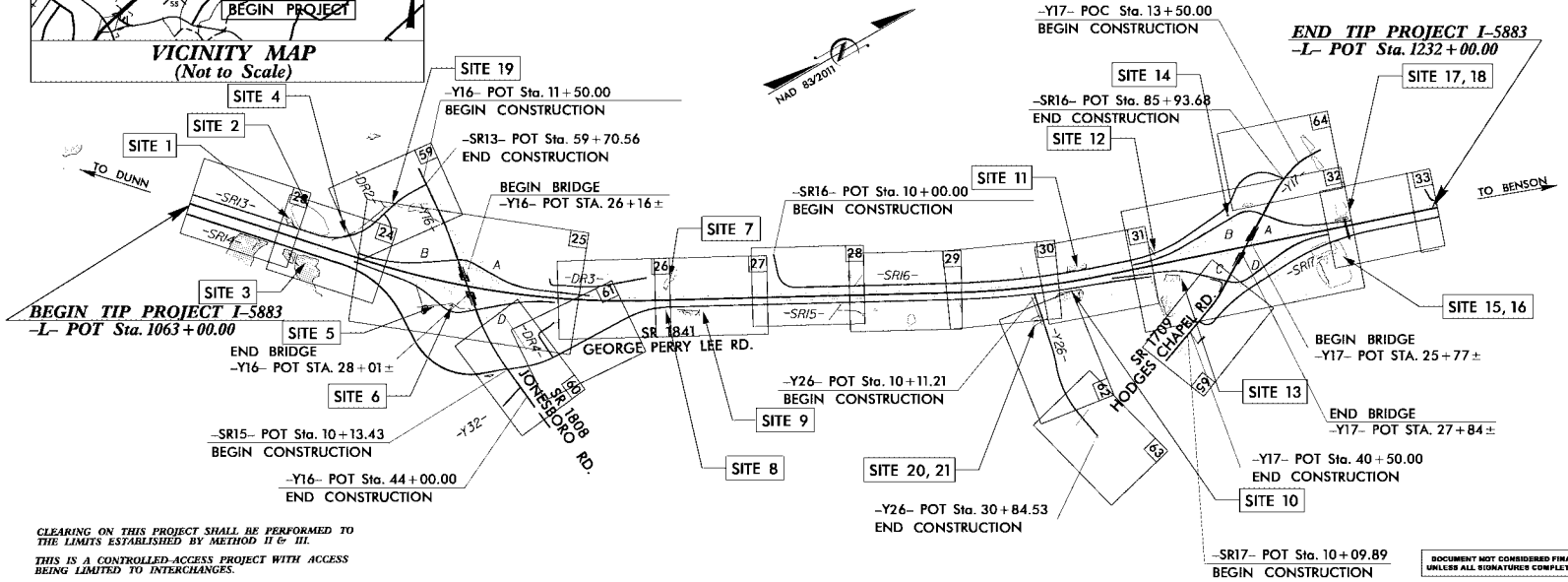
I-5883
FINAL RIGHT OF WAY PLANS

LOCATION: *IMPROVE I-95 INTERCHANGES AT SR 1808 (JONESBORO ROAD) (EXIT 75) AND SR 1709 (HODGES CHAPEL ROAD) (EXIT 77).*

TYPE OF WORK: *GRADING, PAVING, DRAINAGE, AND STRUCTURES*

WETLAND AND SURFACE WATER IMPACTS PERMIT

SECTION 3



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 2019 = 58,000
ADT 2040 = 75,700
K = 7 %
D = 55 %
T = 24 % *
V = 70 MPH
* (TTST 17% + DUAL 7%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5883 ..... 3.201 MILES

TOTAL LENGTH OF TIP PROJECT I-5883 ..... 3.201 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
February 28, 2018

LETTING DATE:
July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

CURTIS TILLMAN, PE
PROJECT DESIGN ENGINEER

STEVE D. KENDALL, PE
NCDOT CONTACT

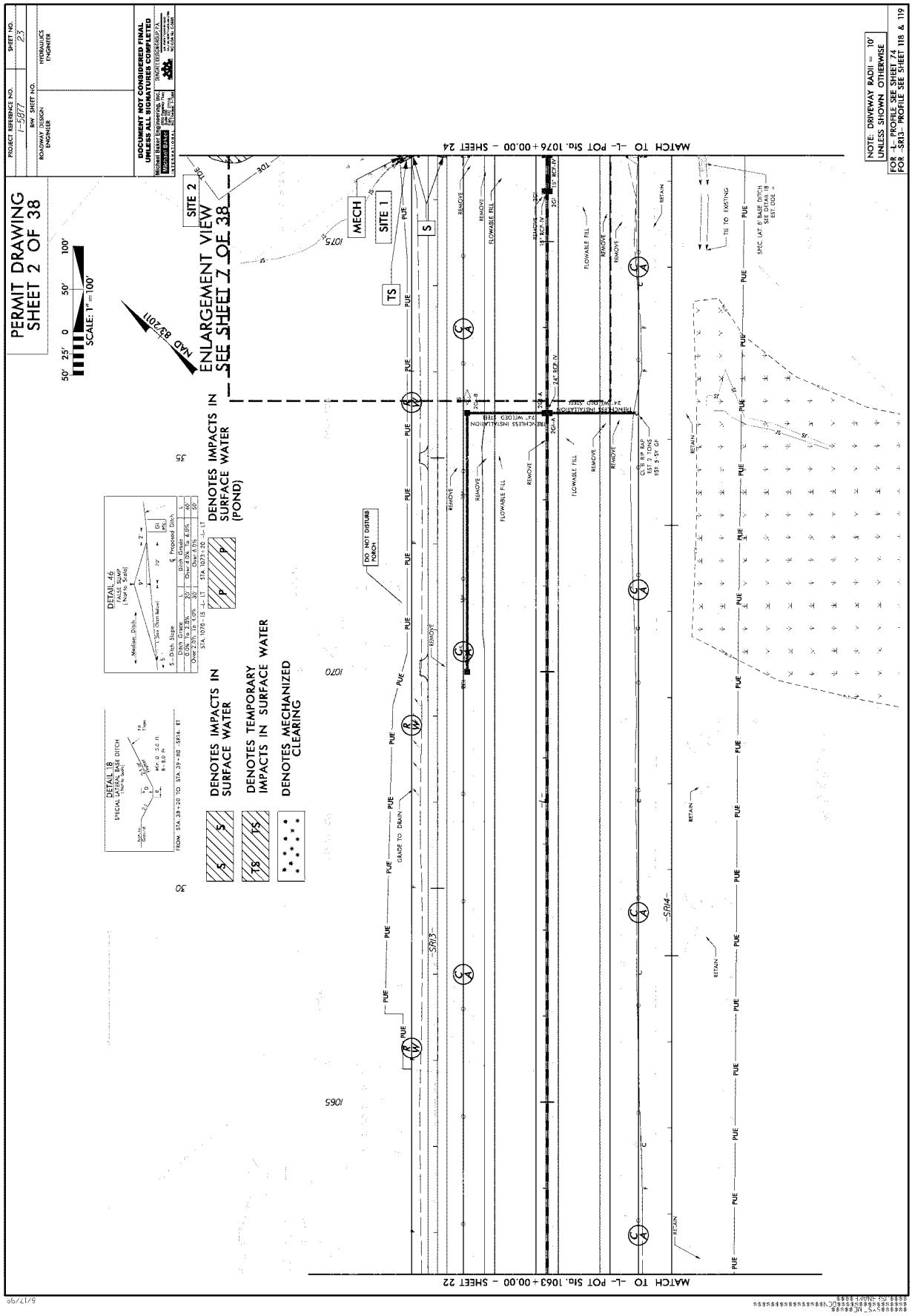
HYDRAULICS ENGINEER

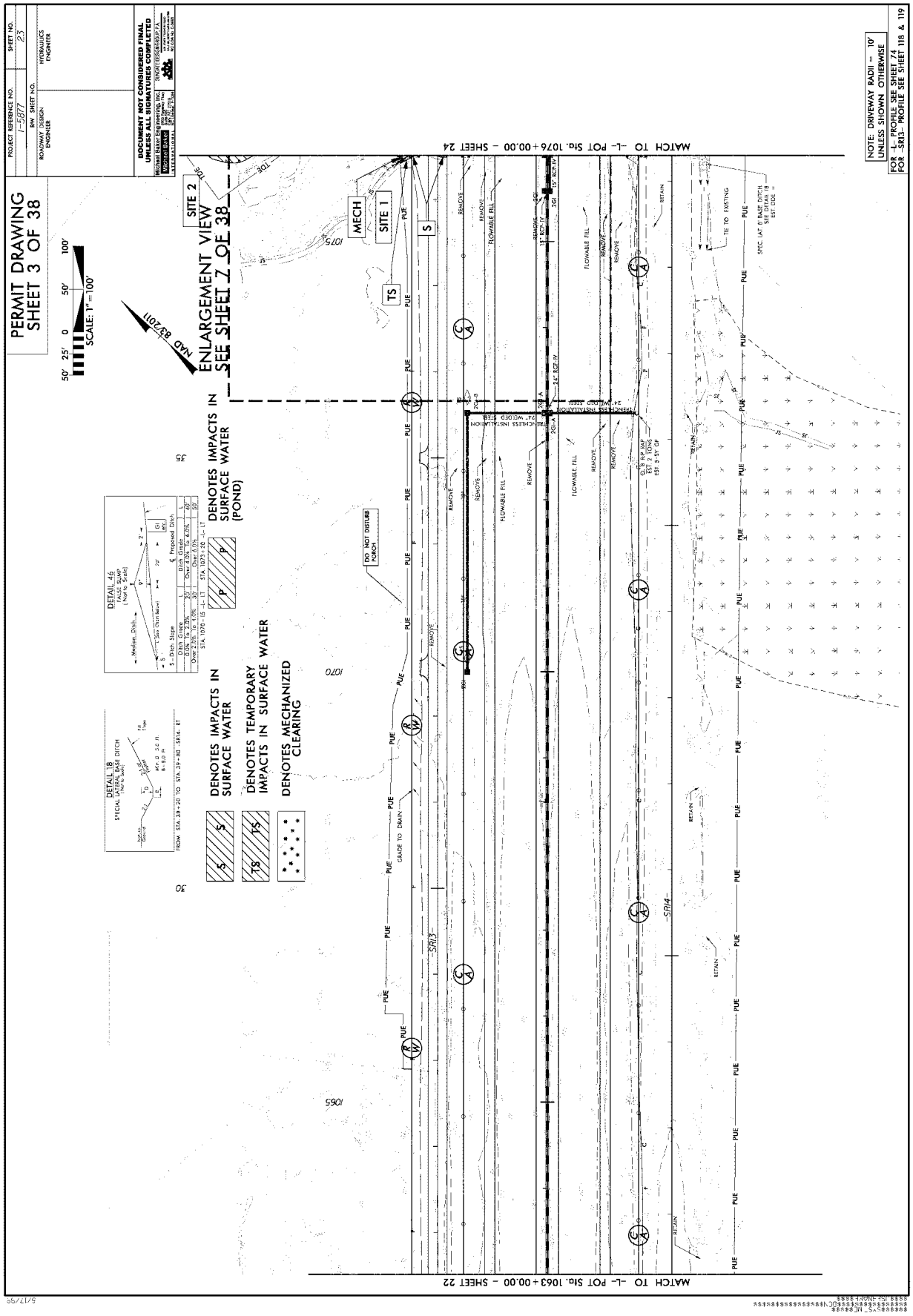
SIGNATURE: P.E.

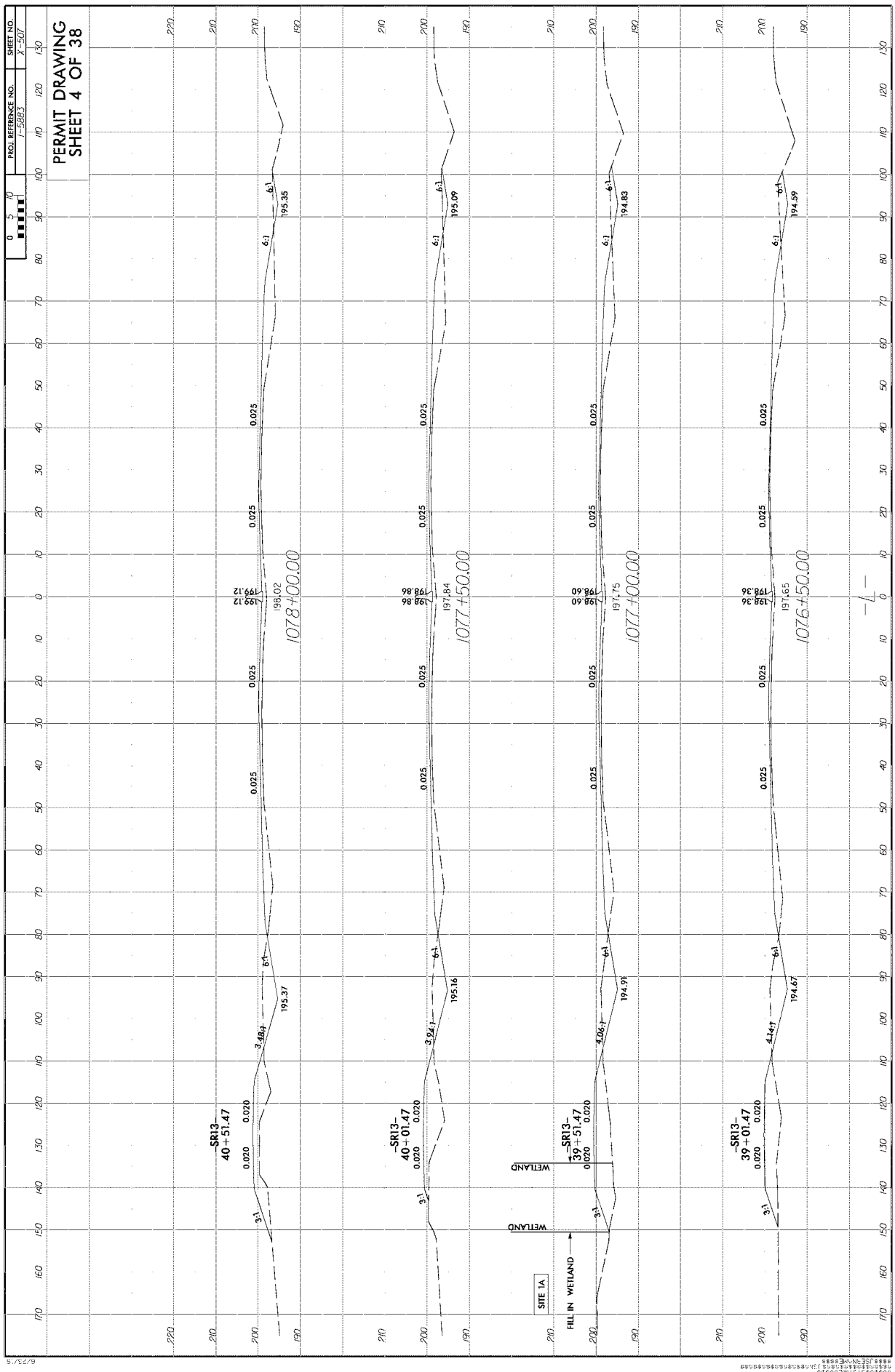
ROADWAY DESIGN ENGINEER

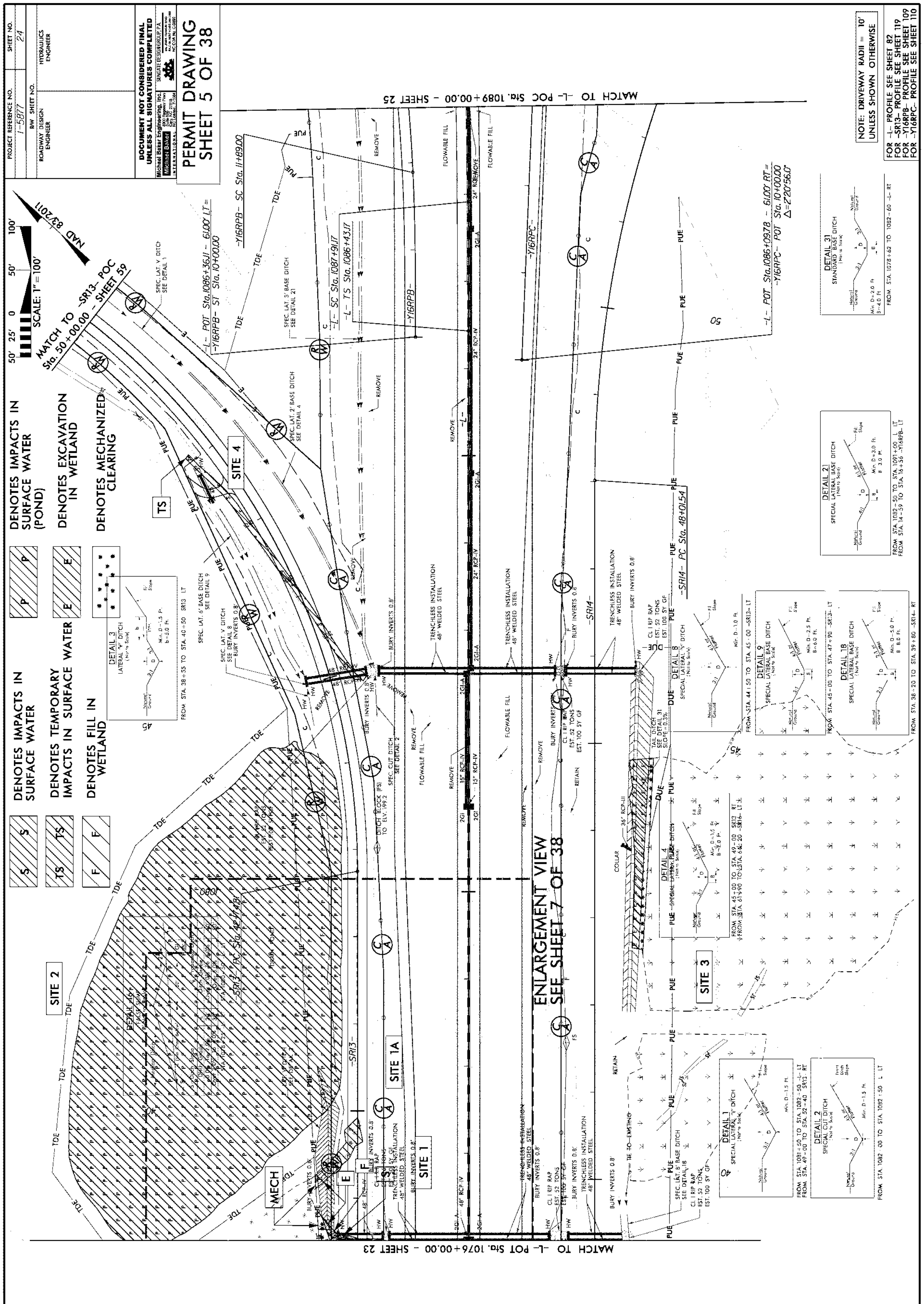
SIGNATURE: P.E.

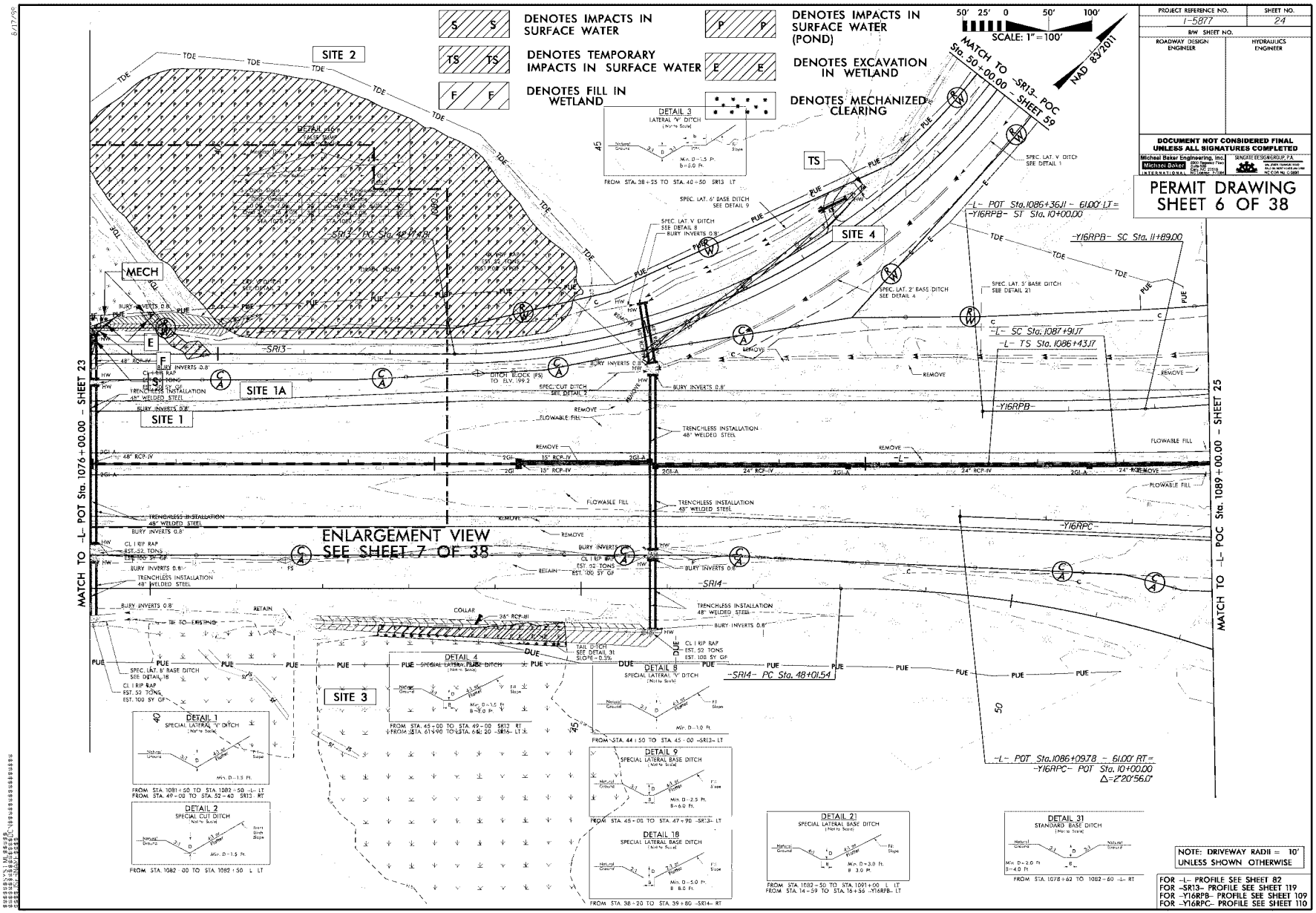
P-65


PERMIT DRAWING
SHEET 2 OF 38
SCALE: 1"=100'
NAD 83/2011
ENLARGEMENT VIEW
SEE SHEET 7 OF 38
SITE 2
SITE 1
MECH
TS
S
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DETAIL 18
SPECIAL LATERAL BASE DITCH
DETAIL 46
FALSE SUMP
DO NOT DISTURB PORCH
GRADE TO DRAIN
FLOWABLE FILL
REMOVE
RETAIN
TIE TO EXISTING
MATCH TO -L- POT Sta. 1076+00.00 - SHEET 24
MATCH TO -L- POT Sta. 1063+00.00 - SHEET 22
-SR13-
-SR14-
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 74
FOR -SR13- PROFILE SEE SHEET 118 & 119
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
PROJECT REFERENCE NO. I-5877
SHEET NO. 23
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER

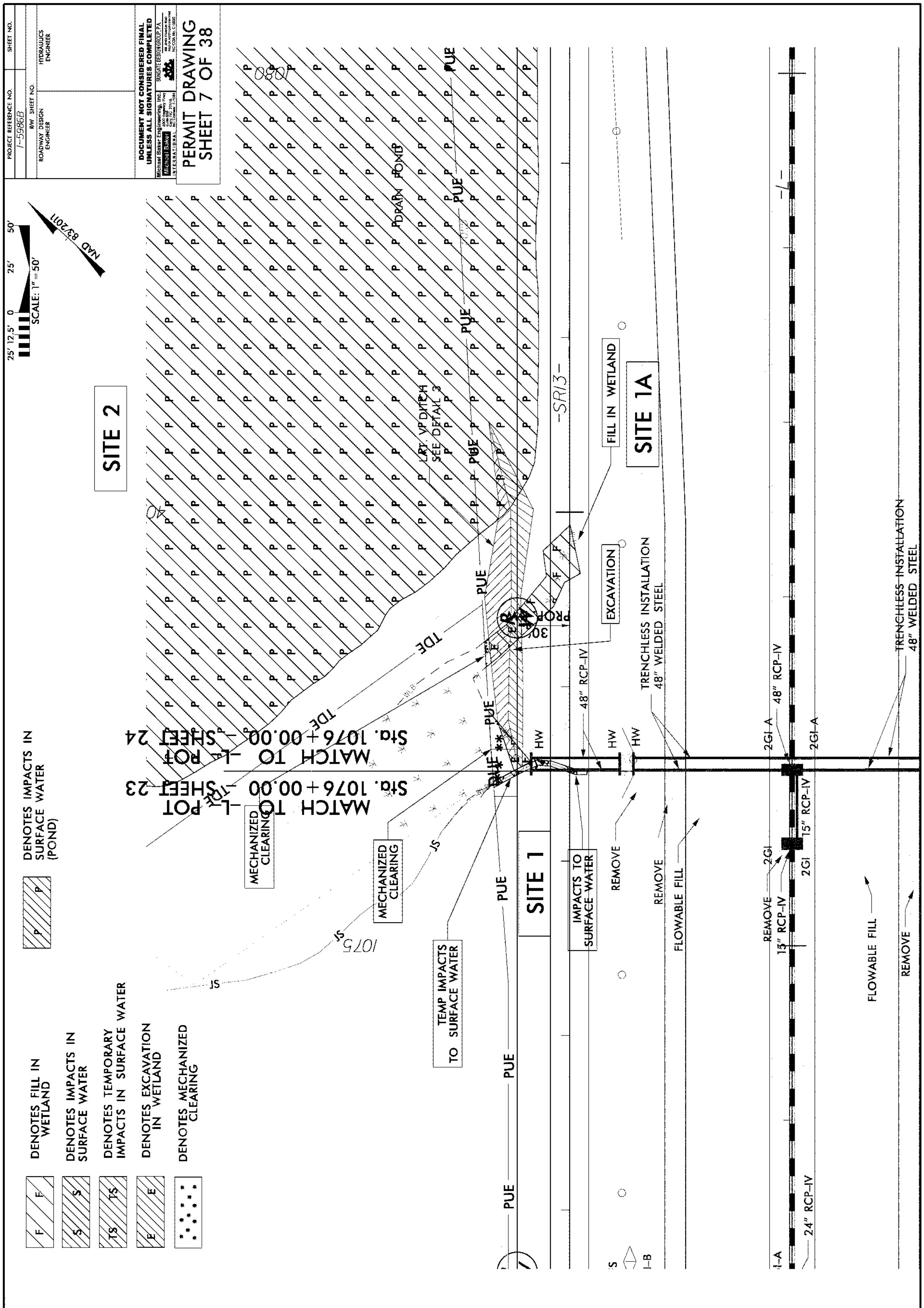

PERMIT DRAWING
SHEET 3 OF 38
SCALE: 1"=100'
NAD 83/2011
ENLARGEMENT VIEW
SEE SHEET 7 OF 38
SITE 2
SITE 1
MECH
TS
S
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DO NOT DISTURB PORCH
DETAIL 46
FALSE SUMP
DETAIL 18
SPECIAL LATERAL BASE DITCH
MATCH TO -L- POT Sta. 1076+00.00 - SHEET 24
MATCH TO -L- POT Sta. 1063+00.00 - SHEET 22
SR13
SR14
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 74
FOR -SR13- PROFILE SEE SHEET 118 & 119
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-5877
SHEET NO.
23
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER

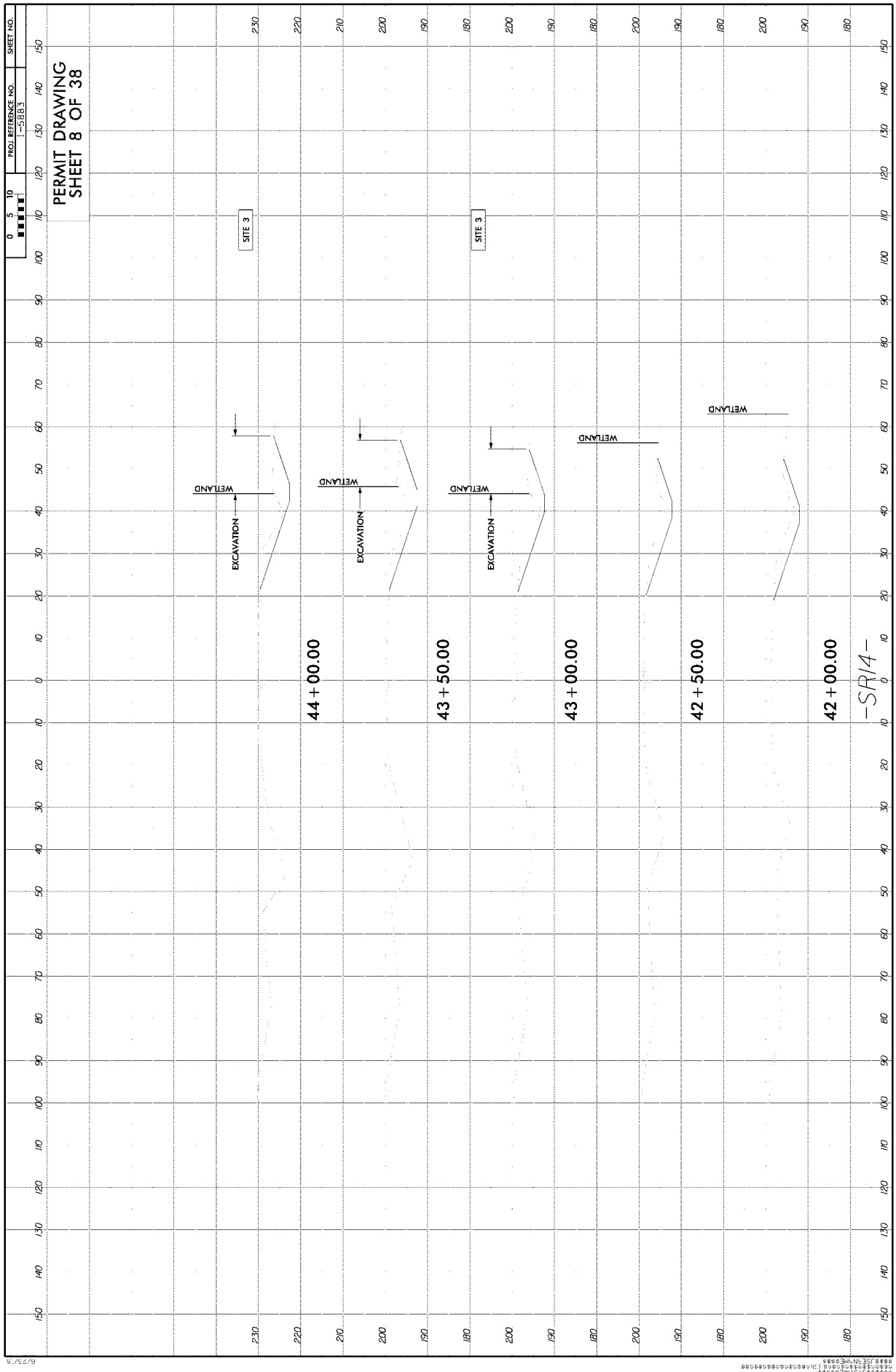

PERMIT DRAWING
SHEET 4 OF 38
PROJ. REFERENCE NO.
7-5883
SHEET NO.
X-507
0 5 10
SR13–
40+51.47
SR13–
40+01.47
SR13–
39+51.47
SR13–
39+01.47
1078+00.00
1077+50.00
1077+00.00
1076+50.00
198.02
197.84
197.75
197.65
199.12
198.86
198.60
198.36
195.35
195.09
194.83
194.59
195.37
195.16
194.91
194.67
6:1
3:1
0.025
0.020
WETLAND
SITE 1A
FILL IN WETLAND

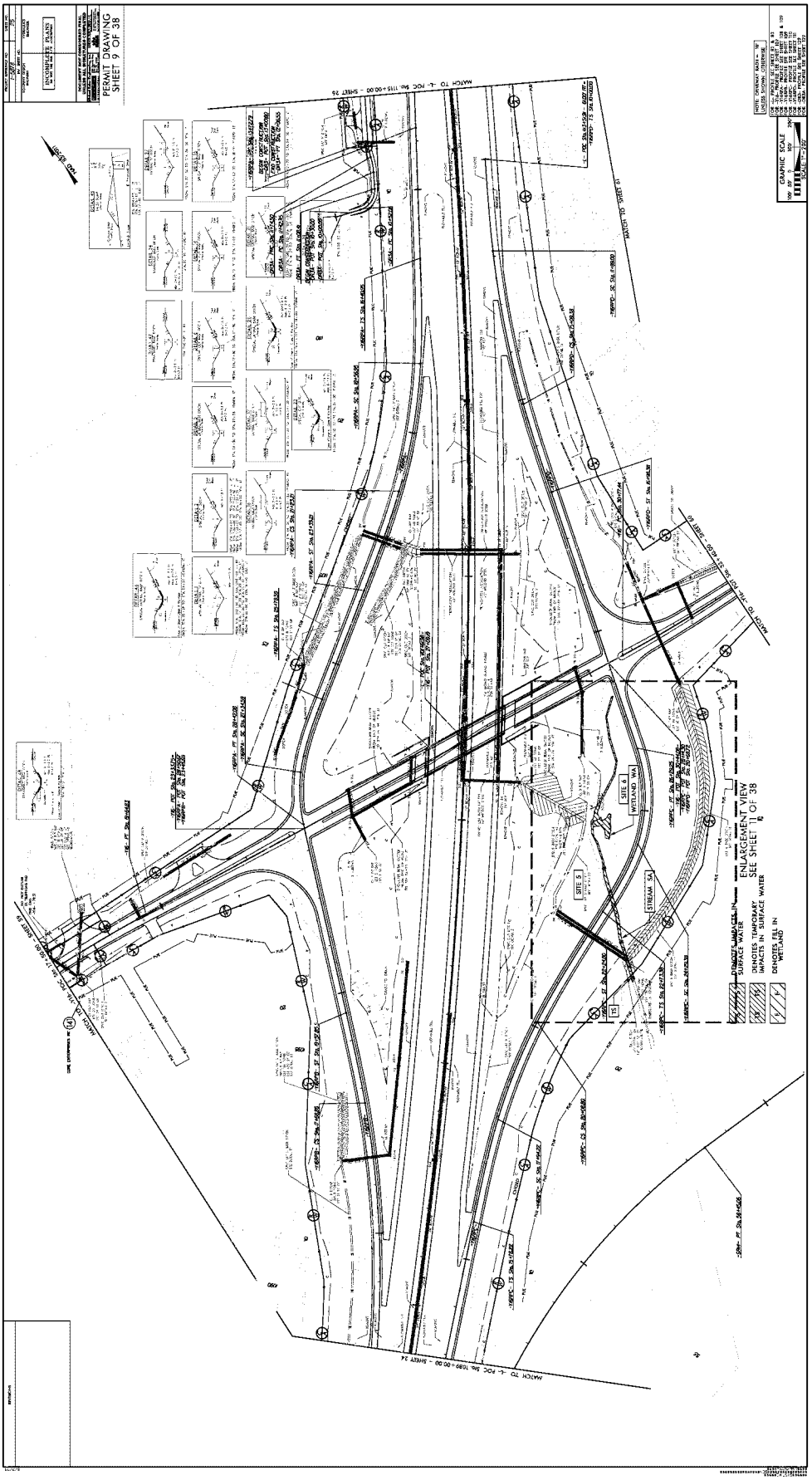

PERMIT DRAWING
SHEET 5 OF 38
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-5877
SHEET NO.
24
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH TO -SR13- POC Sta. 50+00.00 - SHEET 59
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -L- POC Sta. 1089+00.00 - SHEET 25
MATCH TO -L- POT Sta. 1076+00.00 - SHEET 23
ENLARGEMENT VIEW
SEE SHEET 7 OF 38
SITE 1
SITE 1A
SITE 2
SITE 3
SITE 4
MECH
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE

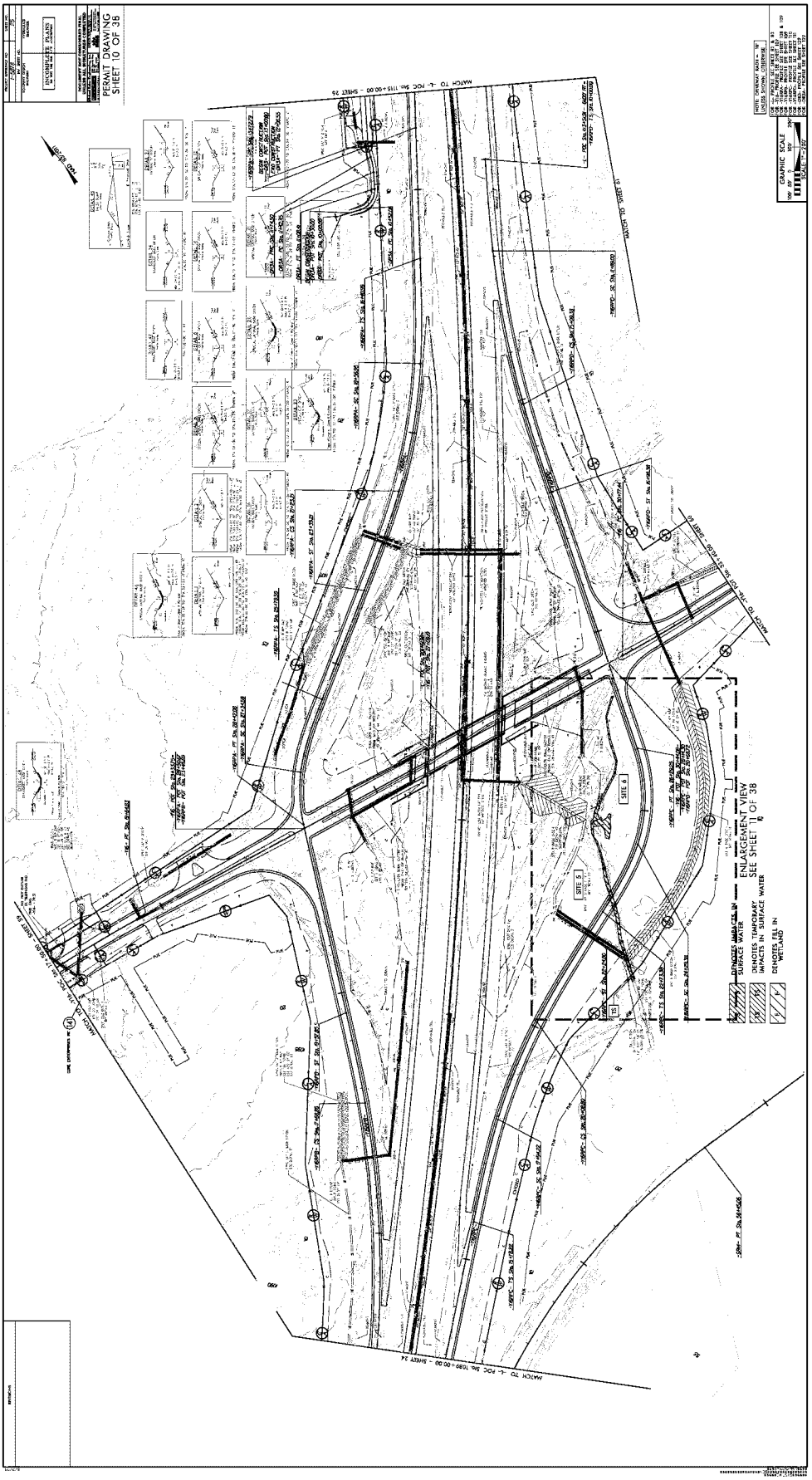

S S
DENOTES IMPACTS IN SURFACE WATER
TS TS
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
F F
DENOTES FILL IN WETLAND
P P
DENOTES IMPACTS IN SURFACE WATER (POND)
E E
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
50' 25' 0 50' 100'
SCALE: 1" = 100'
NAD 83/2011
PROJECT REFERENCE NO.
I-5877
SHEET NO.
24
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker INTERNATIONAL
SEIGART DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 6 OF 38
SITE 1
SITE 1A
SITE 2
SITE 3
SITE 4
MECH
TS
ENLARGEMENT VIEW
SEE SHEET 7 OF 38
MATCH TO -L- POT Sta. 1076+00.00 - SHEET 23
MATCH TO -L- POC Sta. 1089+00.00 - SHEET 25
MATCH TO -SR13- POC Sta. 50+00.00 - SHEET 59
-SR13- PC Sta. 42+77.81
-SR14- PC Sta. 48+01.54
-L- POT Sta.1086+36.11 = 61.00' LT =
-Y16RPB- ST Sta. 10+00.00
-Y16RPB- SC Sta. 11+89.00
-L- SC Sta. 1087+91.17
-L- TS Sta. 1086+43.17
-Y16RPB-
-Y16RPC-
-L- POT Sta.1086+09.78 = 61.00' RT =
-Y16RPC- POT Sta. 10+00.00
Δ=2°20'56.0"
DETAIL 1 SPECIAL LATERAL 'V' DITCH
DETAIL 2 SPECIAL CUT DITCH
DETAIL 3 LATERAL 'V' DITCH
DETAIL 4 SPECIAL LATERAL BASE DITCH
DETAIL 8 SPECIAL LATERAL 'V' DITCH
DETAIL 9 SPECIAL LATERAL BASE DITCH
DETAIL 18 SPECIAL LATERAL BASE DITCH
DETAIL 21 SPECIAL LATERAL BASE DITCH
DETAIL 31 STANDARD BASE DITCH
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 82
FOR -SR13- PROFILE SEE SHEET 119
FOR -Y16RPB- PROFILE SEE SHEET 109
FOR -Y16RPC- PROFILE SEE SHEET 110

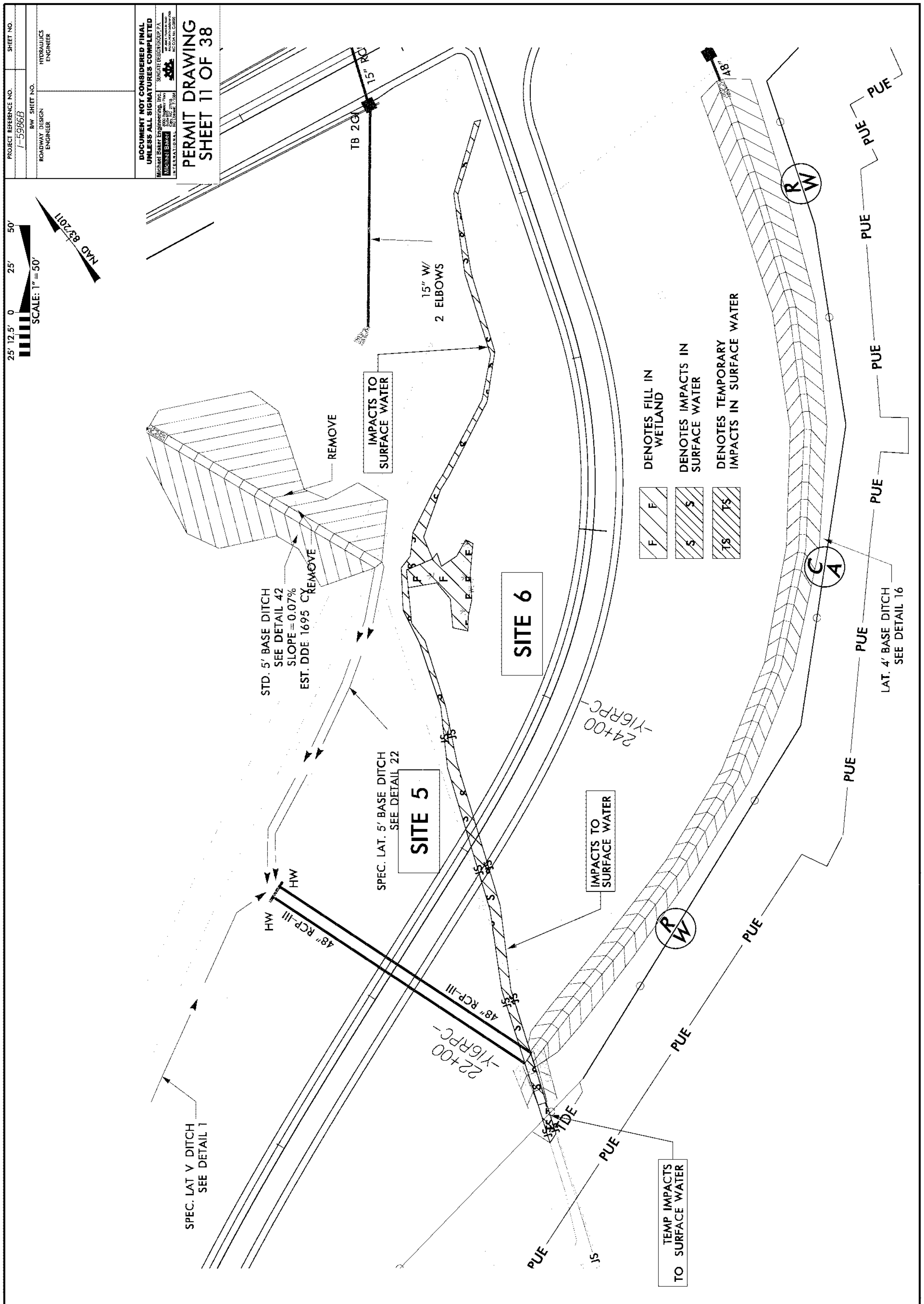
P-70

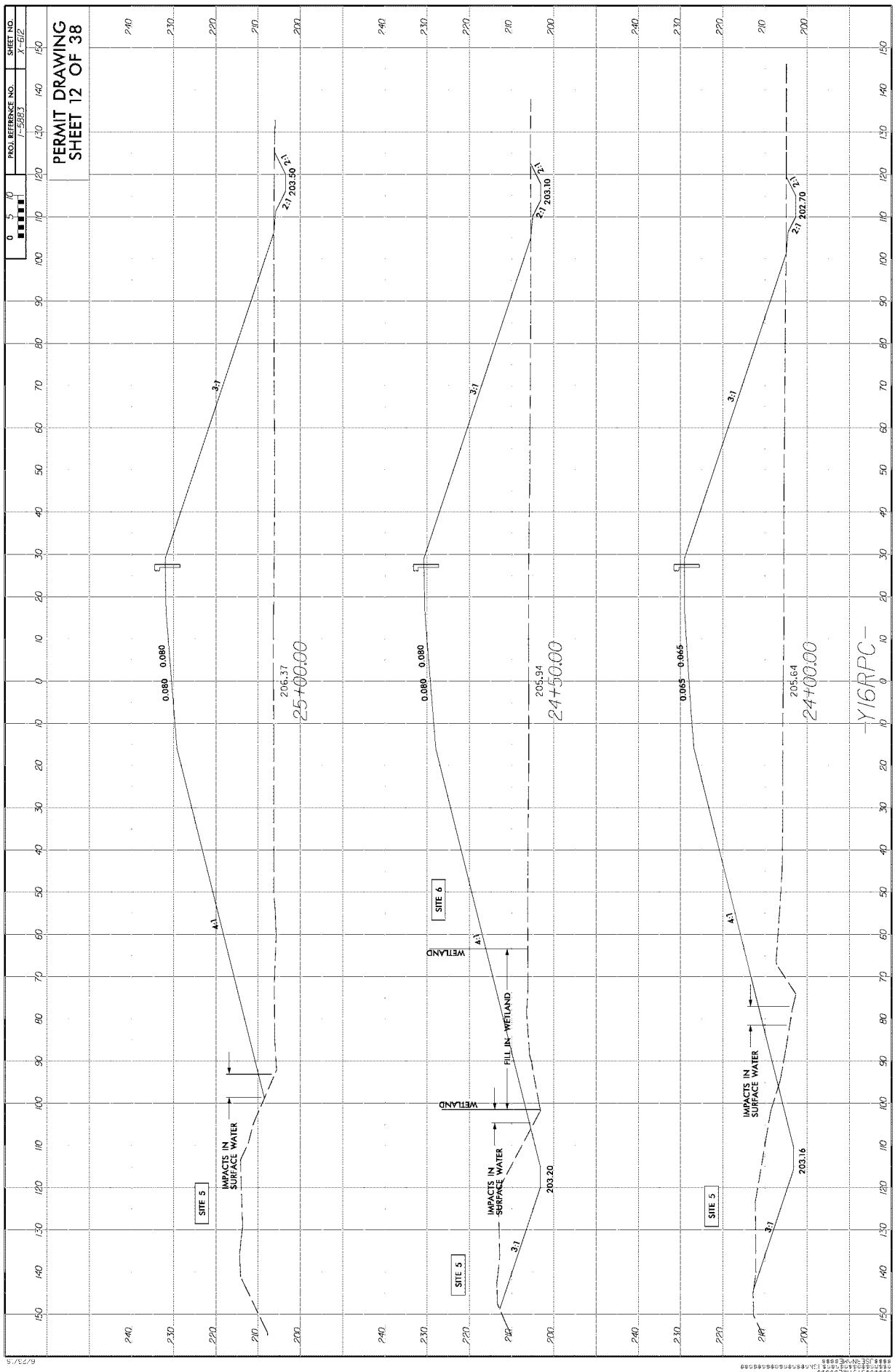

PROJECT REFERENCE NO.
SHEET NO.
I-5986B
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 7 OF 38
SCALE: 1″=50′
NAD 83/2011
SITE 2
SITE 1A
SITE 1
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DRAIN POND
LAT. VP DITCH SEE DETAIL 3
FILL IN WETLAND
EXCAVATION
MATCH TO -L- POT Sta. 1076+00.00 -SHEET 24
MATCH TO -L- POT Sta. 1076+00.00 -SHEET 23
MECHANIZED CLEARING
TEMP IMPACTS TO SURFACE WATER
IMPACTS TO SURFACE WATER
REMOVE
FLOWABLE FILL
TRENCHLESS INSTALLATION 48″ WELDED STEEL
48″ RCP-IV
15″ RCP-IV
24″ RCP-IV
2GI-A
2GI
HW
PUE
TDE
-SR13-
-L-
1080
1075
8/17/99

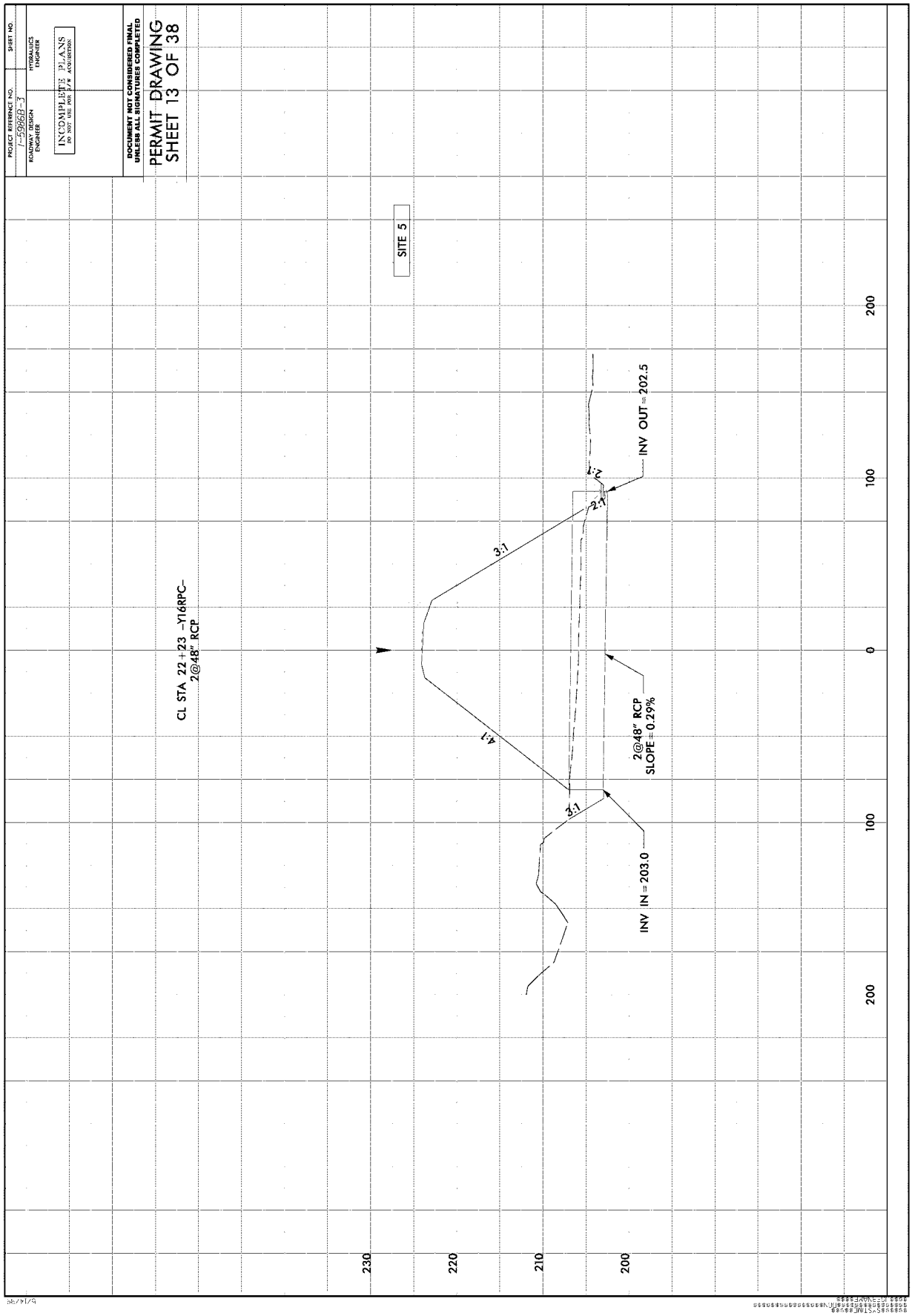

PERMIT DRAWING
SHEET 8 OF 38
PROJ. REFERENCE NO.
1-5883
SHEET NO.
0 5 10
SITE 3
SITE 3
WETLAND
EXCAVATION
WETLAND
EXCAVATION
WETLAND
EXCAVATION
WETLAND
WETLAND
44+00.00
43+50.00
43+00.00
42+50.00
42+00.00
-SR14-

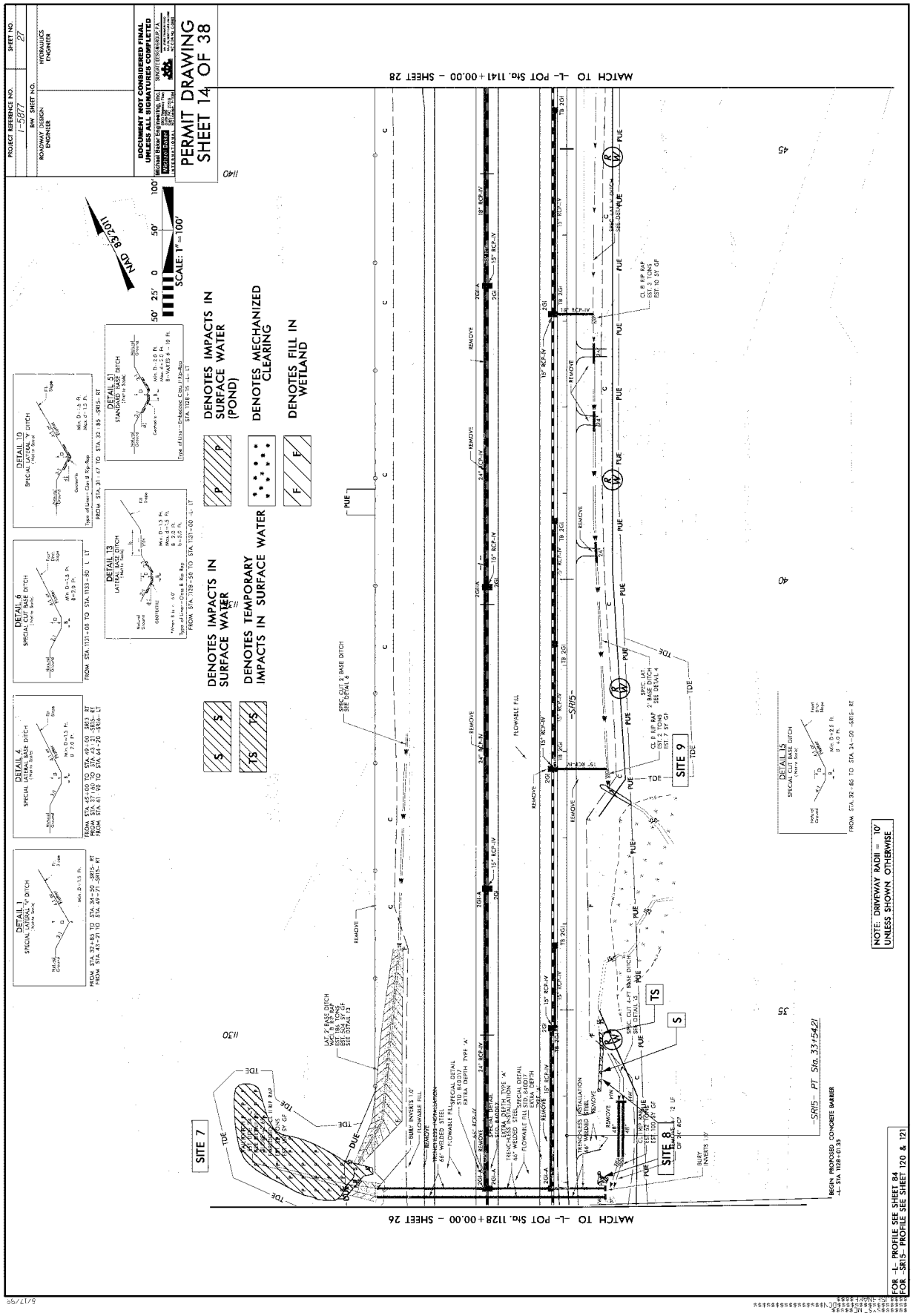

PERMIT DRAWING
SHEET 9 OF 38
ENLARGEMENT VIEW
SEE SHEET 11 OF 38
SITE 4
WETLAND 4A
SITE 5
STREAM 5A
DENOTES UNAVOIDABLE IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
GRAPHIC SCALE

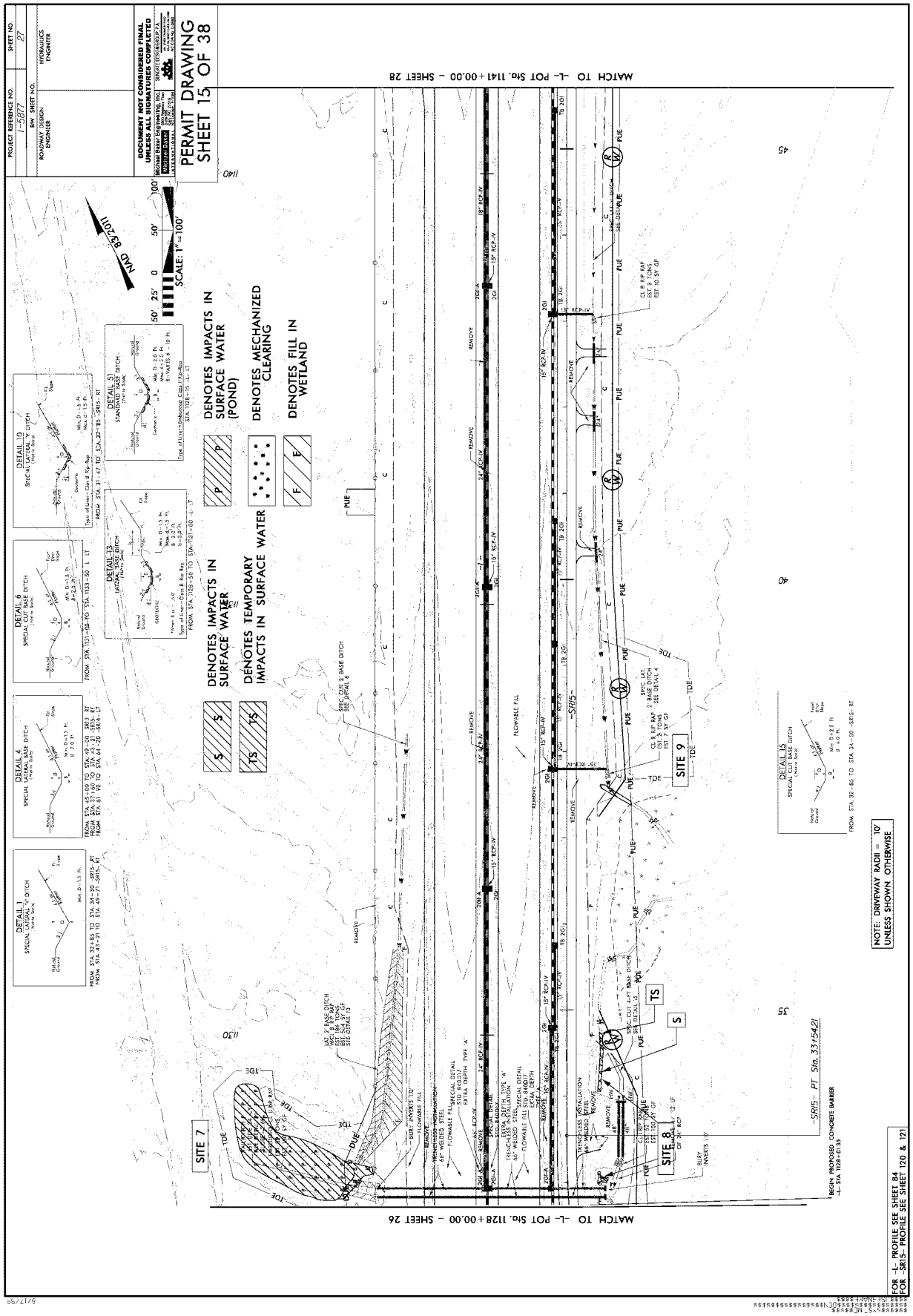

PERMIT DRAWING
SHEET 10 OF 38
ENLARGEMENT VIEW
SEE SHEET 11 OF 38
SITE 5
SITE 6
DENOTES UNAVOIDABLE IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
GRAPHIC SCALE

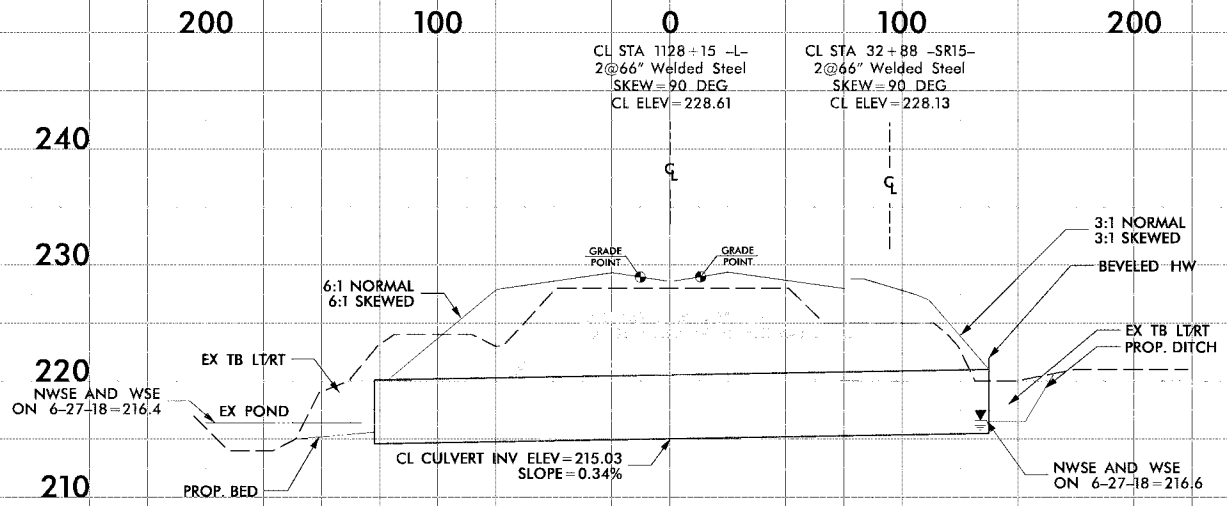

PERMIT DRAWING
SHEET 11 OF 38
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
Michael Baker Engineering, Inc.
SCALE: 1" = 50'
NAD 83/2011
TB 2GI
15" W/
2 ELBOWS
IMPACTS TO
SURFACE WATER
REMOVE
STD. 5' BASE DITCH
SEE DETAIL 42
SLOPE = 0.07%
EST. DDE 1695 CY
SPEC. LAT. 5' BASE DITCH
SEE DETAIL 22
SITE 5
SITE 6
48" RCP-III
HW
24+00
-Y16RPC-
22+00
-Y16RPC-
SPEC. LAT V DITCH
SEE DETAIL 1
TEMP IMPACTS
TO SURFACE WATER
TDE
DENOTES FILL IN
WETLAND
DENOTES IMPACTS IN
SURFACE WATER
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER
LAT. 4' BASE DITCH
SEE DETAIL 16
PUE
R/W
C/A
48"


PERMIT DRAWING
SHEET 12 OF 38
PROJ. REFERENCE NO.
7-5883
SHEET NO.
X-612
0 5 10
25+00.00
24+50.00
24+00.00
206.37
205.94
205.64
203.50
203.10
202.70
203.20
203.16
0.080
0.065
4:1
3:1
2:1
SITE 5
SITE 6
WETLAND
FILL IN WETLAND
IMPACTS IN SURFACE WATER
-Y16RPC-

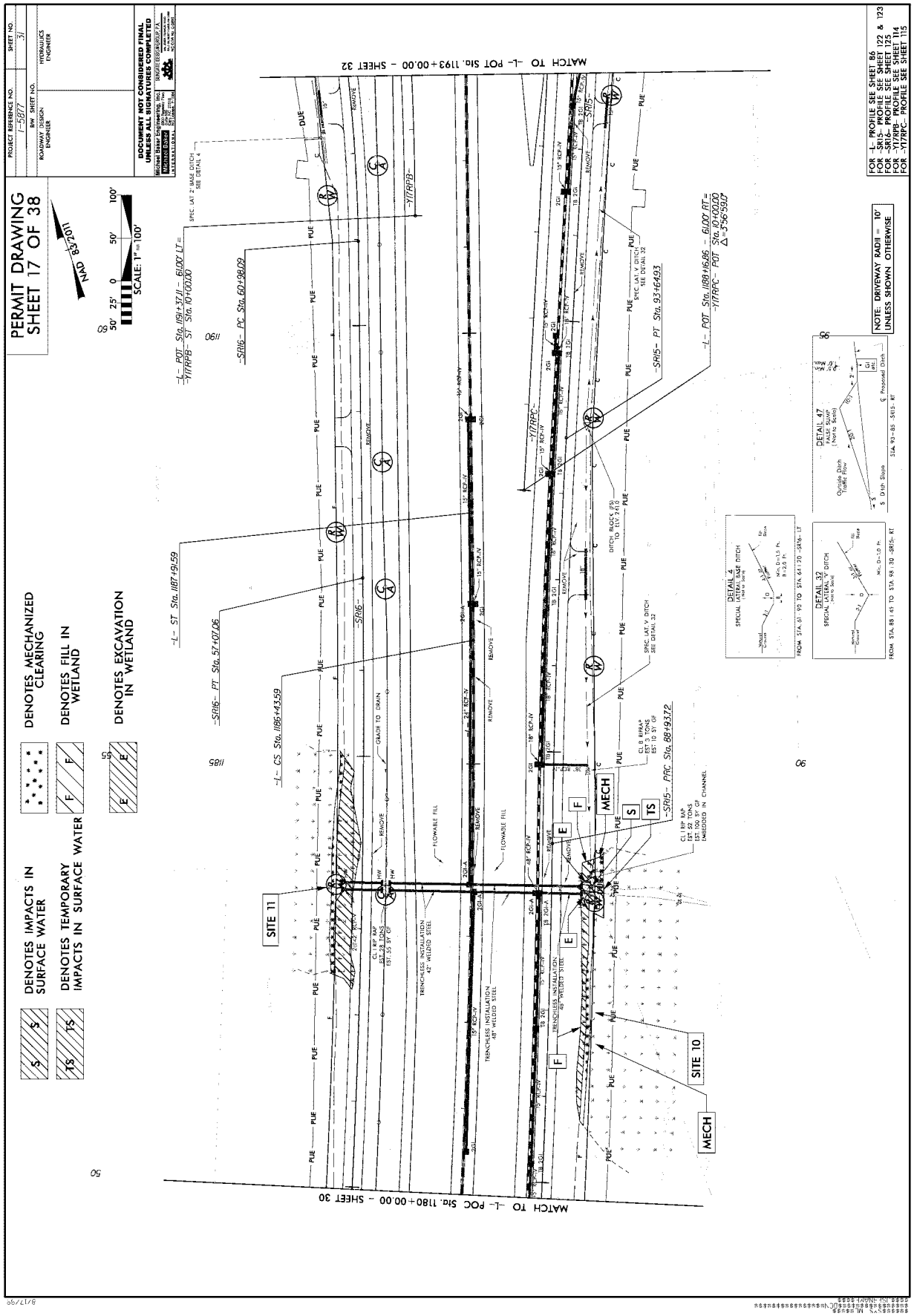

PROJECT REFERENCE NO.
1-5986B-3
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 13 OF 38
SITE 5
CL STA 22+23 -Y16RPC-
2@48" RCP
INV OUT = 202.5
INV IN = 203.0
2@48" RCP
SLOPE = 0.29%
3:1
2:1
1:1
230
220
210
200
200
100
0
100
200

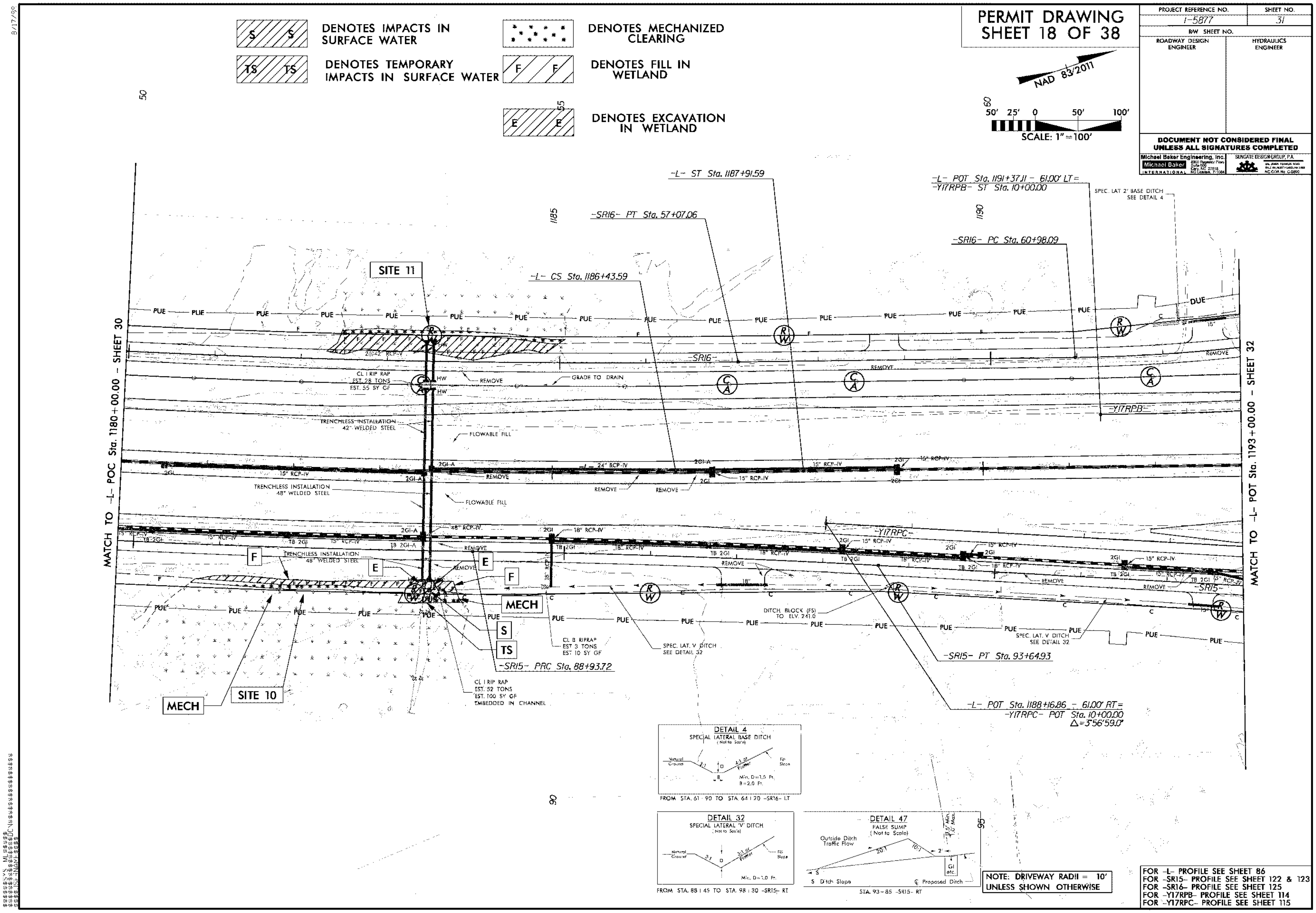

PERMIT DRAWING
SHEET 14 OF 38
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5877
SHEET NO. 27
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
SCALE: 1"=100'
NAD 83/2011
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCH TO -L- POT Sta. 1128+00.00 - SHEET 26
MATCH TO -L- POT Sta. 1141+00.00 - SHEET 28
SITE 7
SITE 8
SITE 9
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 84
FOR -SR15- PROFILE SEE SHEET 120 & 121

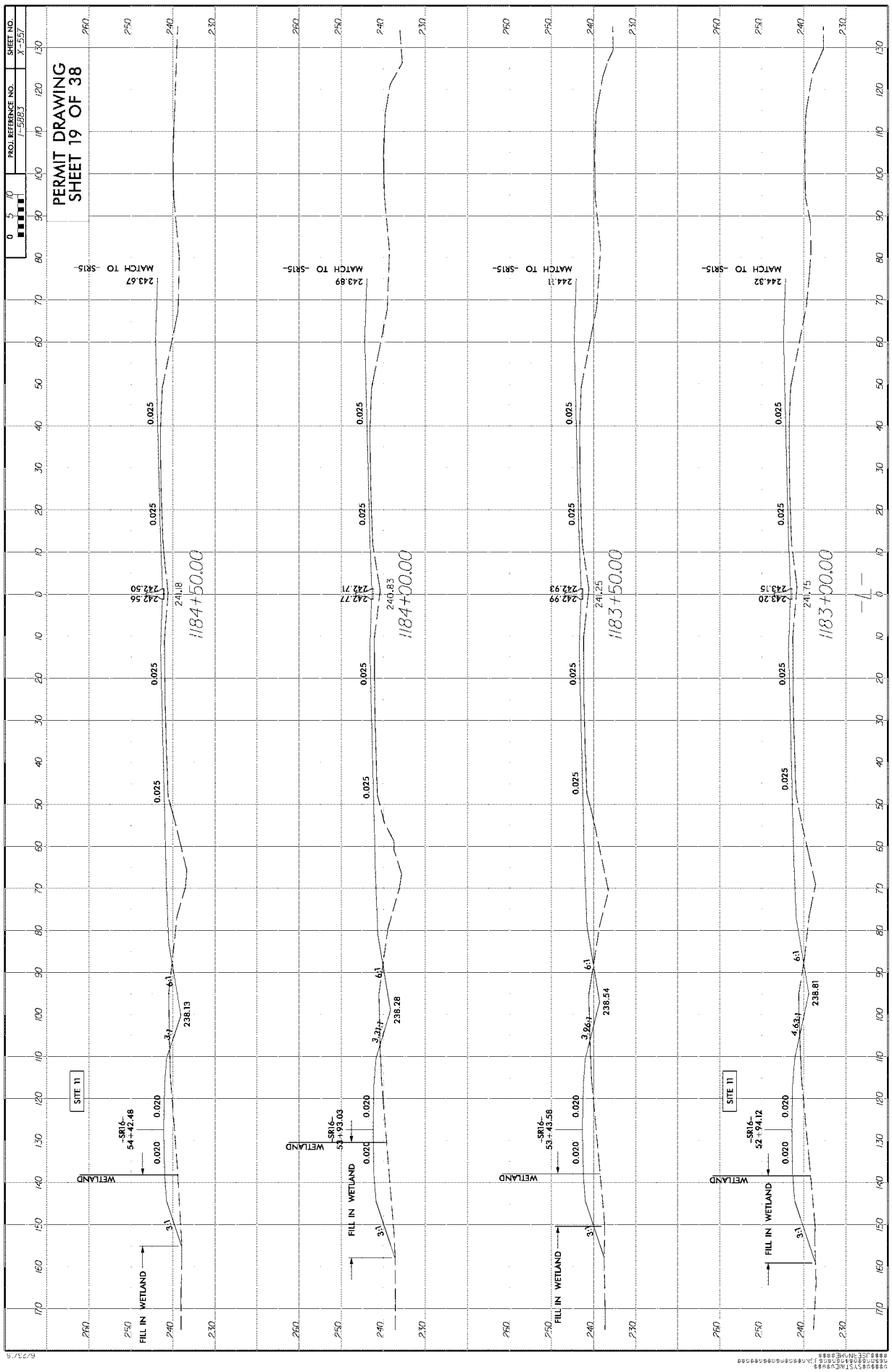

PERMIT DRAWING
SHEET 15 OF 38
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -L- POT Sta. 1128+00.00 - SHEET 26
MATCH TO -L- POT Sta. 1141+00.00 - SHEET 28
SITE 7
SITE 8
SITE 9
-SR15- PT Sta. 33+54.21
BEGIN PROPOSED CONCRETE BARRIER -L- STA. 1128+61.33
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 84
FOR -SR15- PROFILE SEE SHEET 120 & 121
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5877
SHEET NO. 27
HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER
BW SHEET NO.

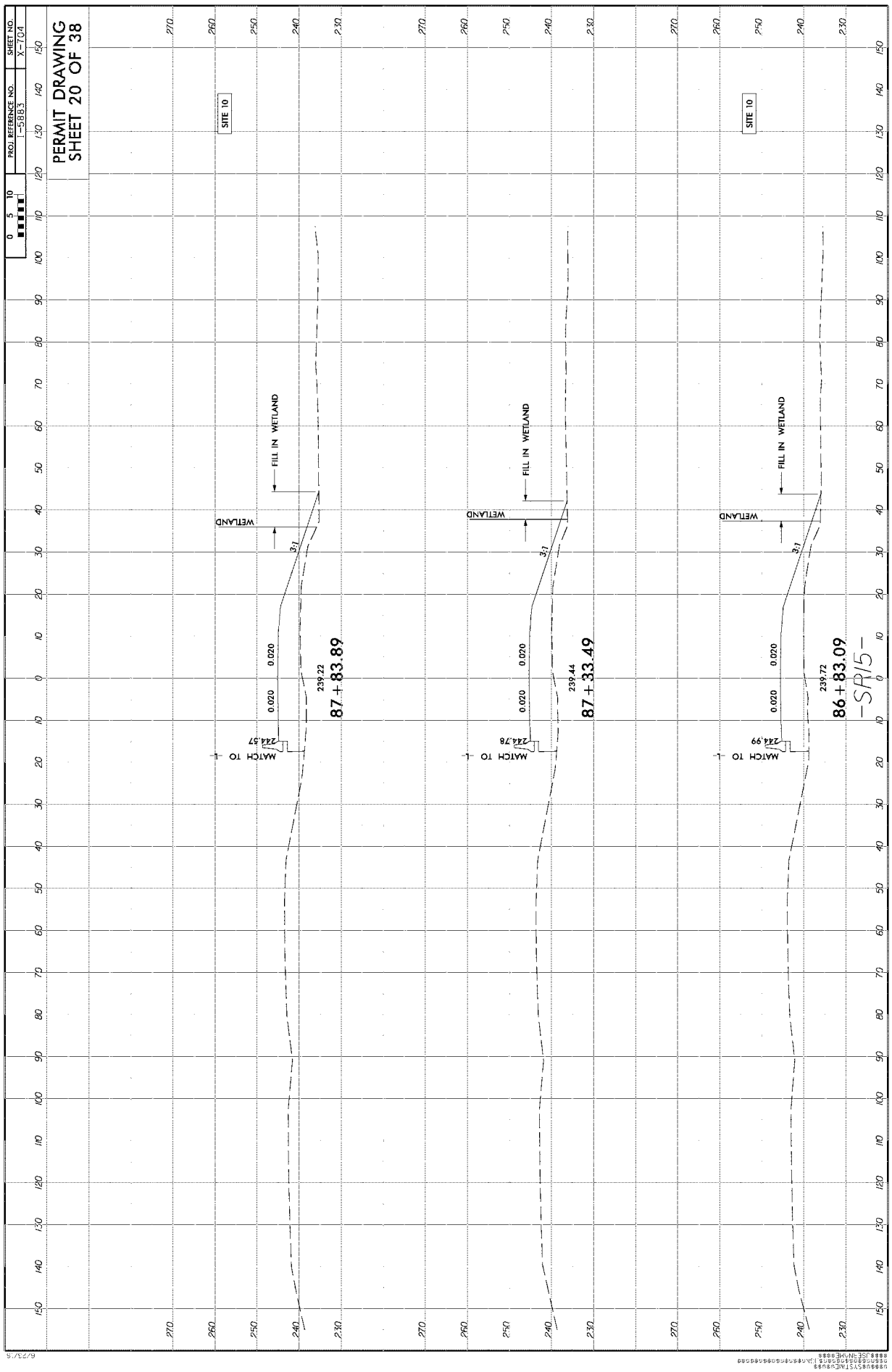

200
100
0
100
200
CL STA 1128+15 –L–
2@66" Welded Steel
SKEW=90 DEG
CL ELEV=228.61
CL STA 32+88 –SR15–
2@66" Welded Steel
SKEW=90 DEG
CL ELEV=228.13
SITE 8
240
230
220
210
GRADE POINT
GRADE POINT
6:1 NORMAL
6:1 SKEWED
3:1 NORMAL
3:1 SKEWED
BEVELED HW
EX TB LT/RT
EX TB LT/RT
PROP. DITCH
NWSE AND WSE
ON 6-27-18=216.4
EX POND
PROP. BED
CL CULVERT INV ELEV=215.03
SLOPE=0.34%
NWSE AND WSE
ON 6-27-18=216.6

P-80

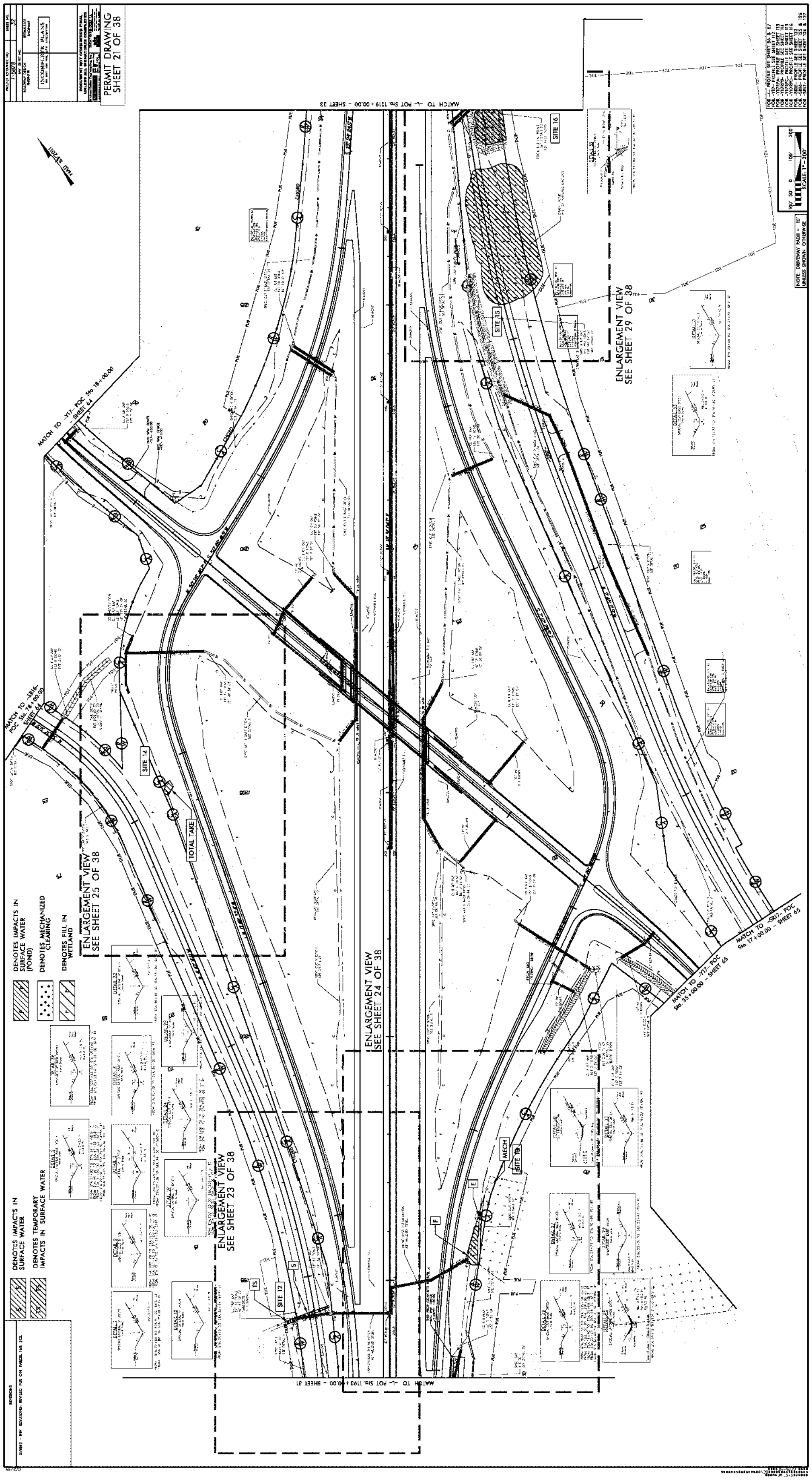

PERMIT DRAWING
SHEET 17 OF 38
PROJECT REFERENCE NO. I-587
SHEET NO. 31
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
NAD 83/2011
SCALE: 1" = 100'
MATCH TO -L- POC Sta. 1180+00.00 - SHEET 30
MATCH TO -L- POT Sta. 1193+00.00 - SHEET 32
-L- CS Sta. 1186+43.59
-SR16- PT Sta. 57+07.06
-L- ST Sta. 1187+91.59
-L- POT Sta. 1191+37.11 - 61.00' LT =
-Y17RPB- ST Sta. 10+00.00
-SR16- PC Sta. 60+98.09
-L- POT Sta. 1188+16.86 - 61.00' RT =
-Y17RPC- POT Sta. 10+00.00
Δ = 56°59'57"
-SR15- PT Sta. 93+64.93
-SR15- PRC Sta. 88+93.72
SITE 11
SITE 10
MECH
TS
S
F
E
DETAIL 4
SPECIAL LATERAL BASE DITCH
DETAIL 32
SPECIAL LATERAL V DITCH
DETAIL 47
FLARE SLOPE
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 86
FOR -SR15- PROFILE SEE SHEET 117
FOR -SR16- PROFILE SEE SHEET 125
FOR -Y17RPB- PROFILE SEE SHEET 114
FOR -Y17RPC- PROFILE SEE SHEET 115


PERMIT DRAWING
SHEET 18 OF 38
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
PROJECT REFERENCE NO. I-5877
SHEET NO. 31
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
NAD 83/2011
SCALE: 1" = 100'
MATCH TO -L- POC Sta. 1180+00.00 - SHEET 30
MATCH TO -L- POT Sta. 1193+00.00 - SHEET 32
SITE 11
SITE 10
MECH
-L- ST Sta. 1187+91.59
-SR16- PT Sta. 57+07.06
-SR16- PC Sta. 60+98.09
-L- CS Sta. 1186+43.59
-L- POT Sta. 1191+37.11 - 61.00' LT = -Y17RPB- ST Sta. 10+00.00
SPEC. LAT 2' BASE DITCH SEE DETAIL 4
-SR15- PRC Sta. 88+93.72
-SR15- PT Sta. 93+64.93
-L- POT Sta. 1188+16.86 - 61.00' RT = -Y17RPC- POT Sta. 10+00.00 Δ=3°56'59.0"
TRENCHLESS INSTALLATION 42" WELDED STEEL
TRENCHLESS INSTALLATION 48" WELDED STEEL
FLOWABLE FILL
GRADE TO DRAIN
DITCH BLOCK (FS) TO ELV. 241.0
SPEC. LAT. V DITCH SEE DETAIL 32
DETAIL 4 SPECIAL LATERAL BASE DITCH (Not to Scale)
FROM STA. 61+90 TO STA 64+20 -SR16- LT
DETAIL 32 SPECIAL LATERAL 'V' DITCH (Not to Scale)
FROM STA. 88+45 TO STA. 98+30 -SR15- RT
DETAIL 47 FALSE SUMP (Not to Scale)
STA. 93+85 -SR15- RT
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 86
FOR -SR15- PROFILE SEE SHEET 122 & 123
FOR -SR16- PROFILE SEE SHEET 125
FOR -Y17RPB- PROFILE SEE SHEET 114
FOR -Y17RPC- PROFILE SEE SHEET 115

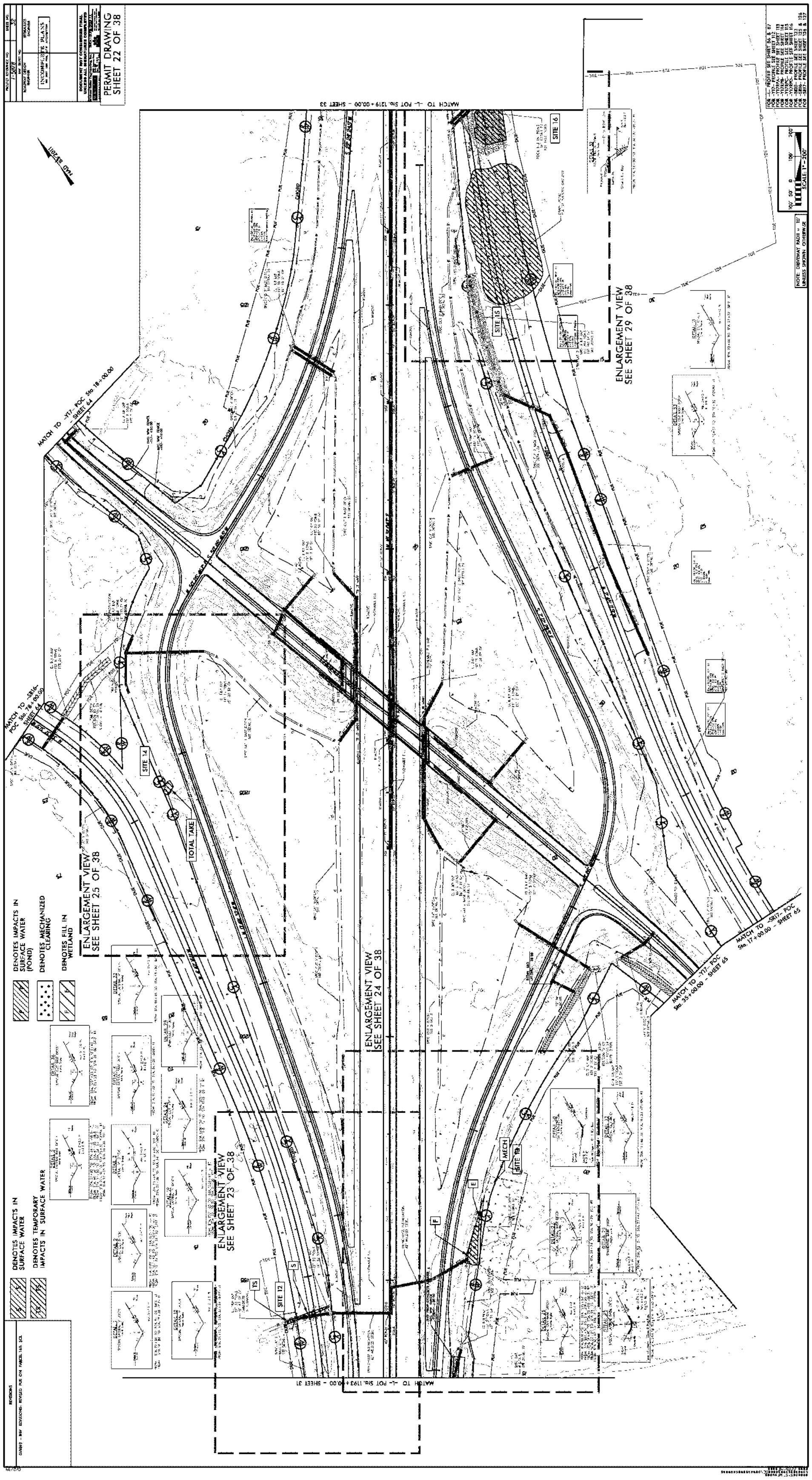

PERMIT DRAWING
SHEET 19 OF 38
PROJ. REFERENCE NO.
7-5883
SHEET NO.
X-557
0 5 10
1184+50.00
1184+00.00
1183+50.00
1183+00.00
MATCH TO -SR15-
243.67
242.56
242.50
243.89
242.77
242.71
244.11
242.99
242.93
244.32
243.20
243.15
SITE 11
-SR16-
54+42.48
53+93.03
53+43.58
52+94.12
WETLAND
FILL IN WETLAND
0.025
0.020
6:1
3:1
3.3:1
3.96:1
4.63:1
238.13
238.28
238.54
238.81

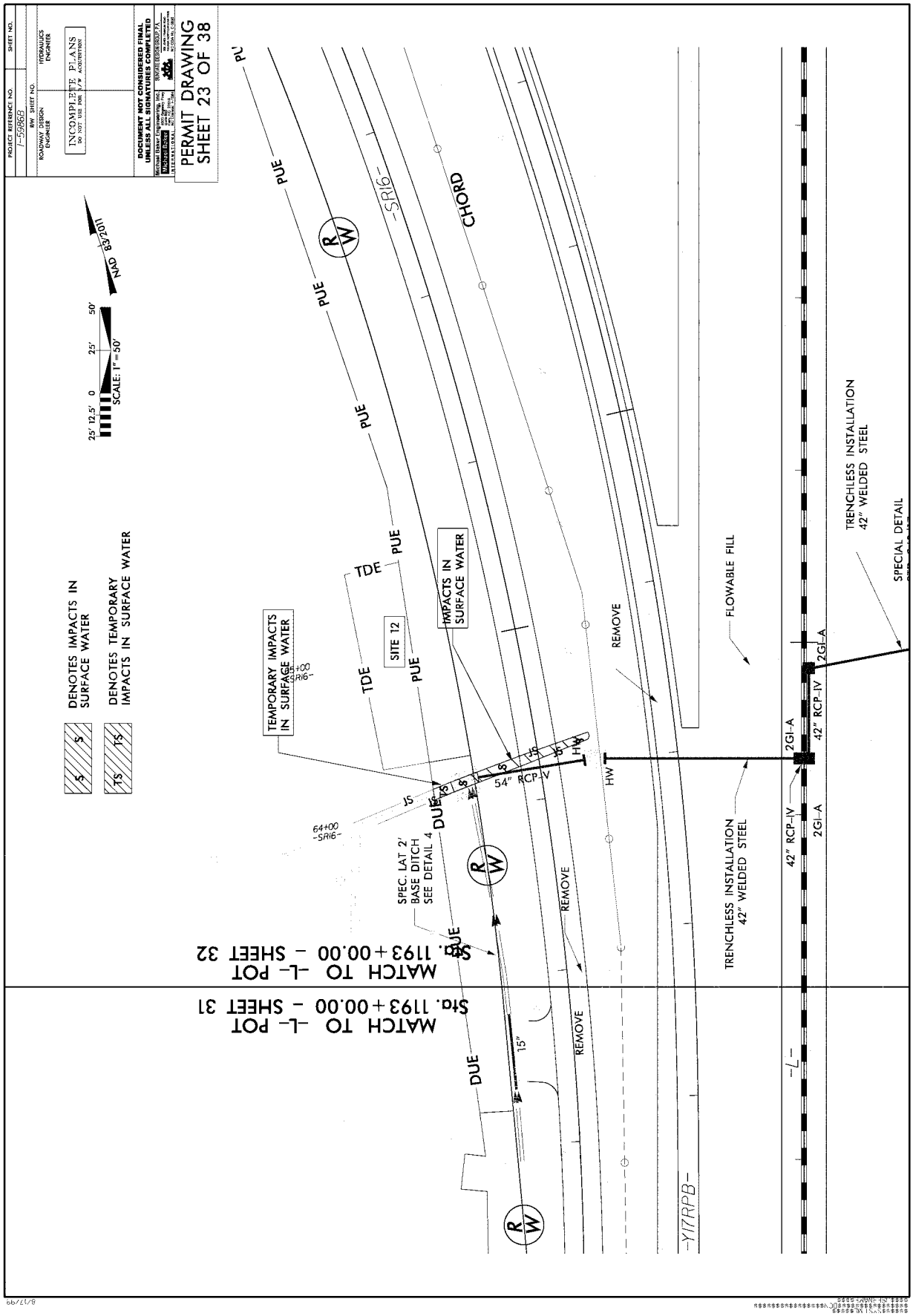

PERMIT DRAWING
SHEET 20 OF 38
PROJ REFERENCE NO.
I-5883
SHEET NO.
X-704
SITE 10
FILL IN WETLAND
WETLAND
3:1
0.020
0.020
239.22
87+83.89
MATCH TO
244.37
SITE 10
FILL IN WETLAND
WETLAND
3:1
0.020
0.020
239.44
87+33.49
MATCH TO
244.78
SITE 10
FILL IN WETLAND
WETLAND
3:1
0.020
0.020
239.72
86+83.09
MATCH TO
244.99
-SR15-

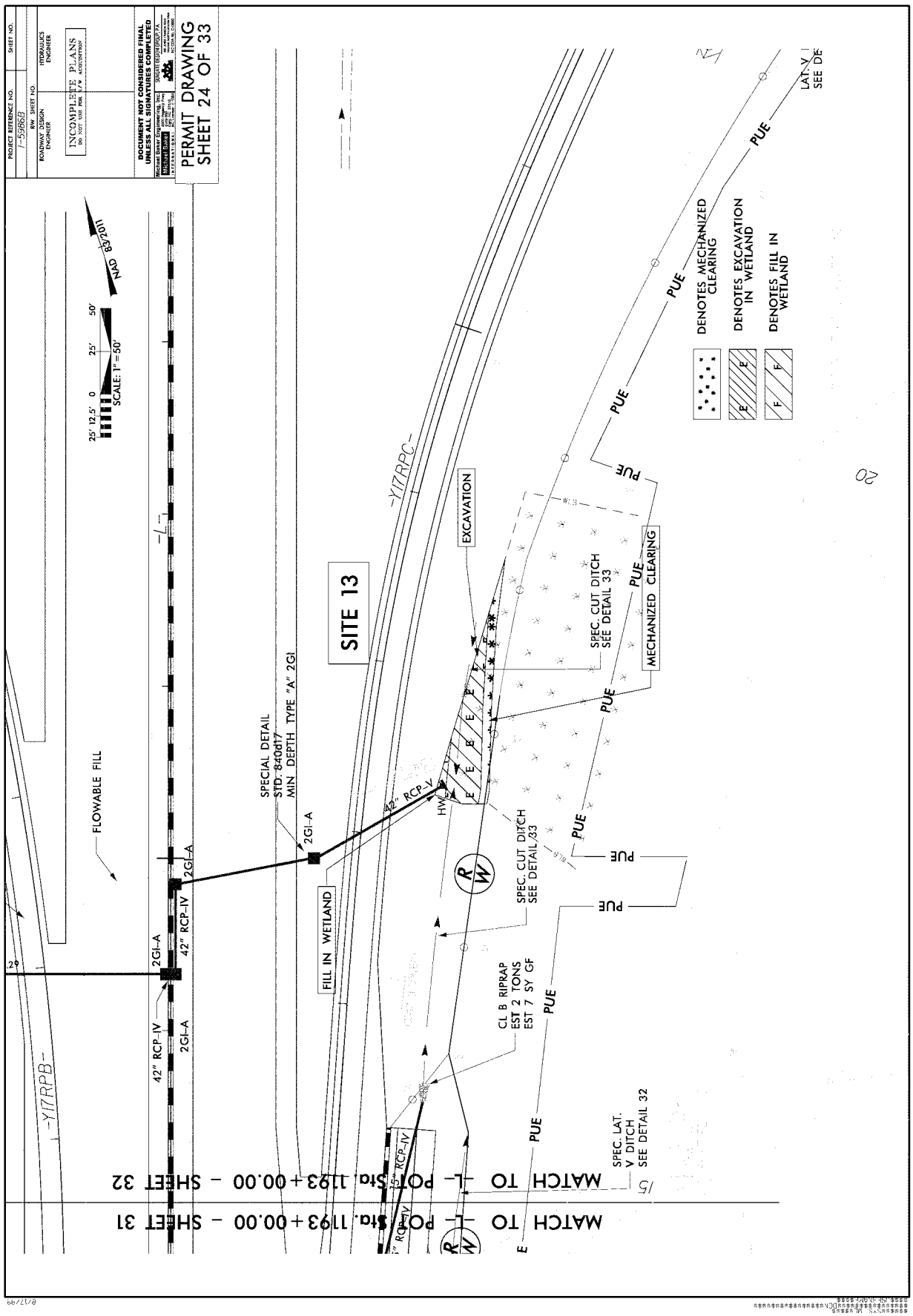
P-85

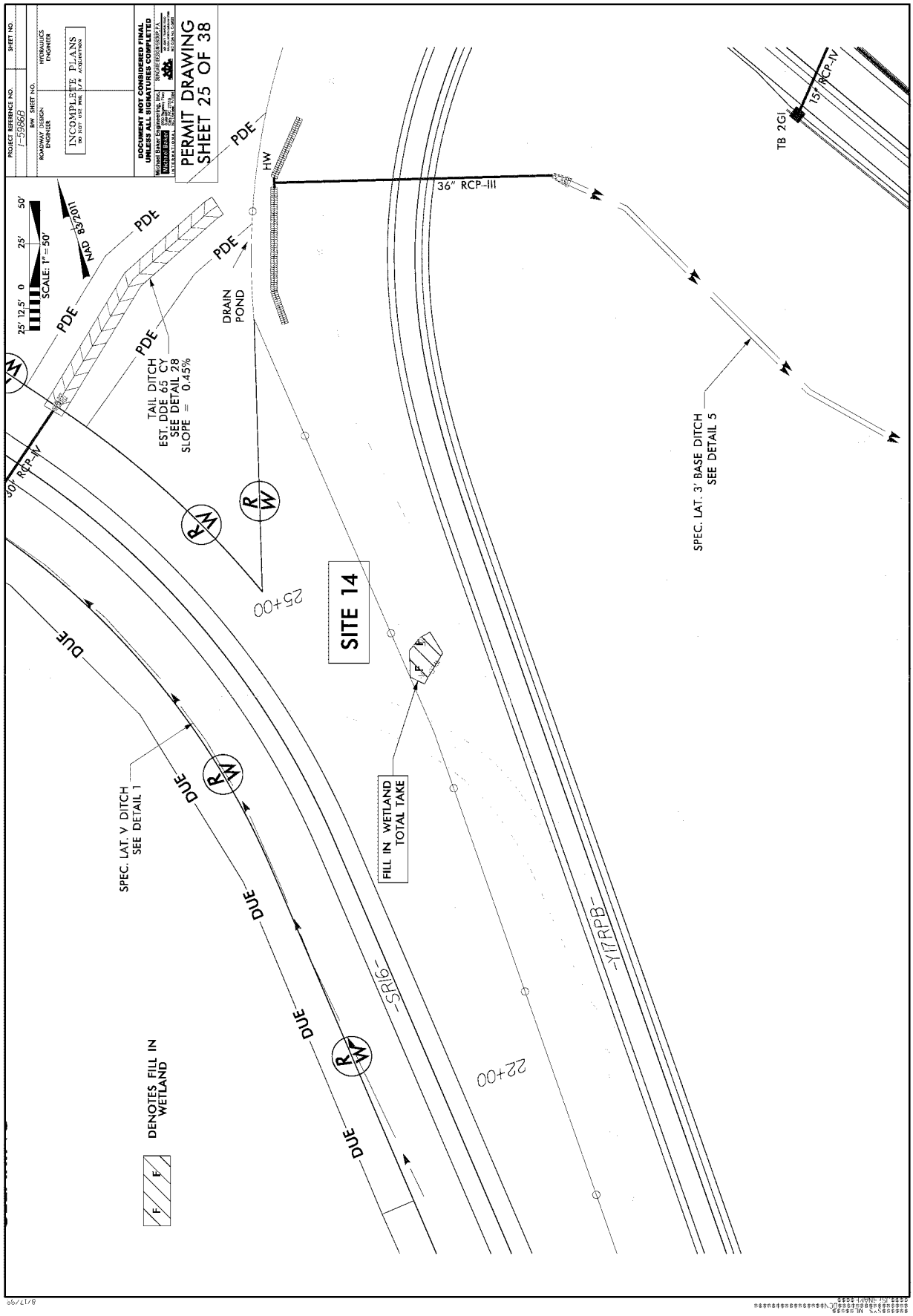

PERMIT DRAWING
SHEET 21 OF 38
ENLARGEMENT VIEW
SEE SHEET 29 OF 38
ENLARGEMENT VIEW
SEE SHEET 25 OF 38
ENLARGEMENT VIEW
SEE SHEET 24 OF 38
ENLARGEMENT VIEW
SEE SHEET 23 OF 38
SITE 12
SITE 14
SITE 15
SITE 16
TOTAL TAKE
MECH
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND

P-86

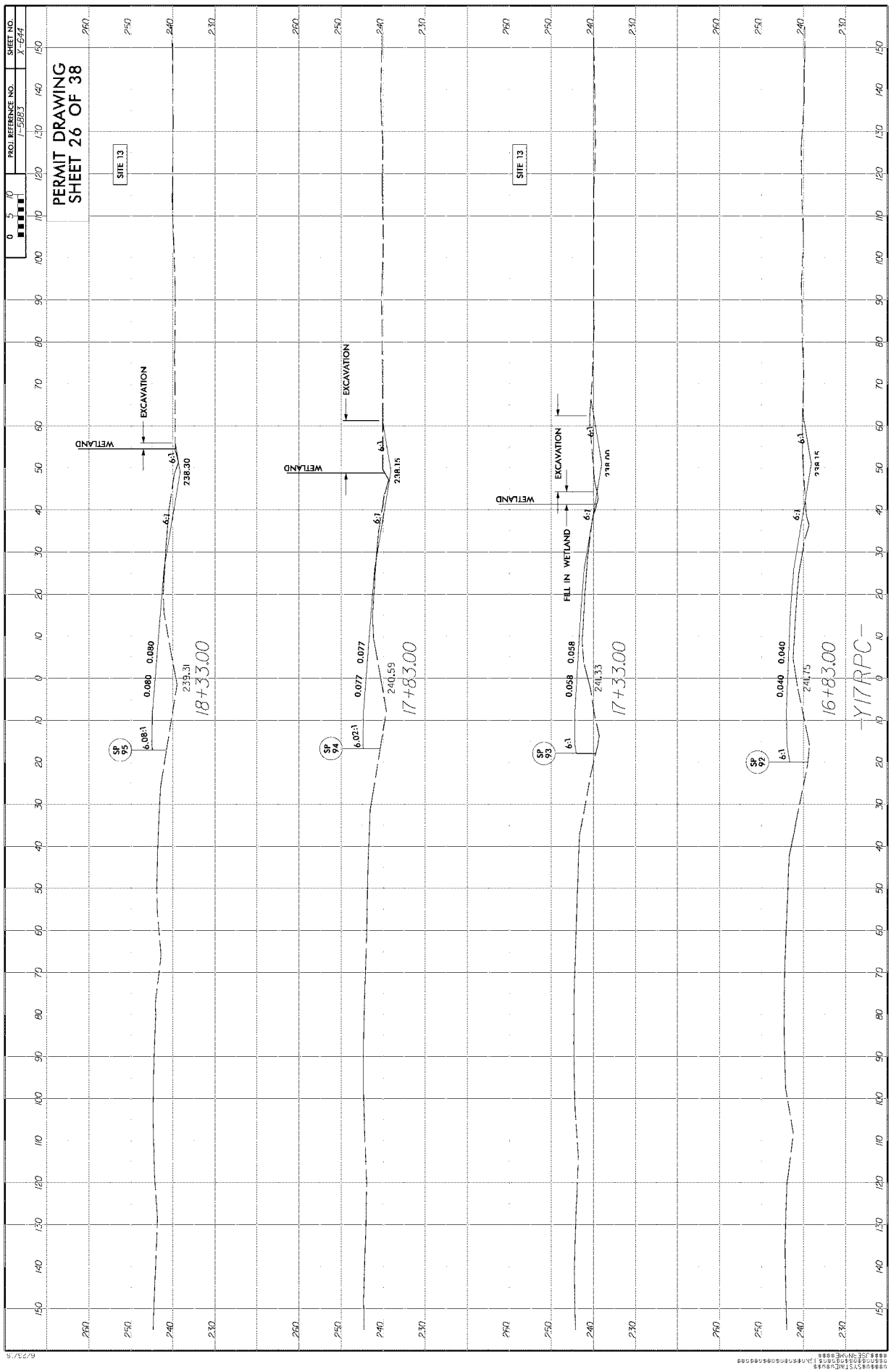

PERMIT DRAWING
SHEET 22 OF 38
ENLARGEMENT VIEW
SEE SHEET 29 OF 38
ENLARGEMENT VIEW
SEE SHEET 25 OF 38
ENLARGEMENT VIEW
SEE SHEET 24 OF 38
ENLARGEMENT VIEW
SEE SHEET 23 OF 38
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
SITE 12
SITE 13
SITE 14
SITE 15
SITE 16
TOTAL TAKE

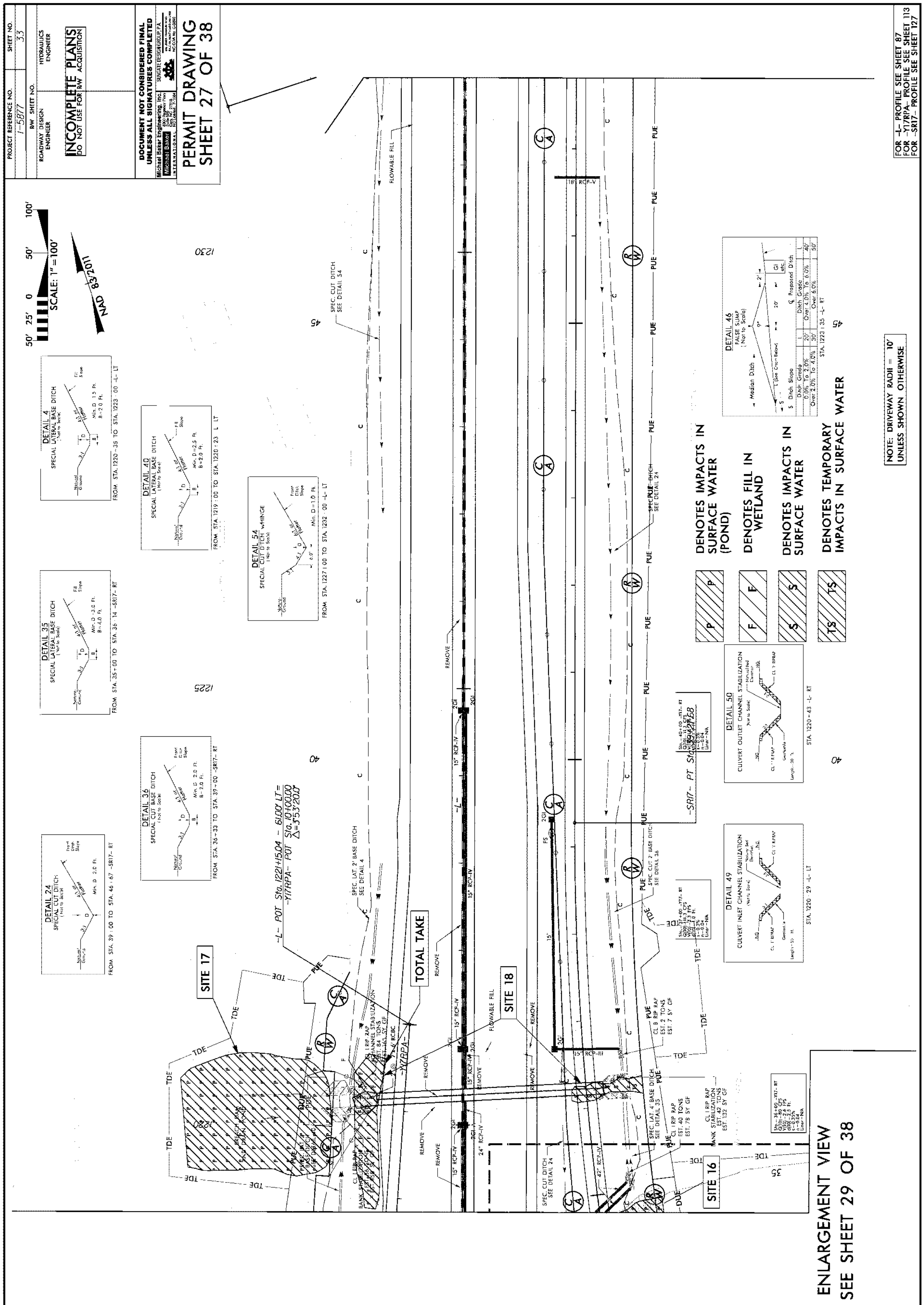

PROJECT REFERENCE NO.
7-5986
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 23 OF 38
SCALE: 1" = 50'
NAD 83/2011
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PUE
TDE
SITE 12
TEMPORARY IMPACTS IN SURFACE WATER
IMPACTS IN SURFACE WATER
-SR16-
CHORD
REMOVE
FLOWABLE FILL
TRENCHLESS INSTALLATION
42" WELDED STEEL
SPECIAL DETAIL
54" RCP-V
42" RCP-IV
2GI-A
HW
DUE
SPEC. LAT 2' BASE DITCH SEE DETAIL 4
15"
-L-
-Y17RPB-
MATCH TO -L- POT
Sta. 1193+00.00 - SHEET 31
MATCH TO -L- POT
Sta. 1193+00.00 - SHEET 32

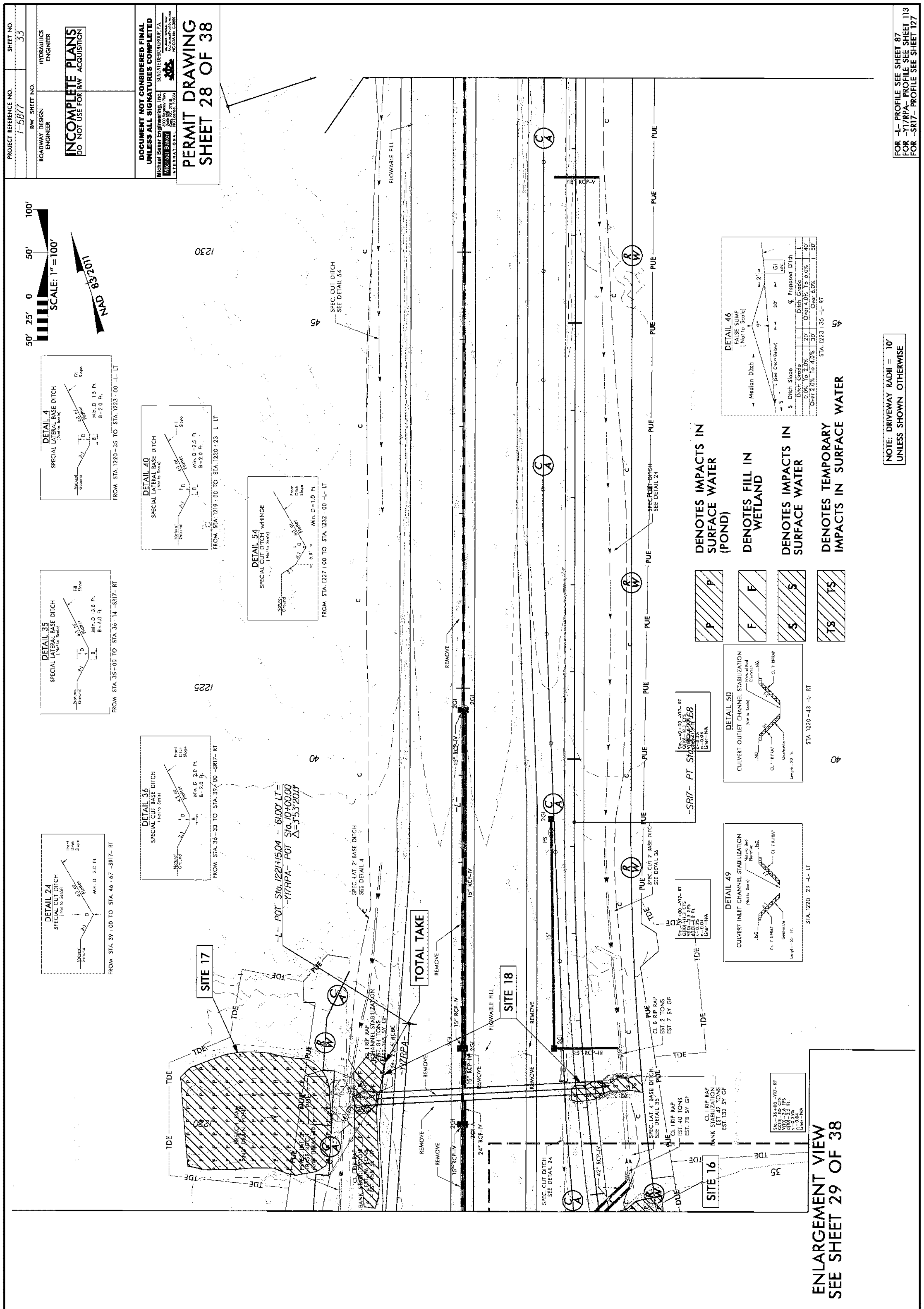

PERMIT DRAWING
SHEET 24 OF 33
INCOMPLETE PLANS
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
ROADWAY DESIGN ENGINEER
RW SHEET NO
HYDRAULICS ENGINEER
SCALE: 1" = 50'
NAD 83/2011
SITE 13
FLOWABLE FILL
SPECIAL DETAIL
STD. 840d17
MIN. DEPTH TYPE "A" 2GI
2GI-A
42" RCP-IV
42" RCP-V
FILL IN WETLAND
EXCAVATION
SPEC. CUT DITCH
SEE DETAIL 33
MECHANIZED CLEARING
PUE
CL B RIPRAP
EST 2 TONS
EST 7 SY GF
SPEC. LAT.
V DITCH
SEE DETAIL 32
-Y17RPB-
-Y17RPC-
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
DENOTES FILL IN WETLAND
MATCH TO -L- POT Sta. 1193+00.00 - SHEET 31
MATCH TO -L- POT Sta. 1193+00.00 - SHEET 32

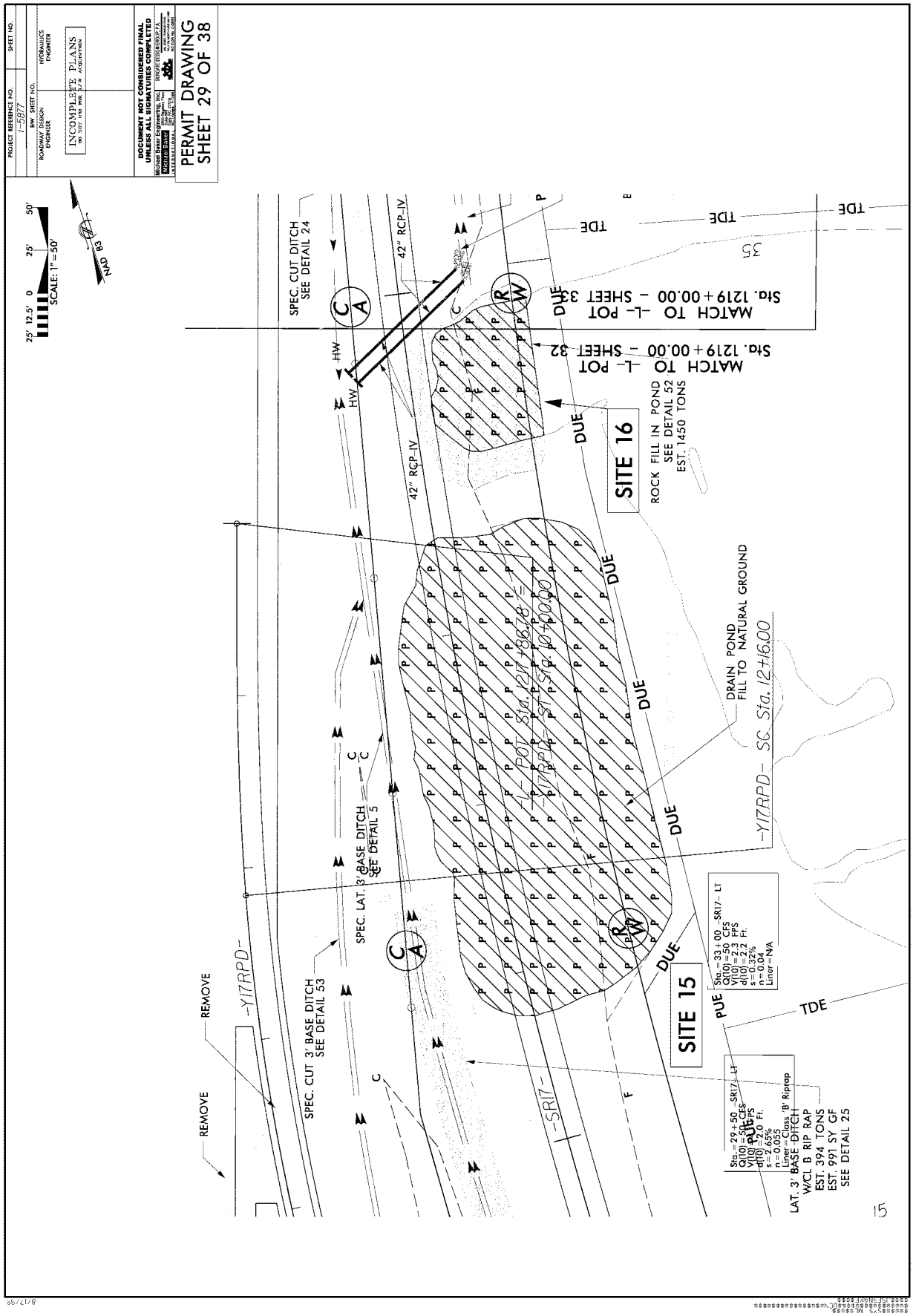

PROJECT REFERENCE NO.
SHEET NO.
7-5986B
BW
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
PERMIT DRAWING
SHEET 25 OF 38
SCALE: 1"= 50'
25' 12.5' 0 25' 50'
NAD 83/2011
PDE
HW
DRAIN POND
TAIL DITCH
EST. DDE 65 CY
SEE DETAIL 28
SLOPE = 0.45%
36" RCP-III
TB 2GI
15" RCP-IV
30" RCP-IV
SPEC. LAT. 3' BASE DITCH
SEE DETAIL 5
SITE 14
25+00
22+00
DUE
SPEC. LAT. V DITCH
SEE DETAIL 1
FILL IN WETLAND
TOTAL TAKE
-SR16-
-YITRPB-
DENOTES FILL IN WETLAND

P-90


PERMIT DRAWING
SHEET 26 OF 38
PROJ. REFERENCE NO.
7-5883
SHEET NO.
X-644
SITE 13
SITE 13
EXCAVATION
WETLAND
EXCAVATION
WETLAND
EXCAVATION
WETLAND
FILL IN WETLAND
SP 95
SP 94
SP 93
SP 92
18+33.00
17+83.00
17+33.00
16+83.00
239.31
240.59
241.33
241.75
238.30
238.15
0.080
0.077
0.058
0.040
6:1
6.08:1
6.02:1
-Y17RPC-


INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 27 OF 38
SCALE: 1" = 100'
NAD 83/2011
SITE 17
SITE 18
SITE 16
TOTAL TAKE
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
ENLARGEMENT VIEW
SEE SHEET 29 OF 38
FOR -L- PROFILE SEE SHEET 87
FOR -Y17RPA- PROFILE SEE SHEET 113
FOR -SR17- PROFILE SEE SHEET 127


PERMIT DRAWING
SHEET 28 OF 38
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5877
SHEET NO. 33
SCALE: 1" = 100'
NAD 83/2011
SITE 16
SITE 17
SITE 18
TOTAL TAKE
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
ENLARGEMENT VIEW
SEE SHEET 29 OF 38
FOR -L- PROFILE SEE SHEET 87
FOR -Y17RPA- PROFILE SEE SHEET 113
FOR -SR17- PROFILE SEE SHEET 127

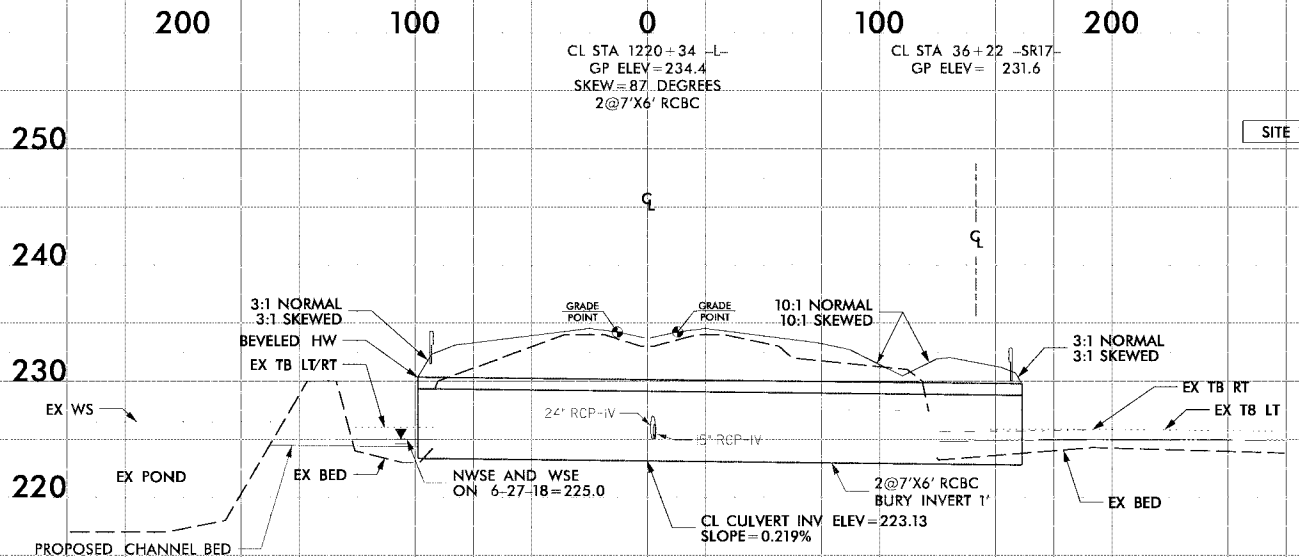

PERMIT DRAWING
SHEET 29 OF 38
INCOMPLETE PLANS
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SCALE: 1" = 50'
NAD 83
SPEC. CUT DITCH SEE DETAIL 24
42" RCP-IV
MATCH TO -L- POT Sta. 1219+00.00 - SHEET 32
MATCH TO -L- POT Sta. 1219+00.00 - SHEET 33
SITE 16
ROCK FILL IN POND SEE DETAIL 52 EST. 1450 TONS
DRAIN POND FILL TO NATURAL GROUND
-Y17RPD- SC Sta. 12+16.00
-Y17RPD- POT Sta. 12+86.18
-Y17RPD- ST Sta. 10+00.00
SPEC. LAT. 3' BASE DITCH SEE DETAIL 5
SPEC. CUT 3' BASE DITCH SEE DETAIL 53
REMOVE
-SR17-
SITE 15
Sta. = 33+00 -SR17- LT
Q(10) = 50 CFS
V(10) = 2.2 FPS
d(10) = 2.2 Ft.
s = 0.32%
n = 0.04
Liner = NA
Sta. = 29+50 -SR17- LT
Q(10) = 50 CFS
V(10) = 2.0 FPS
d(10) = 2.0 Ft.
s = 2.65%
n = 0.05
Liner = Class 'B' Riprap
LAT. 3' BASE DITCH W/CL B RIP RAP EST. 394 TONS EST. 991 SY GF SEE DETAIL 25
DUE
PUE
TDE
HW
MH
15

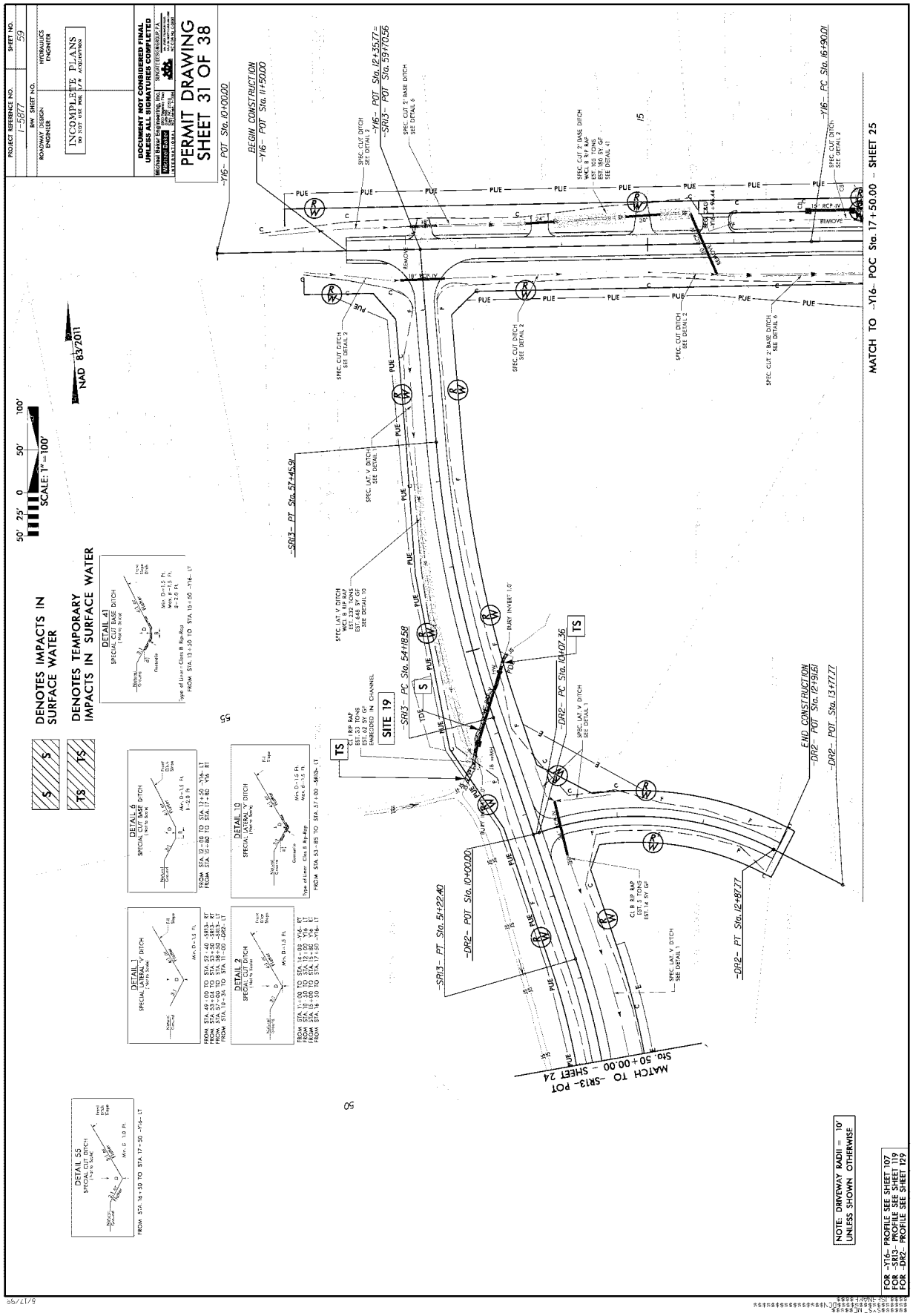
PROJECT REFERENCE NO.	SHEET NO.
I-5986B-3	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

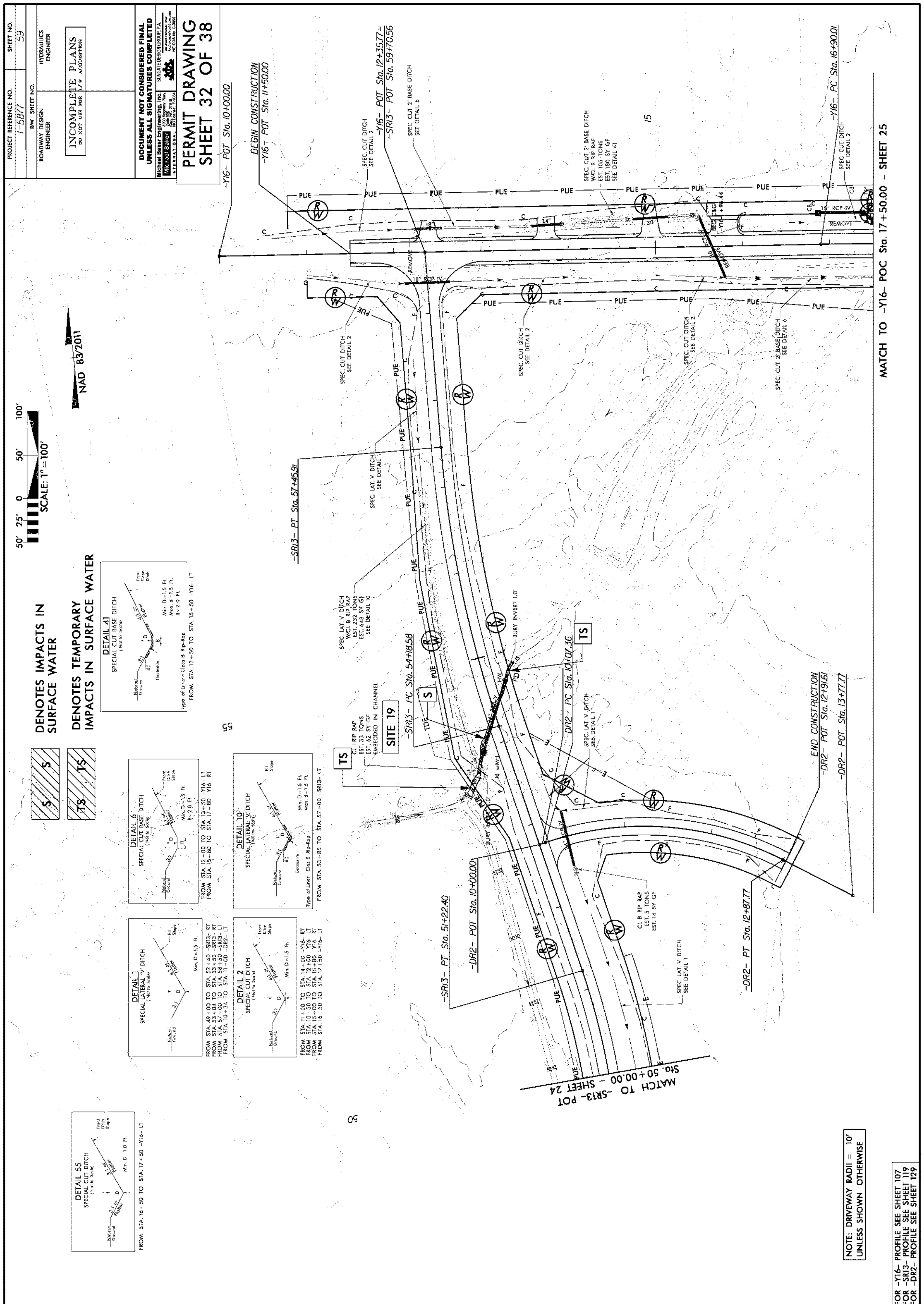
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 30 OF 38



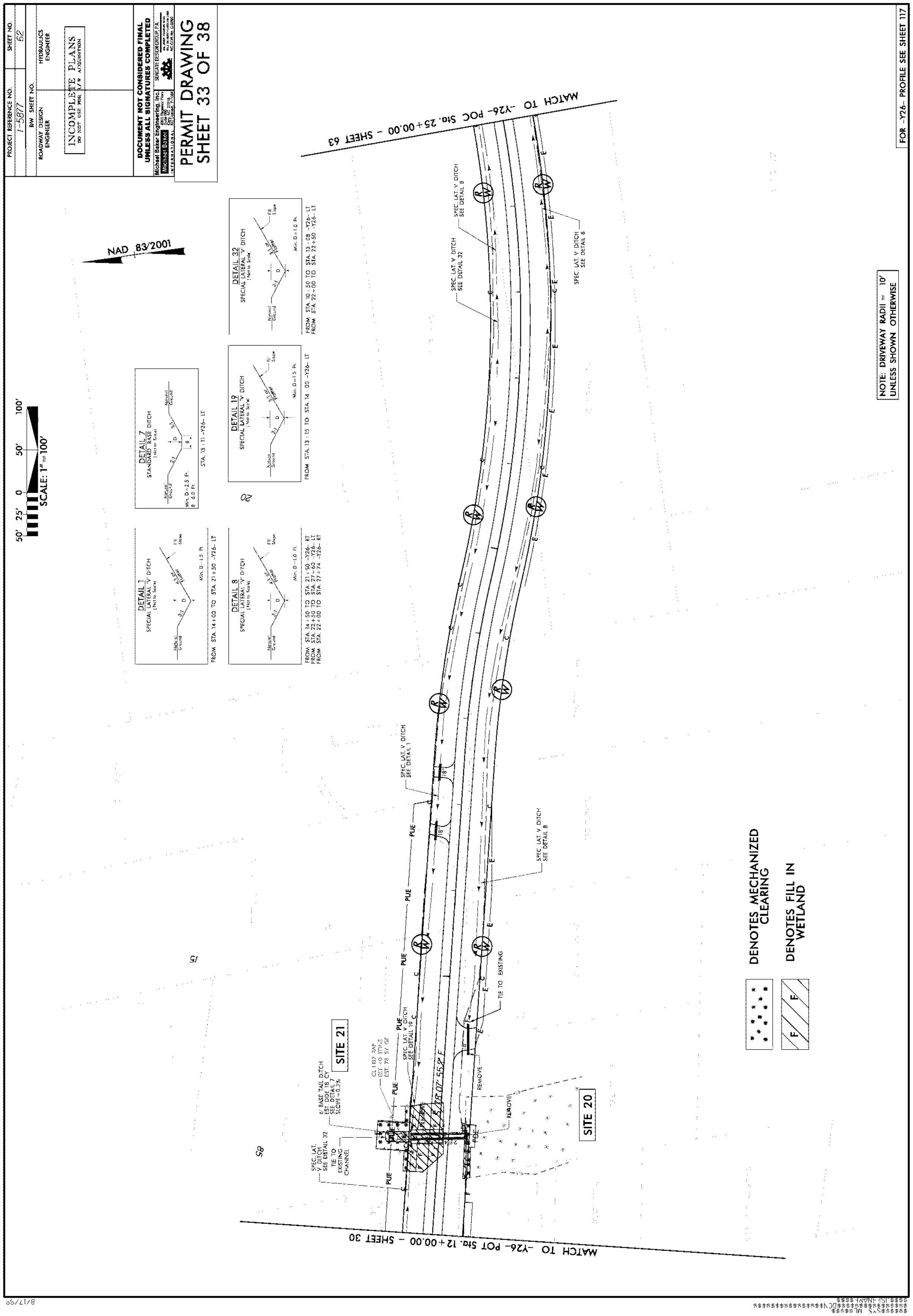

PROJECT REFERENCE NO. I-5877
SHEET NO. 59
BW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Melissa Bailey
PERMIT DRAWING
SHEET 31 OF 38
SCALE: 1"=100'
NAD 83/2011
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
-Y16- POT Sta. 10+00.00
BEGIN CONSTRUCTION -Y16- POT Sta. 11+50.00
-SR13- PT Sta. 57+45.91
-SR13- PC Sta. 54+18.58
-SR13- PT Sta. 51+22.40
-DR2- POT Sta. 10+00.00
-DR2- PC Sta. 10+07.36
-DR2- PT Sta. 13+17.77
END CONSTRUCTION -DR2- POT Sta. 12+91.61
-Y16- POT Sta. 12+35.77= -SR13- POT Sta. 59+70.56
-Y16- PC Sta. 16+99.01
SITE 19
MATCH TO -SR13- POT Sta. 50+00.00 - SHEET 24
MATCH TO -Y16- POC Sta. 17+50.00 - SHEET 25
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -Y16- PROFILE SEE SHEET 107
FOR -SR13- PROFILE SEE SHEET 119
FOR -DR2- PROFILE SEE SHEET 129
DETAIL 1
DETAIL 2
DETAIL 4
DETAIL 10
DETAIL 41
DETAIL 55

P-96

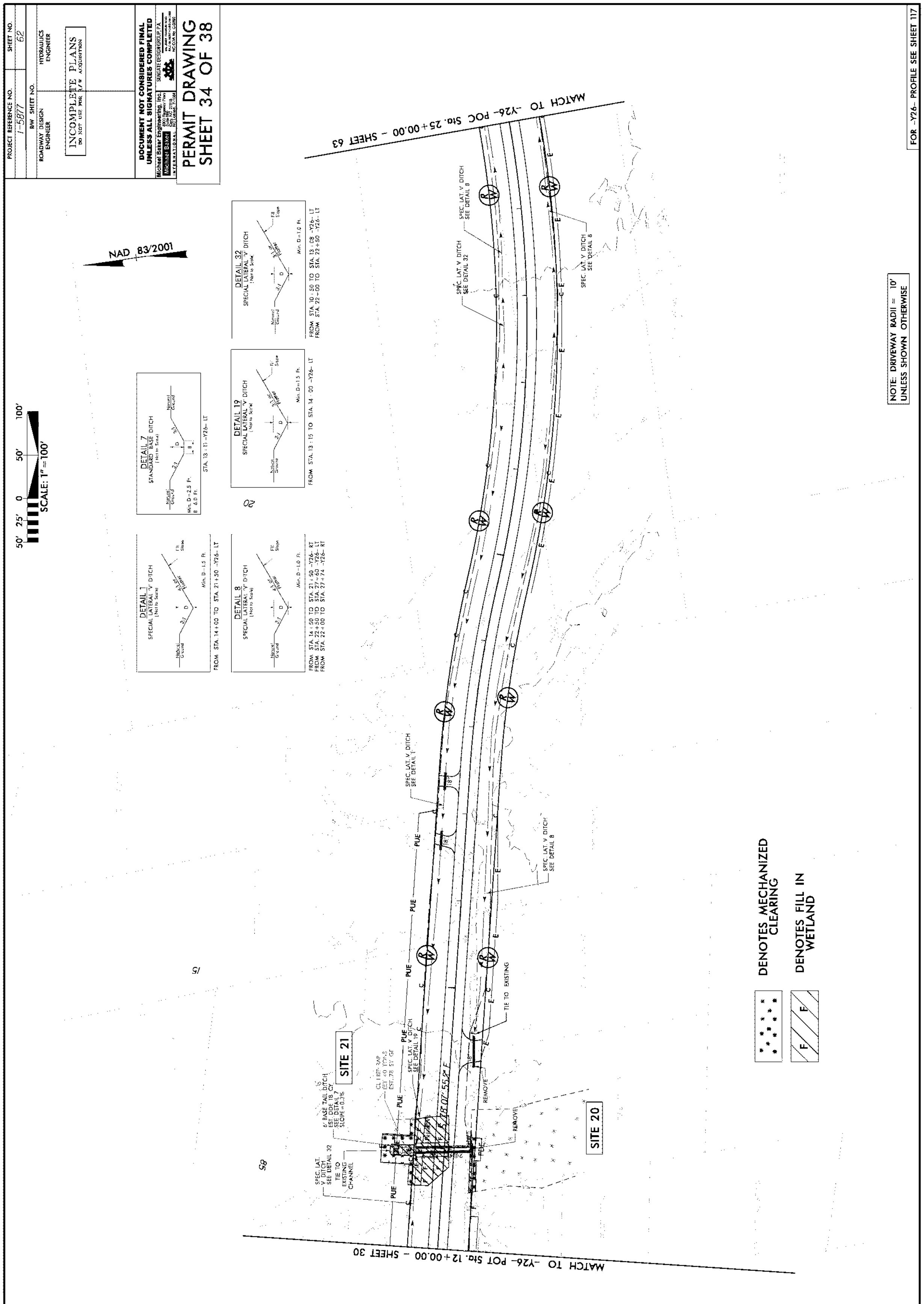


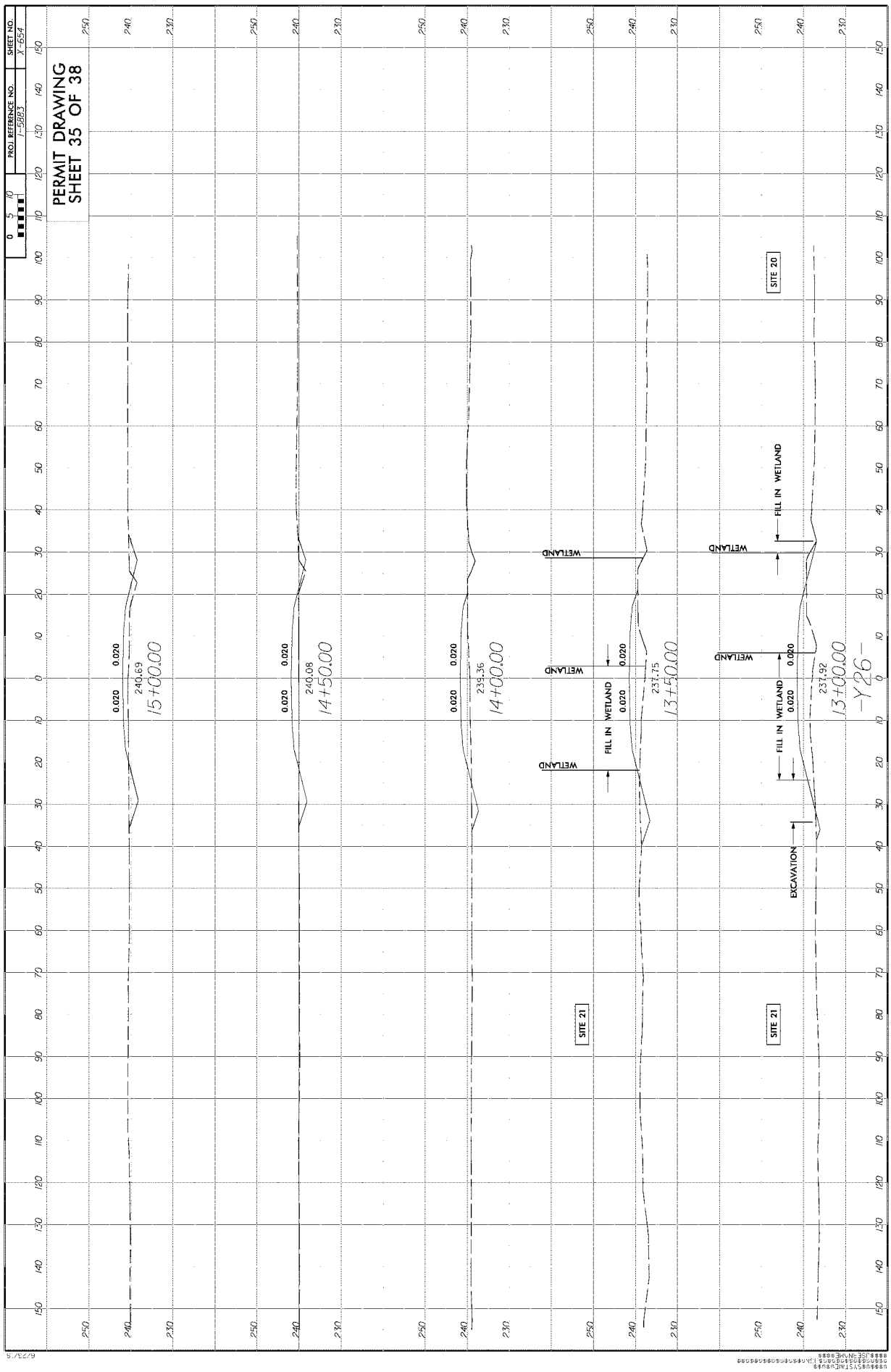
PROJECT REFERENCE NO. I-5877
SHEET NO. 59
PERMIT DRAWING
SHEET 32 OF 38
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SCALE: 1" = 100'
NAD 83/2011
SITE 19
BEGIN CONSTRUCTION -Y16- POT Sta. 11+50.00
-Y16- POT Sta. 10+00.00
-Y16- POT Sta. 12+35.77 = -SR13- POT Sta. 59+70.56
-Y16- PC Sta. 16+90.01
MATCH TO -Y16- POC Sta. 17+50.00 - SHEET 25
MATCH TO -SR13- POT Sta. 50+00.00 - SHEET 24
-SR13- PT Sta. 57+45.91
-SR13- PC Sta. 54+18.58
-SR13- PT Sta. 51+22.40
-DR2- POT Sta. 10+00.00
-DR2- PC Sta. 10+07.36
-DR2- PT Sta. 12+87.77
END CONSTRUCTION -DR2- POT Sta. 12+91.61
-DR2- POT Sta. 13+77.77
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -Y16- PROFILE SEE SHEET 107
FOR -SR13- PROFILE SEE SHEET 119
FOR -DR2- PROFILE SEE SHEET 129
DETAIL 1 SPECIAL LATERAL V DITCH
DETAIL 2 SPECIAL CUT DITCH
DETAIL 6 SPECIAL CUT BASE DITCH
DETAIL 10 SPECIAL LATERAL V DITCH
DETAIL 41 SPECIAL CUT BASE DITCH
DETAIL 55 SPECIAL CUT DITCH

P-97



PROJECT REFERENCE NO.
I-5877
SHEET NO.
62
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 33 OF 38
NAD 83/2001
SCALE: 1" = 100'
MATCH TO -Y26- POC Sta. 25+00.00 - SHEET 63
MATCH TO -Y26- POT Sta. 12+00.00 - SHEET 30
SITE 21
SITE 20
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -Y26- PROFILE SEE SHEET 117


PROJECT REFERENCE NO. I-5877
SHEET NO. 62
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
PERMIT DRAWING SHEET 34 OF 38
NAD 83/2001
SCALE: 1" = 100'
DETAIL 1 SPECIAL LATERAL 'V' DITCH (Not to Scale)
FROM STA. 14+00 TO STA. 21+50 -Y26- LT
DETAIL 7 STANDARD BASE DITCH (Not to Scale)
STA. 13+11 -Y26- LT
DETAIL 8 SPECIAL LATERAL 'V' DITCH (Not to Scale)
DETAIL 19 SPECIAL LATERAL 'V' DITCH (Not to Scale)
FROM STA. 13+15 TO STA. 14+00 -Y26- LT
DETAIL 32 SPECIAL LATERAL 'V' DITCH (Not to Scale)
MATCH TO -Y26- POC Sta. 25+00.00 - SHEET 63
MATCH TO -Y26- POT Sta. 12+00.00 - SHEET 30
SPEC. LAT. V DITCH SEE DETAIL 8
SPEC. LAT. V DITCH SEE DETAIL 32
SPEC. LAT. V DITCH SEE DETAIL 1
SPEC. LAT. V DITCH SEE DETAIL 19
TIE TO EXISTING
REMOVE
SITE 20
SITE 21
6' BASE TAIL DITCH SEE DETAIL 7
TIE TO EXISTING CHANNEL
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -Y26- PROFILE SEE SHEET 117


PERMIT DRAWING
SHEET 35 OF 38
PROJ. REFERENCE NO.
7-5883
SHEET NO.
X-654
0 5 10
15+00.00
14+50.00
14+00.00
13+50.00
13+00.00
240.69
240.08
239.36
237.75
237.92
0.020
WETLAND
FILL IN WETLAND
EXCAVATION
SITE 21
SITE 20
-Y26-

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
1	1075+91 to 1076+34 -L-LT	2 AT 48" PIPES	0.001		0.003	0.007		0.003	0.001	43	15	
1A	1076+60 to 1077+41 -L-LT	DRAINAGE DITCH	0.020		0.006	0.001						
2	1075+92 to 1081+72 -L-LT	POND						2.950				
3	41+32 to 44+84-SR14-RT	DRAINAGE DITCH			0.060	0.050						
4	44+86 to 48+09-SR13-	ROADWAY FILL						0.050	0.001	321	8	
5	21+85 to 22+21-Y16RPC-	ROADWAY FILL						0.030		248		
	22+21 to 24+03-Y16RPC-RT	OUTLET CHANNEL						0.003	0.002	27	21	
6	24+21 to 24+83-Y16RPC-LT	ROADWAY FILL	0.020									
7	1127+08 to 1129+43-L-LT	POND						0.200				
		2 AT 66" PIPE						0.100				
8	1128+33 -L- RT	ROADWAY FILL						0.002	0.001	12	14	
	1129+35 to 1130+03-L-RT	ROADWAY FILL						0.004		53		
9	1132+67 to 1132+90-L-RT	ROADWAY FILL						0.004		41		
TOTALS*:			**0.041**	**0.000**	**0.069**	**0.058**	**0.000**	**3.346**	**0.005**	**745**	**58**	**0**

*Rounded totals are sum of actual impacts

NOTES:

Site 6: Wetland Total Take

Revised 2018 Feb

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
04-20-2020 (Rev)
HARNETT COUNTY
I-5883
53083.1.1

P-100

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
10	1180+80 to 1182+98-L-RT	2 AT 48" PIPE	0.040			0.070						
	1183+40 to 1183+72-L-RT	OUTLET CHANNEL			0.070			0.003	0.002	20	10	
11	1182+35 to 1185+15-L-LT	2 AT 48" PIPE	0.110			0.060						
12	64+09 to 64+34-SR16-	54" PIPE						0.008		69		
		OUTLET CHANNEL						0.002	0.002	16	12	
13	17+23 to 19+17-Y17RPC-RT	42" PIPE	0.002		0.040	0.040						
14	24+28 to 24+55-Y17RPB-LT	ROADWAY FILL	0.008									
15	30+73 to 33+56-SR17-	POND						0.760				
16	34+02 to 34+89-SR17-RT	ROCK FILL IN POND						0.100				
17	10+45 to 11+82-Y17RPA-RT	POND						0.490				
18	1220+34 -L-	2 AT 7'x6' RCBC						0.020		37		
	1219+97 to 1220+81-L-LT	INLET CHANNEL	0.094					0.009		26		
	1220+35 to 1220+55-L-RT	OUTLET CHANNEL						0.009	0.006	31	15	
TOTALS*:			**0.254**	**0.000**	**0.110**	**0.170**	**0.000**	**1.401**	**0.010**	**199**	**37**	**0**

*Rounded totals are sum of actual impacts

NOTES:

Site 14: Wetland Total Take

Revised 2018 Feb

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
04-20-2020 (Rev)
HARNETT COUNTY
I-5883
53083.1.1

P-101

WETLAND AND SURACE WATER IMPACTS SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
19	53+56 to 54+86-SR13-	54" PIPE						0.007	0.002	100	22	
	53+56 to 53+89-SR13-LT	OUTLET CHANNEL						0.001	0.002	18	16	
20	12+67 to 13+62-Y26-RT	2 at 42" PIPE	0.030			0.011						
21	12+72 to 13+54-Y26-	2 at 42" PIPE	0.040		0.010							
	13+05 to 13+18-Y26-LT	OUTLET CHANNEL			0.008	0.033						
	12+72 to 13+54-Y26-LT	DRAINAGE DITCH			0.020							
	TOTALS THIS PAGE		0.070	0.000	0.038	0.044	0.000	0.008	0.004	118	38	
	TOTALS SHEET 36		0.041	0.000	0.069	0.058	0.000	3.346	0.005	745	58	0
	TOTALS SHEET 37		0.254	0.000	0.110	0.170	0.000	1.401	0.010	199	37	0
TOTALS*:			**0.365**	**0.000**	**0.217**	**0.272**	**0.000**	**4.755**	**0.019**	**1062**	**133**	**0**

*Rounded totals are sum of actual impacts

NOTES:

Site 18: Wetland Total Take

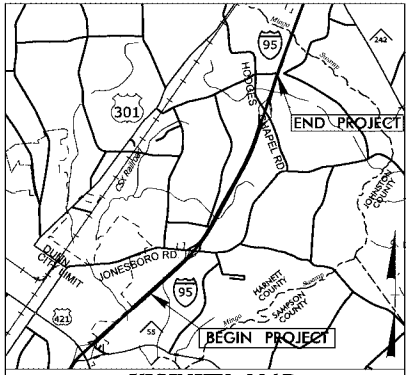
Revised 2018 Feb

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
04-20-2020 (Rev)
HARNETT COUNTY
I-5883
53083.1.1
SHEET 38 OF 38

P-102

CONTRACT: TIP PROJECT: I-5883

See Sheet 1A I or Index of Sheets
See Sheet 1B I or Conventional Symbols



VICINITY MAP
(Not to Scale)

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HARNETT COUNTY

PERMIT DRAWING
SHEET 1 OF 11

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5883	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
53083.1.1	NHPP-0095(033)74	P.E.	
53083.2.2	NHPP-0095(033)74	R/W & UTIL.	

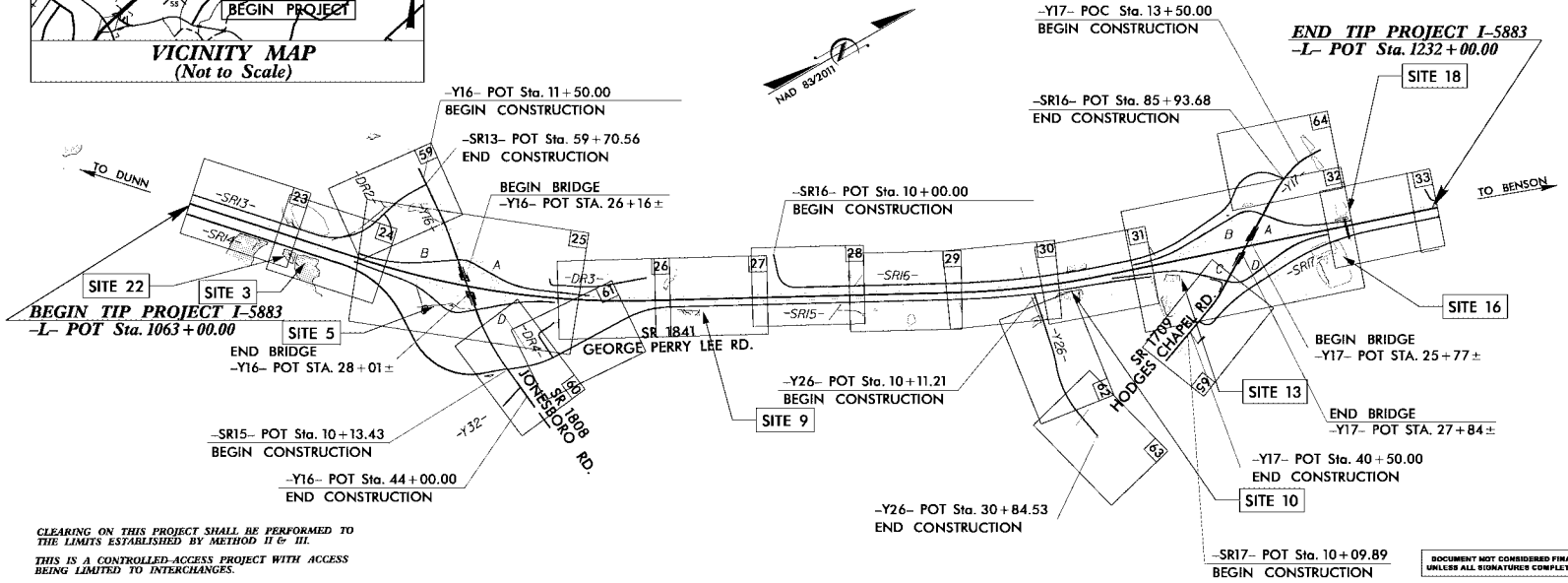
I-5883
FINAL RIGHT OF WAY PLANS

LOCATION: IMPROVE I-95 INTERCHANGES AT SR 1808 (JONESBORO ROAD) (EXIT 75) AND SR 1709 (HODGES CHAPEL ROAD) (EXIT 77).

TYPE OF WORK: GRADING, PAVING, DRAINAGE, AND STRUCTURES

WETLAND AND SURFACE WATER IMPACTS PERMIT

UTILITY – SECTION 3



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 2019 = 58,000
ADT 2040 = 75,700
K = 7 %
D = 55 %
T = 24 % *
V = 70 MPH
* (TTST 17% + DUAL 7%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5883 ..... 3.201 MILES

TOTAL LENGTH OF TIP PROJECT I-5883 ..... 3.201 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: February 28, 2018

LETTING DATE: July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

CURTIS TILLMAN, PE
PROJECT DESIGN ENGINEER

STEVE D. KENDALL, PE
NCDOT CONTACT

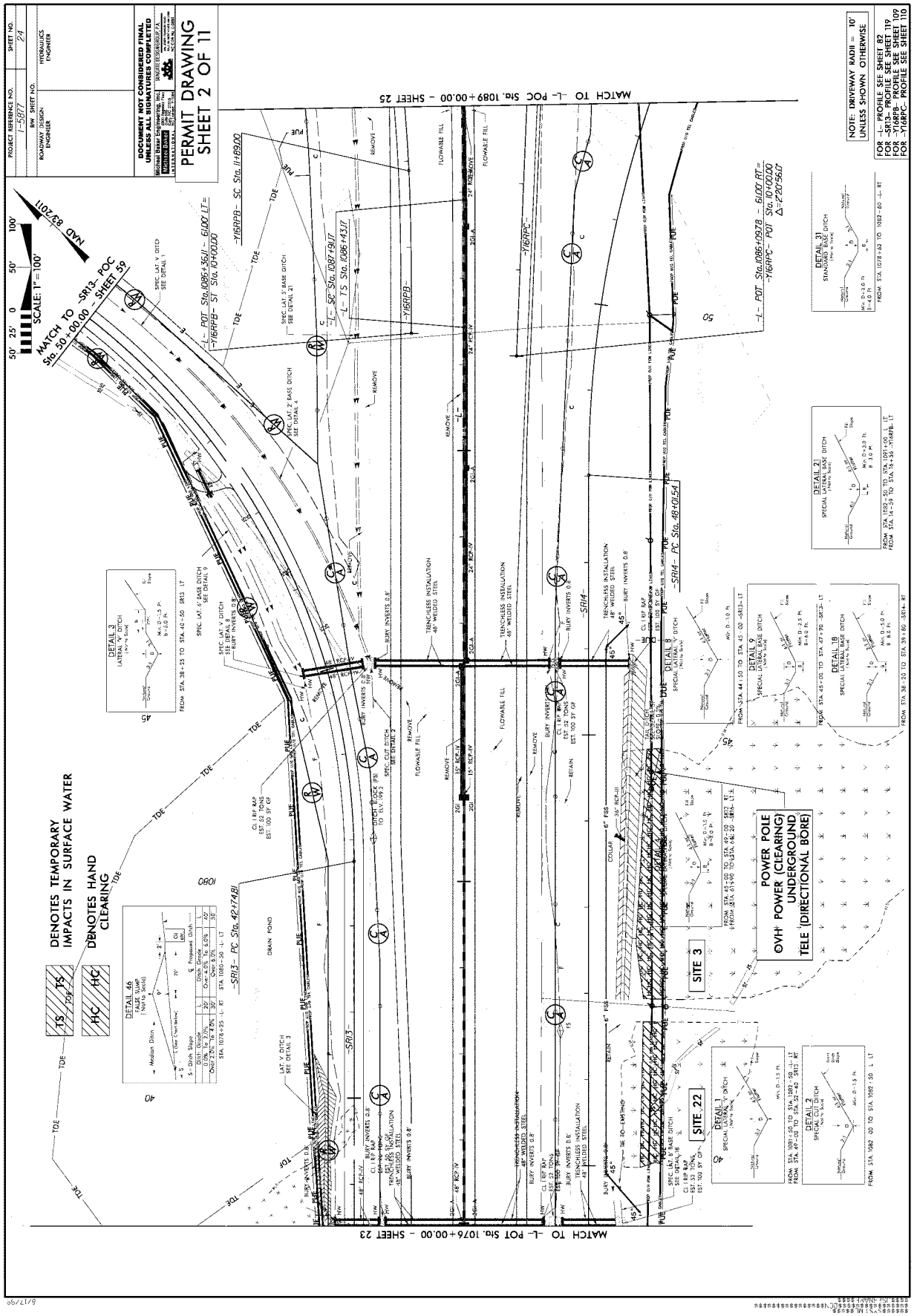
HYDRAULICS ENGINEER

SIGNATURE: P.E.

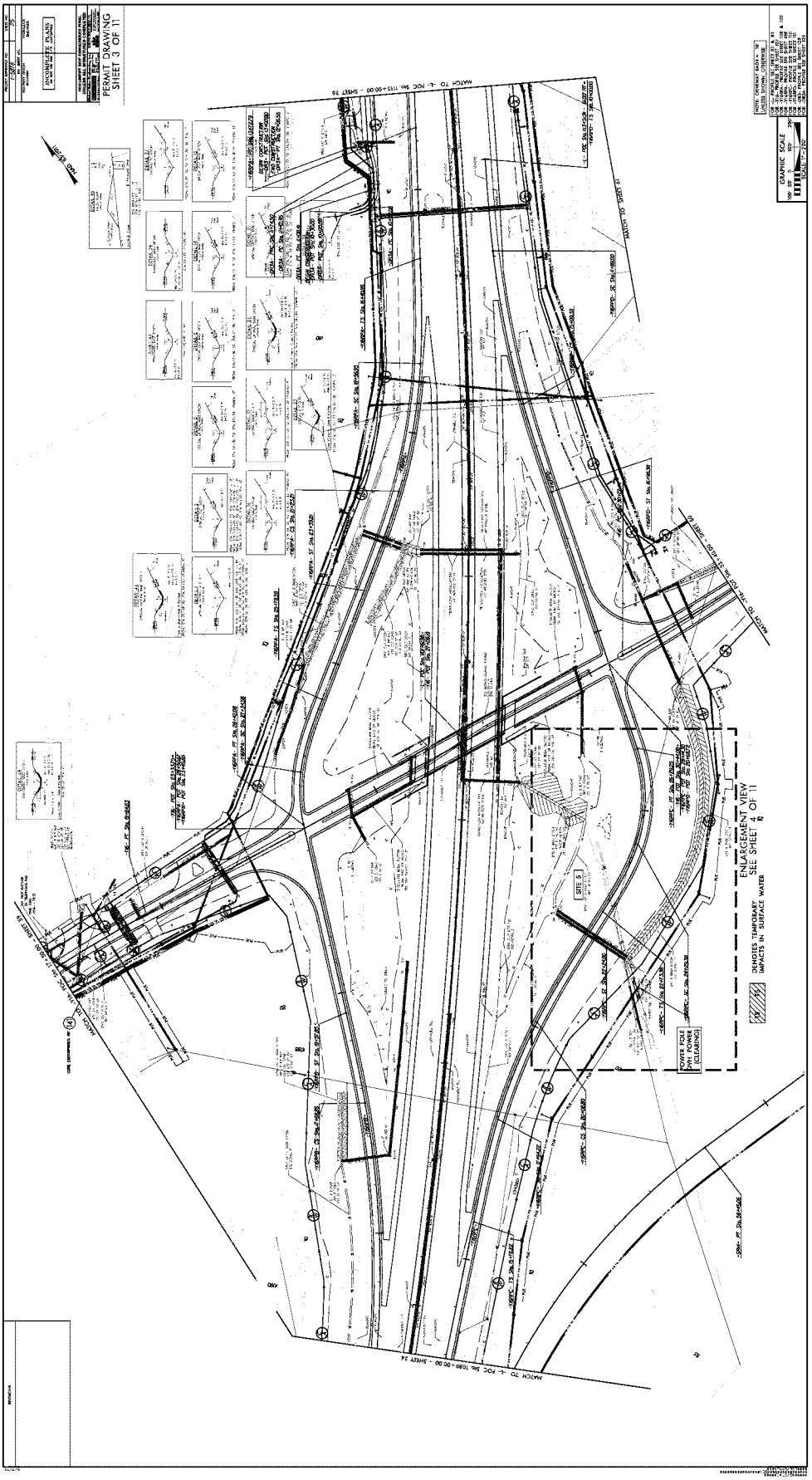
ROADWAY DESIGN ENGINEER

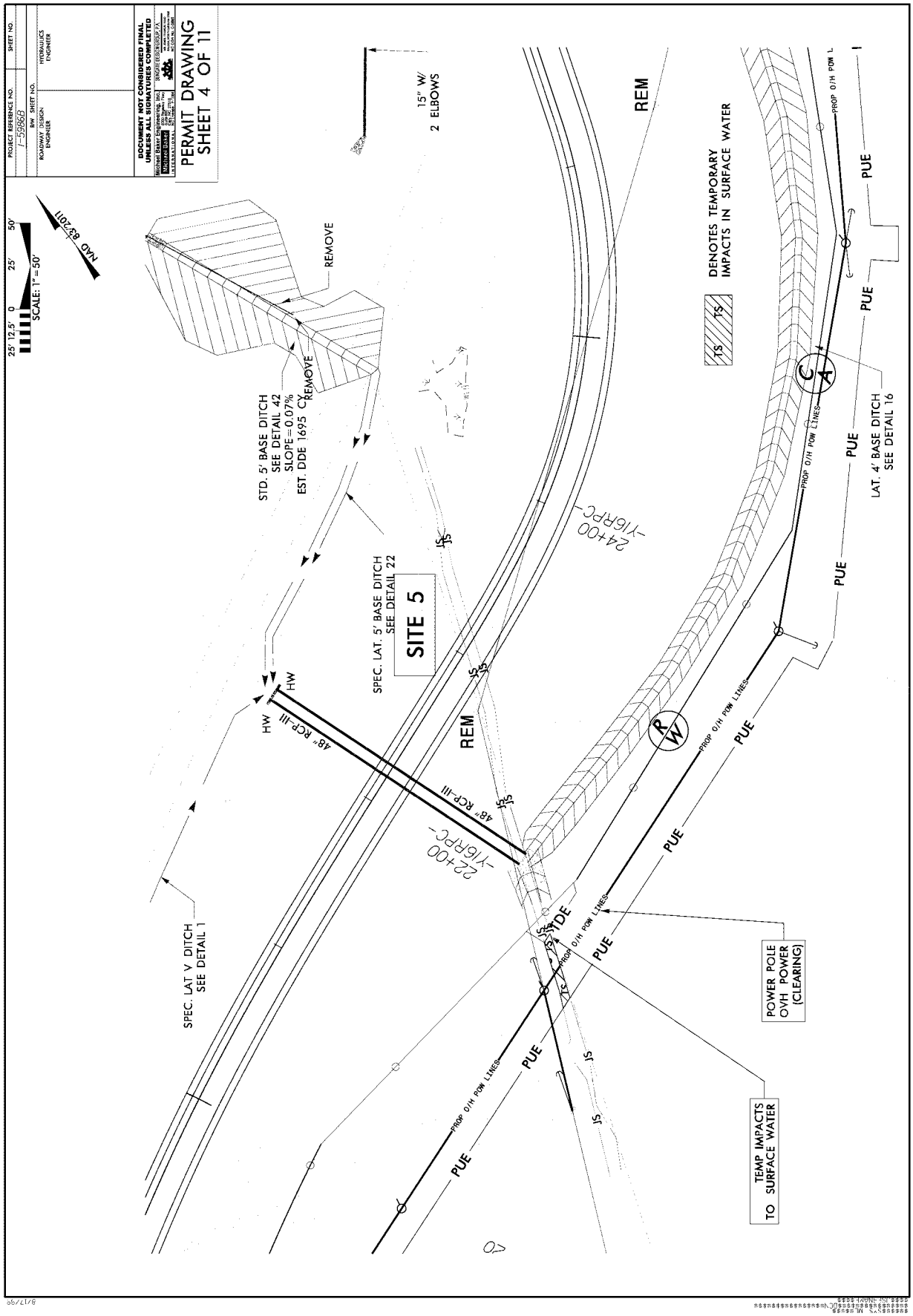
SIGNATURE: P.E.

P-104

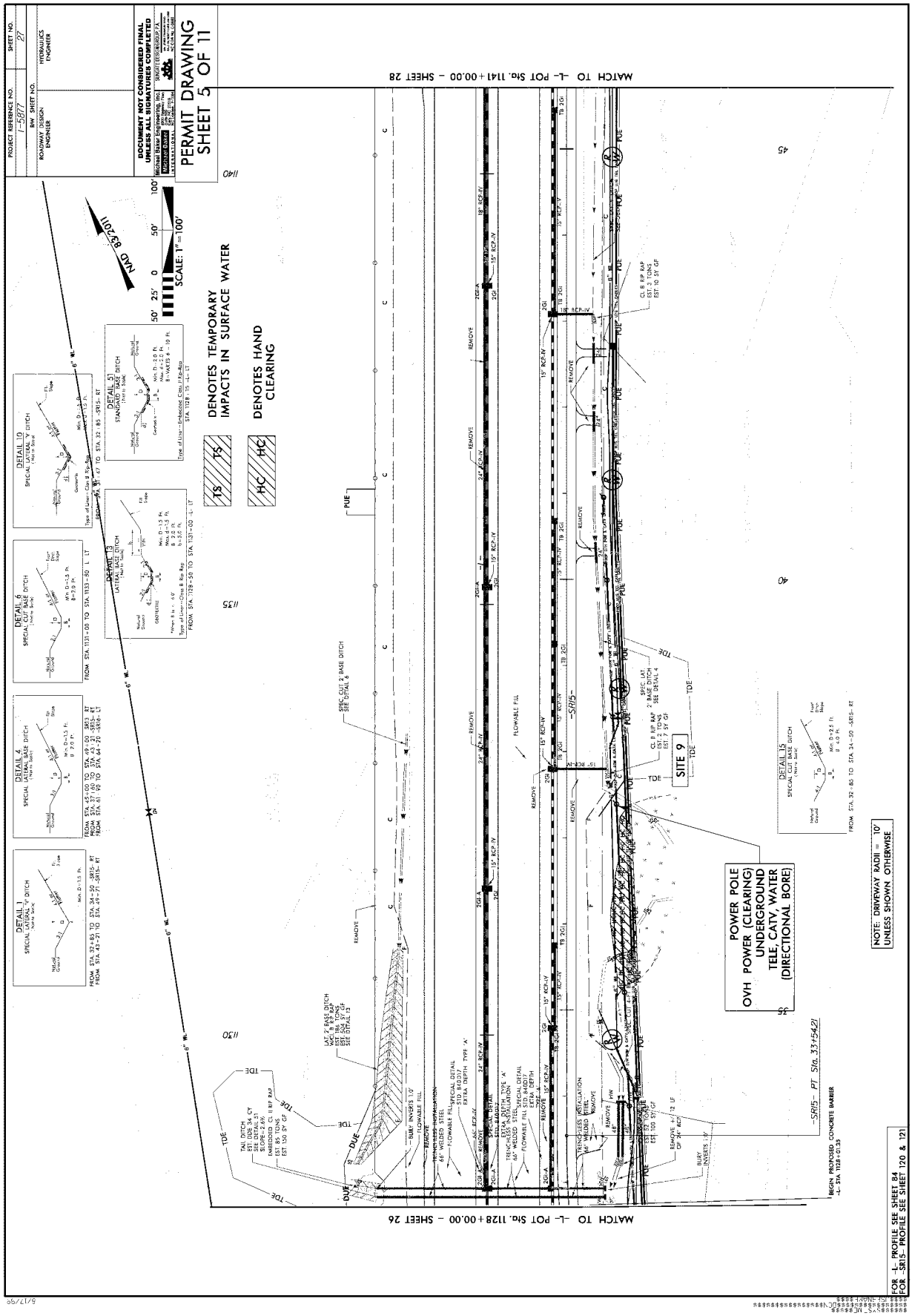

PERMIT DRAWING
SHEET 2 OF 11
PROJECT REFERENCE NO. I-5877
SHEET NO. 24
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83/2011
SCALE: 1"=100'
MATCH TO -SR13- POC Sta. 50+00.00 - SHEET 59
MATCH TO -L- POC Sta. 1089+00.00 - SHEET 25
MATCH TO -L- POT Sta. 1076+00.00 - SHEET 23
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES HAND CLEARING
SITE 3
SITE 22
POWER POLE (CLEARING)
ØVH POWER UNDERGROUND
TELE (DIRECTIONAL BORE)
-SR13- PC Sta. 42+74.81
-SR14- PC Sta. 48+10.54
-Y6RPB- POT Sta. 1086+36.11 - 61.00 LT = -Y6RPB- ST Sta. 1090.00
-Y6RPB- SC Sta. 1087+91.17
-L- TS Sta. 1086+43.17
-Y6RPC- POT Sta. 1086+09.78 - 61.00 RT = -Y6RPC- POT Sta. 1090.00 Δ=2°30'56.17
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 82
FOR -SR13- PROFILE SEE SHEET 119
FOR -Y6RPB- PROFILE SEE SHEET 109
FOR -Y6RPC- PROFILE SEE SHEET 110

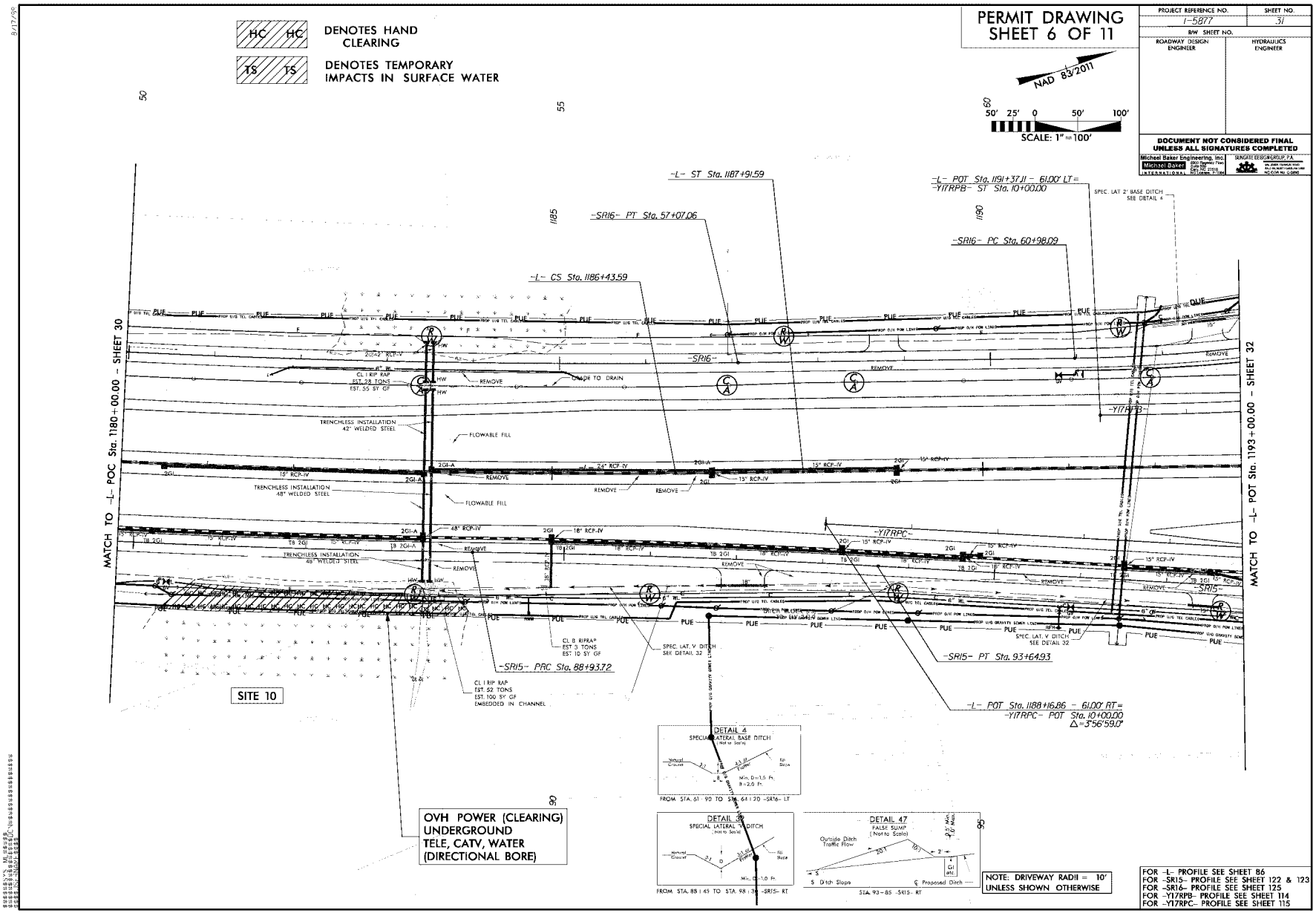
P-105


PERMIT DRAWING
SHEET 3 OF 11
ENLARGEMENT VIEW
SEE SHEET 4 OF 11
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER
SITE 5
MATCH TO SHEET 24
MATCH TO SHEET 23
MATCH TO SHEET 25

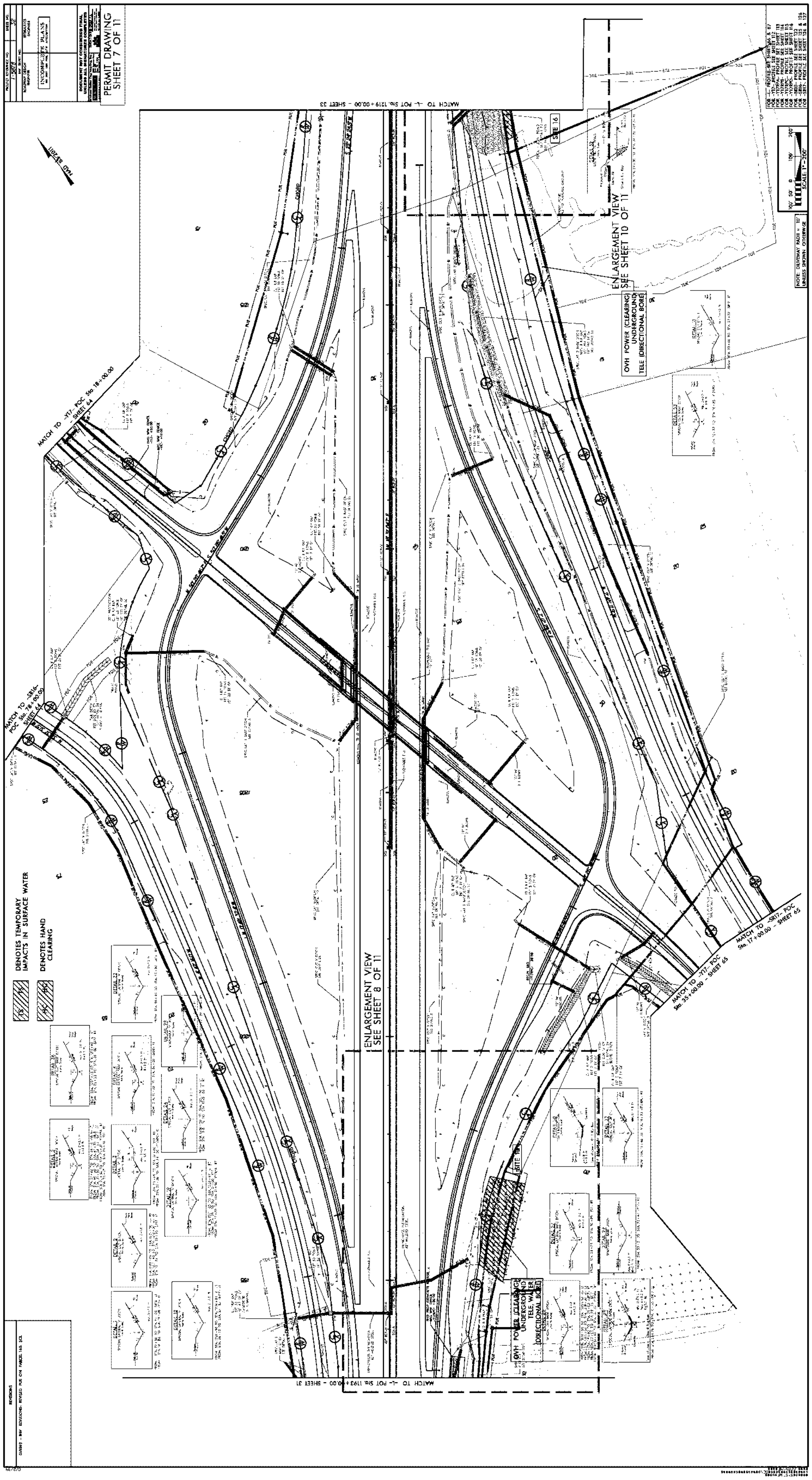

PERMIT DRAWING
SHEET 4 OF 11
PROJECT REFERENCE NO.
7-5968
SHEET NO.
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SCALE: 1" = 50'
NAD 83/2011
SITE 5
REMOVE
STD. 5' BASE DITCH
SEE DETAIL 42
SLOPE=0.07%
EST. DDE 1695 CY
SPEC. LAT. 5' BASE DITCH
SEE DETAIL 22
SPEC. LAT V DITCH
SEE DETAIL 1
48" RCP-III
15" W/
2 ELBOWS
REM
PROP O/H POW LINES
PUE
TS
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER
LAT. 4' BASE DITCH
SEE DETAIL 16
POWER POLE
OVH POWER
(CLEARING)
TEMP IMPACTS
TO SURFACE WATER
22+00 -Y16RPC-
24+00 -Y16RPC-

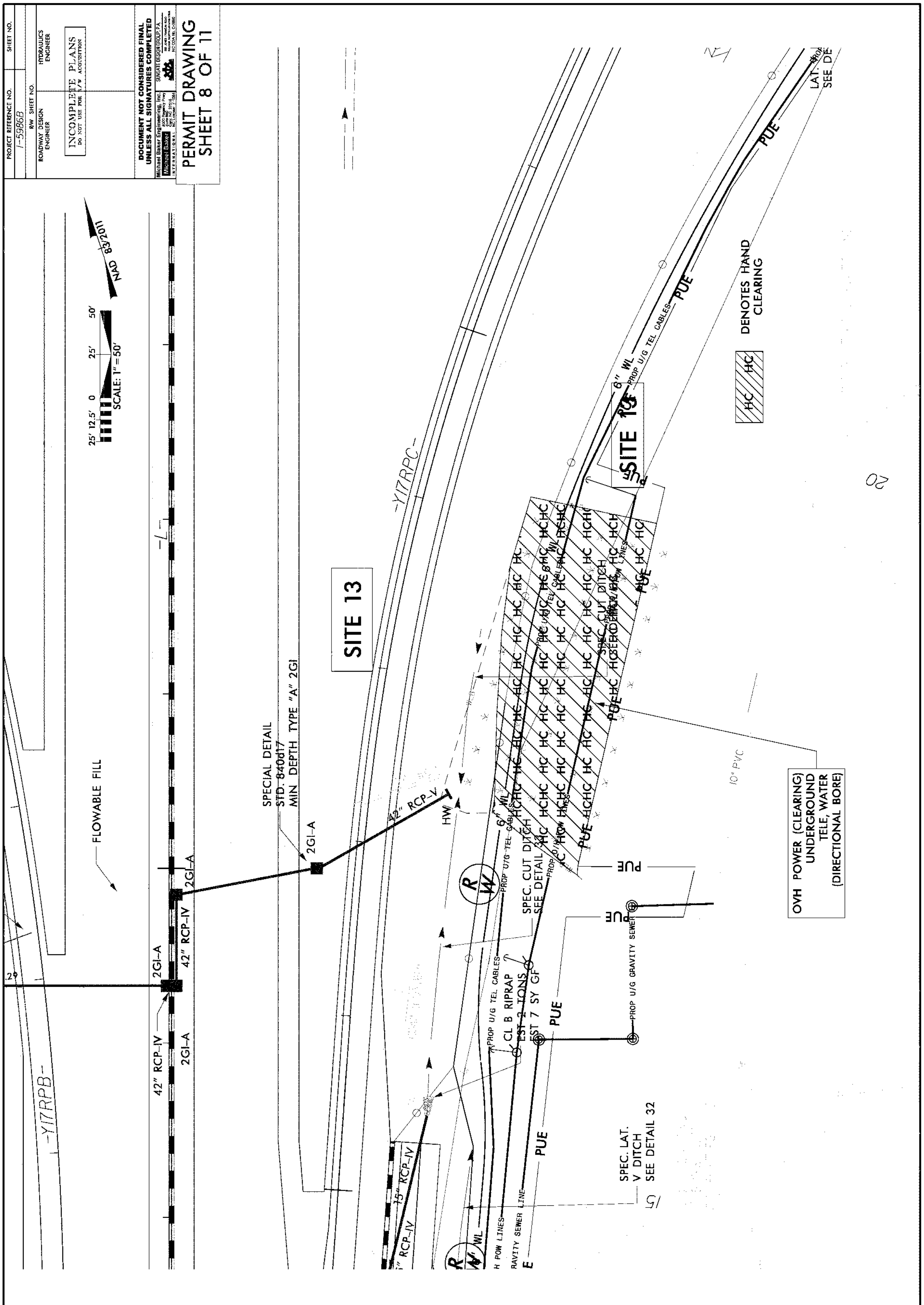
P-107

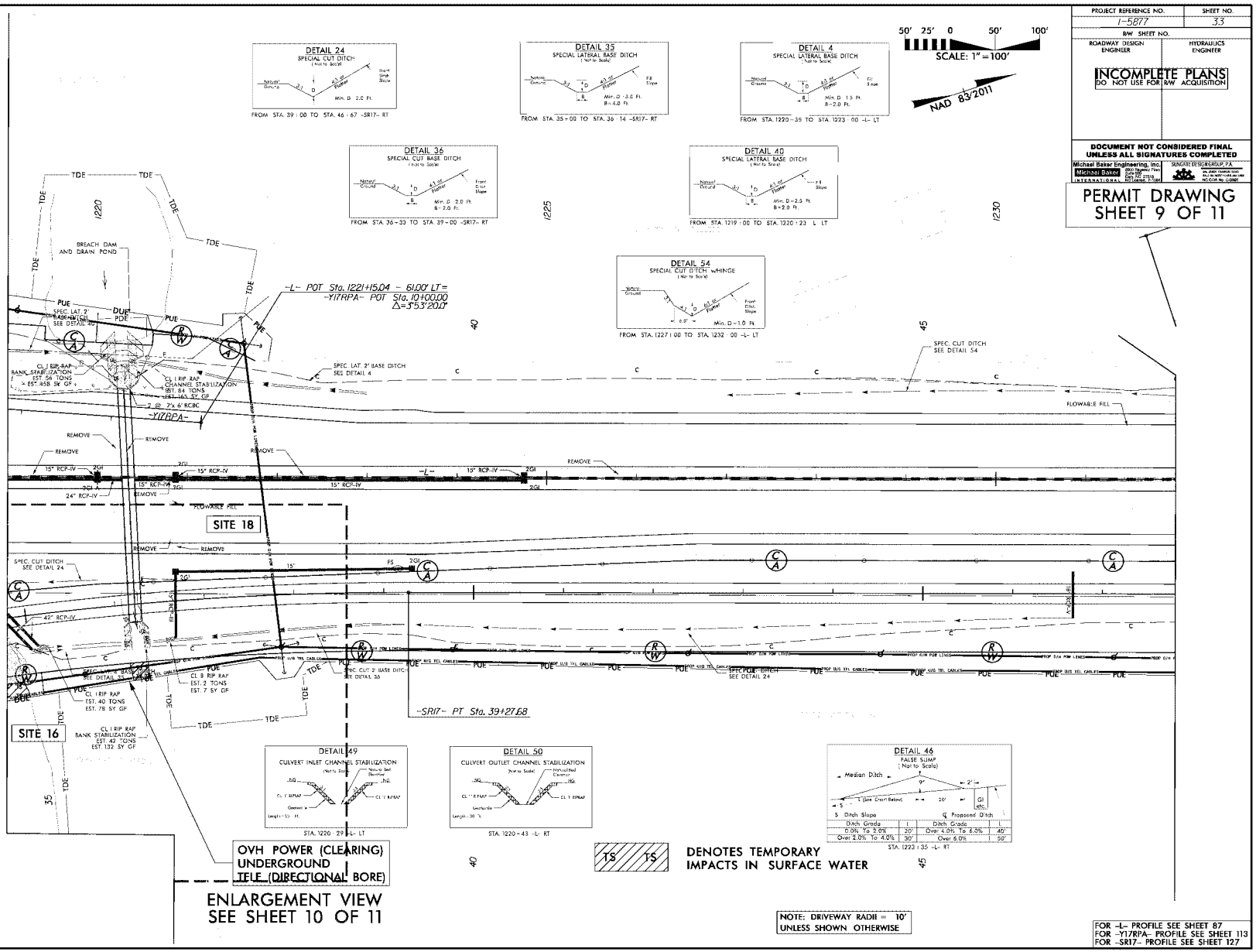

PERMIT DRAWING
SHEET 5 OF 11
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES HAND CLEARING
SCALE: 1"=100'
NAD 83/2011
MATCH TO -L- POT Sta. 1128+00.00 - SHEET 26
MATCH TO -L- POT Sta. 1141+00.00 - SHEET 28
SITE 9
POWER POLE (CLEARING)
OVH POWER (CLEARING)
UNDERGROUND TELE, CATV, WATER (DIRECTIONAL BORE)
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5877
SHEET NO. 27
FOR -L- PROFILE SEE SHEET 84
FOR -SR15- PROFILE SEE SHEET 120 & 121


HC HC DENOTES HAND CLEARING
TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER
PERMIT DRAWING
SHEET 6 OF 11
NAD 83/2011
50' 25' 0 50' 100'
SCALE: 1" = 100'
PROJECT REFERENCE NO. I-5877
SHEET NO. 31
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker INTERNATIONAL
SUNGATE DESIGN GROUP, P.A.
-L- ST Sta. 1187+91.59
-SR16- PT Sta. 57+07.06
-L- CS Sta. 1186+43.59
-L- POT Sta. 1191+37.11 - 61.00' LT =
-Y17RPB- ST Sta. 10+00.00
-SR16- PC Sta. 60+98.09
SPEC. LAT. 2' BASE DITCH SEE DETAIL 4
MATCH TO -L- POC Sta. 1180+00.00 - SHEET 30
MATCH TO -L- POT Sta. 1193+00.00 - SHEET 32
-SR16-
-Y17RPB-
-Y17RPC-
-SR15-
-SR15- PRC Sta. 88+93.72
-SR15- PT Sta. 93+64.93
-L- POT Sta. 1188+16.86 - 61.00' RT =
-Y17RPC- POT Sta. 10+00.00
Δ = 3°56'59.0"
SITE 10
OVH POWER (CLEARING)
UNDERGROUND
TELE, CATV, WATER
(DIRECTIONAL BORE)
DETAIL 4
SPECIAL LATERAL BASE DITCH
FROM STA. 61+90 TO STA. 64+20 -SR16- LT
DETAIL 5
SPECIAL LATERAL V-DITCH
FROM STA. 88+45 TO STA. 98+35 -SR15- RT
DETAIL 47
FALSE SUMP
STA. 93+85 -SR15- RT
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 86
FOR -SR15- PROFILE SEE SHEET 122 & 123
FOR -SR16- PROFILE SEE SHEET 125
FOR -Y17RPB- PROFILE SEE SHEET 114
FOR -Y17RPC- PROFILE SEE SHEET 115

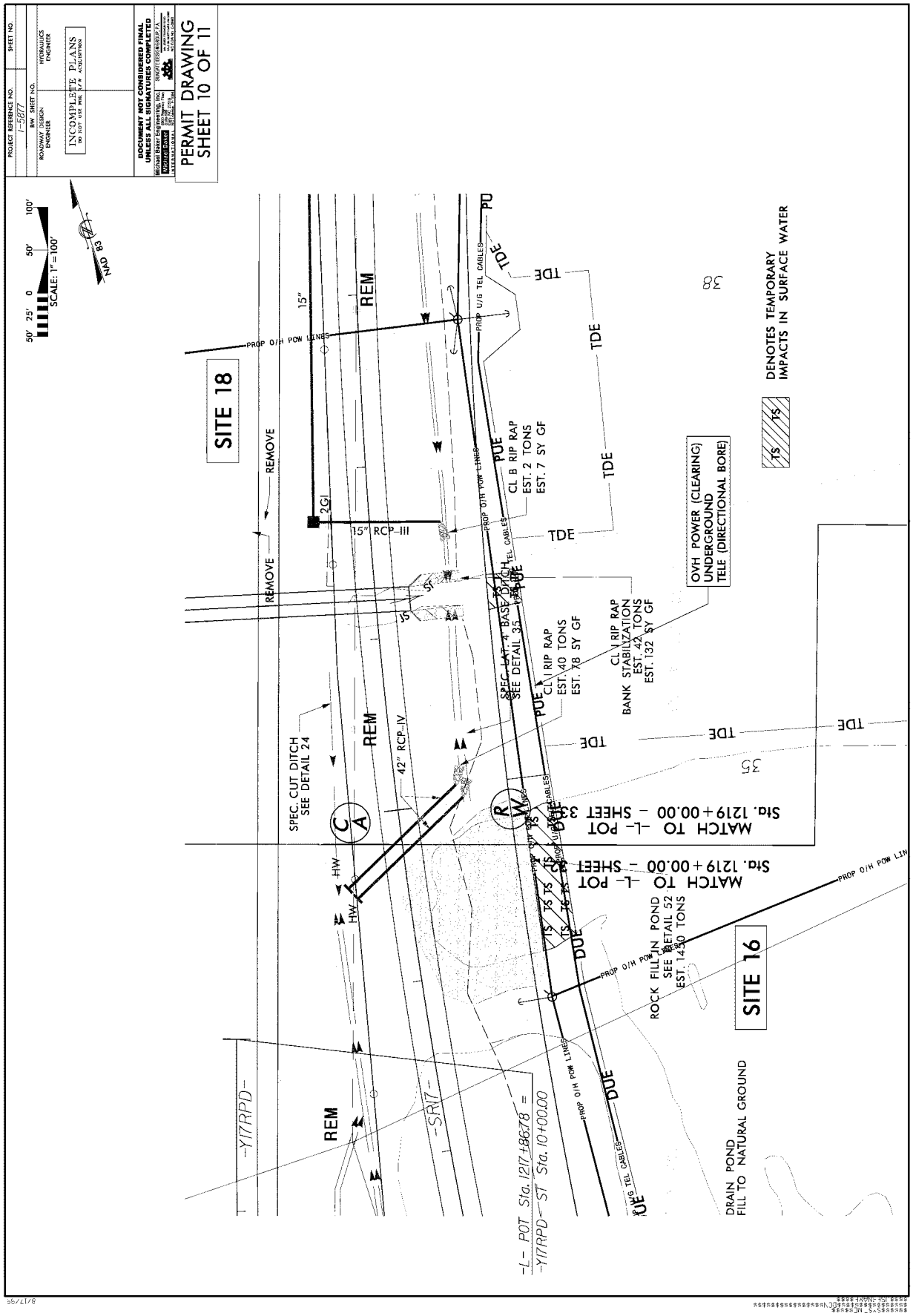
P-108


PERMIT DRAWING
SHEET 7 OF 11
ENLARGEMENT VIEW
SEE SHEET 10 OF 11
ENLARGEMENT VIEW
SEE SHEET 8 OF 11
OVH POWER (CLEARING)
UNDERGROUND
TELE (DIRECTIONAL BORE)
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER
DENOTES HAND
CLEARING


PERMIT DRAWING
SHEET 8 OF 11
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
PROJECT REFERENCE NO.
SHEET NO.
I-5986B
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SCALE: 1" = 50'
NAD 83/2011
-L-
-Y17RPB-
-Y17RPC-
SITE 13
SITE 14
FLOWABLE FILL
SPECIAL DETAIL
STD. 840.17
MIN DEPTH TYPE "A" 2GI
2GI-A
42" RCP-IV
42" RCP-V
15" RCP-IV
HW
SPEC. CUT DITCH
SEE DETAIL 32
CL B RIPRAP
EST 2 TONS
EST 7 SY GF
PROP U/G TEL CABLES
PROP U/G GRAVITY SEWER
PUE
SPEC. LAT.
V DITCH
SEE DETAIL 32
DENOTES HAND CLEARING
OVH POWER (CLEARING)
UNDERGROUND
TELE, WATER
(DIRECTIONAL BORE)
10" PVC
6" WL


DETAIL 24
SPECIAL CUT DITCH
FROM STA. 39+00 TO STA. 46+67 -SR17- RT
DETAIL 35
SPECIAL LATERAL BASE DITCH
FROM STA. 35+00 TO STA. 36+14 -SR17- RT
DETAIL 4
SPECIAL LATERAL BASE DITCH
FROM STA. 1220+35 TO STA. 1223+00 -L- LT
50' 25' 0 50' 100'
SCALE: 1" = 100'
NAD 83/2011
DETAIL 36
SPECIAL CUT BASE DITCH
FROM STA. 36+33 TO STA. 39+00 -SR17- RT
DETAIL 40
SPECIAL LATERAL BASE DITCH
FROM STA. 1219+00 TO STA. 1220+23 -L- LT
DETAIL 54
SPECIAL CUT DITCH w/HINGE
FROM STA. 1227+00 TO STA. 1232+00 -L- LT
1220
1225
1230
TDE
BREACH DAM AND DRAIN POND
-L- POT Sta. 1221+15.04 = 61.00' LT =
-Y17RPA- POT Sta. 10+00.00
Δ=3°53'20.0"
PUE
SPEC. LAT. 2' BASE DITCH SEE DETAIL 4
CL I RIP RAP BANK STABILIZATION EST. 56 TONS EST. 458 SY GF
CL I RIP RAP CHANNEL STABILIZATION EST. 84 TONS EST. 665 SY GF
2 @ 7'x 6' RCBC
-Y17RPA-
REMOVE
15" RCP-IV
24" RCP-IV
2GI
-L-
SPEC. CUT DITCH SEE DETAIL 54
FLOWABLE FILL
SITE 18
SITE 16
SPEC. CUT DITCH SEE DETAIL 24
42" RCP-IV
CL I RIP RAP EST. 40 TONS EST. 78 SY GF
CL I RIP RAP BANK STABILIZATION EST. 42 TONS EST. 132 SY GF
CL II RIP RAP EST. 2 TONS EST. 7 SY GF
SPEC. CUT 2' BASE DITCH SEE DETAIL 36
-SR17- PT Sta. 39+27.68
DETAIL 49
CULVERT INLET CHANNEL STABILIZATION
STA. 1220+29 -L- LT
DETAIL 50
CULVERT OUTLET CHANNEL STABILIZATION
STA. 1220+43 -L- RT
DETAIL 46
FALSE SUMP
Median Ditch
Ditch Grade
Proposed Ditch
STA. 1223+35 -L- RT
OVH POWER (CLEARING)
UNDERGROUND TELE (DIRECTIONAL BORE)
ENLARGEMENT VIEW SEE SHEET 10 OF 11
TS TS
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
PROJECT REFERENCE NO.
I-5877
SHEET NO.
3.3
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker INTERNATIONAL
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 9 OF 11
FOR -L- PROFILE SEE SHEET 87
FOR -Y17RPA- PROFILE SEE SHEET 113
FOR -SR17- PROFILE SEE SHEET 127

P-111


PROJECT REFERENCE NO.
I-587
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W # ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
PERMIT DRAWING
SHEET 10 OF 11
SCALE: 1" = 100'
NAD 83
SITE 18
SITE 16
REMOVE
REM
15" RCP-III
42" RCP-IV
2GI
SPEC. CUT DITCH
SEE DETAIL 24
SPEC. CUT & BASE DITCH
SEE DETAIL 33
PROP O/H POW LINES
PROP U/G TEL CABLES
CL B RIP RAP
EST. 2 TONS
EST. 7 SY GF
CL I RIP RAP
EST. 40 TONS
EST. 78 SY GF
CL I RIP RAP
BANK STABILIZATION
EST. 42 TONS
EST. 132 SY GF
OVH POWER (CLEARING)
UNDERGROUND
TELE (DIRECTIONAL BORE)
DENOTES TEMPORARY
IMPACTS IN SURFACE WATER
TDE
PUE
DUE
TS
HW
ROCK FILL IN POND
SEE DETAIL 52
EST. 1450 TONS
DRAIN POND
FILL TO NATURAL GROUND
MATCH TO -L- POT
Sta. 1219+00.00 - SHEET 33
-L- POT Sta. 1217+86.78 =
-Y1?RPD- ST Sta. 10+00.00
-Y1?RPD-
-SR17-

WETLAND AND SURACE WATER IMPACTS 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)
3	41+32 to 44+84-SR14-RT	UTILITY					0.181					
5	22+21 to 24+03-Y16RPC-RT	UTILITY							0.004		40	
9	35+16 to 37+39-SR15-RT	UTILITY					0.102		0.002		31	
10	15+33 to 18+90-SR15-RT	UTILITY					0.190		0.002		14	
13	17+23 to 19+17-Y17RPC-RT	UTILITY					0.301					
16	34+02 to 34+89-SR17-RT	UTILITY							0.010		19	
18	1220+35 to 1220+55-L-RT	UTILITY							0.008		19	
22	39+98 to 41+67-SR14-RT	UTILITY					0.094		0.004		23	
TOTALS*:			**0.000**	**0.000**	**0.000**	**0.000**	**0.868**	**0.000**	**0.030**	**0**	**146**	**0**

*Rounded totals are sum of actual impacts

NOTES:

Site 6: Wetland Total Take

Revised 2018 Feb

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-20-2020
HARNETT COUNTY
I-5883
53083.1.1
SHEET 11 OF 11

P-113

CONTRACT: TIP PROJECT: I-5986B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PERMIT DRAWING
SHEET 1 OF 37

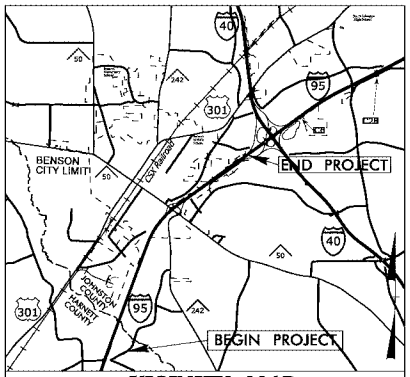
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
47532.1.3	?	P.E.
47532.2.3	?	R/W & UTIL.

I-5986B
FINAL RIGHT OF WAY PLANS

HARNETT AND JOHNSTON COUNTIES

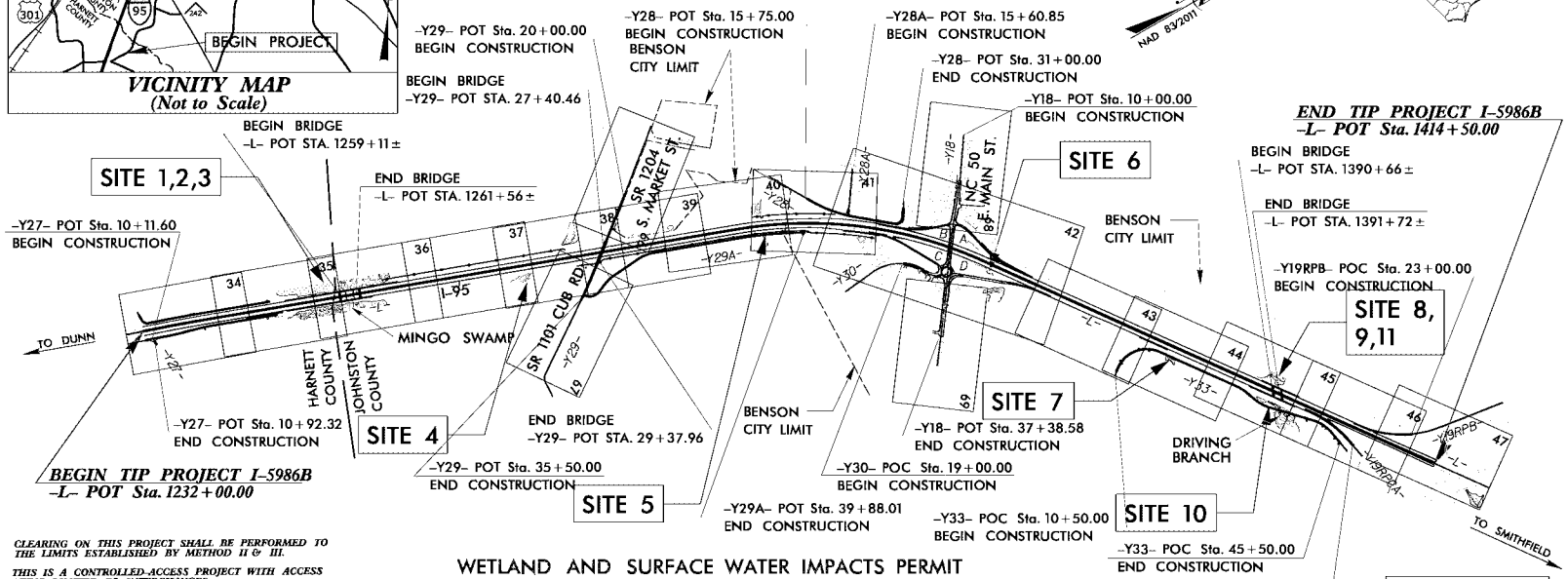
See Sheet 1A for Index of Sheets
See Sheet 1B for Conventional Symbols



VICINITY MAP
(Not to Scale)

LOCATION: IMPROVE I-95 INTERCHANGES AND WIDEN TO EIGHT LANES FROM NORTH OF SR 1709 (HODGES CHAPEL ROAD) (EXIT 77) TO I-40) (EXIT 81).

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS, CULVERT AND STRUCTURES



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

A PORTION OF THIS PROJECT IS WITHIN BENSON MUNICIPAL BOUNDARIES

WETLAND AND SURFACE WATER IMPACTS PERMIT
SECTION 4 (NORTH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 2020 = 66,700
ADT 2040 = 92,900
K = 7 %
D = 55 %
T = 18 % *
V = 70 MPH
* (TTST 13% + DUAL 5%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5986B ..... 3.390 MILES
LENGTH STRUCTURES TIP PROJECT I-5986B ..... 0.066 MILES
TOTAL LENGTH OF TIP PROJECT I-5986B ..... 3.456 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: August 30, 2019

LETTING DATE: July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

RICK STATON
PROJECT DESIGN ENGINEER

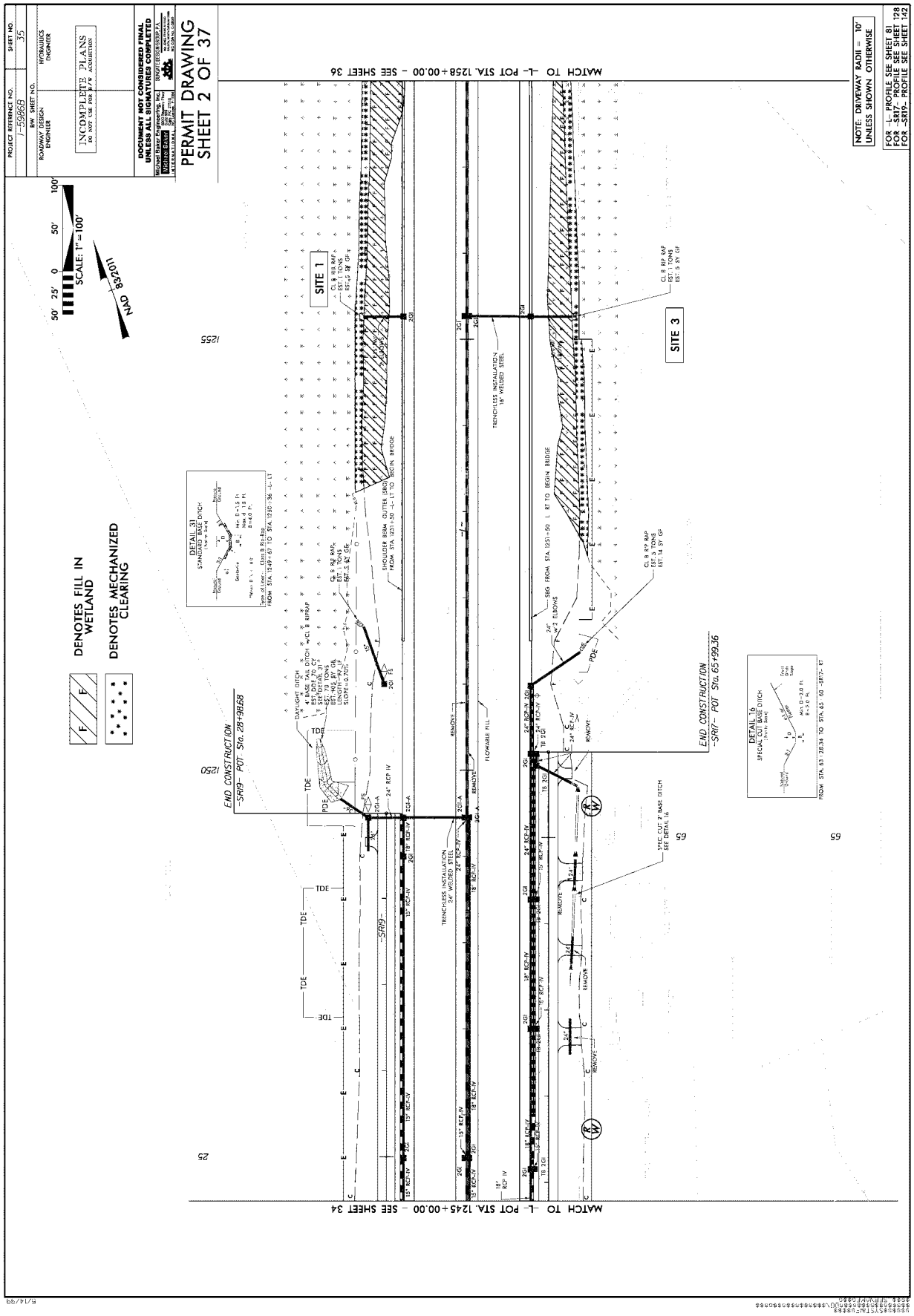
STEVE D. KENDALL, PE
NCDOT CONTACT

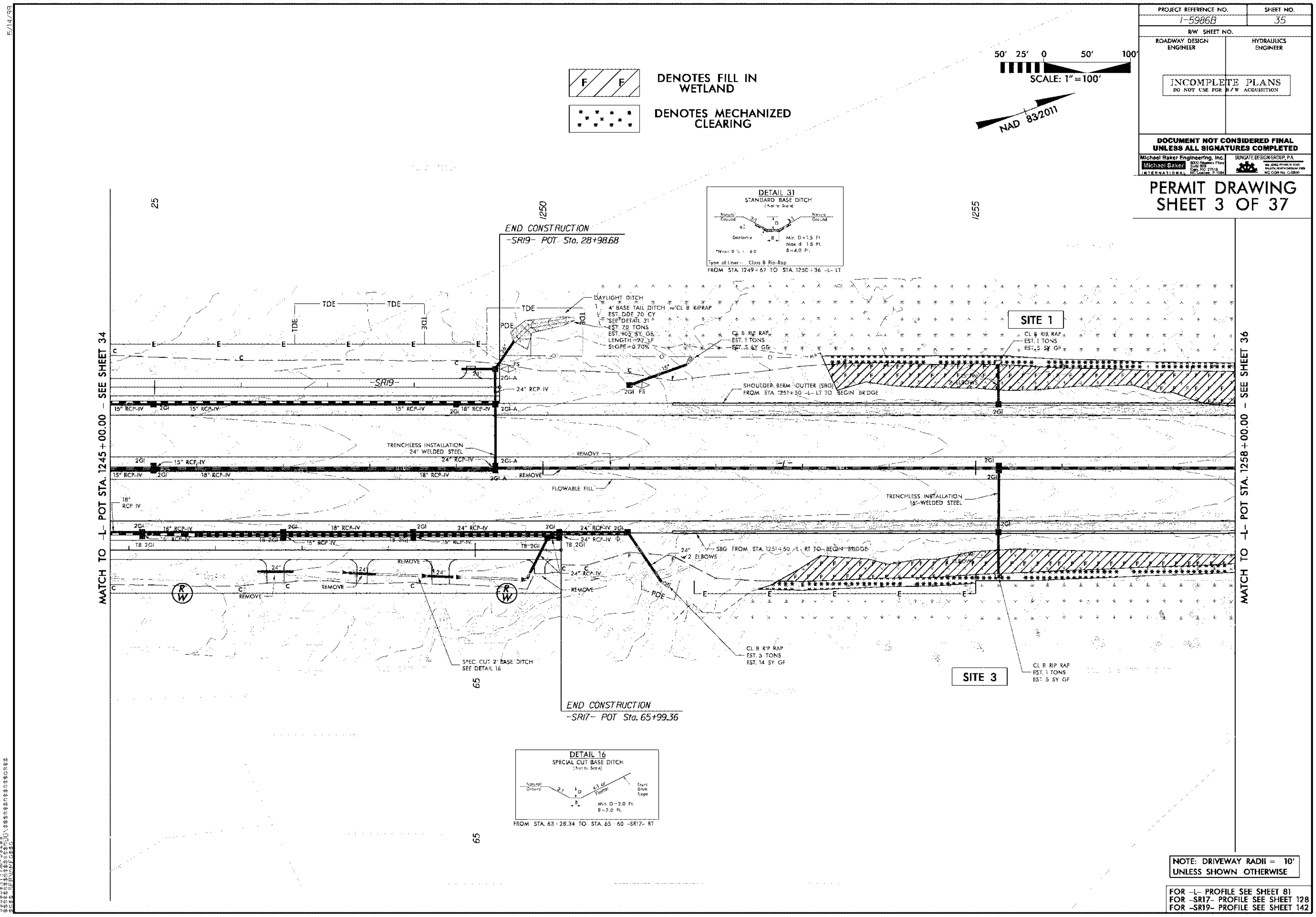
HYDRAULICS ENGINEER
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

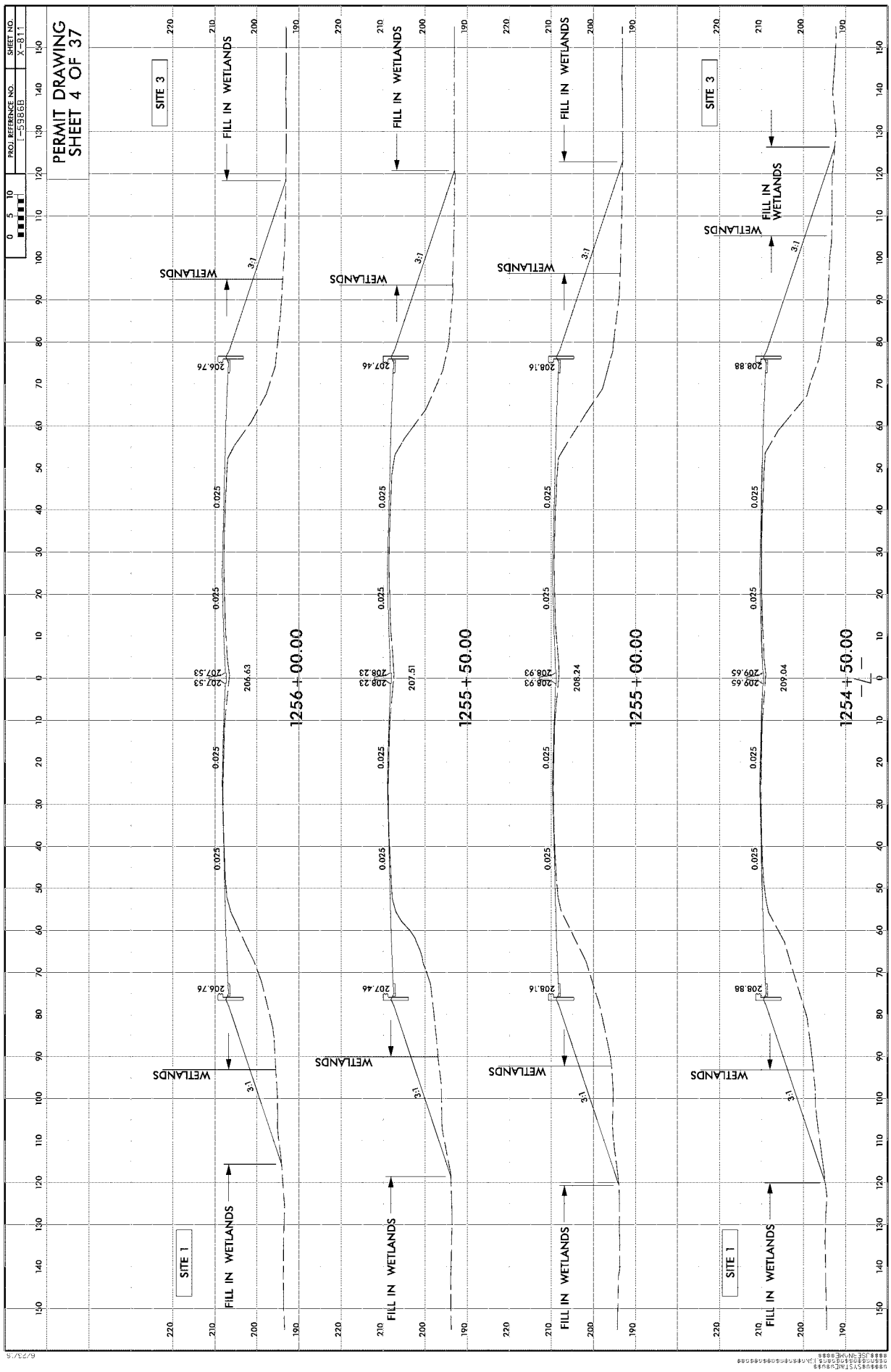
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

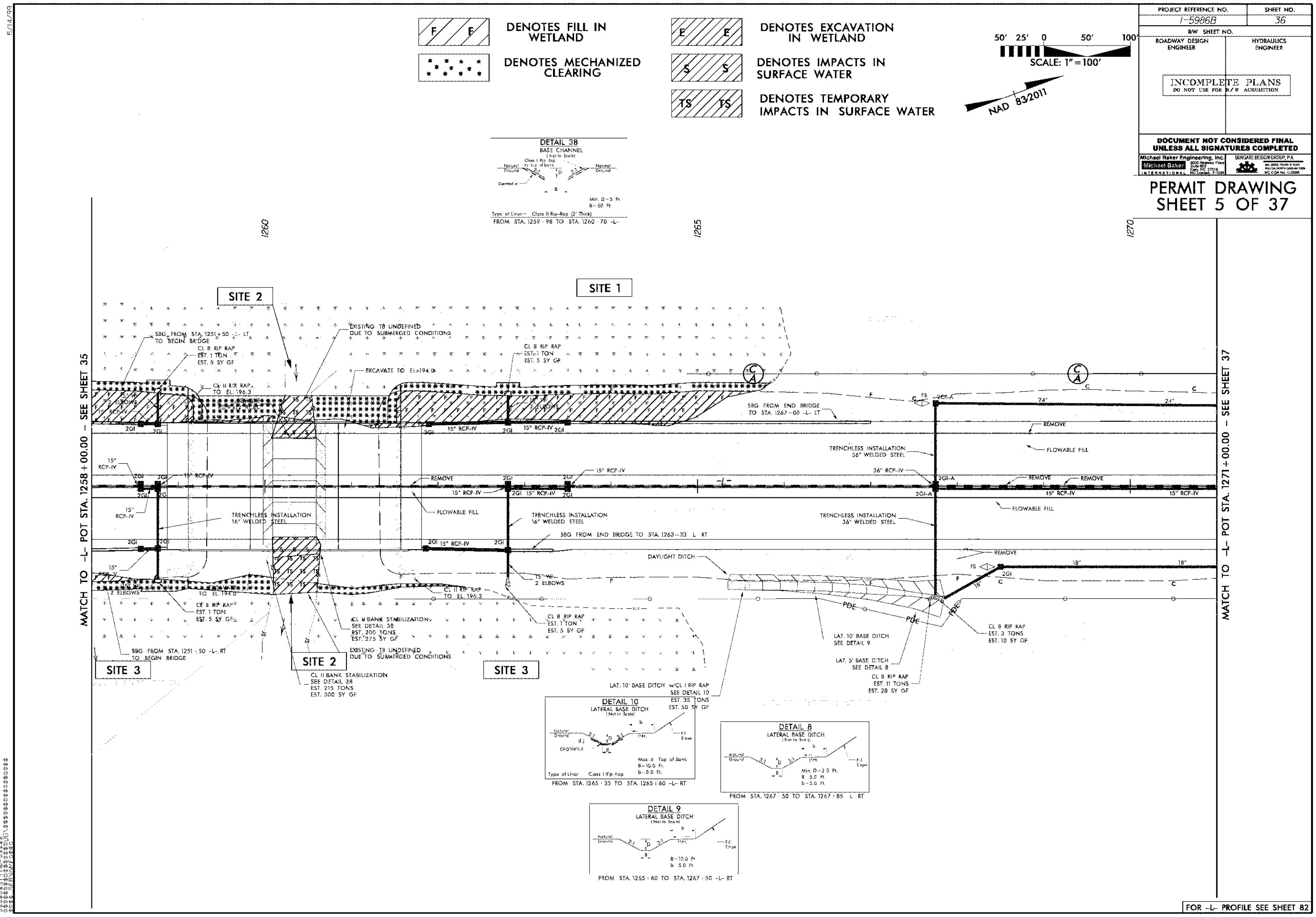
P-114


PROJECT REFERENCE NO.
I-5986B
SHEET NO.
35
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
PERMIT DRAWING
SHEET 2 OF 37
SCALE: 1"=100'
NAD 83/2011
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH TO -L- POT STA. 1258+00.00 - SEE SHEET 36
MATCH TO -L- POT STA. 1245+00.00 - SEE SHEET 34
END CONSTRUCTION -SR19- POT Sta. 281+98.68
END CONSTRUCTION -SR17- POT Sta. 65+99.36
SITE 1
SITE 3
DETAIL 31
STANDARD BASE DITCH
DETAIL 16
SPECIAL CUT BASE DITCH
DAYLIGHT DITCH
4' BASE FILL DITCH
SHOULDER BERM GUTTER (SBG)
TRENCHLESS INSTALLATION 24" WELDED STEEL
TRENCHLESS INSTALLATION 16" WELDED STEEL
FLOWABLE FILL
REMOVE
SPEC. CUT 2' BASE DITCH SEE DETAIL 16
NOTE: DRIVEWAY RADII = 30' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 81
FOR -SR17- PROFILE SEE SHEET 128
FOR -SR19- PROFILE SEE SHEET 142


PROJECT REFERENCE NO. I-5986B
SHEET NO. 35
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 3 OF 37
SCALE: 1" = 100'
NAD 83/2011
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DETAIL 31
STANDARD BASE DITCH
Type of Liner = Class B Rip-Rap
FROM STA. 1249+67 TO STA. 1250+36 -L- LT
END CONSTRUCTION
-SR19- POT Sta. 28+98.68
DAYLIGHT DITCH
4' BASE TAIL DITCH w/CL B RIPRAP
EST. DDE 70 CY
SEE DETAIL 31
EST. 70 TONS
EST. 105 SY GF
LENGTH=27 LF
SLOPE=0.70%
CL B RIP RAP
EST. 7 TONS
EST. 5 SY GF
SITE 1
CL B RIP RAP
EST. 1 TONS
EST. 5 SY GF
SHOULDER BERM GUTTER (SBG)
FROM STA. 1251+50 -L- LT TO BEGIN BRIDGE
TRENCHLESS INSTALLATION
24" WELDED STEEL
TRENCHLESS INSTALLATION
16" WELDED STEEL
FLOWABLE FILL
REMOVE
SBG FROM STA. 1251+50 -L- RT TO BEGIN BRIDGE
2 ELBOWS
SPEC. CUT 2' BASE DITCH
SEE DETAIL 16
CL B RIP RAP
EST. 5 TONS
EST. 14 SY GF
SITE 3
CL B RIP RAP
EST. 1 TONS
EST. 5 SY GF
END CONSTRUCTION
-SR17- POT Sta. 65+99.36
DETAIL 16
SPECIAL CUT BASE DITCH
FROM STA. 63+28.34 TO STA. 65+60 -SR17- RT
MATCH TO -L- POT STA. 1245+00.00 - SEE SHEET 34
MATCH TO -L- POT STA. 1258+00.00 - SEE SHEET 36
NOTE: DRIVEWAY RADII = 10'
UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEET 81
FOR -SR17- PROFILE SEE SHEET 128
FOR -SR19- PROFILE SEE SHEET 142

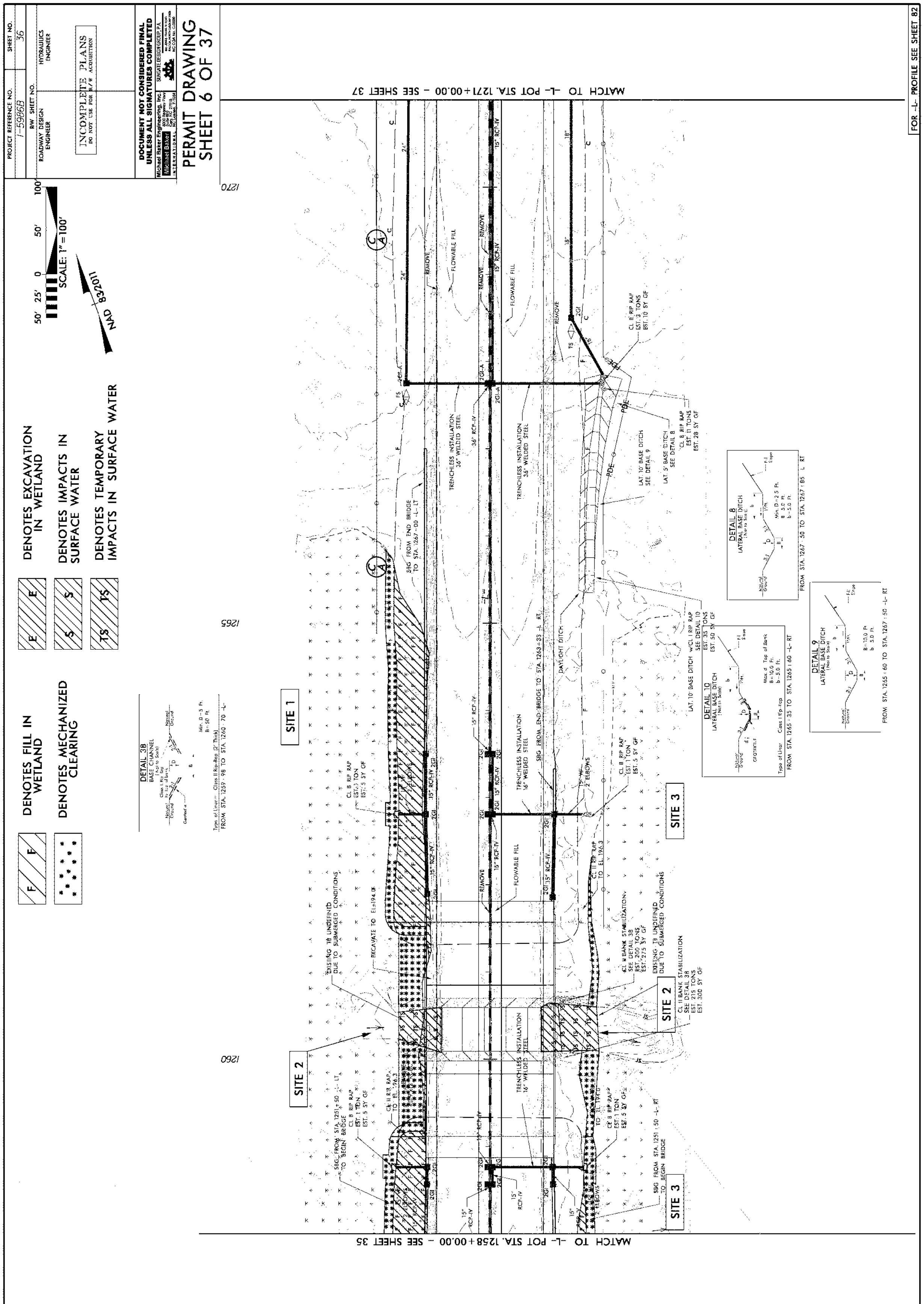
P-117


PERMIT DRAWING
SHEET 4 OF 37
PROJ REFERENCE NO.
5986B
SHEET NO.
X-811
SITE 3
SITE 1
FILL IN WETLANDS
WETLANDS
3:1
0.025
1256+00.00
1255+50.00
1255+00.00
1254+50.00
206.76
207.53
206.63
207.46
208.23
207.51
208.16
208.93
208.24
208.88
209.65
209.04

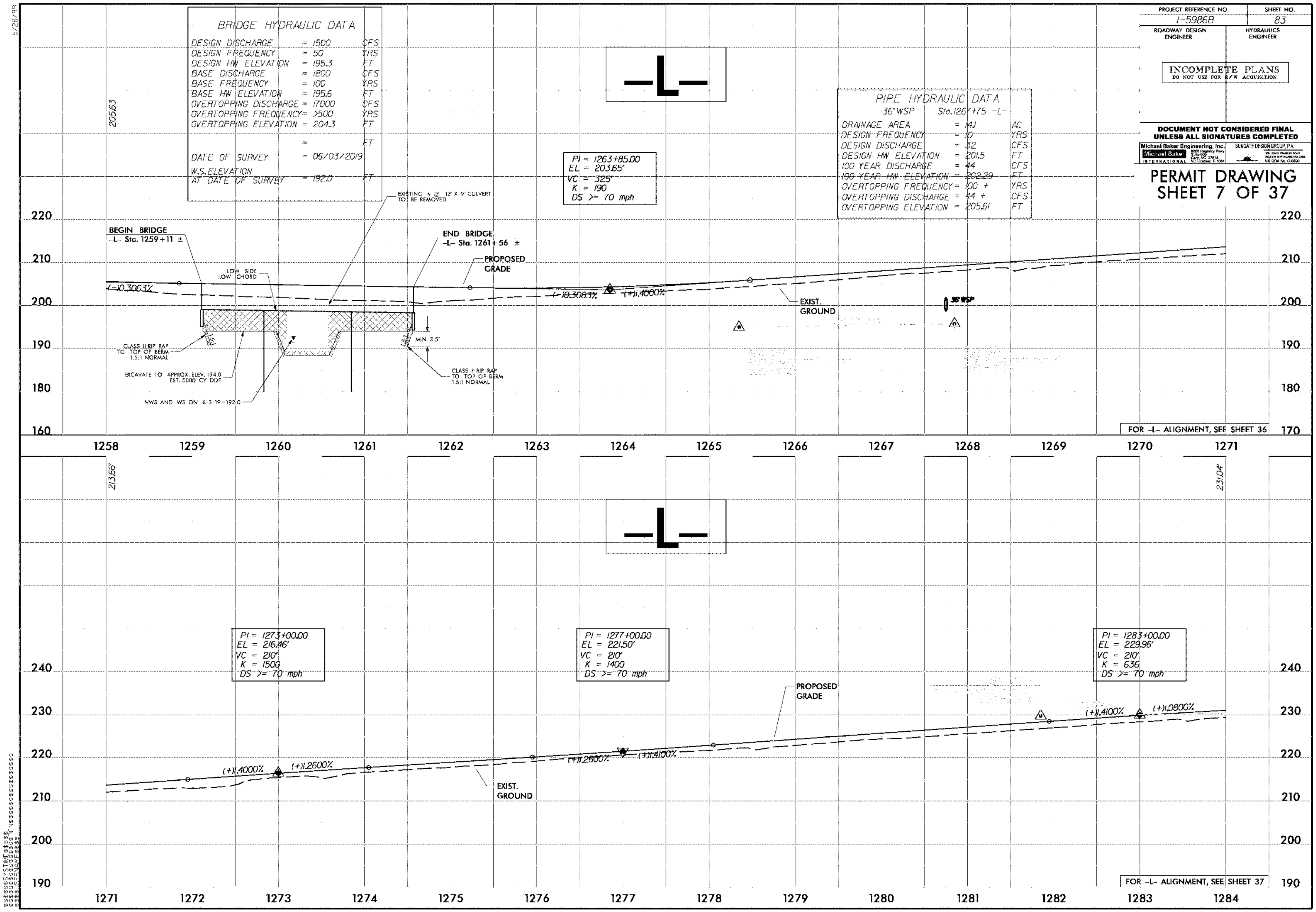


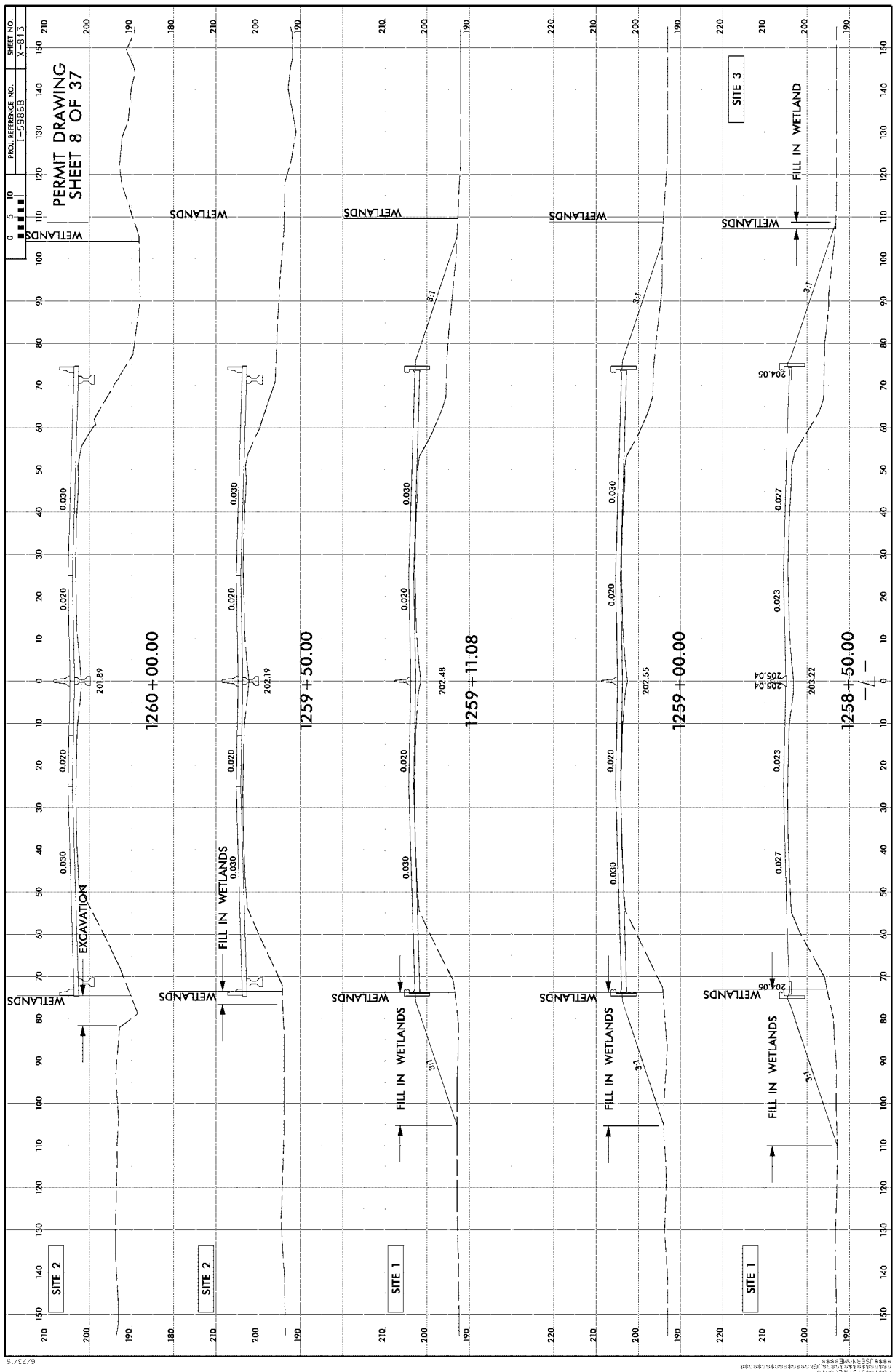
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SCALE: 1" = 100'
NAD 83/2011
PROJECT REFERENCE NO. I-5986B
SHEET NO. 36
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING SHEET 5 OF 37
DETAIL 38 BASE CHANNEL
FROM STA. 1259+98 TO STA. 1260+70 -L-
SITE 1
SITE 2
SITE 3
MATCH TO -L- POT STA. 1258+00.00 - SEE SHEET 35
MATCH TO -L- POT STA. 1271+00.00 - SEE SHEET 37
TRENCHLESS INSTALLATION 16" WELDED STEEL
TRENCHLESS INSTALLATION 36" WELDED STEEL
SBG FROM END BRIDGE TO STA. 1267+00 -L- LT
SBG FROM END BRIDGE TO STA. 1263+33 -L- RT
DAYLIGHT DITCH
FLOWABLE FILL
REMOVE
CL II BANK STABILIZATION SEE DETAIL 38 EST. 215 TONS EST. 300 SY GF
CL II BANK STABILIZATION SEE DETAIL 38 EST. 200 TONS EST. 275 SY GF
EXISTING TB UNDEFINED DUE TO SUBMERGED CONDITIONS
EXCAVATE TO EL=194.0
LAT. 10' BASE DITCH SEE DETAIL 9
LAT. 5' BASE DITCH SEE DETAIL 8
CL B RIP RAP EST. 11 TONS EST. 28 SY GF
CL B RIP RAP EST. 3 TONS EST. 10 SY GF
LAT. 10' BASE DITCH W/CL I RIP RAP SEE DETAIL 10 EST. 35 TONS EST. 50 SY GF
DETAIL 10 LATERAL BASE DITCH
FROM STA. 1265+35 TO STA. 1265+60 -L- RT
DETAIL 8 LATERAL BASE DITCH
FROM STA. 1267+50 TO STA. 1267+85 -L- RT
DETAIL 9 LATERAL BASE DITCH
FROM STA. 1265+60 TO STA. 1267+50 -L- RT
FOR -L- PROFILE SEE SHEET 82

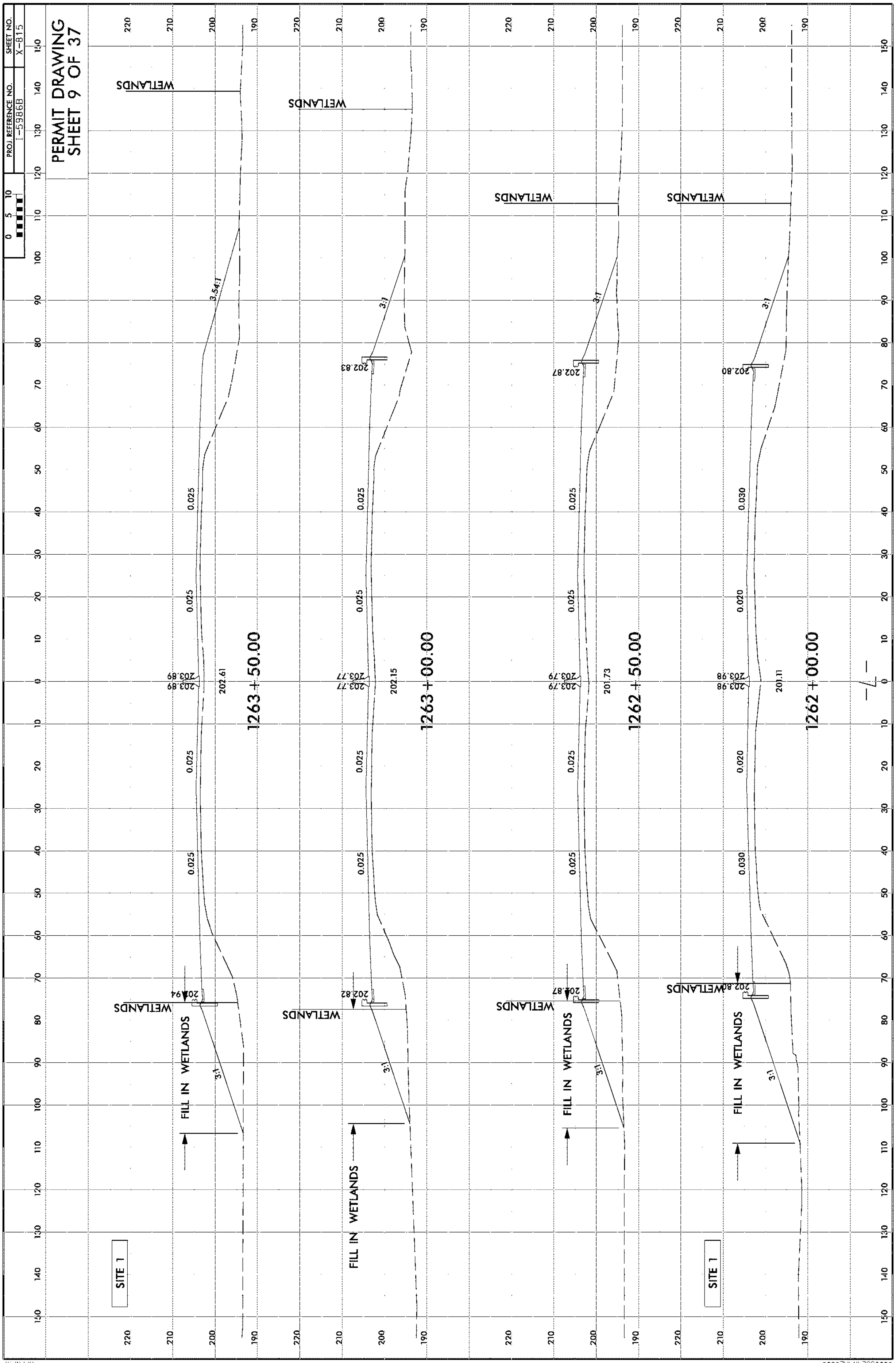
P-119

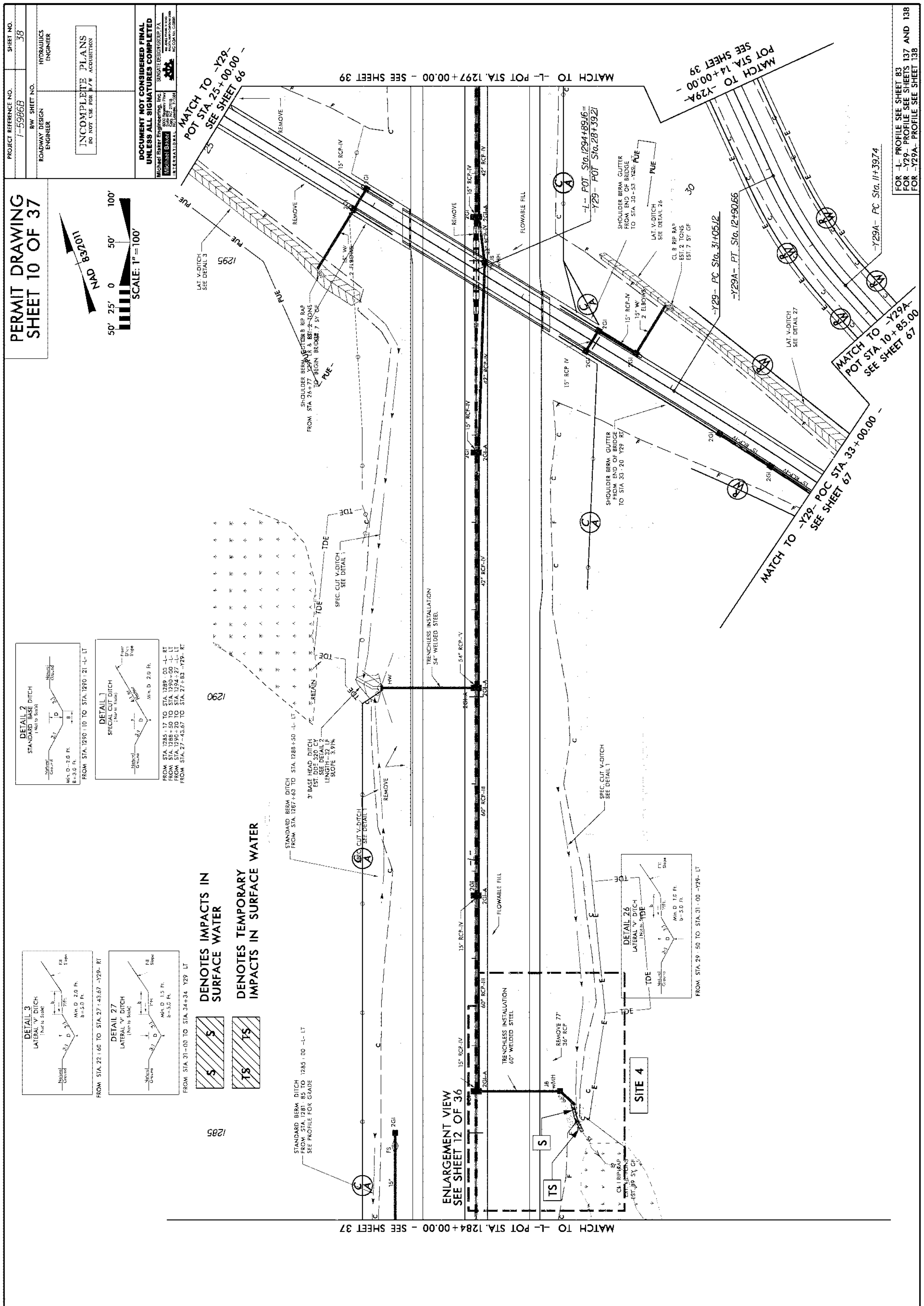


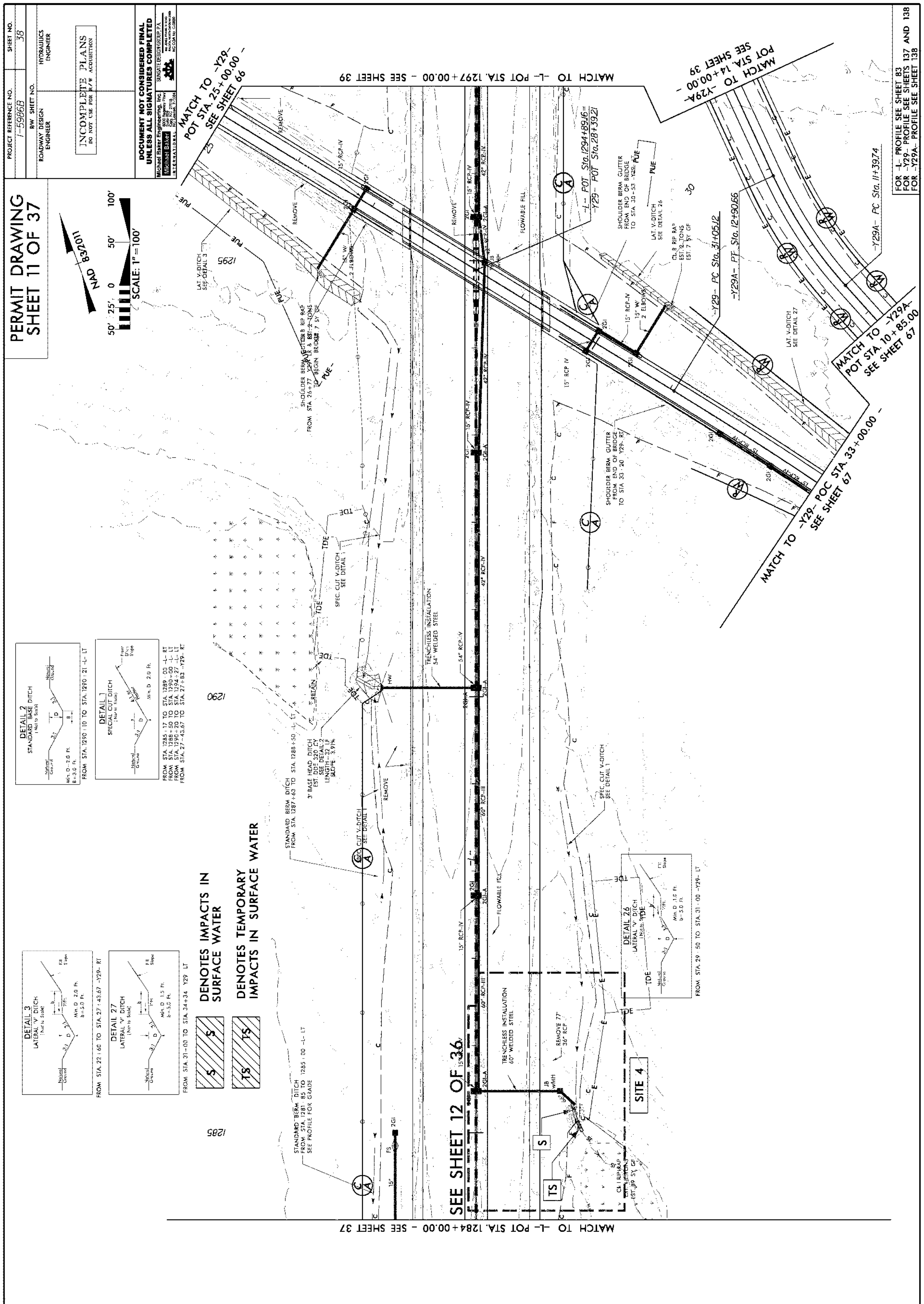
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
36
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 6 OF 37
SCALE: 1" = 100'
NAD 83/2011
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCH TO -L- POT STA. 1271+00.00 – SEE SHEET 37
MATCH TO -L- POT STA. 1258+00.00 – SEE SHEET 35
FOR -L- PROFILE SEE SHEET 82
SITE 1
SITE 2
SITE 3
TRENCHLESS INSTALLATION
FLOWABLE FILL
DAYLIGHT DITCH
DETAIL 8
DETAIL 9
DETAIL 10
DETAIL 38

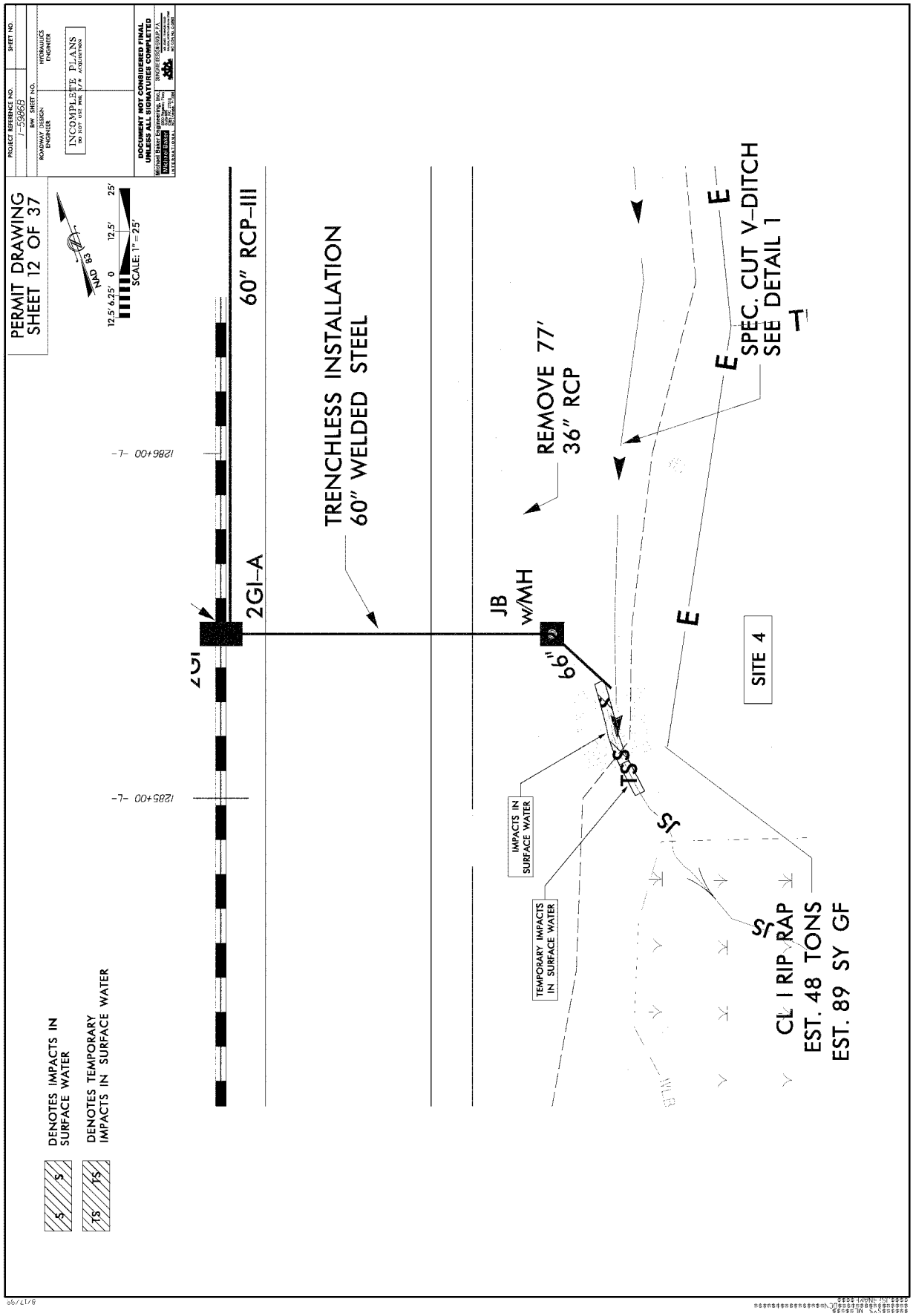

PROJECT REFERENCE NO. I-5986B
SHEET NO. 83
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
PERMIT DRAWING
SHEET 7 OF 37
BRIDGE HYDRAULIC DATA
DESIGN DISCHARGE = 1500 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 195.3 FT
BASE DISCHARGE = 1800 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 195.6 FT
OVERTOPPING DISCHARGE = 17000 CFS
OVERTOPPING FREQUENCY = >500 YRS
OVERTOPPING ELEVATION = 204.3 FT
= FT
DATE OF SURVEY = 05/03/2019
W.S. ELEVATION AT DATE OF SURVEY = 192.0 FT
PIPE HYDRAULIC DATA
36" WSP Sta.1267+75 -L-
DRAINAGE AREA = 14J AC
DESIGN FREQUENCY = 10 YRS
DESIGN DISCHARGE = 32 CFS
DESIGN HW ELEVATION = 201.5 FT
100 YEAR DISCHARGE = 44 CFS
100 YEAR HW ELEVATION = 202.29 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 44 + CFS
OVERTOPPING ELEVATION = 205.51 FT
-L-
PI = 1263+85.00
EL = 203.65'
VC = 325'
K = 190
DS >= 70 mph
BEGIN BRIDGE -L- Sta. 1259+11 ±
END BRIDGE -L- Sta. 1261+56 ±
EXISTING 4 @ 12' X 9' CULVERT TO BE REMOVED
PROPOSED GRADE
LOW SIDE LOW CHORD
(-)0.3063%
(+)1.4000%
EXIST. GROUND
36" WSP
MIN. 3.5'
CLASS II RIP RAP TO TOP OF BERM 1.5:1 NORMAL
EXCAVATE TO APPROX ELEV. 194.0 EST. 5000 CY DDE
NWS AND WS ON 6-3-19=192.0
CLASS I RIP RAP TO TOP OF BERM 1.5:1 NORMAL
205.63
FOR -L- ALIGNMENT, SEE SHEET 36
1258 1259 1260 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271
213.56'
231.04'
-L-
PI = 1273+00.00
EL = 216.46'
VC = 210'
K = 1500
DS >= 70 mph
PI = 1277+00.00
EL = 221.50'
VC = 210'
K = 1400
DS >= 70 mph
PI = 1283+00.00
EL = 229.96'
VC = 210'
K = 636
DS >= 70 mph
PROPOSED GRADE
EXIST. GROUND
(+)1.4000%
(+)1.2600%
(+)1.4100%
(+)1.0800%
FOR -L- ALIGNMENT, SEE SHEET 37
1271 1272 1273 1274 1275 1276 1277 1278 1279 1280 1281 1282 1283 1284


PERMIT DRAWING
SHEET 8 OF 37
PROJ. REFERENCE NO.
5986B
SHEET NO.
X-813
0 5 10
SITE 2
SITE 2
SITE 1
SITE 1
SITE 3
WETLANDS
EXCAVATION
FILL IN WETLANDS
FILL IN WETLAND
1260+00.00
1259+50.00
1259+11.08
1259+00.00
1258+50.00
201.89
202.19
202.48
202.55
203.22
204.05
205.04
3:1
0.030
0.020
0.027
0.023


PERMIT DRAWING
SHEET 9 OF 37
PROJ. REFERENCE NO.
I-5986B
SHEET NO.
X-815
1263+50.00
1263+00.00
1262+50.00
1262+00.00
-L-
WETLANDS
FILL IN WETLANDS
SITE 1
3:1
3.54:1


PERMIT DRAWING
SHEET 10 OF 37
NAD 83/2011
SCALE: 1" = 100'
PROJECT REFERENCE NO. I-5986B
SHEET NO. 38
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCH TO -L- POT STA. 1297+00.00 - SEE SHEET 39
MATCH TO -L- POT STA. 1284+00.00 - SEE SHEET 37
MATCH TO -Y29- POT STA. 25+00.00 - SEE SHEET 66
MATCH TO -Y29- POC STA. 33+00.00 - SEE SHEET 67
MATCH TO -Y29A- POT STA. 14+00.00 SEE SHEET 39
MATCH TO -Y29A- POT STA. 10+85.00 SEE SHEET 67
ENLARGEMENT VIEW SEE SHEET 12 OF 36
SITE 4
FOR -L- PROFILE SEE SHEET 83
FOR -Y29- PROFILE SEE SHEETS 137 AND 138
FOR -Y29A- PROFILE SEE SHEET 138


PERMIT DRAWING
SHEET 11 OF 37
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 4
SEE SHEET 12 OF 36
MATCH TO -L- POT STA. 1297+00.00 - SEE SHEET 39
MATCH TO -L- POT STA. 1284+00.00 - SEE SHEET 37
MATCH TO -Y29- POT STA. 25+00.00 - SEE SHEET 66
MATCH TO -Y29- POC STA. 33+00.00 - SEE SHEET 67
MATCH TO -Y29A- POT STA. 10+85.00 SEE SHEET 67
MATCH TO -Y29A- POT STA. 14+00.00 - SEE SHEET 39
FOR -L- PROFILE SEE SHEET 83
FOR -Y29- PROFILE SEE SHEETS 137 AND 138
FOR -Y29A- PROFILE SEE SHEET 138


PERMIT DRAWING
SHEET 12 OF 37
PROJECT REFERENCE NO.
I-5968
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
NAD 83
SCALE: 1" = 25'
60" RCP-III
TRENCHLESS INSTALLATION
60" WELDED STEEL
2GI-A
JB w/MH
REMOVE 77'
36" RCP
SPEC. CUT V-DITCH
SEE DETAIL 1
SITE 4
IMPACTS IN SURFACE WATER
TEMPORARY IMPACTS IN SURFACE WATER
CL I RIP RAP
EST. 48 TONS
EST. 89 SY GF
1286+00
1285+00
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER

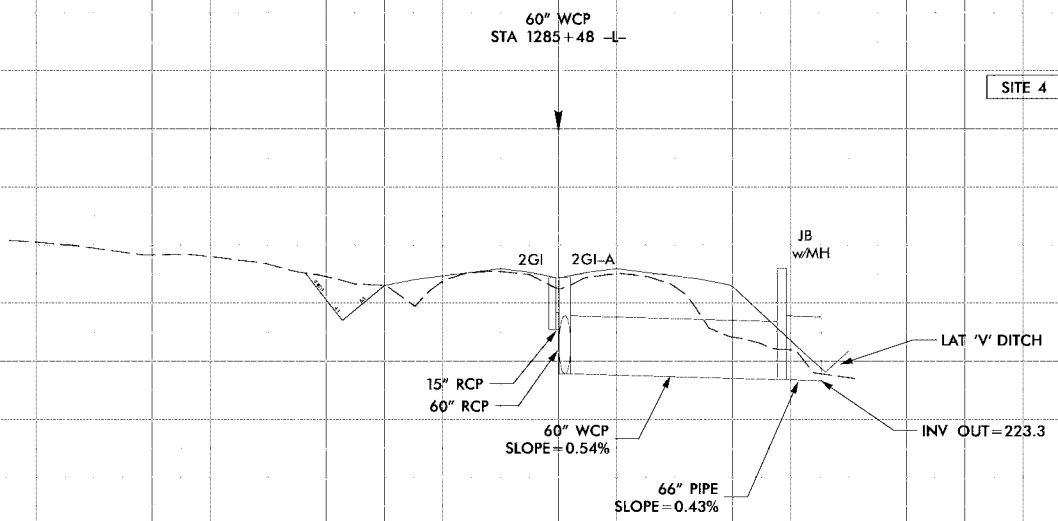
PROJECT REFERENCE NO. | SHEET NO.

ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

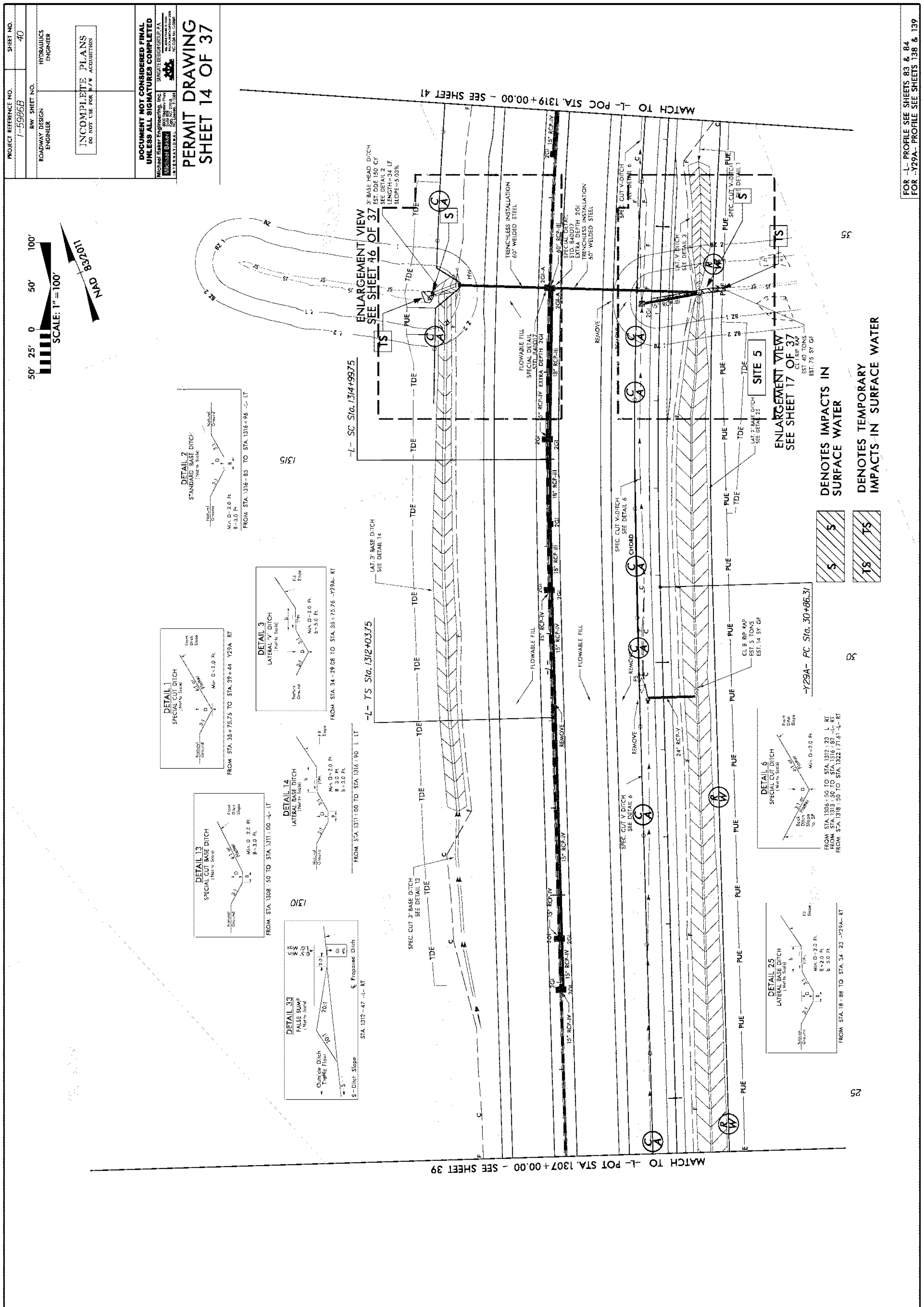
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

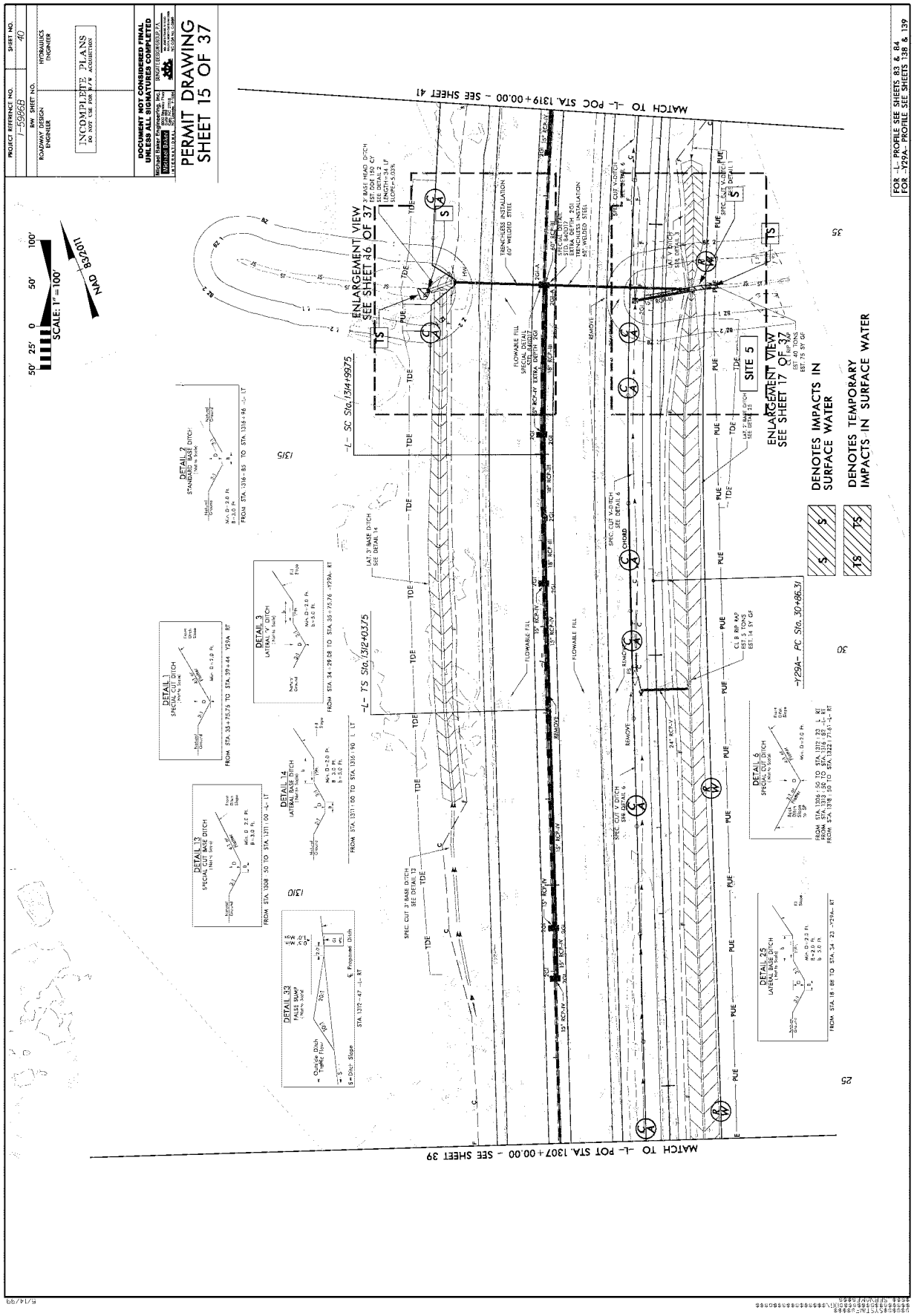
PERMIT DRAWING
SHEET 13 OF 37

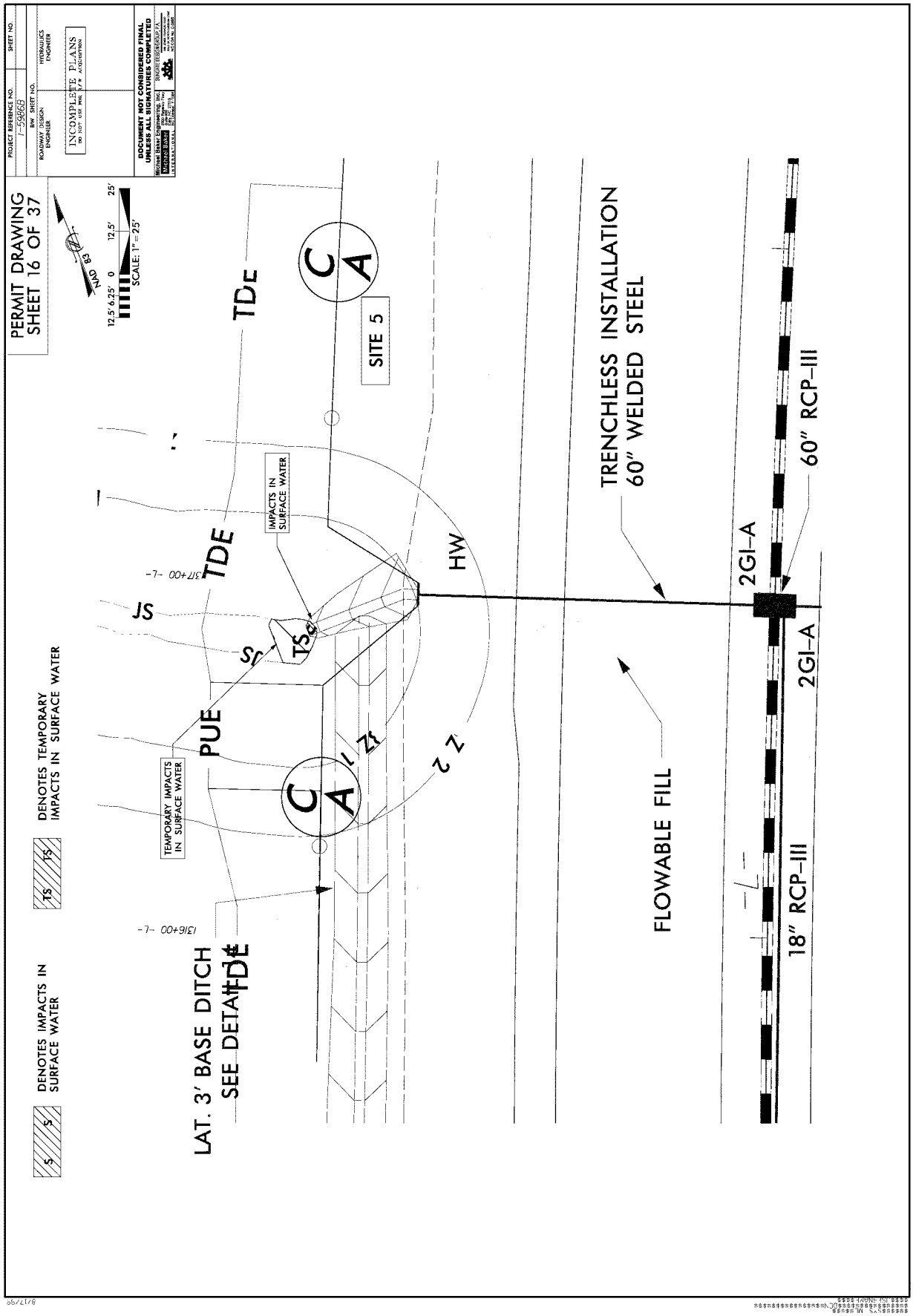


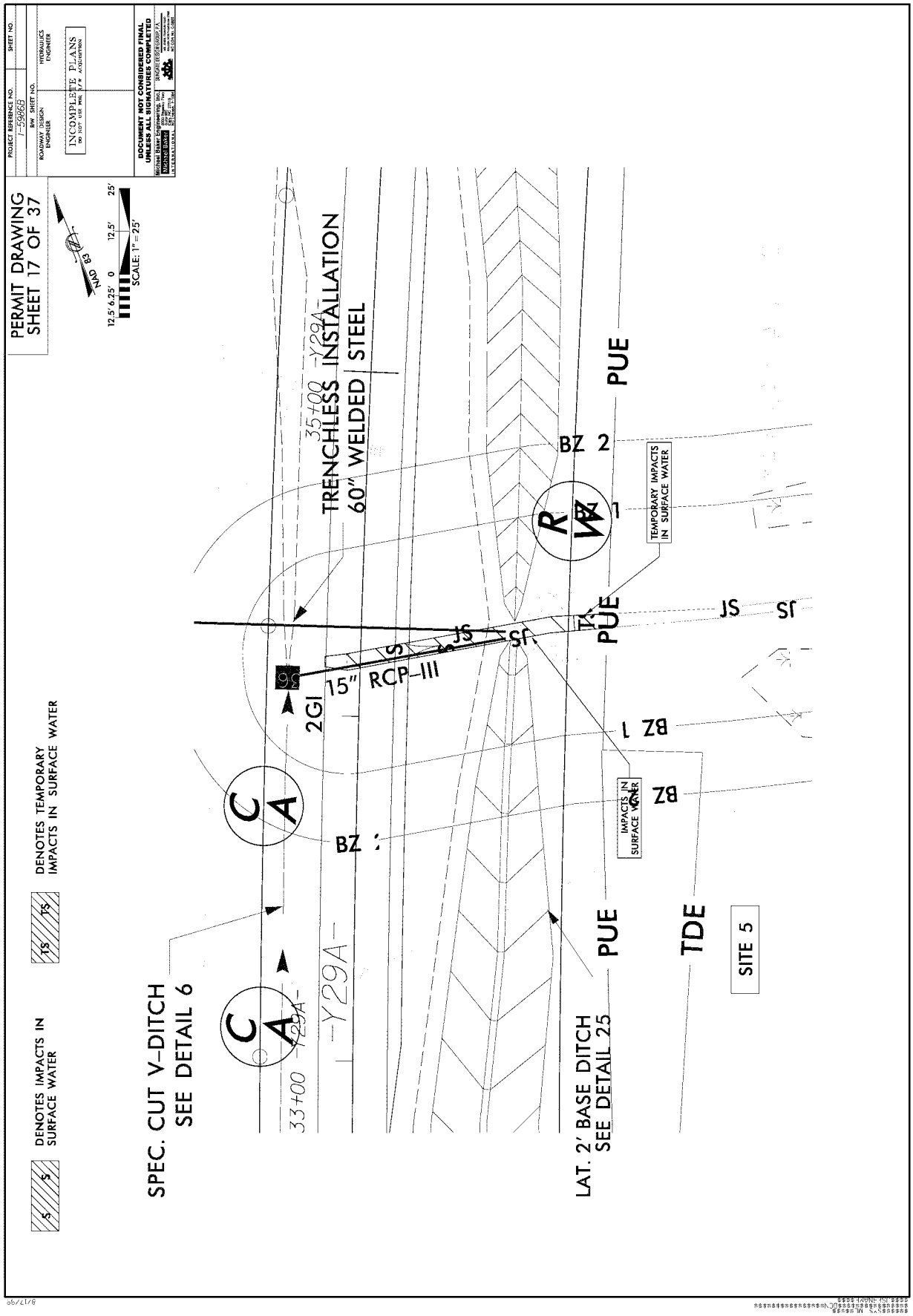
P-126


PERMIT DRAWING
SHEET 14 OF 37
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
40
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SCALE: 1"=100'
NAD 83/2011
MATCH TO -L- POC STA. 1319+00.00 - SEE SHEET 41
MATCH TO -L- POT STA. 1307+00.00 - SEE SHEET 39
ENLARGEMENT VIEW SEE SHEET 16 OF 37
ENLARGEMENT VIEW SEE SHEET 17 OF 37
SITE 5
-L- SC Sta. 1314+99.75
-L- TS Sta. 1312+03.75
-Y29A- PC Sta. 30+86.31
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
TRENCHLESS INSTALLATION 60" WELDED STEEL
FLOWABLE FILL
DETAIL 1 SPECIAL CUT DITCH
DETAIL 2 STANDARD BASE DITCH
DETAIL 3 LATERAL "V" DITCH
DETAIL 6 SPECIAL CUT DITCH
DETAIL 13 SPECIAL CUT BASE DITCH
DETAIL 14 LATERAL BASE DITCH
DETAIL 25 LATERAL BASE DITCH
DETAIL 33 FALSE SUMP
FOR -L- PROFILE SEE SHEETS 83 & 84
FOR -Y29A- PROFILE SEE SHEETS 138 & 139

P-128


PROJECT REFERENCE NO. 7-5968
SHEET NO. 40
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
PERMIT DRAWING
SHEET 15 OF 37
SCALE: 1"=100'
NAD 83/2011
MATCH TO -L- POC STA. 1319+00.00 - SEE SHEET 41
MATCH TO -L- POT STA. 1307+00.00 - SEE SHEET 39
ENLARGEMENT VIEW
SEE SHEET 16 OF 37
ENLARGEMENT VIEW
SEE SHEET 17 OF 37
SITE 5
-L- SC Sta. 1314+19.75
-L- TS Sta. 1312+40.75
-Y29A- PC Sta. 30+86.31
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
FOR -L- PROFILE SEE SHEETS 83 & 84
FOR -Y29A- PROFILE SEE SHEETS 138 & 139
DETAIL 1
DETAIL 2
DETAIL 3
DETAIL 6
DETAIL 13
DETAIL 14
DETAIL 25
DETAIL 33


PERMIT DRAWING
SHEET 16 OF 37
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
NAD 83
SCALE: 1" = 25'
12.5' 6.25' 0 12.5' 25'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
LAT. 3' BASE DITCH
SEE DETAIL
TDE
PUE
JS
TS
SITE 5
IMPACTS IN SURFACE WATER
TEMPORARY IMPACTS IN SURFACE WATER
HW
TRENCHLESS INSTALLATION
60" WELDED STEEL
FLOWABLE FILL
2GI-A
60" RCP-III
18" RCP-III
13+00
16+00
17+00

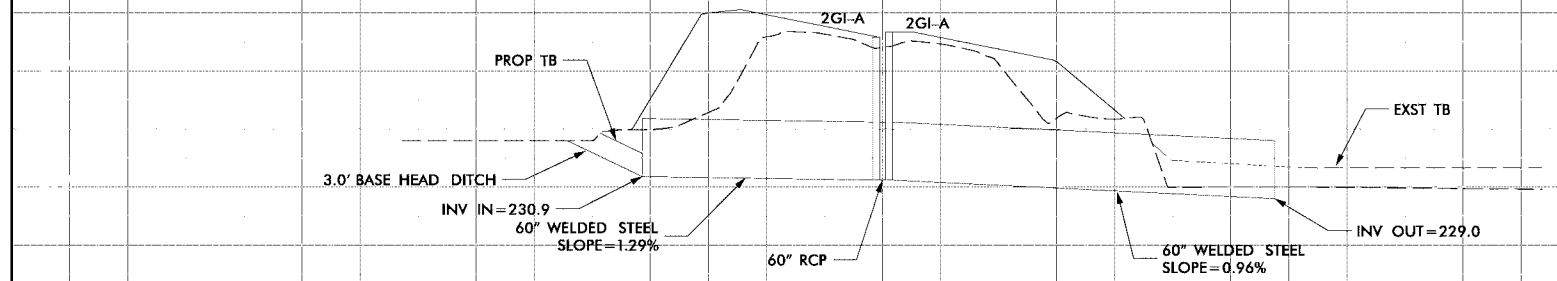

PROJECT REFERENCE NO.
I-5986B
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 17 OF 37
NAD 83
SCALE: 1" = 25'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SPEC. CUT V-DITCH
SEE DETAIL 6
33+00 -Y29A-
35+00 -Y29A-
TRENCHLESS INSTALLATION
60" WELDED STEEL
15" RCP-III
2GI
BZ 2
BZ 1
TEMPORARY IMPACTS IN SURFACE WATER
IMPACTS IN SURFACE WATER
PUE
TDE
SITE 5
LAT. 2' BASE DITCH
SEE DETAIL 25

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

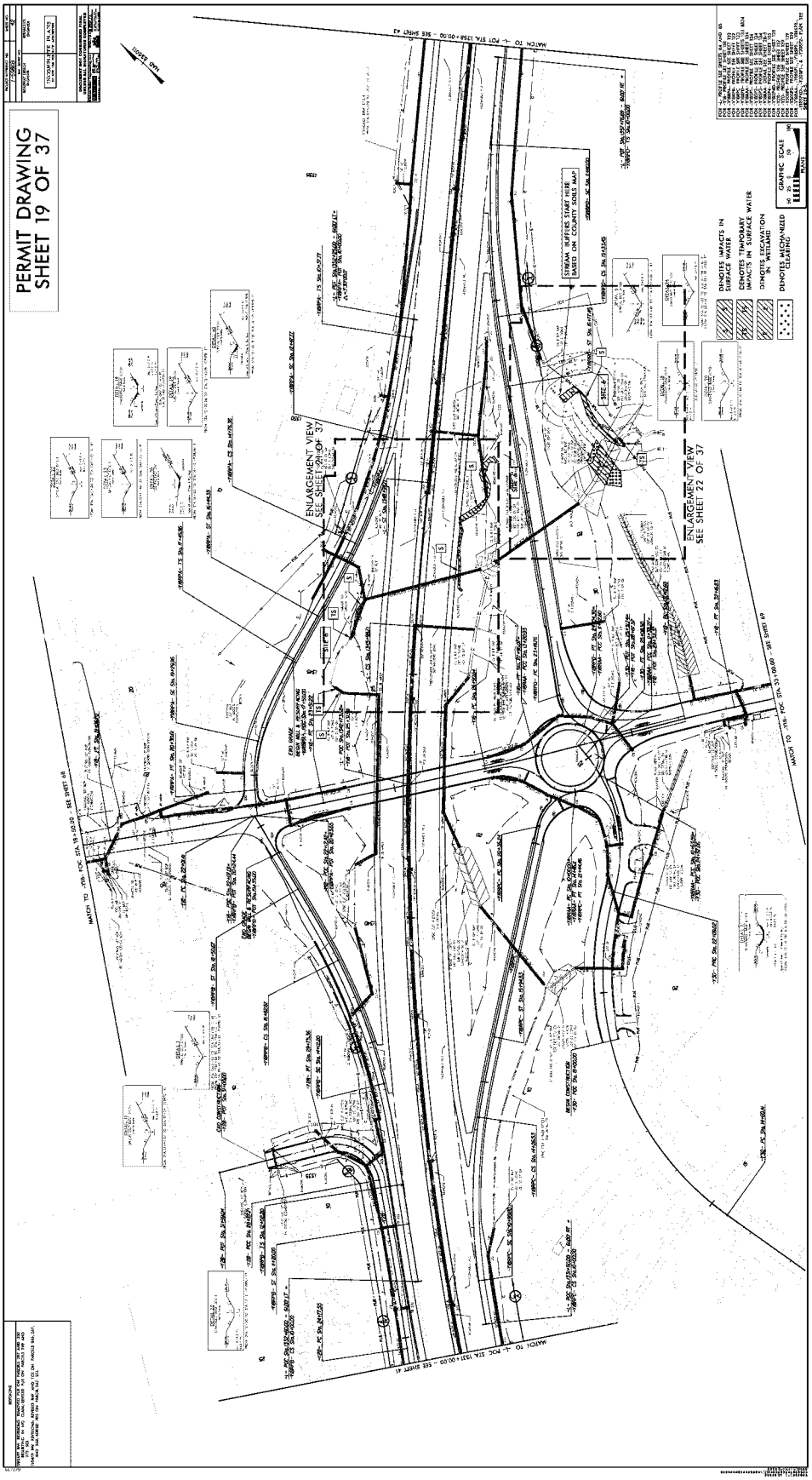
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

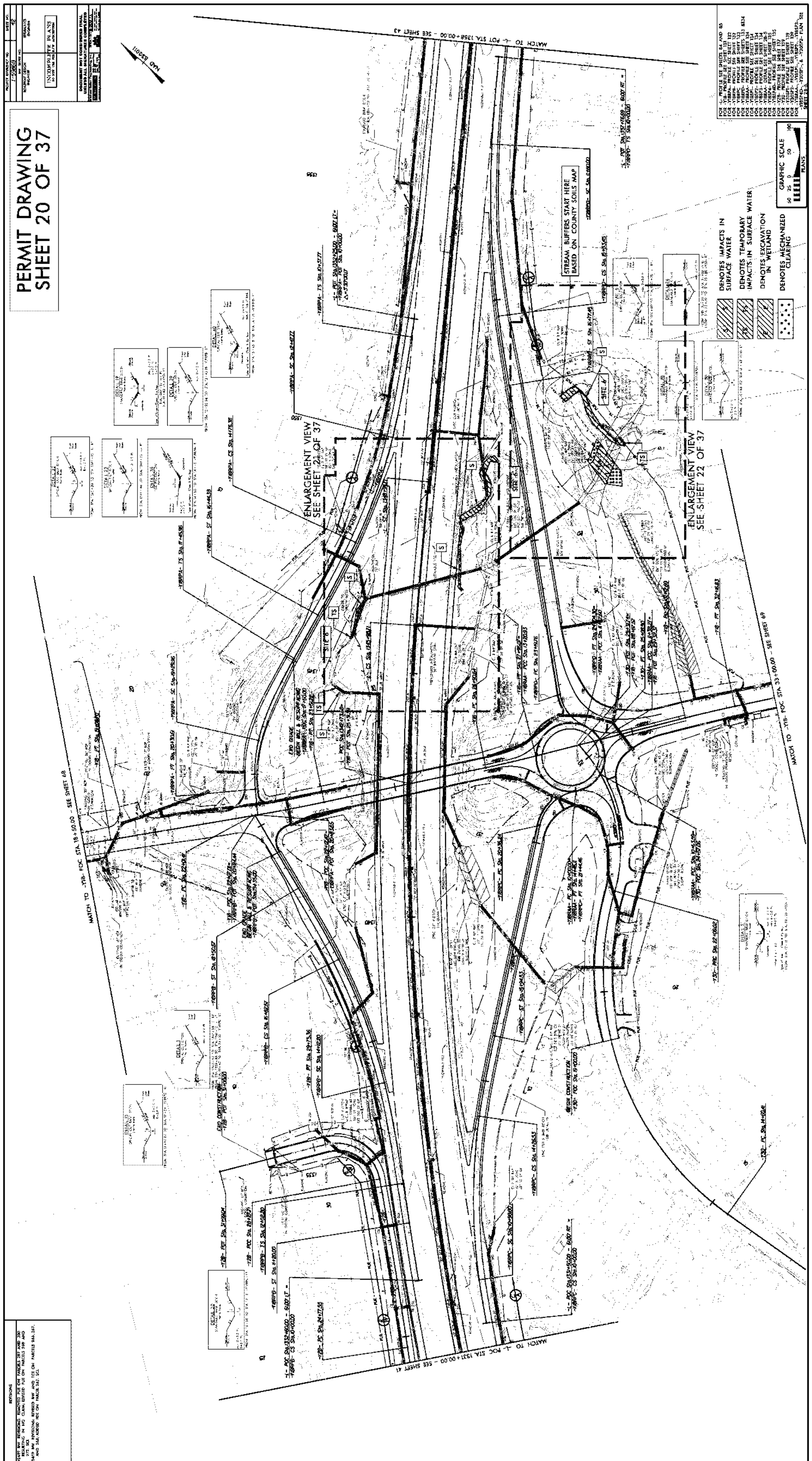
PERMIT DRAWING
SHEET 18 OF 37

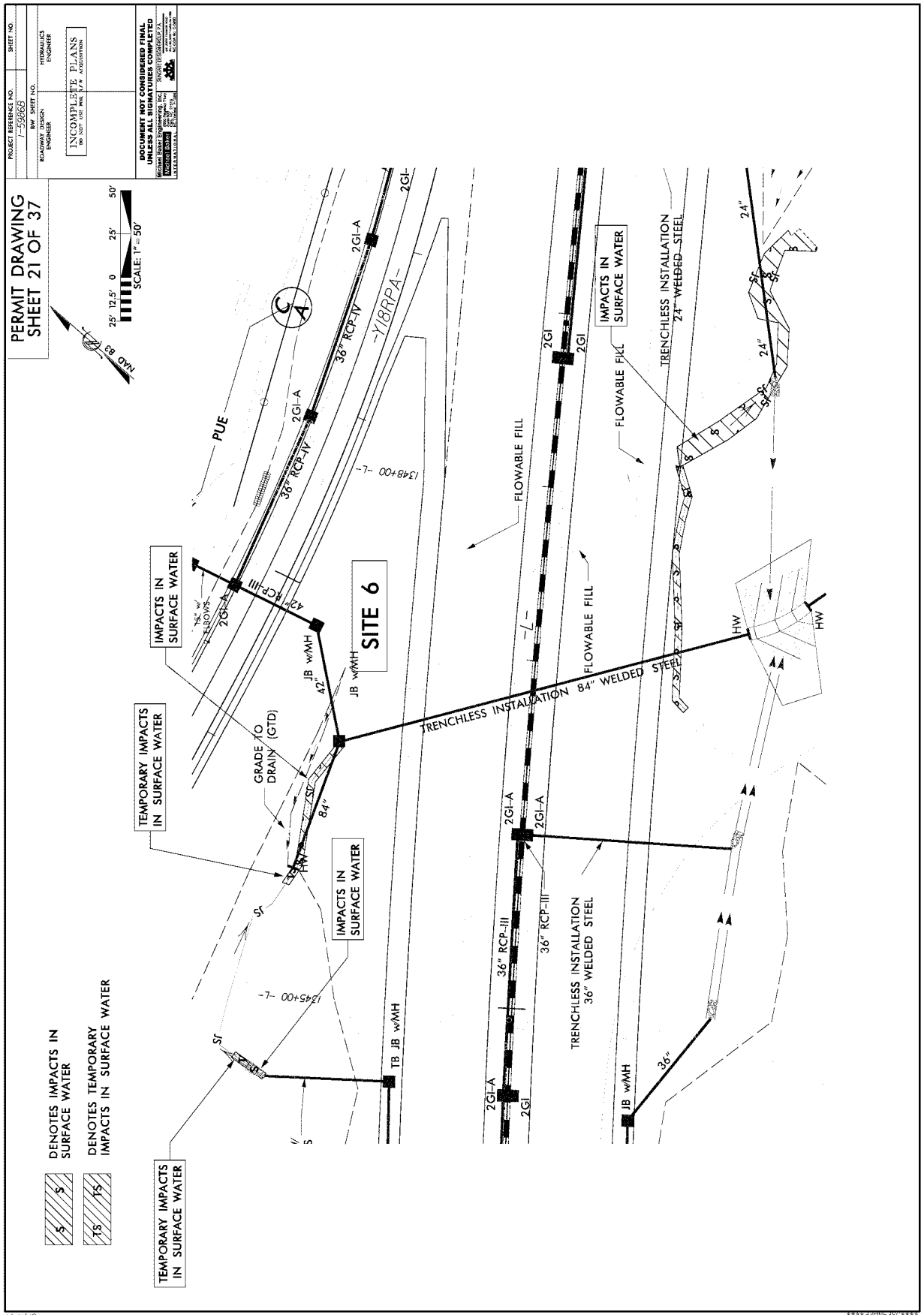


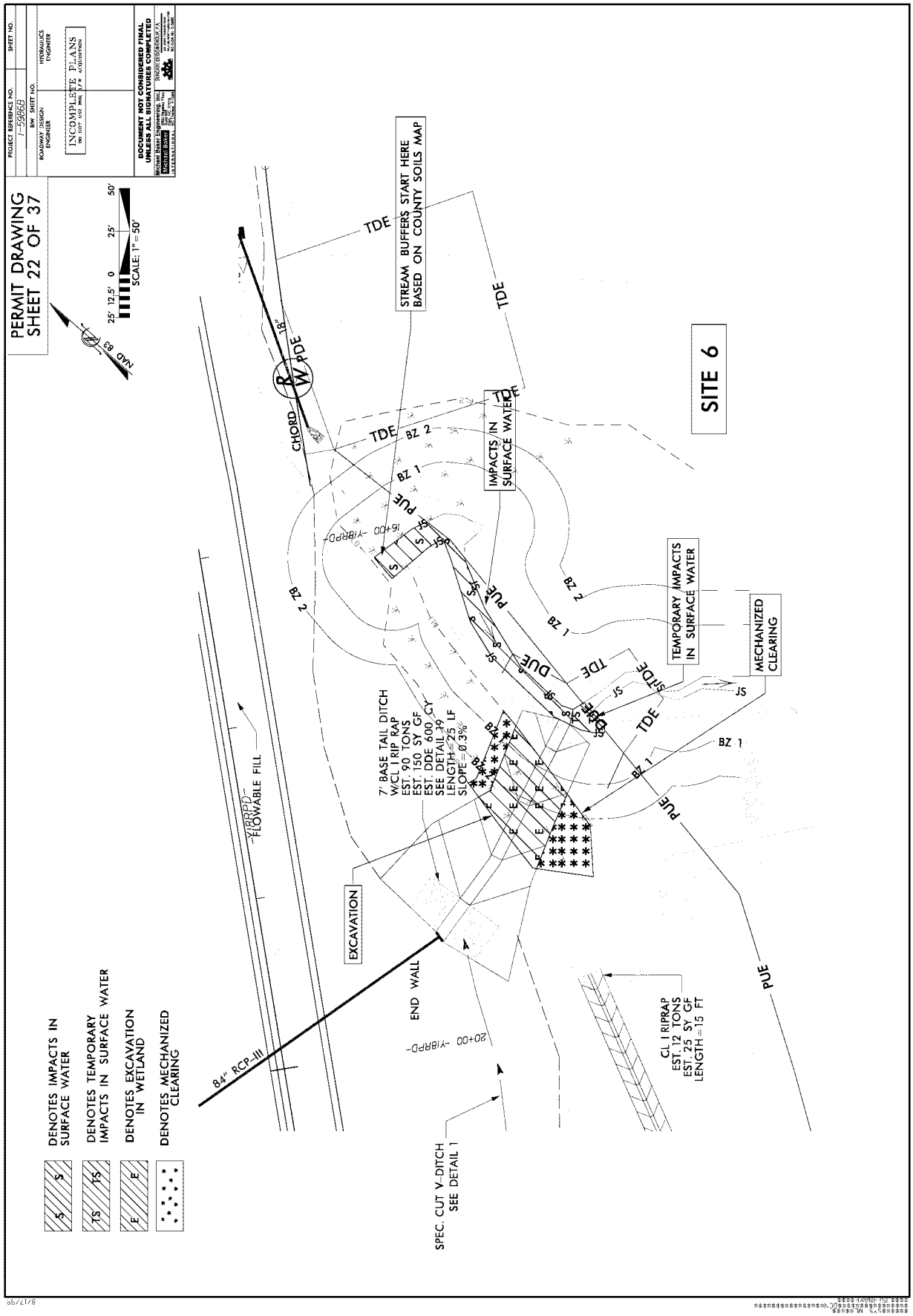
P-131

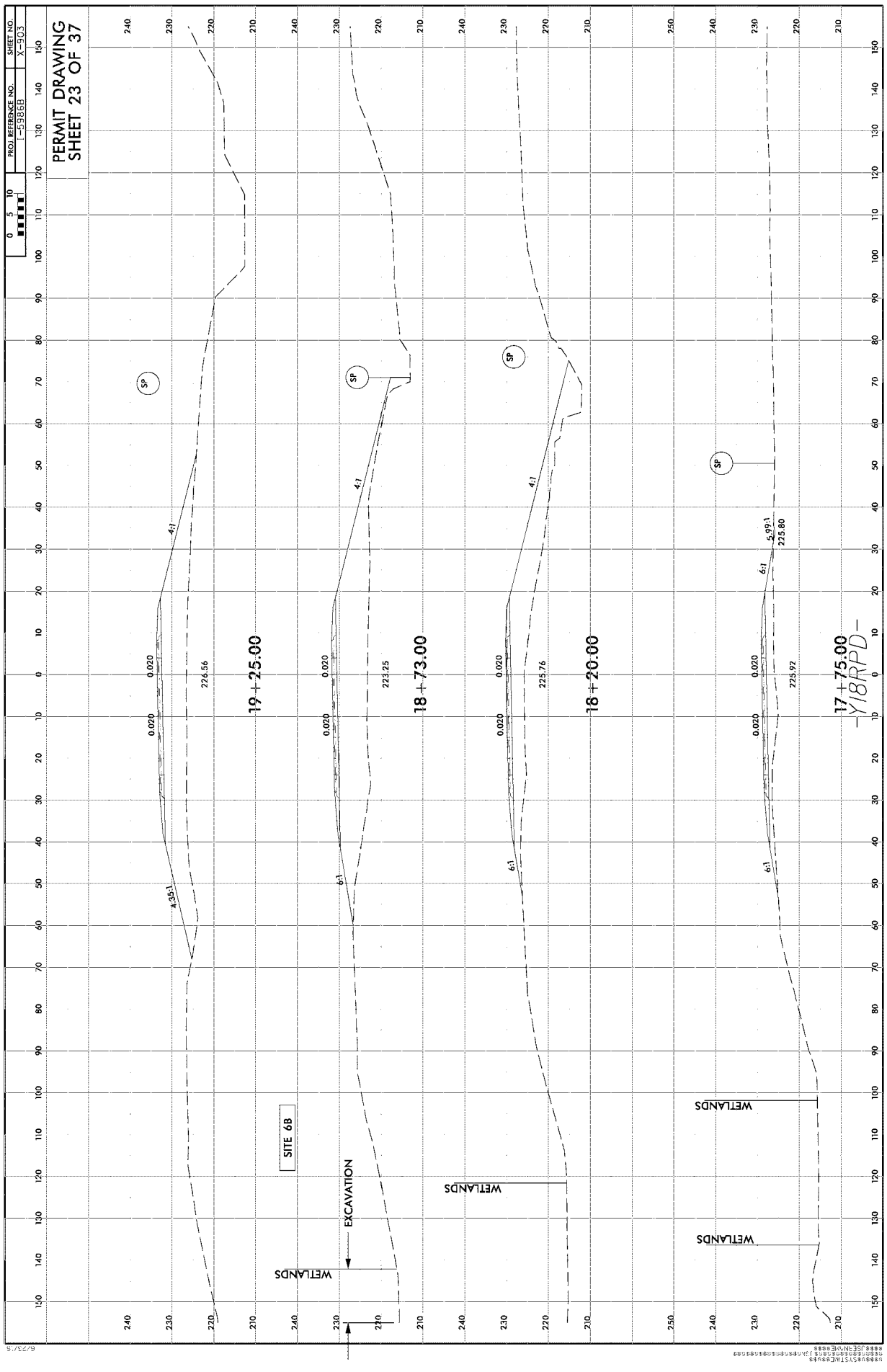
P-132

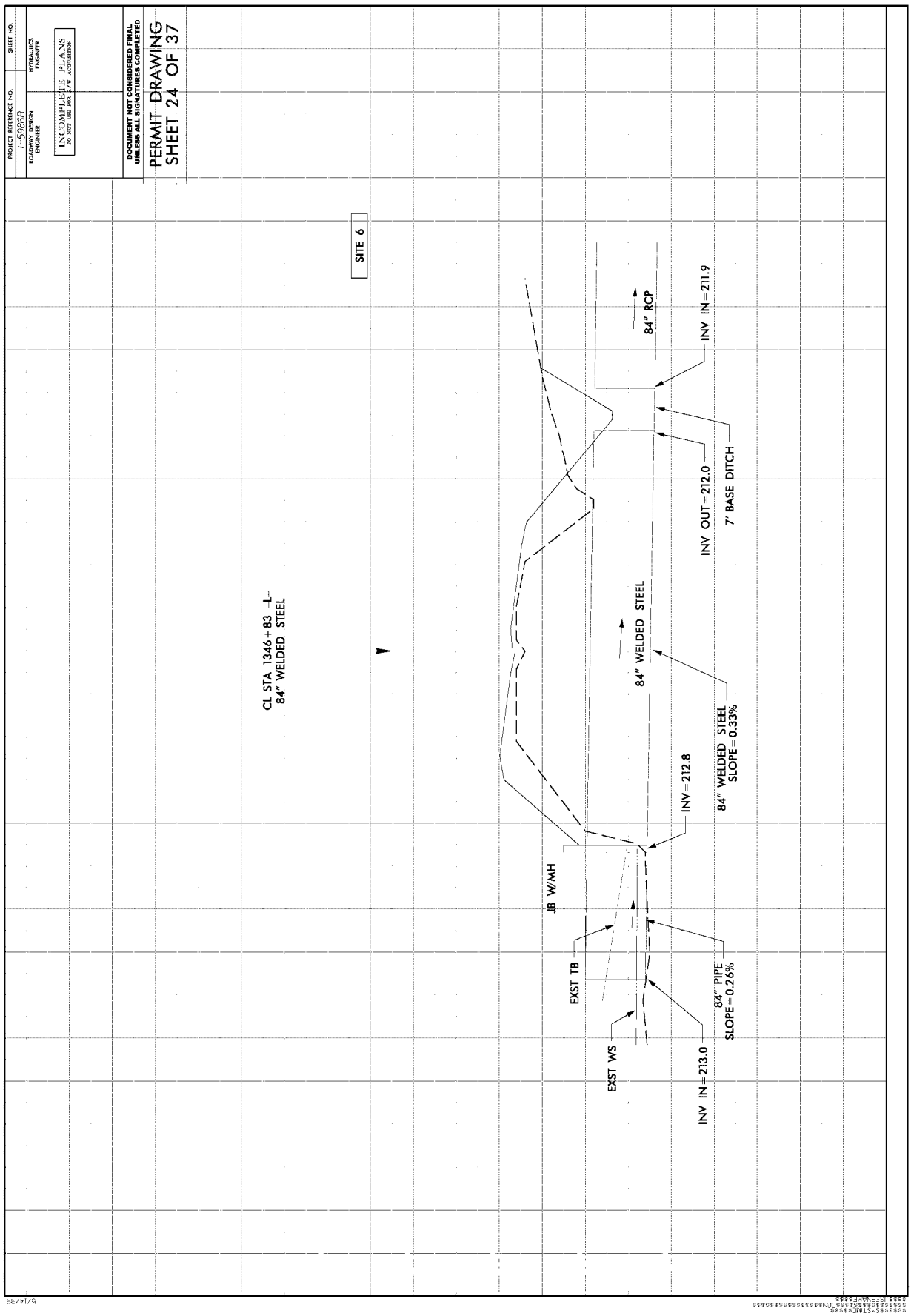

PERMIT DRAWING
SHEET 19 OF 37
ENLARGEMENT VIEW
SEE SHEET 21 OF 37
ENLARGEMENT VIEW
SEE SHEET 22 OF 37
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
GRAPHIC SCALE
STREAM BUFFERS START HERE LOCATED ON COUNTY SCALE MAP
NEW CONSTRUCTION


PERMIT DRAWING
SHEET 20 OF 37
ENLARGEMENT VIEW
SEE SHEET 22 OF 37
ENLARGEMENT VIEW
SEE SHEET 22 OF 37
STREAM BUFFERS START HERE
BASED ON COUNTY SOILS MAP
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
GRAPHIC SCALE
PLANS


PERMIT DRAWING
SHEET 21 OF 37
PROJECT REFERENCE NO.
1-5968
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
NAD 83
SCALE: 1" = 50'
25' 12.5' 0 25' 50'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
TEMPORARY IMPACTS IN SURFACE WATER
IMPACTS IN SURFACE WATER
SITE 6
PUE
YIBRPA
36" RCP-IV
42" RCP-III
2GI-A
2GI
JB w/MH
HW
TB JB w/MH
GRADE TO DRAIN (GTD)
FLOWABLE FILL
TRENCHLESS INSTALLATION 84" WELDED STEEL
TRENCHLESS INSTALLATION 36" WELDED STEEL
TRENCHLESS INSTALLATION 24" WELDED STEEL
36" RCP-III
24"
36"
84"
13+48.00
13+45.00


PERMIT DRAWING
SHEET 22 OF 37
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
NAD 83
SCALE: 1" = 50'
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
SITE 6
STREAM BUFFERS START HERE BASED ON COUNTY SOILS MAP
IMPACTS IN SURFACE WATER
TEMPORARY IMPACTS IN SURFACE WATER
MECHANIZED CLEARING
EXCAVATION
7' BASE TAIL DITCH
W/CL I RIP RAP
EST. 90 TONS
EST. 150 SY GF
EST. DDE 600 CY
SEE DETAIL 19
LENGTH = 25 LF
SLOPE = 0.3%
FLOWABLE FILL
END WALL
SPEC. CUT V-DITCH
SEE DETAIL 1
84" RCP-III
CL I RIPRAP
EST. 12 TONS
EST. 25 SY GF
LENGTH = 15 FT
CHORD
TDE
PUE
BZ 1
BZ 2
JS
DDE


PERMIT DRAWING
SHEET 23 OF 37
PROJ REFERENCE NO.
SHEET NO.
X-903
19+25.00
18+73.00
18+20.00
17+75.00
SITE 6B
EXCAVATION
WETLANDS
SP
4:1
6:1
4.35:1
0.020
226.56
223.25
225.76
225.92
225.80

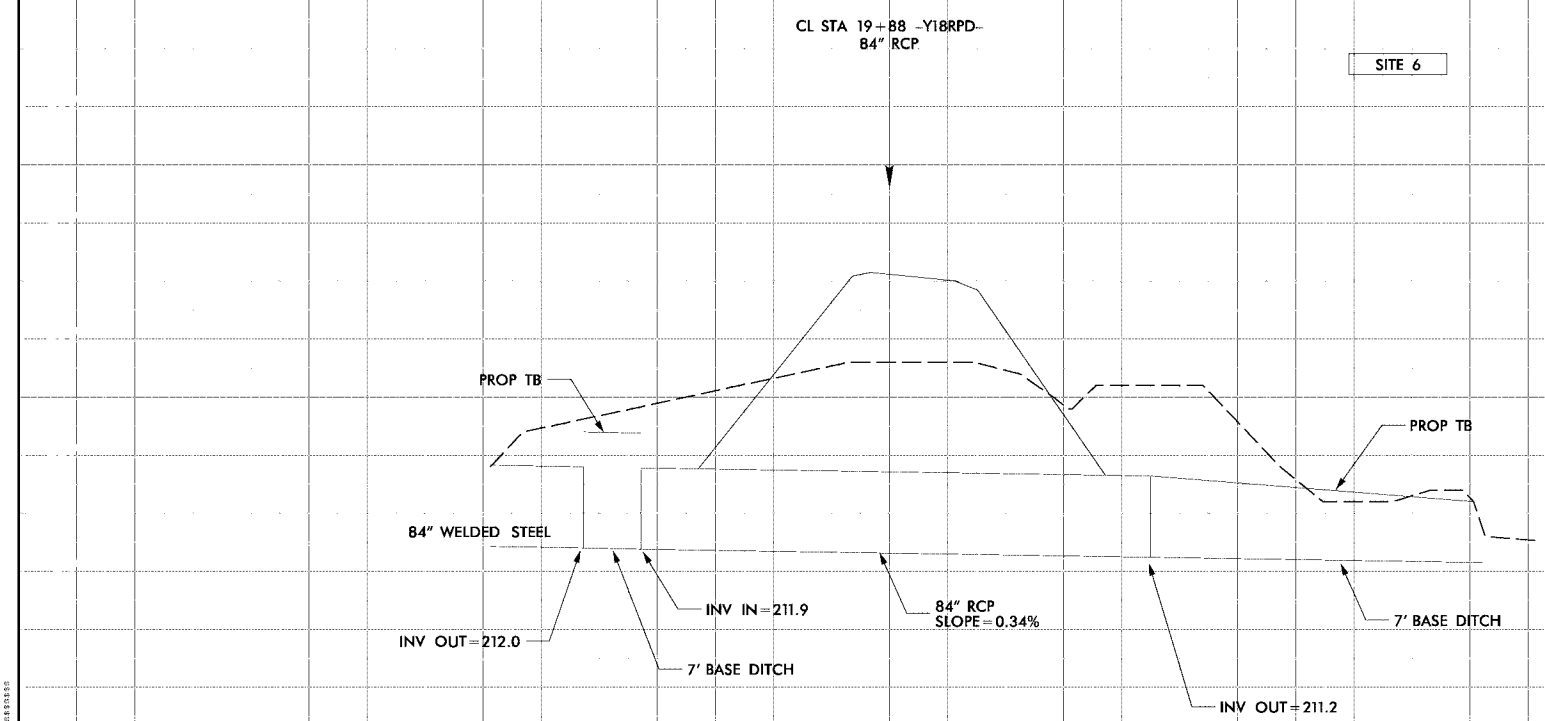

PROJECT REFERENCE NO.
I-5986B
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 24 OF 37
SITE 6
CL STA 1346+83 -L-
84" WELDED STEEL
84" RCP
INV IN=211.9
INV OUT=212.0
7' BASE DITCH
84" WELDED STEEL
84" WELDED STEEL
SLOPE=0.33%
INV=212.8
JB W/MH
EXST TB
EXST WS
INV IN=213.0
84" PIPE
SLOPE=0.26%

PROJECT REFERENCE NO.	SHEET NO.
I-5986B	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

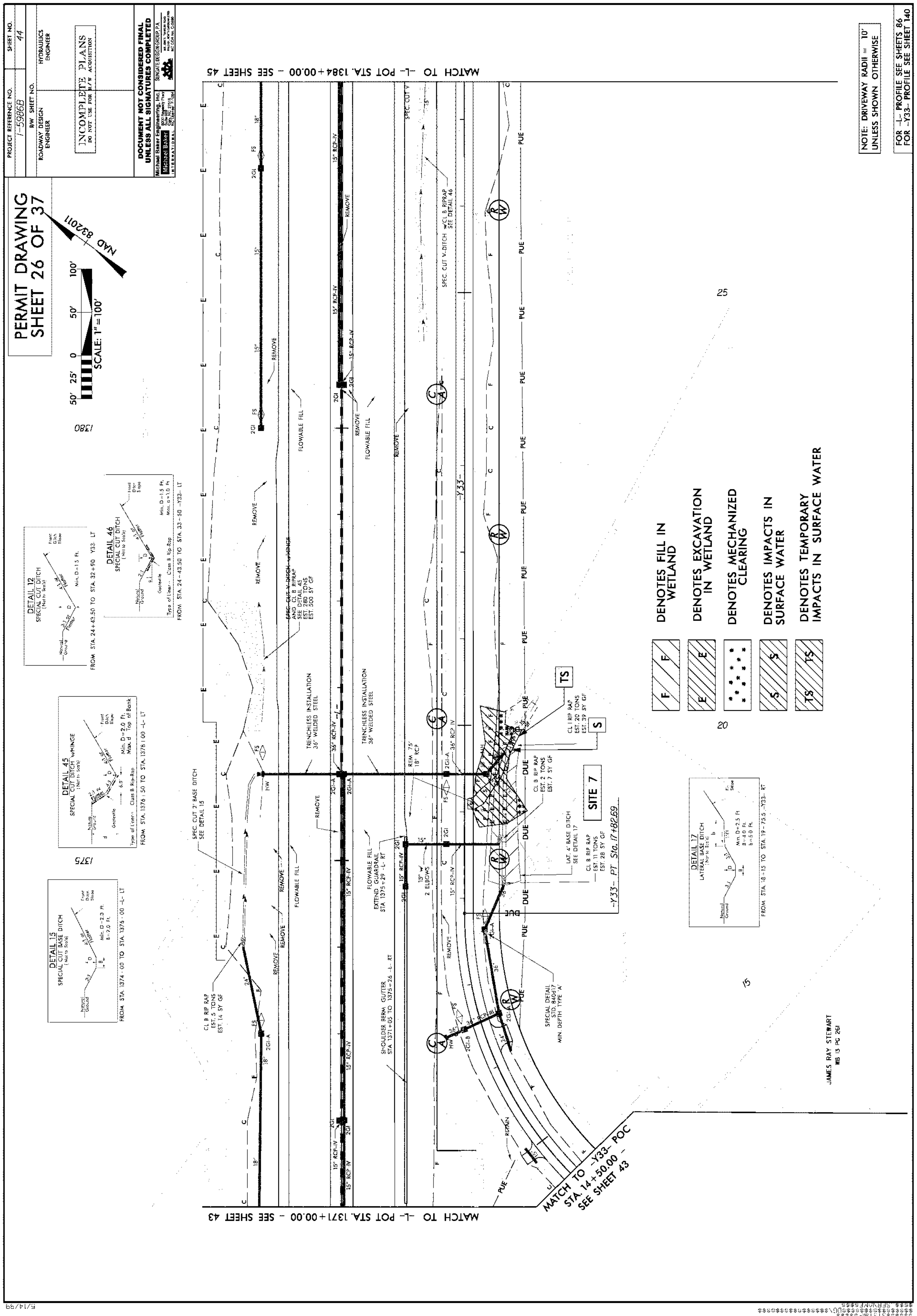
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

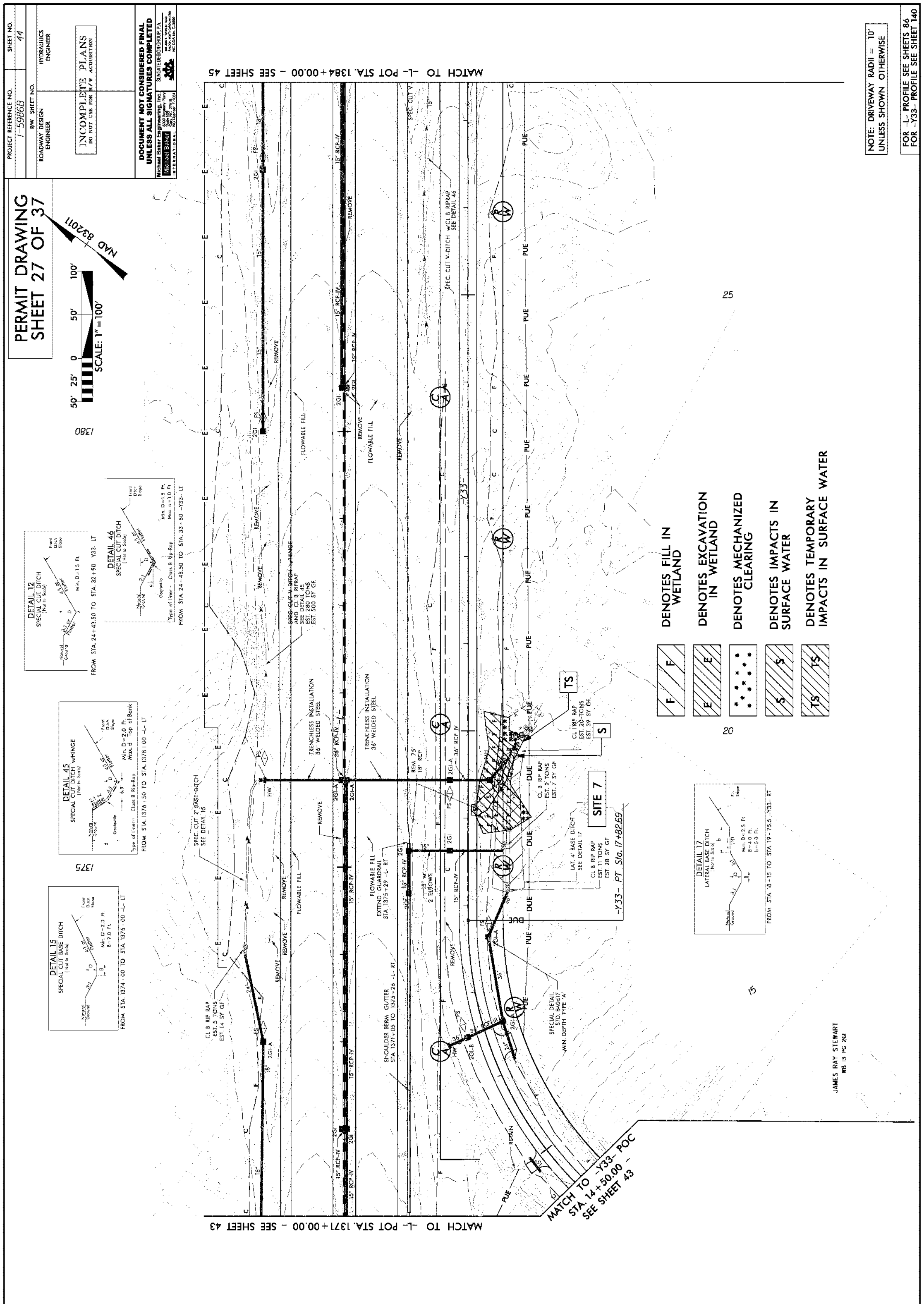
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 25 OF 37

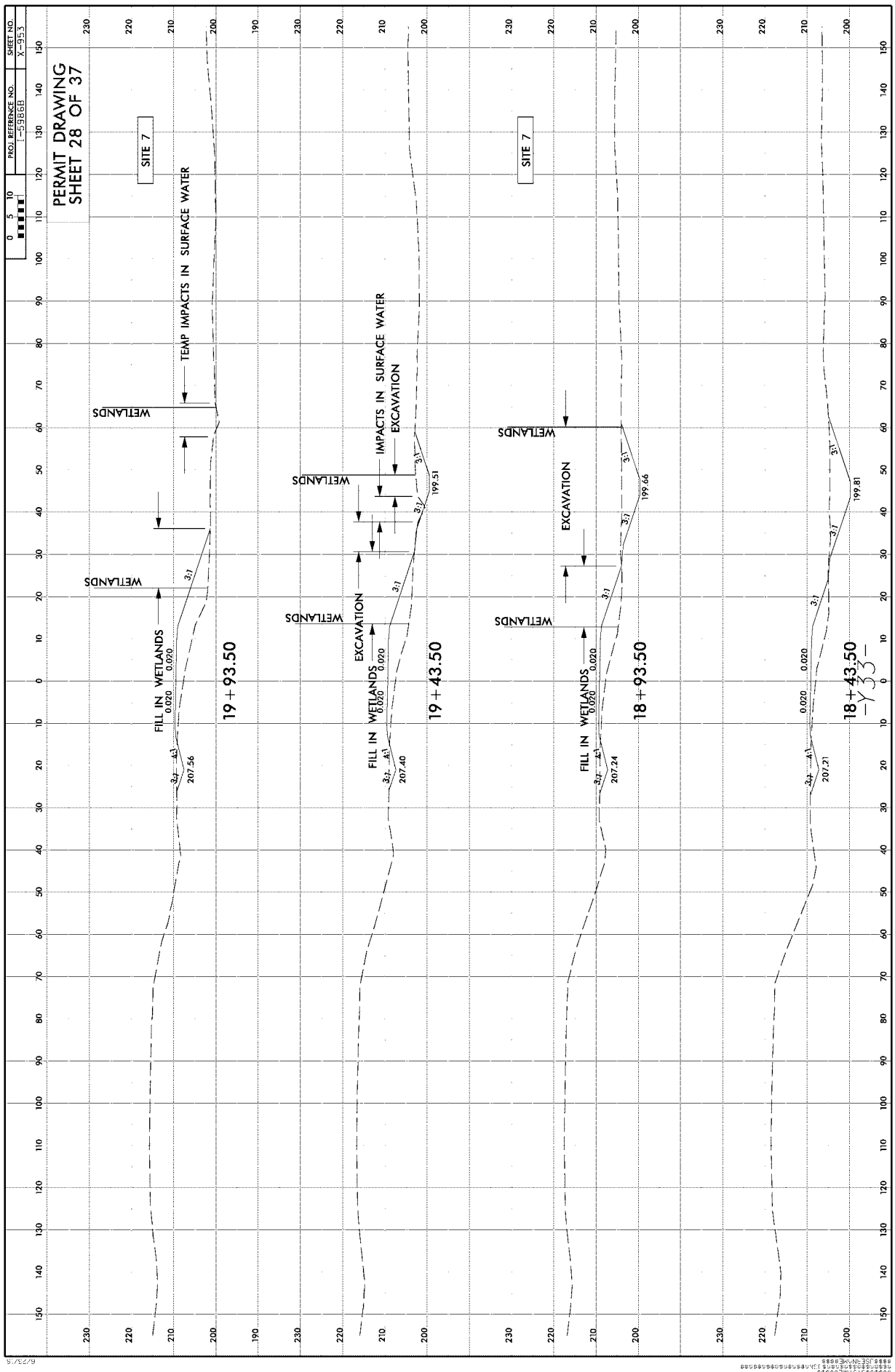


P-138

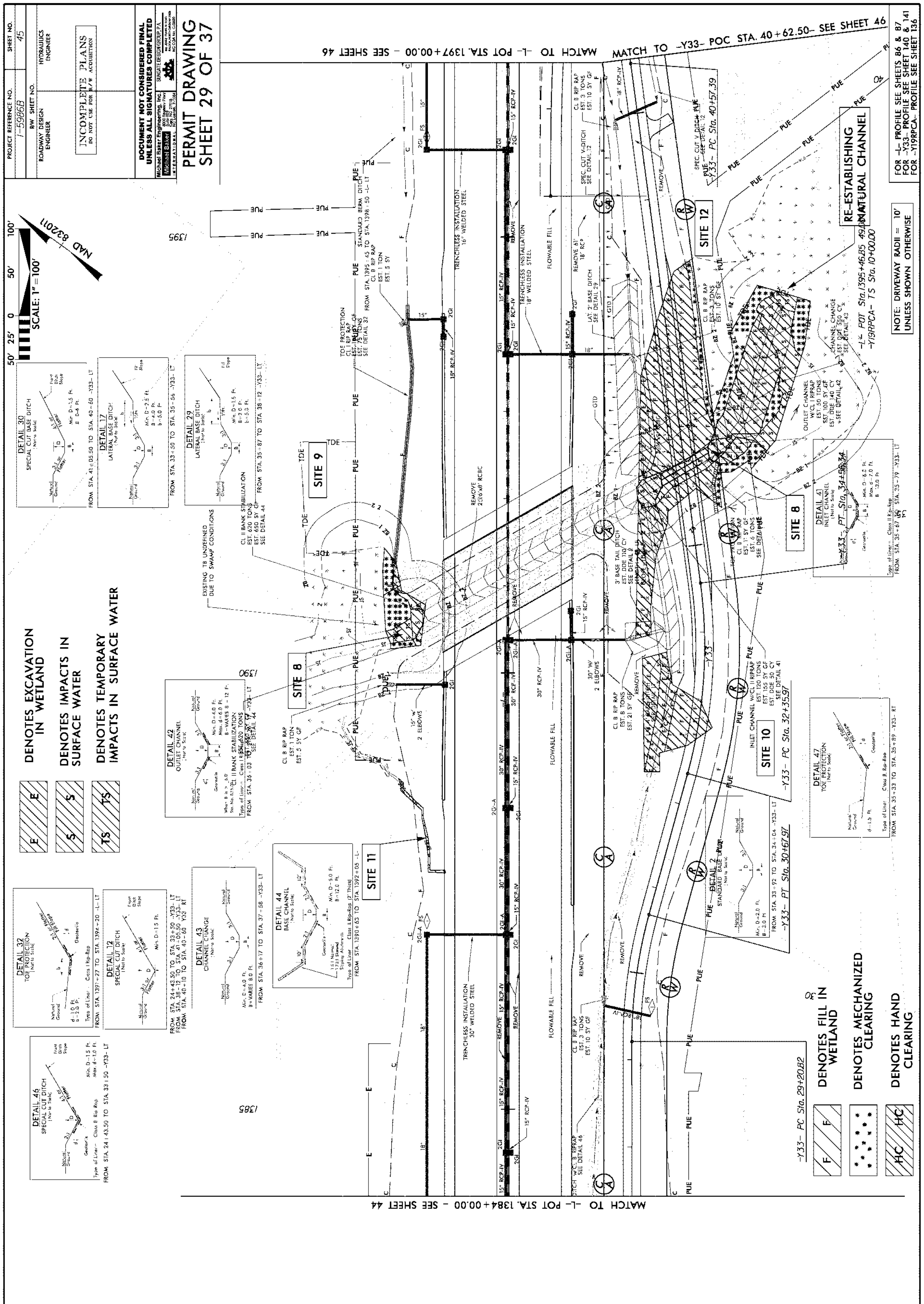

PERMIT DRAWING
SHEET 26 OF 37
SCALE: 1" = 100'
NAD 83/2011
PROJECT REFERENCE NO. I-5986B
SHEET NO. 44
INCOMPLETE PLANS
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
MATCH TO -L- POT STA. 1384+00.00 – SEE SHEET 45
MATCH TO -L- POT STA. 1371+00.00 – SEE SHEET 43
MATCH TO -Y33- POC STA. 14+50.00 – SEE SHEET 43
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86
FOR -Y33- PROFILE SEE SHEET 140
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 7
-Y33- PT Sta. 17+82.69
DETAIL 12 SPECIAL CUT DITCH
DETAIL 46 SPECIAL CUT DITCH
DETAIL 45 SPECIAL CUT DITCH W/HINGE
DETAIL 15 SPECIAL CUT BASE DITCH
DETAIL 17 LATERAL BASE DITCH
TRENCHLESS INSTALLATION 36" WELDED STEEL
JAMES RAY STEWART

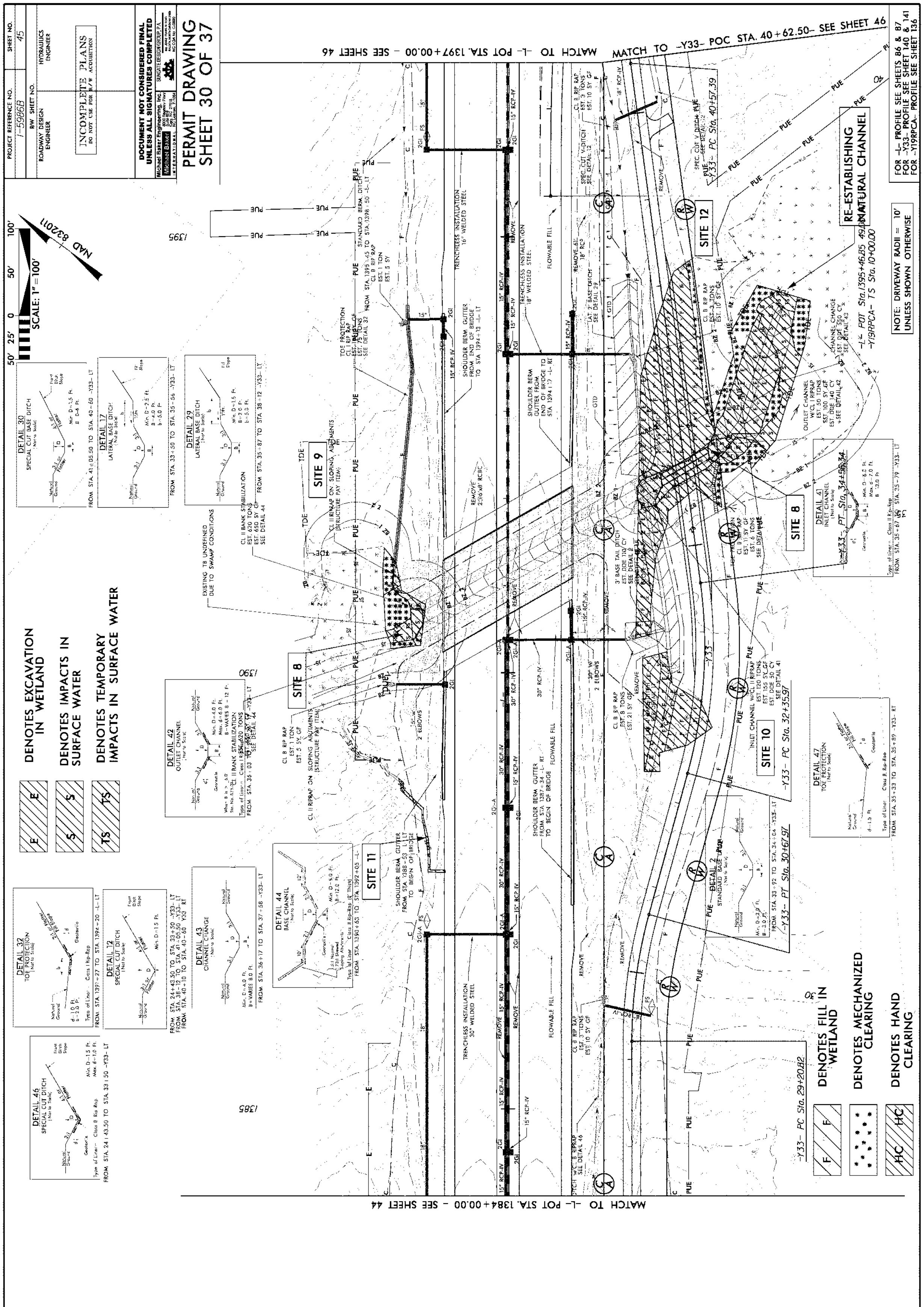

PERMIT DRAWING
SHEET 27 OF 37
SCALE: 1" = 100'
NAD 83/2011
PROJECT REFERENCE NO. I-5986B
SHEET NO. 44
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 45
MATCH TO -L- POT STA. 1371+00.00 - SEE SHEET 43
MATCH TO -Y33- POC STA. 14+50.00 - SEE SHEET 43
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86
FOR -Y33- PROFILE SEE SHEET 140
SITE 7
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DETAIL 12
DETAIL 15
DETAIL 17
DETAIL 45
DETAIL 46
TRENCHLESS INSTALLATION 36" WELDED STEEL
JAMES RAY STEWART

P-141

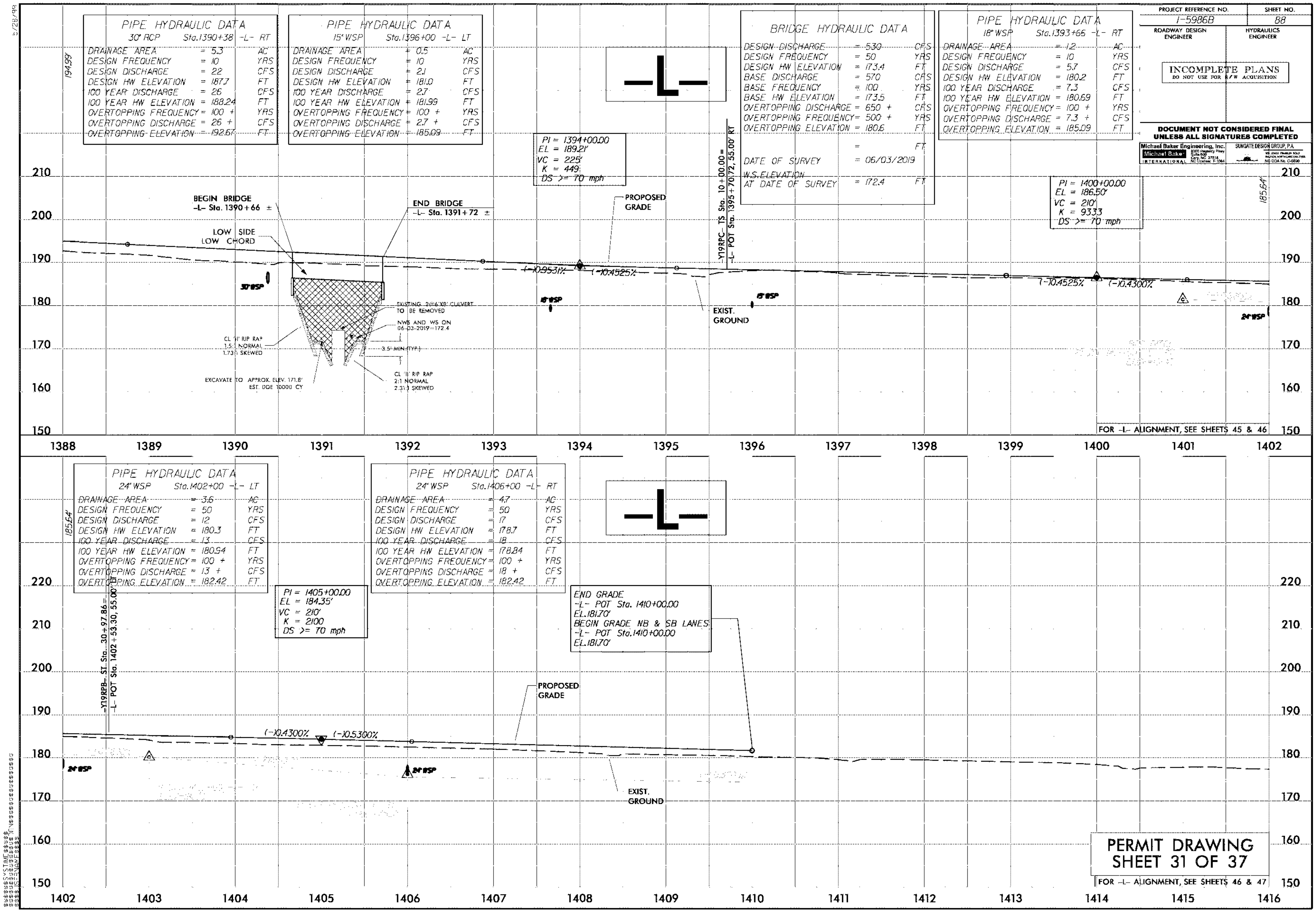

PERMIT DRAWING
SHEET 28 OF 37
SHEET NO. X-953
PROJ. REFERENCE NO. [-5986B
0 5 10
SITE 7
TEMP IMPACTS IN SURFACE WATER
WETLANDS
FILL IN WETLANDS 0.020
0.020
3:1
4:1
207.56
19+93.50
IMPACTS IN SURFACE WATER
EXCAVATION
199.51
EXCAVATION
19+43.50
SITE 7
199.66
18+93.50
199.81
207.24
207.21
18+43.50

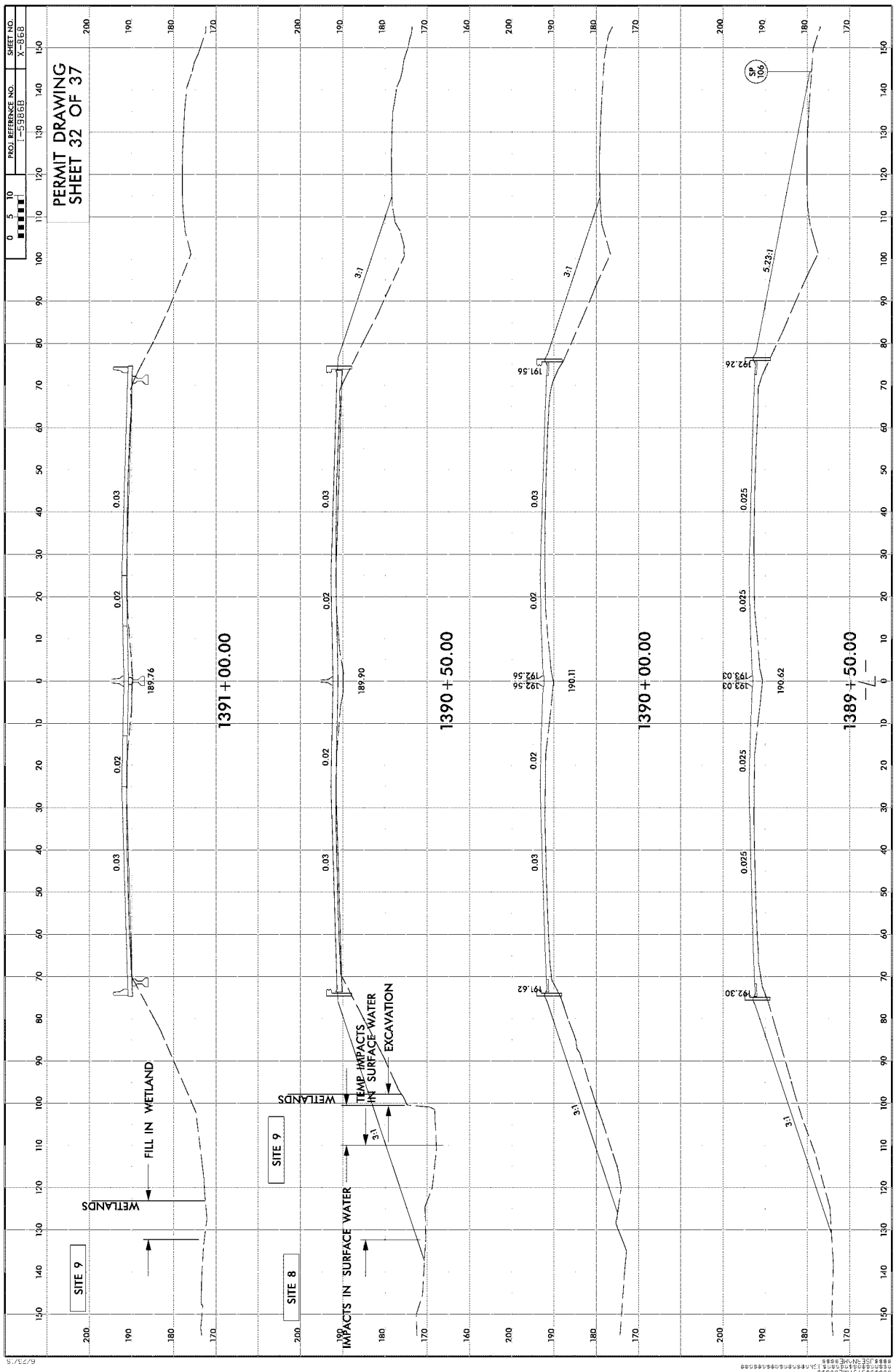
P-142

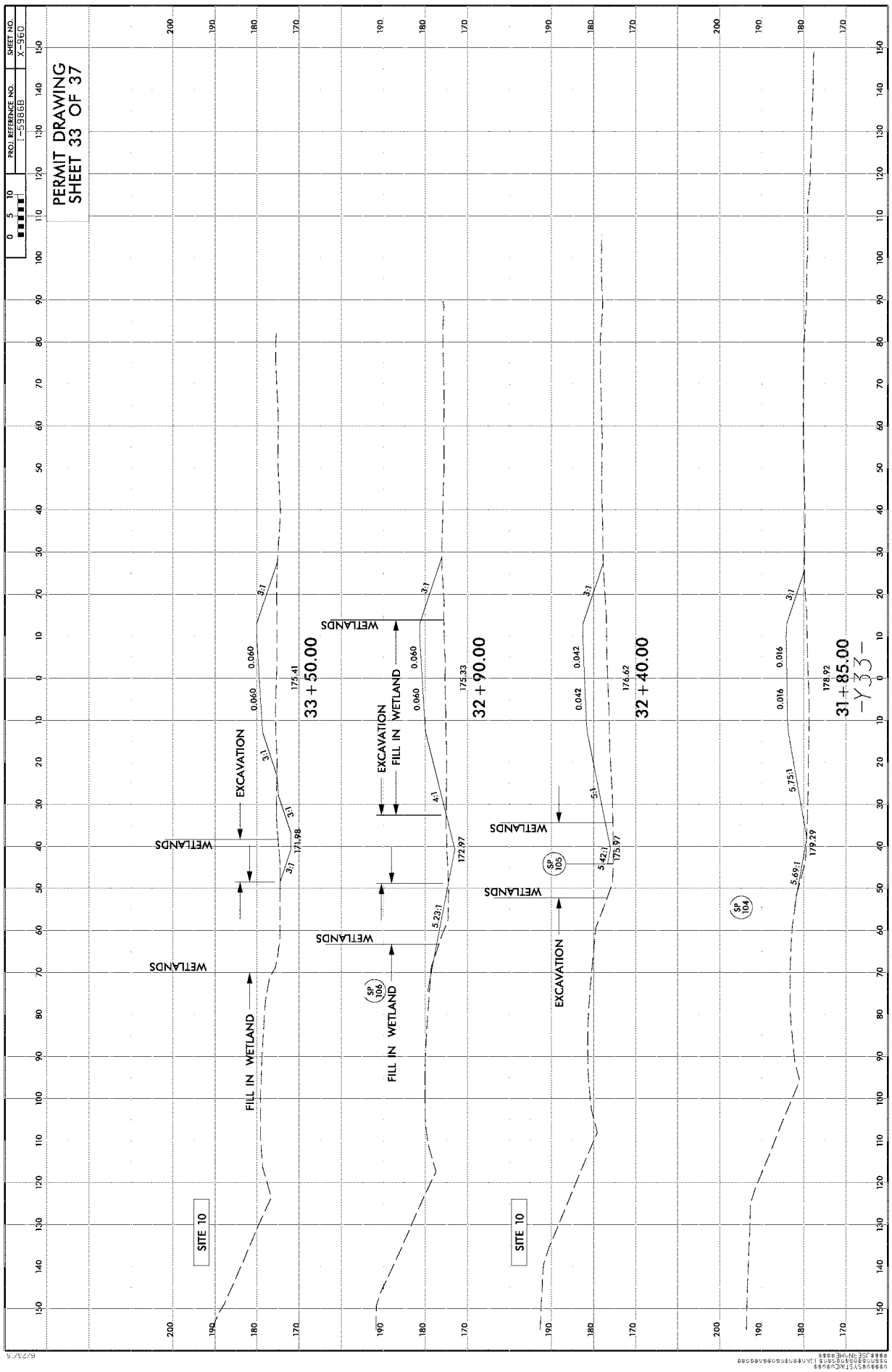

PERMIT DRAWING
SHEET 29 OF 37
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PROJECT REFERENCE NO. I-5986B
SHEET NO. 45
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -L- POT STA. 1397+00.00 - SEE SHEET 46
MATCH TO -Y33- POC STA. 40+62.50- SEE SHEET 46
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 44
SITE 8
SITE 9
SITE 10
SITE 11
SITE 12
RE-ESTABLISHING NATURAL CHANNEL
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86 & 87
FOR -Y33- PROFILE SEE SHEET 140 & 141
FOR -Y19RPCA- PROFILE SEE SHEET 136
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES HAND CLEARING
TRENCHLESS INSTALLATION 30" WELDED STEEL
TRENCHLESS INSTALLATION 16" WELDED STEEL
TRENCHLESS INSTALLATION 18" WELDED STEEL
FLOWABLE FILL
-Y33- PC Sta. 29+20.82
-Y33- PT Sta. 30+67.97
-Y33- PC Sta. 32+35.97
-Y33- PT Sta. 34+56.34
-Y33- PC Sta. 40+57.39
-L- POT Sta. 1395+46.85
-Y19RPCA- TS Sta. 10+00.00
DETAIL 46 SPECIAL CUT DITCH
DETAIL 32 TOE PROTECTION
DETAIL 12 SPECIAL CUT DITCH
DETAIL 43 CHANNEL CHANGE
DETAIL 44 BASE CHANNEL
DETAIL 42 OUTLET CHANNEL
DETAIL 30 SPECIAL CUT BASE DITCH
DETAIL 17 LATERAL BASE DITCH
DETAIL 29 LATERAL BASE DITCH
DETAIL 47 TOE PROTECTION
DETAIL 2 STANDARD BASE DITCH
DETAIL 41 INLET CHANNEL

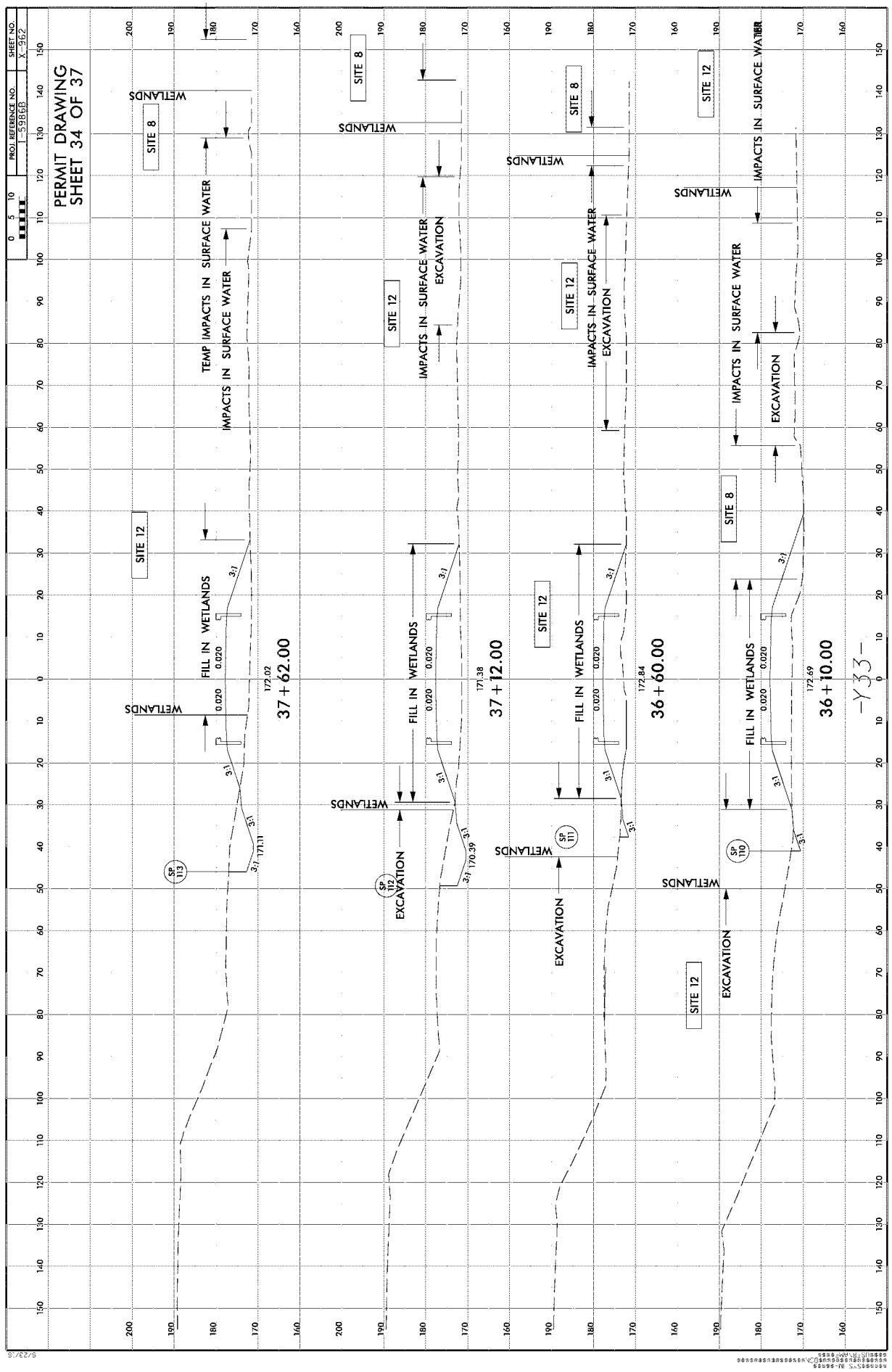


PERMIT DRAWING
SHEET 30 OF 37
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
45
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
NAD 83/2011
SCALE: 1" = 100'
MATCH TO -L- POT STA. 1397+00.00 - SEE SHEET 46
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 44
MATCH TO -Y33- POC STA. 40+62.50- SEE SHEET 46
SITE 8
SITE 9
SITE 10
SITE 11
SITE 12
RE-ESTABLISHING NATURAL CHANNEL
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES HAND CLEARING


PROJECT REFERENCE NO. I-5986B
SHEET NO. 88
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
PIPE HYDRAULIC DATA
30" RCP Sta.1390+38 -L- RT
DRAINAGE AREA = 5.3 AC
DESIGN FREQUENCY = 10 YRS
DESIGN DISCHARGE = 22 CFS
DESIGN HW ELEVATION = 187.7 FT
100 YEAR DISCHARGE = 26 CFS
100 YEAR HW ELEVATION = 188.24 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 26 + CFS
OVERTOPPING ELEVATION = 192.67 FT
PIPE HYDRAULIC DATA
15" WSP Sta.1396+00 -L- LT
DRAINAGE AREA = 0.5 AC
DESIGN FREQUENCY = 10 YRS
DESIGN DISCHARGE = 2.1 CFS
DESIGN HW ELEVATION = 181.0 FT
100 YEAR DISCHARGE = 2.7 CFS
100 YEAR HW ELEVATION = 181.99 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 2.7 + CFS
OVERTOPPING ELEVATION = 185.09 FT
-L-
PI = 1394+00.00
EL = 189.21'
VC = 225'
K = 449
DS >= 70 mph
PROPOSED GRADE
BRIDGE HYDRAULIC DATA
DESIGN DISCHARGE = 530 CFS
DESIGN FREQUENCY = 50 YRS
DESIGN HW ELEVATION = 173.4 FT
BASE DISCHARGE = 570 CFS
BASE FREQUENCY = 100 YRS
BASE HW ELEVATION = 173.5 FT
OVERTOPPING DISCHARGE = 650 + CFS
OVERTOPPING FREQUENCY = 500 + YRS
OVERTOPPING ELEVATION = 180.6 FT
= FT
DATE OF SURVEY = 06/03/2019
W.S. ELEVATION AT DATE OF SURVEY = 172.4 FT
-Y19RPC- TS Sta. 10+00.00 = -L- POT Sta. 1395+70.72, 55.00' RT
PIPE HYDRAULIC DATA
18" WSP Sta.1393+65 -L- RT
DRAINAGE AREA = 1.2 AC
DESIGN FREQUENCY = 10 YRS
DESIGN DISCHARGE = 5.7 CFS
DESIGN HW ELEVATION = 180.2 FT
100 YEAR DISCHARGE = 7.3 CFS
100 YEAR HW ELEVATION = 180.69 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 7.3 + CFS
OVERTOPPING ELEVATION = 185.09 FT
PI = 1400+00.00
EL = 186.50'
VC = 210'
K = 9333
DS >= 70 mph
194.99
185.64'
BEGIN BRIDGE -L- Sta. 1390+66 ±
END BRIDGE -L- Sta. 1391+72 ±
LOW SIDE
LOW CHORD
30" WSP
EXISTING 2@6'X8' CULVERT TO BE REMOVED
NWS AND WS ON 06-03-2019-172.4
3.5' MIN (TYP.)
CL 'I' RIP RAP 1.5:1 NORMAL 1.73:1 SKEWED
CL 'II' RIP RAP 2:1 NORMAL 2.31:1 SKEWED
EXCAVATE TO APPROX. ELEV. 171.8' EST. DDE 10000 CY
18" WSP
(-)0.9531%
(-)0.4525%
EXIST. GROUND
15" WSP
(-)0.4525%
(-)0.4300%
24" WSP
FOR -L- ALIGNMENT, SEE SHEETS 45 & 46
210
200
190
180
170
160
150
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
PIPE HYDRAULIC DATA
24" WSP Sta.1402+00 -L- LT
DRAINAGE AREA = 3.6 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 12 CFS
DESIGN HW ELEVATION = 180.3 FT
100 YEAR DISCHARGE = 13 CFS
100 YEAR HW ELEVATION = 180.94 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 13 + CFS
OVERTOPPING ELEVATION = 182.42 FT
PIPE HYDRAULIC DATA
24" WSP Sta.1406+00 -L- RT
DRAINAGE AREA = 4.7 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 17 CFS
DESIGN HW ELEVATION = 178.7 FT
100 YEAR DISCHARGE = 18 CFS
100 YEAR HW ELEVATION = 178.84 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 18 + CFS
OVERTOPPING ELEVATION = 182.42 FT
-L-
185.64'
-Y19RPB- ST Sta. 30+97.86 = -L- POT Sta. 1402+53.30, 55.00' LT
PI = 1405+00.00
EL = 184.35'
VC = 210'
K = 2100
DS >= 70 mph
END GRADE
-L- POT Sta. 1410+00.00
EL.181.70'
BEGIN GRADE NB & SB LANES
-L- POT Sta.1410+00.00
EL.181.70'
PROPOSED GRADE
(-)0.4300%
(-)0.5300%
24" WSP
24" WSP
EXIST. GROUND
PERMIT DRAWING
SHEET 31 OF 37
FOR -L- ALIGNMENT, SEE SHEETS 46 & 47
220
210
200
190
180
170
160
150
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416


PERMIT DRAWING
SHEET 32 OF 37
PROJ. REFERENCE NO. B-5986B
SHEET NO. X-868
1391+00.00
1390+50.00
1390+00.00
1389+50.00
SITE 9
SITE 8
SITE 9
WETLANDS
FILL IN WETLAND
IMPACTS IN SURFACE WATER
WETLANDS
TEMP. IMPACTS IN SURFACE WATER EXCAVATION
189.76
189.90
190.11
190.62
191.56
192.56
193.03
191.62
192.30
192.26
3:1
5.23:1
0.03
0.02
0.025
SP 106


PERMIT DRAWING
SHEET 33 OF 37
PROJ. REFERENCE NO.
I-5986B
SHEET NO.
X-960
33+50.00
32+90.00
32+40.00
31+85.00
-Y33-
SITE 10
SITE 10
WETLANDS
WETLANDS
WETLANDS
WETLANDS
WETLANDS
EXCAVATION
FILL IN WETLAND
EXCAVATION
FILL IN WETLAND
EXCAVATION
SP 106
SP 105
SP 104
3:1
4:1
5:1
5.23:1
5.42:1
5.69:1
5.75:1
0.060
0.042
0.016
175.41
171.98
175.33
172.97
176.62
175.97
178.92
179.29


PERMIT DRAWING
SHEET 34 OF 37
PROJ. REFERENCE NO. 1-5986B
SHEET NO. X-962
0 5 10
SITE 8
SITE 12
WETLANDS
TEMP IMPACTS IN SURFACE WATER
IMPACTS IN SURFACE WATER
EXCAVATION
FILL IN WETLANDS
0.020
3:1
SP 113
SP 112
SP 111
SP 110
172.02
37+62.00
171.38
37+12.00
172.84
36+60.00
172.69
36+10.00
171.11
170.39
-Y33-

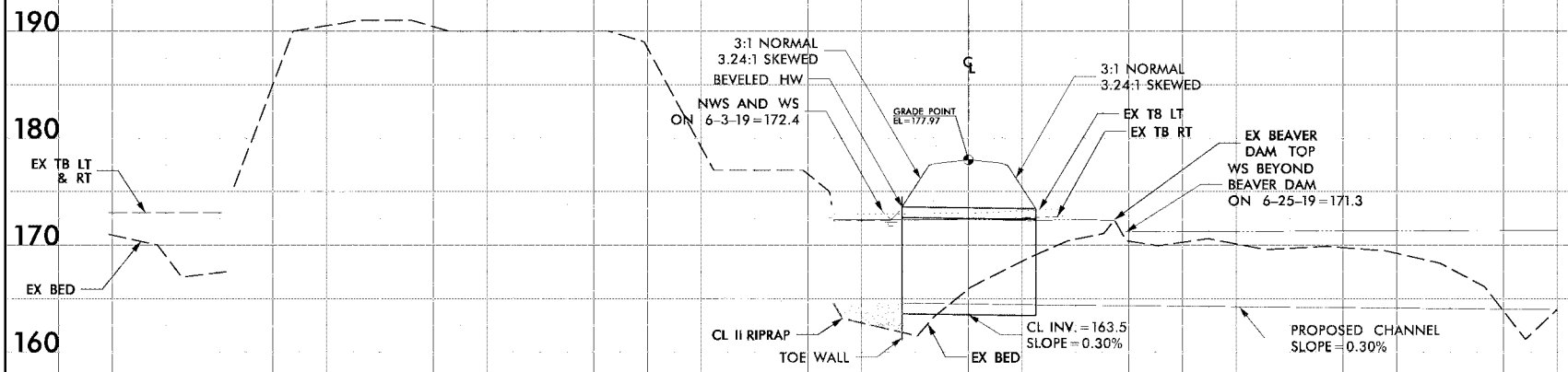
PROJECT REFERENCE NO.	SHEET NO.
I-5986B	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 35 OF 37

SITE 8



P-148

WETLAND AND SURACE WATER IMPACTS 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)
1	1253+22 to 1265+83-L-LT	ROADWAY FILL	0.656			0.232						
2	1259+11 to 1261+57-L-	BRIDGE	0.018		0.002	0.209		0.051	0.091	45	70	
						0.049						
3	1252+49 to 1262+32-L-RT	ROADWAY FILL	0.256			0.153						
4	1285+01 to 1285+34-L-RT	ROADWAY FILL						0.002	0.001	24	10	
5	1316+76 to 1316+89-L-LT	60" RCP INLET CHANNEL						0.001	0.003	3	10	
	34+13 to 34+31-Y29A-RT	60" RCP OUTLET CHANNEL						0.008	0.001	73	10	
6	1344+53 to 1344+68-L-LT	30" RCP						0.001	0.001	11	10	
	1345+63 to 1346+46-L-LT	84" PIPE						0.007	0.001	79	10	
	1346+77 to 1348+18-L-RT	ROADWAY FILL						0.013		143		
	1348+18 to 1349+61-L-RT	ROADWAY FILL						0.037		176		
	17+00 to 18+38-Y18RPD-LT							0.039	0.005	175	15	
	18+16 to 19+12-Y18RPD-LT	84" RCP OUTLET CHANNEL			0.050	0.020						
7	18+82 to 20+22-Y33-LT	36" WSP OUTLET CHANNEL	0.041		0.048	0.013		0.018	0.003	92	49	
TOTALS*:			**0.971**	**0.000**	**0.100**	**0.676**	**0.000**	**0.177**	**0.106**	**821**	**184**	**0**

*Rounded totals are sum of actual impacts

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-5-2020
HARNETT/JOHNSON COUNTIES
I-5883
53083.1.1

Revised 2018 Feb

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
8	1390+32 to 1391+00-L-LT	BRIDGE	0.001		0.010	0.068			0.012		29	
		BANK STABILIZATION								18		
	35+91 -Y33-	2 AT 6'x9' RCBC						0.003		63		
	35+50 to 35+93-Y33-LT	INLET CHANNEL			0.003			0.020		31		
	35+89 to 36+36-Y33-RT	OUTLET BANK STABILIZATION								32		
	35+78 to 37+86-Y33-RT	OUTLET CHANNEL			0.139	0.104		0.086	0.010	207	16	
9	1390+91 to 1391+43-L-LT	ROADWAY FILL	0.004			0.011						
10	32+25 to 33+76-Y33-	ROADWAY FILL	0.090		0.050							
11	1387+71 to 1388+79-L-LT	ROADWAY FILL						0.006	0.002	105	29	
12	33+94 to 38+27-Y33-	ROADWAY FILL	0.332		0.080	0.025						
	TOTALS THIS SHEET		0.427	0.000	0.282	0.208	0.000	0.115	0.024	456	74	
	TOTALS SHEET 35		0.971	0.000	0.100	0.676	0.000	0.177	0.106	821	184	0
TOTALS*:			**1.398**	**0.000**	**0.382**	**0.884**	**0.000**	**0.292**	**0.130**	**1277**	**258**	**0**

*Rounded totals are sum of actual impacts

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-5-2020
HARNETT/JOHNSON COUNTIES
I-5883
53083.1.1
SHEET 37 OF 37

Revised 2018 Feb

P-150

CONTRACT: TIP PROJECT: I-5986B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PERMIT DRAWING
SHEET 1 OF 10

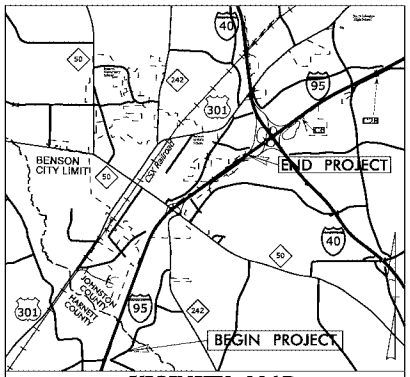
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
47532.1.3	?	P.E.	
47532.2.3	?	R/W & UTIL.	

HARNETT AND JOHNSTON COUNTIES

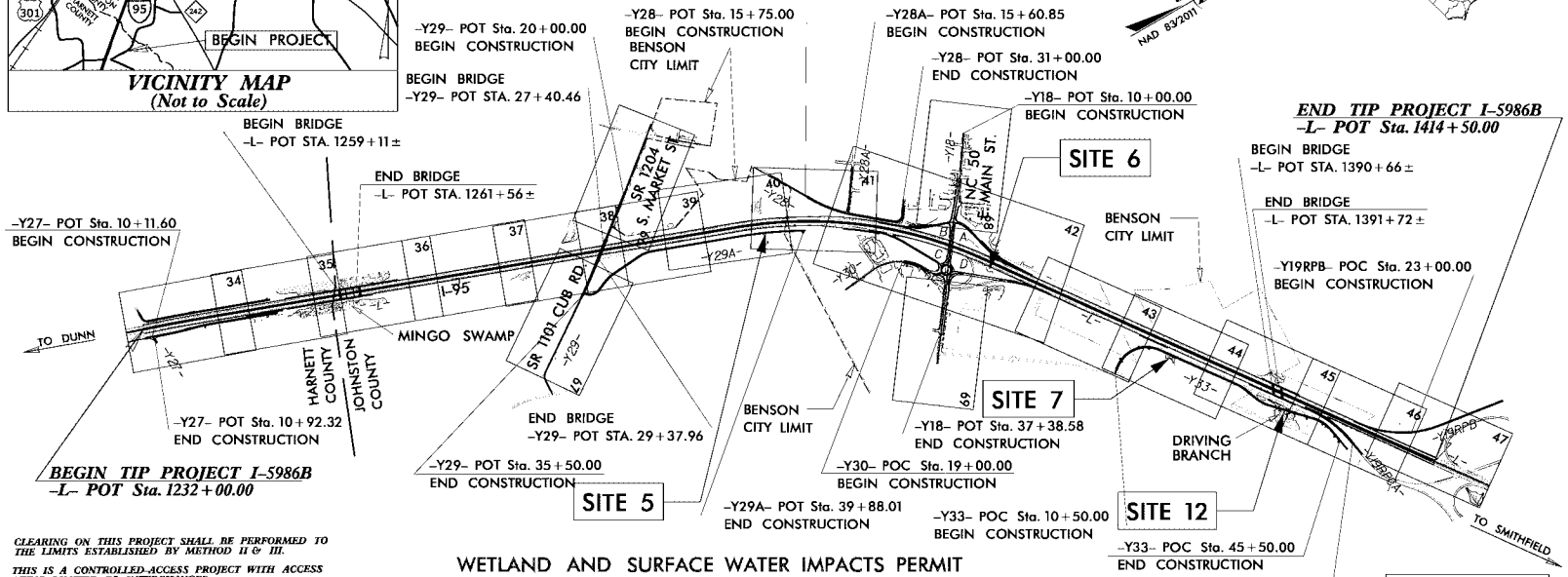
I-5986B
FINAL RIGHT OF WAY PLANS

LOCATION: IMPROVE I-95 INTERCHANGES AND WIDEN TO EIGHT LANES FROM NORTH OF SR 1709 (HODGES CHAPEL ROAD) (EXIT 77) TO I-40) (EXIT 81).

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS, CULVERT AND STRUCTURES



VICINITY MAP
(Not to Scale)



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

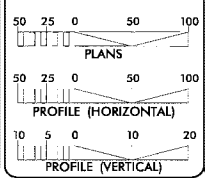
A PORTION OF THIS PROJECT IS WITHIN BENSON MUNICIPAL BOUNDARIES

WETLAND AND SURFACE WATER IMPACTS PERMIT

UTILITIES SECTION 4 (NORTH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES



DESIGN DATA

ADT 2020 = 66,700
ADT 2040 = 92,900
K = 7 %
D = 55 %
T = 18 % *
V = 70 MPH
* (TTST 13% + DUAL 5%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5986B ..... 3.390 MILES
LENGTH STRUCTURES TIP PROJECT I-5986B ..... 0.066 MILES
TOTAL LENGTH OF TIP PROJECT I-5986B ..... 3.456 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: August 30, 2019

LETTING DATE: July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

RICK STATON
PROJECT DESIGN ENGINEER

STEVE D. KENDALL, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

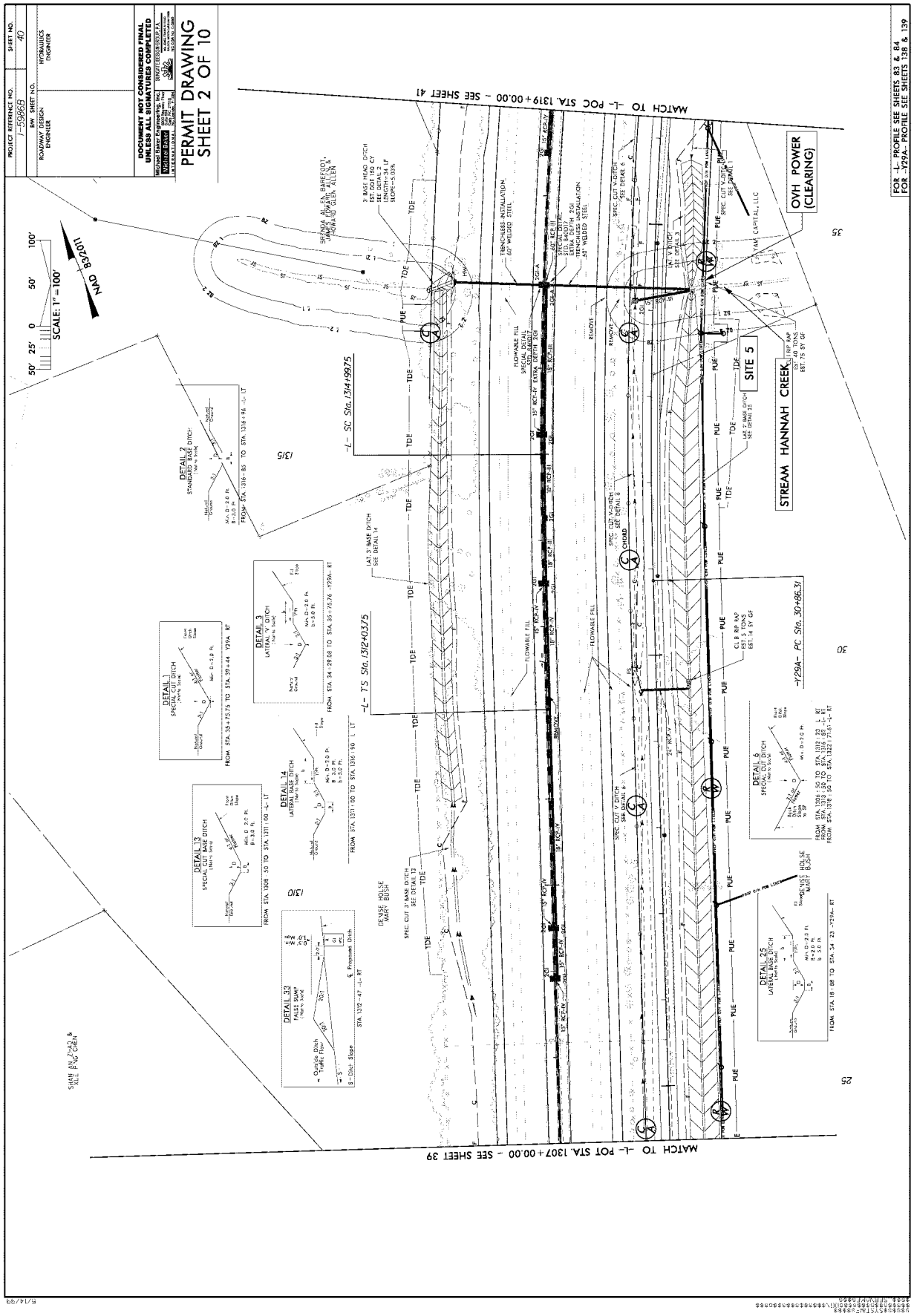
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

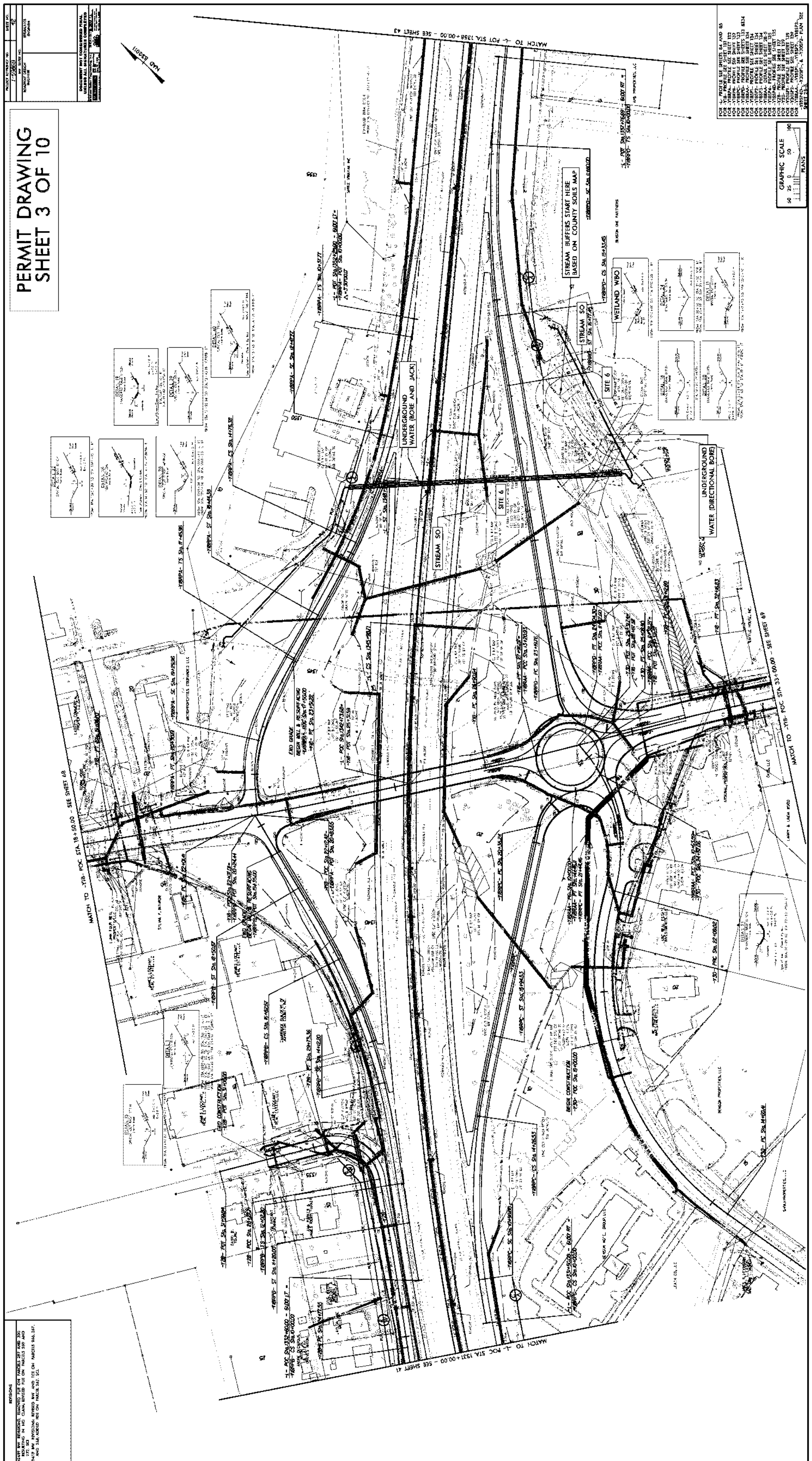
SIGNATURE: P.E.

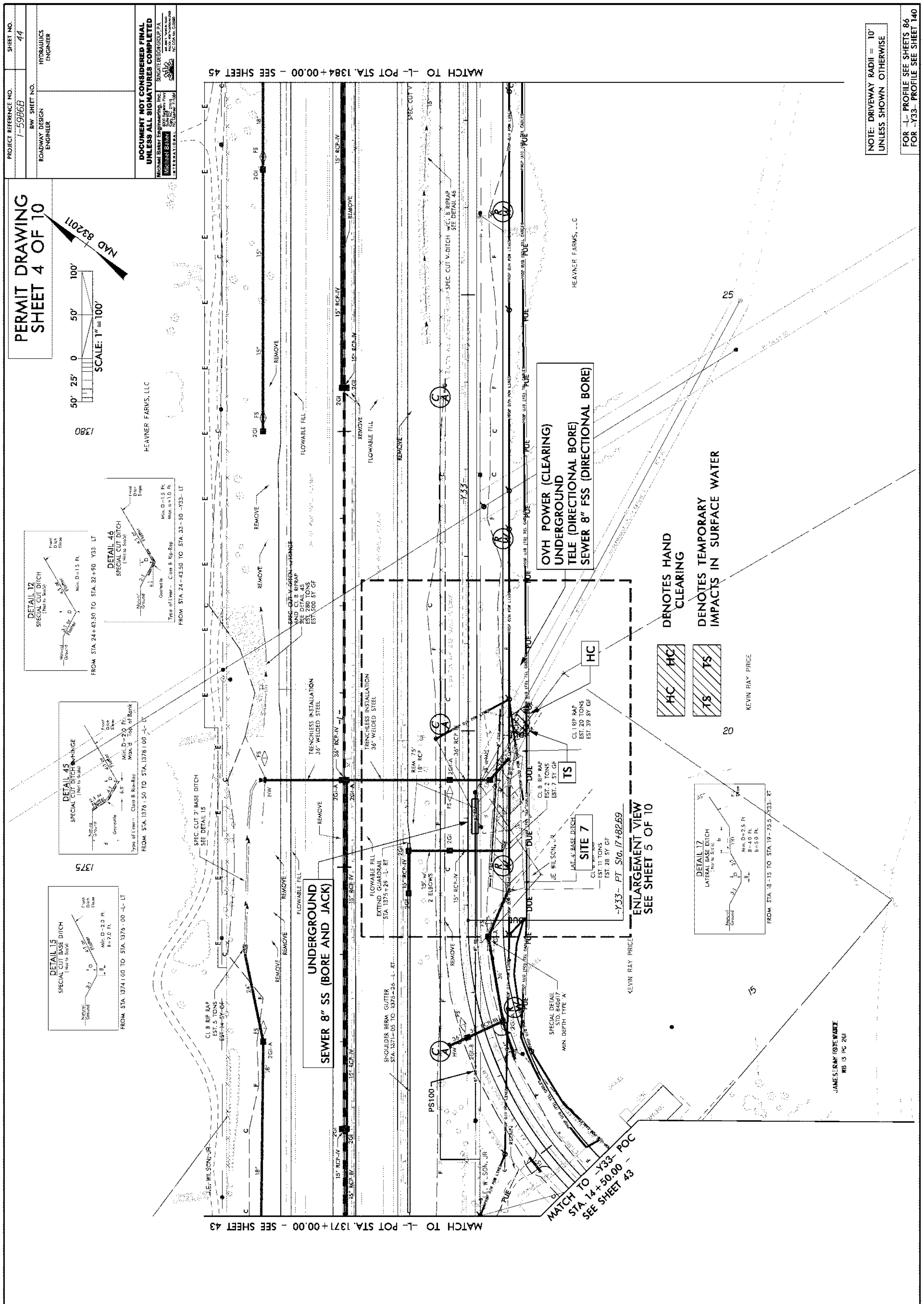
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

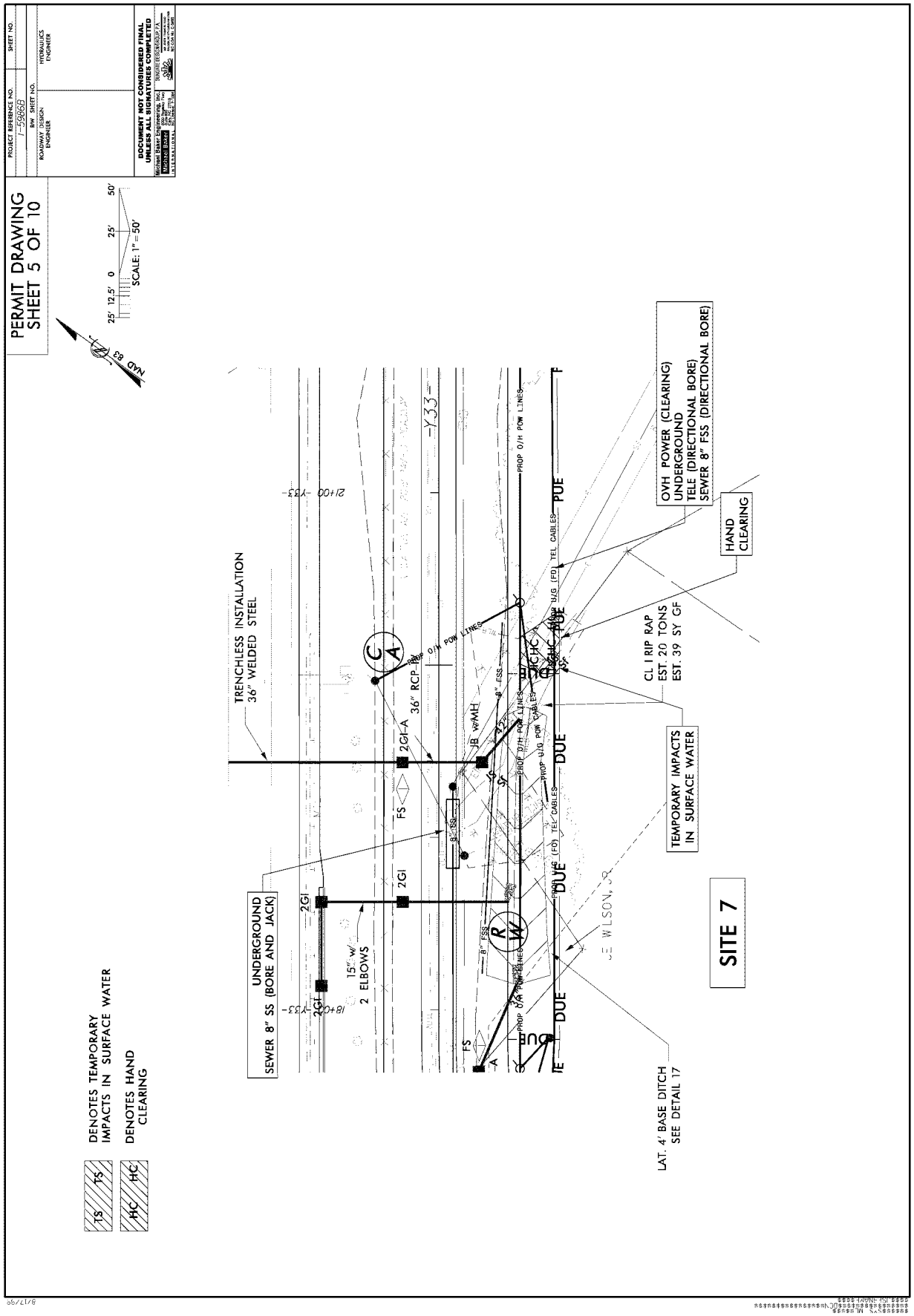
P-152


PERMIT DRAWING
SHEET 2 OF 10
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. 1-5968
SHEET NO. 40
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -L- POT STA. 1319+00.00 - SEE SHEET 41
MATCH TO -L- POT STA. 1307+00.00 - SEE SHEET 39
-L- SC Sta. 1314+19.75
-L- TS Sta. 1312+40.75
-Y29A- PC Sta. 30+86.31
STREAM HANNAH CREEK
SITE 5
OVH POWER (CLEARING)
FOR -L- PROFILE SEE SHEETS 83 & 84
FOR -Y29A- PROFILE SEE SHEETS 138 & 139
DETAIL 1 SPECIAL CUT V-DITCH
DETAIL 2 STANDARD BASE DITCH
DETAIL 3 LATERAL V-DITCH
DETAIL 6 SPECIAL CUT DITCH
DETAIL 13 SPECIAL CUT V-DITCH
DETAIL 14 LATERAL BASE DITCH
DETAIL 25 LATERAL BASE DITCH
DETAIL 33 FALSE SUMP
SPEC. CUT V-DITCH SEE DETAIL 6
LAT. V-DITCH SEE DETAIL 3
LAT. 3' BASE DITCH SEE DETAIL 14
SPEC CUT 3' BASE DITCH SEE DETAIL 13
3' BASE HEAD DITCH
TRENCHLESS INSTALLATION 60" WELDED STEEL
FLOWABLE FILL
CL B RIP RAP
DENISE HOUSE MARY BUSH
SHAN AN ZHAO & SUE PING CHEN
CHORD

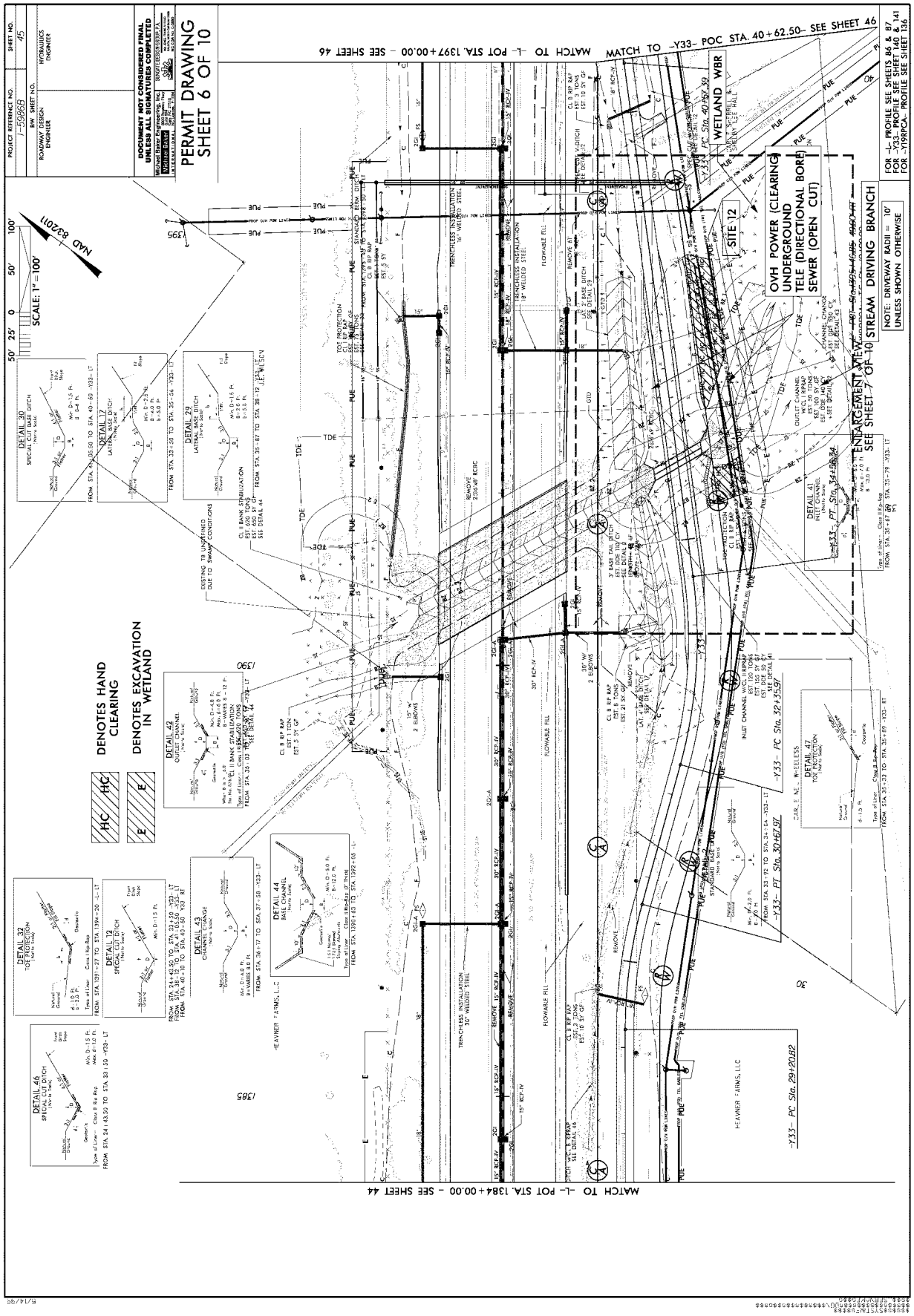
P-153

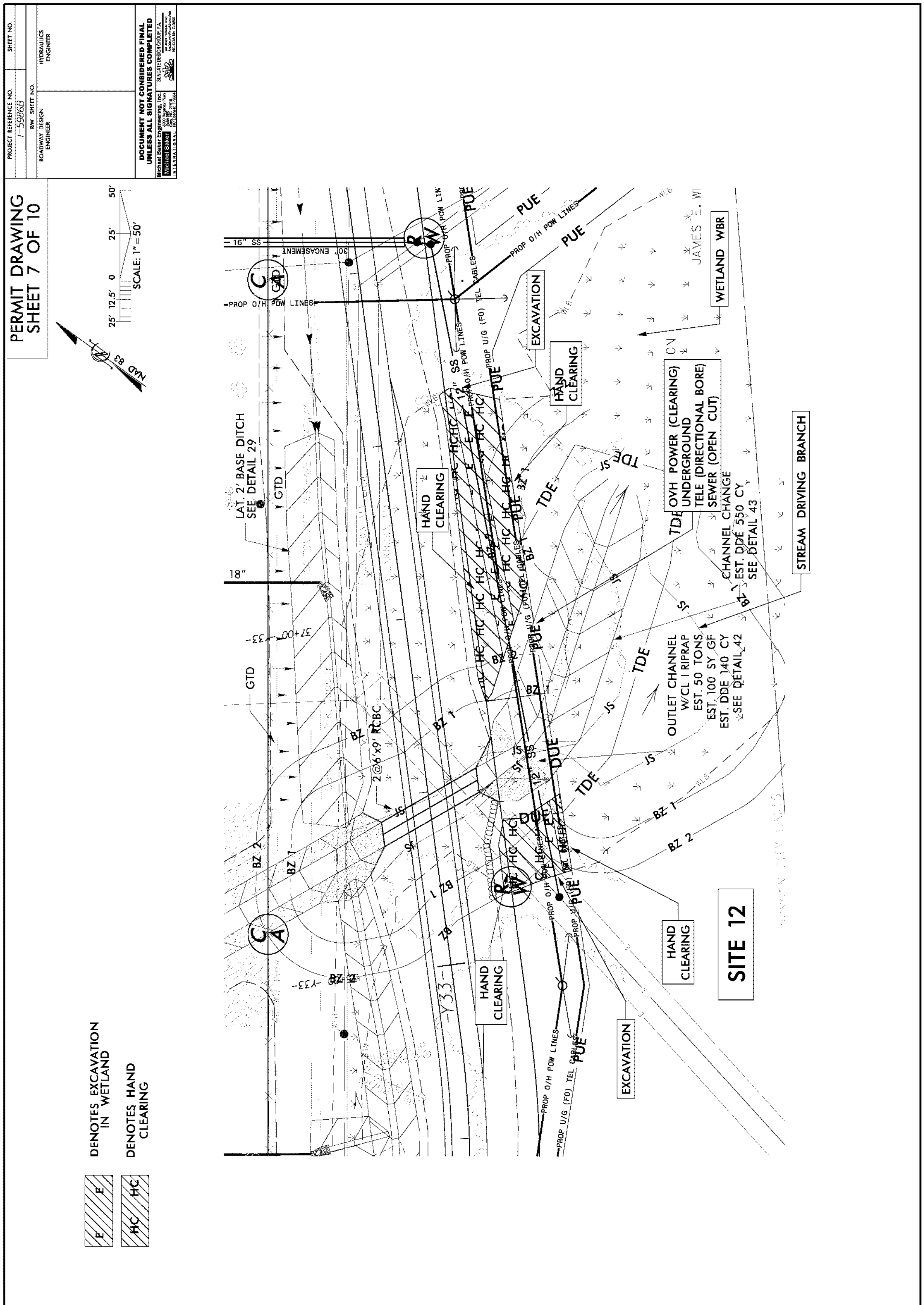

PERMIT DRAWING
SHEET 3 OF 10
UNDERGROUND WATER (BORE AND JACK)
STREAM SO
SITE 6
UNDERGROUND WATER (DIRECTIONAL BORE)
STREAM BUFFERS START HERE BASED ON COUNTY SOILS MAP
WETLAND WBO
STREAM SO
SITE 6
GRAPHIC SCALE

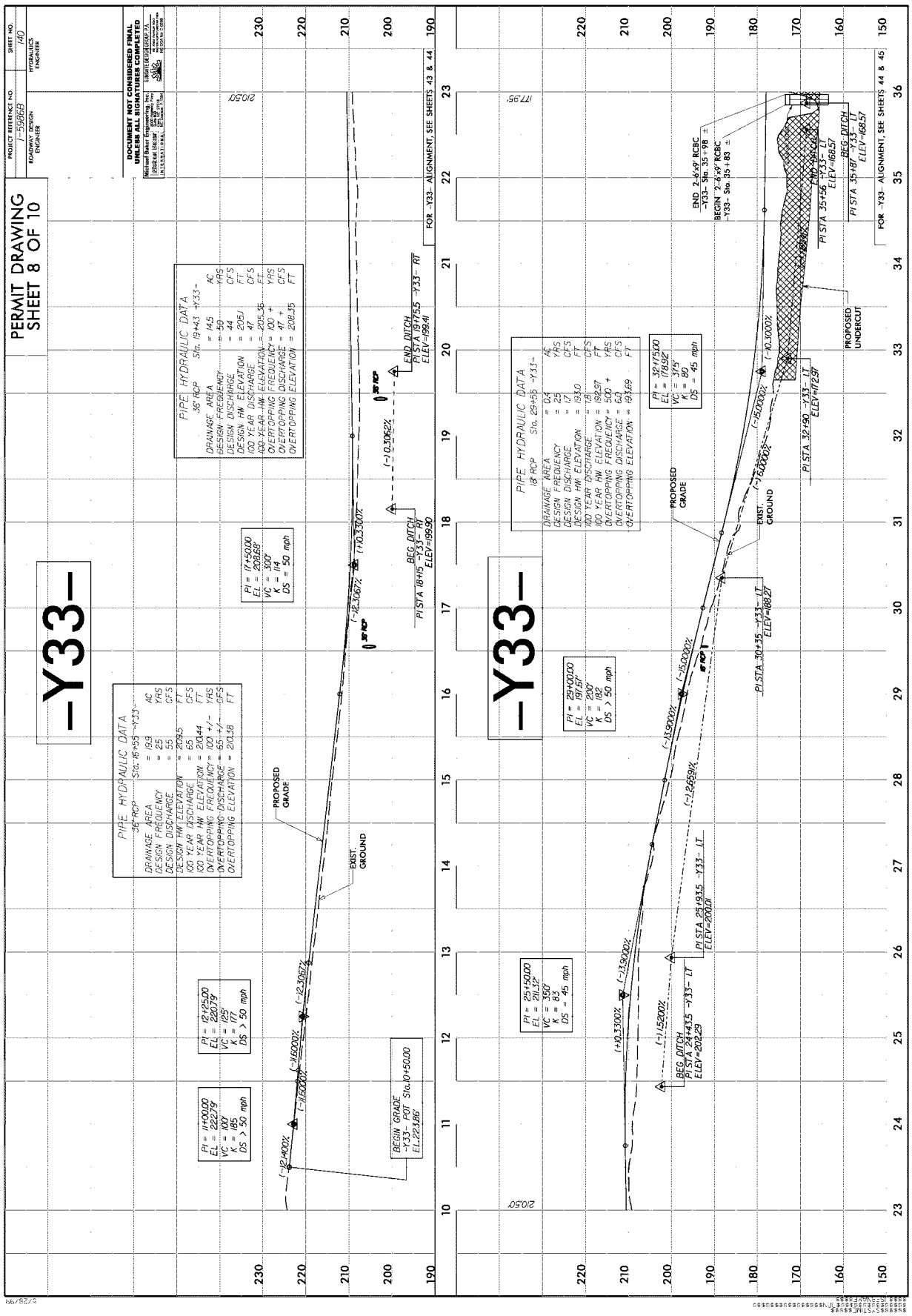

PERMIT DRAWING
SHEET 4 OF 10
SCALE: 1" = 100'
NAD 83/2011
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
I-5986B
44
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 45
MATCH TO -L- POT STA. 1371+00.00 - SEE SHEET 43
MATCH TO -Y33- POC STA. 14+50.00 - SEE SHEET 43
OVH POWER (CLEARING)
UNDERGROUND
TELE (DIRECTIONAL BORE)
SEWER 8" FSS (DIRECTIONAL BORE)
UNDERGROUND
SEWER 8" SS (BORE AND JACK)
DENOTES HAND CLEARING
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
HC
TS
SITE 7
ENLARGEMENT VIEW
SEE SHEET 5 OF 10
-Y33- PT Sta. 17+82.69
HEAVNER FARMS, LLC
KEVIN RAY PRICE
JE WILSON, JR
PS100
TRENCHLESS INSTALLATION 36" WELDED STEEL
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86
FOR -Y33- PROFILE SEE SHEET 140
DETAIL 12
DETAIL 15
DETAIL 17
DETAIL 45
DETAIL 46

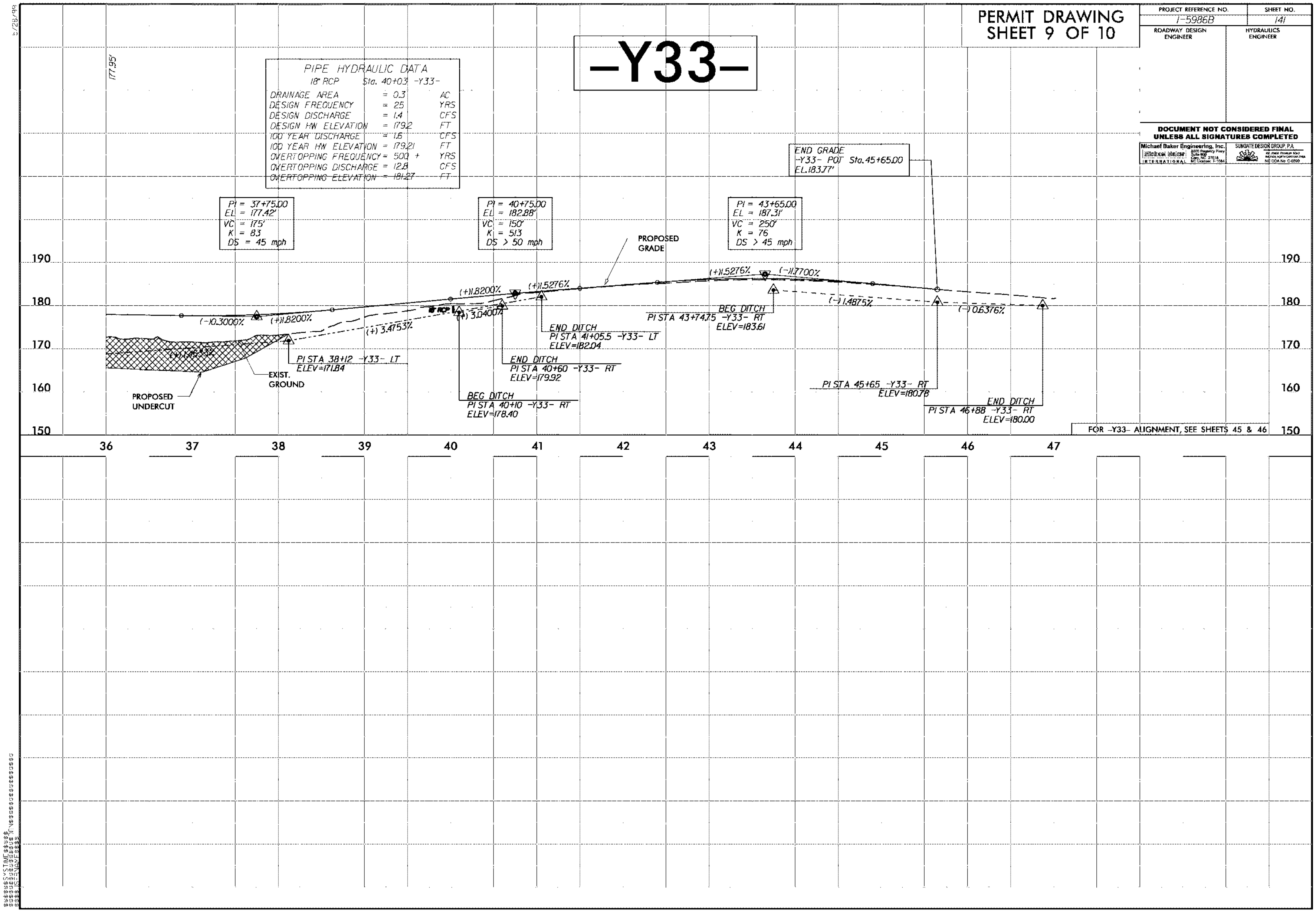

PERMIT DRAWING
SHEET 5 OF 10
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
NAD 83
SCALE: 1" = 50'
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES HAND CLEARING
TRENCHLESS INSTALLATION
36" WELDED STEEL
UNDERGROUND
SEWER 8" SS (BORE AND JACK)
15" w/
2 ELBOWS
36" RCP
JB w/MH
OVH POWER (CLEARING)
UNDERGROUND
TELE (DIRECTIONAL BORE)
SEWER 8" FSS (DIRECTIONAL BORE)
HAND
CLEARING
CL I RIP RAP
EST. 20 TONS
EST. 39 SY GF
TEMPORARY IMPACTS
IN SURFACE WATER
LAT. 4' BASE DITCH
SEE DETAIL 17
SITE 7
E WILSON, JR

P-156


PERMIT DRAWING
SHEET 6 OF 10
PROJECT REFERENCE NO. 7-5988
SHEET NO. 45
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SANGATI DESIGN GROUP, P.A.
SCALE: 1" = 100'
NAD 83/2011
DENOTES HAND CLEARING
DENOTES EXCAVATION IN WETLAND
MATCH TO -L- POT STA. 1397+00.00 - SEE SHEET 46
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 44
MATCH TO -Y33- POC STA. 40+62.50- SEE SHEET 46
-Y33- PC Sta. 40+47.39
WETLAND WBR
SITE 12
OVH POWER (CLEARING)
UNDERGROUND TELE (DIRECTIONAL BORE)
SEWER (OPEN CUT)
ENLARGEMENT VIEW
SEE SHEET 7 OF 10
STREAM DRIVING BRANCH
-Y33- PT Sta. 34+06.24
-Y33- PC Sta. 32+35.97
-Y33- PT Sta. 30+67.97
-Y33- PC Sta. 29+20.82
HEAVNER FARMS, LLC
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86 & 87
FOR -Y33- PROFILE SEE SHEET 140 & 141
FOR -Y19RPCA- PROFILE SEE SHEET 136


PERMIT DRAWING
SHEET 7 OF 10
PROJECT REFERENCE NO.
I-5986B
SHEET NO.
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
NAD 83
SCALE: 1" = 50'
DENOTES EXCAVATION IN WETLAND
DENOTES HAND CLEARING
LAT. 2' BASE DITCH SEE DETAIL 29
HAND CLEARING
EXCAVATION
OVH POWER (CLEARING)
UNDERGROUND TELE (DIRECTIONAL BORE)
SEWER (OPEN CUT)
CHANNEL CHANGE
EST. DDE 550 CY
SEE DETAIL 43
WETLAND WBR
STREAM DRIVING BRANCH
OUTLET CHANNEL
W/CL I RIPRAP
EST. 50 TONS
EST. 100 SY GF
EST. DDE 140 CY
SEE DETAIL 42
2@6'x9' RCBC
SITE 12
PROP O/H POW LINES
PROP U/G (FO) TEL CABLES
PUE
DUE
TDE
-Y33-
GTD
BZ 1
BZ 2
18"
16" SS
30" ENCASEMENT
JAMES E. WI


PERMIT DRAWING
SHEET 8 OF 10
-Y33-
PROJECT REFERENCE NO. 1-5966B
SHEET NO. 140
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SURGETECH GROUP P.A.
PIPE HYDRAULIC DATA
36" RCP Sta. 16+55 -Y33-
DRAINAGE AREA = 19.9 AC
DESIGN FREQUENCY = 25 YRS
DESIGN DISCHARGE = 55 CFS
DESIGN HW ELEVATION = 209.5 FT
100 YEAR DISCHARGE = 65 CFS
100 YEAR HW ELEVATION = 210.44 FT
OVERTOPPING FREQUENCY = 100 +/- YRS
OVERTOPPING DISCHARGE = 65 +/- CFS
OVERTOPPING ELEVATION = 210.38 FT
PI = 11+00.00
EL = 222.39'
VC = 100'
K = 185
DS > 50 mph
PI = 12+25.00
EL = 220.79'
VC = 105'
K = 177
DS > 50 mph
PROPOSED GRADE
EXIST. GROUND
BEGIN GRADE -Y33- POT Sta.10+50.00 EL.223.86'
PIPE HYDRAULIC DATA
36" RCP Sta. 19+43 -Y33-
DRAINAGE AREA = 14.5 AC
DESIGN FREQUENCY = 50 YRS
DESIGN DISCHARGE = 44 CFS
DESIGN HW ELEVATION = 205.1 FT
100 YEAR DISCHARGE = 47 CFS
100 YEAR HW ELEVATION = 205.36 FT
OVERTOPPING FREQUENCY = 100 + YRS
OVERTOPPING DISCHARGE = 47 + CFS
OVERTOPPING ELEVATION = 208.35 FT
PI = 17+50.00
EL = 208.88'
VC = 300'
K = 144
DS = 50 mph
BEG DITCH PI STA 18+15 -Y33- RT ELEV=199.90
END DITCH PI STA 19+75.5 -Y33- RT ELEV=199.41
FOR -Y33- ALIGNMENT, SEE SHEETS 43 & 44
-Y33-
PIPE HYDRAULIC DATA
18" RCP Sta. 29+55 -Y33-
DRAINAGE AREA = 0.4 AC
DESIGN FREQUENCY = 25 YRS
DESIGN DISCHARGE = 2.3 CFS
DESIGN HW ELEVATION = 193.10 FT
100 YEAR DISCHARGE = 3.1 CFS
100 YEAR HW ELEVATION = 192.97 FT
OVERTOPPING FREQUENCY = 500 + YRS
OVERTOPPING DISCHARGE = 6.0 CFS
OVERTOPPING ELEVATION = 193.69 FT
PI = 25+50.00
EL = 211.32'
VC = 360'
K = 83
DS = 45 mph
PI = 29+00.00
EL = 191.51'
VC = 230'
K = 82
DS > 50 mph
PI = 32+75.00
EL = 178.92'
VC = 375'
K = 80
DS = 45 mph
PROPOSED GRADE
EXIST. GROUND
PROPOSED UNDERCUT
END 2-6'x9' RCBC -Y33- Sta. 35+98 ±
BEGIN 2-6'x9' RCBC -Y33- Sta. 35+83 ±
PI STA 24+43.5 -Y33- LT ELEV=202.29
PI STA 25+93.5 -Y33- LT ELEV=200.01
PI STA 30+35 -Y33- LT ELEV=188.27
PI STA 32+90 -Y33- LT ELEV=178.91
PI STA 35+56 -Y33- LT ELEV=168.57
PI STA 35+87 -Y33- LT ELEV=168.57
BEG DITCH
FOR -Y33- ALIGNMENT, SEE SHEETS 44 & 45


PERMIT DRAWING
SHEET 9 OF 10
PROJECT REFERENCE NO. I-5986B
SHEET NO. 141
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
SUNGATE DESIGN GROUP, P.A.
-Y33-
PIPE HYDRAULIC DATA
18" RCP Sta. 40+03 -Y33-
DRAINAGE AREA = 0.3 AC
DESIGN FREQUENCY = 25 YRS
DESIGN DISCHARGE = 1.4 CFS
DESIGN HW ELEVATION = 179.2 FT
100 YEAR DISCHARGE = 1.6 CFS
100 YEAR HW ELEVATION = 179.21 FT
OVERTOPPING FREQUENCY = 500 + YRS
OVERTOPPING DISCHARGE = 12.8 CFS
OVERTOPPING ELEVATION = 181.27 FT
PI = 37+75.00 EL = 177.42' VC = 175' K = 83 DS = 45 mph
PI = 40+75.00 EL = 182.88' VC = 150' K = 513 DS > 50 mph
PI = 43+65.00 EL = 187.31' VC = 250' K = 76 DS > 45 mph
END GRADE -Y33- POT Sta.45+65.00 EL.183.77'
PROPOSED GRADE
EXIST. GROUND
PROPOSED UNDERCUT
(-)0.3000%
(+)1.8200%
(+)3.4753%
(+)3.0400%
(+)1.8200%
(+)1.5276%
(+)1.5276%
(-)1.7700%
(-)1.4875%
(-)0.6376%
PI STA 38+12 -Y33- LT ELEV=171.84
BEG DITCH PI STA 40+10 -Y33- RT ELEV=178.40
END DITCH PI STA 40+60 -Y33- RT ELEV=179.92
END DITCH PI STA 41+05.5 -Y33- LT ELEV=182.04
BEG DITCH PI STA 43+74.75 -Y33- RT ELEV=183.61
PI STA 45+65 -Y33- RT ELEV=180.78
END DITCH PI STA 46+88 -Y33- RT ELEV=180.00
FOR -Y33- ALIGNMENT, SEE SHEETS 45 & 46
177.95'
190
180
170
160
150
36
37
38
39
40
41
42
43
44
45
46
47

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS: Permanent Fill In Wetlands (ac)	WETLAND IMPACTS: Temp. Fill In Wetlands (ac)	WETLAND IMPACTS: Excavation in Wetlands (ac)	WETLAND IMPACTS: Mechanized Clearing in Wetlands (ac)	WETLAND IMPACTS: Hand Clearing in Wetlands (ac)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	SURFACE WATER IMPACTS: Temp. SW impacts (ac)	SURFACE WATER IMPACTS: Existing Channel Impacts Permanent (ft)	SURFACE WATER IMPACTS: Existing Channel Impacts Temp. (ft)	SURFACE WATER IMPACTS: Natural Stream Design (ft)
5	34+13 to 34+31-Y29A-RT	UTILITY										
6	1348+18 to 1349+61-L-RT	UTILITY										
	17+00 to 18+38-Y18RPD-LT											
	18+16 to 19+12-Y18RPD-LT											
7	18+82 to 20+22-Y33-LT	UTILITY					0.013		0.001		10	
12	33+94 to 38+27-Y33-	UTILITY			0.043		0.109					
TOTALS*:			**0.000**	**0.000**	**0.043**	**0.000**	**0.122**	**0.000**	**0.001**	**0**	**10**	**0**

*Rounded totals are sum of actual impacts

NOTES:

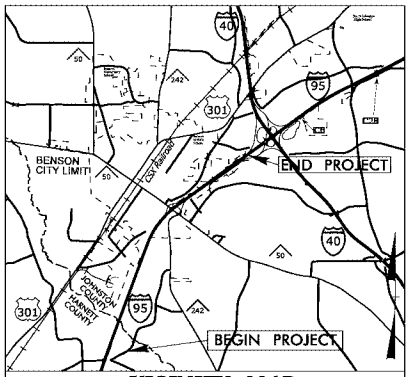
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
12-28-2020
HARNETT/JOHNSON COUNTIES
I-5986B
53083.1.1
SHEET 10 OF 10

Revised 2018 Feb

P-160

CONTRACT: TIP PROJECT: I-5986B

See Sheet 1A for Index of Sheets
See Sheet 1B for Conventional Symbols



VICINITY MAP
(Not to Scale)

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HARNETT AND JOHNSTON COUNTIES

BUFFER DRAWING
SHEET 1 OF 7

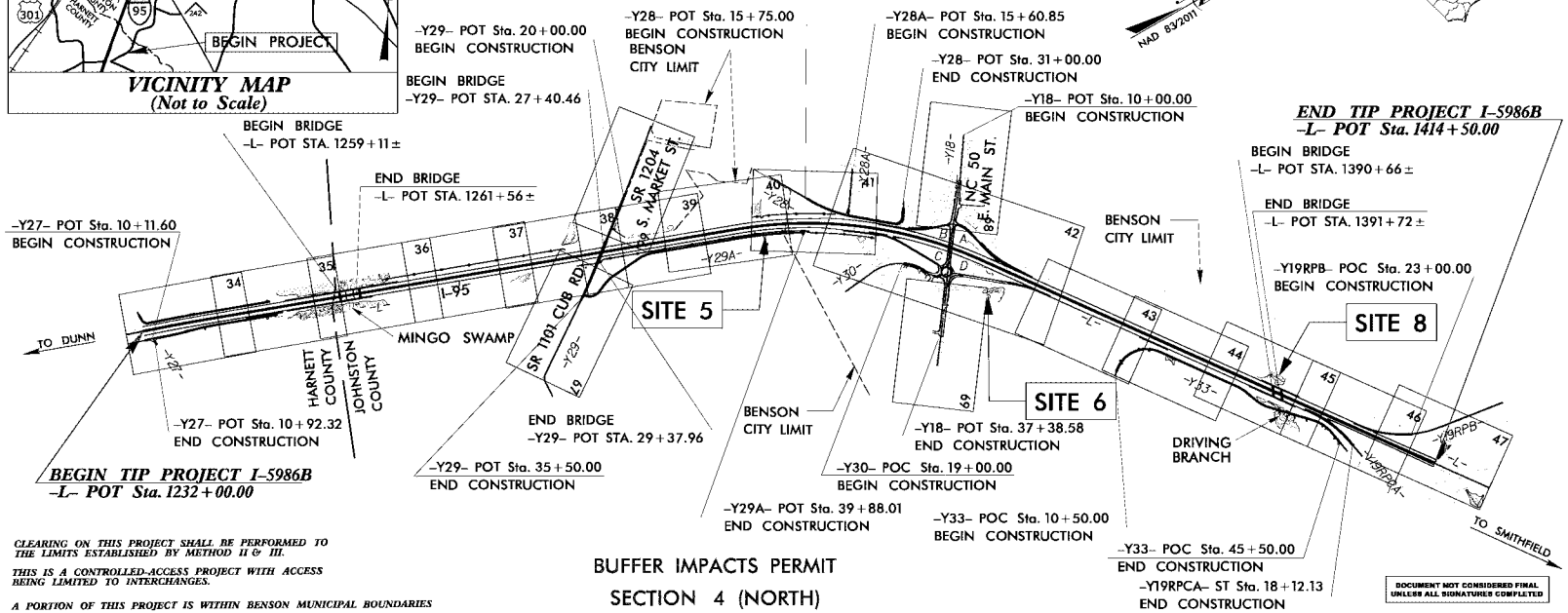
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
47532.1.3	?	P.E.
47532.2.3	?	R/W & UTIL.

I-5986B
FINAL RIGHT OF WAY PLANS

LOCATION: IMPROVE I-95 INTERCHANGES AND WIDEN TO EIGHT LANES FROM NORTH OF SR 1709 (HODGES CHAPEL ROAD) (EXIT 77) TO I-40) (EXIT 81).

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS, CULVERT AND STRUCTURES



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II & III.

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

A PORTION OF THIS PROJECT IS WITHIN BENSON MUNICIPAL BOUNDARIES

BUFFER IMPACTS PERMIT
SECTION 4 (NORTH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 2020 = 66,700
ADT 2040 = 92,900
K = 7 %
D = 55 %
T = 18 % *
V = 70 MPH
* (TTST 13% + DUAL 5%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5986B ..... 3.390 MILES
LENGTH STRUCTURES TIP PROJECT I-5986B ..... 0.066 MILES
TOTAL LENGTH OF TIP PROJECT I-5986B ..... 3.456 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: August 30, 2019

LETTING DATE: July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

RICK STATON
PROJECT DESIGN ENGINEER

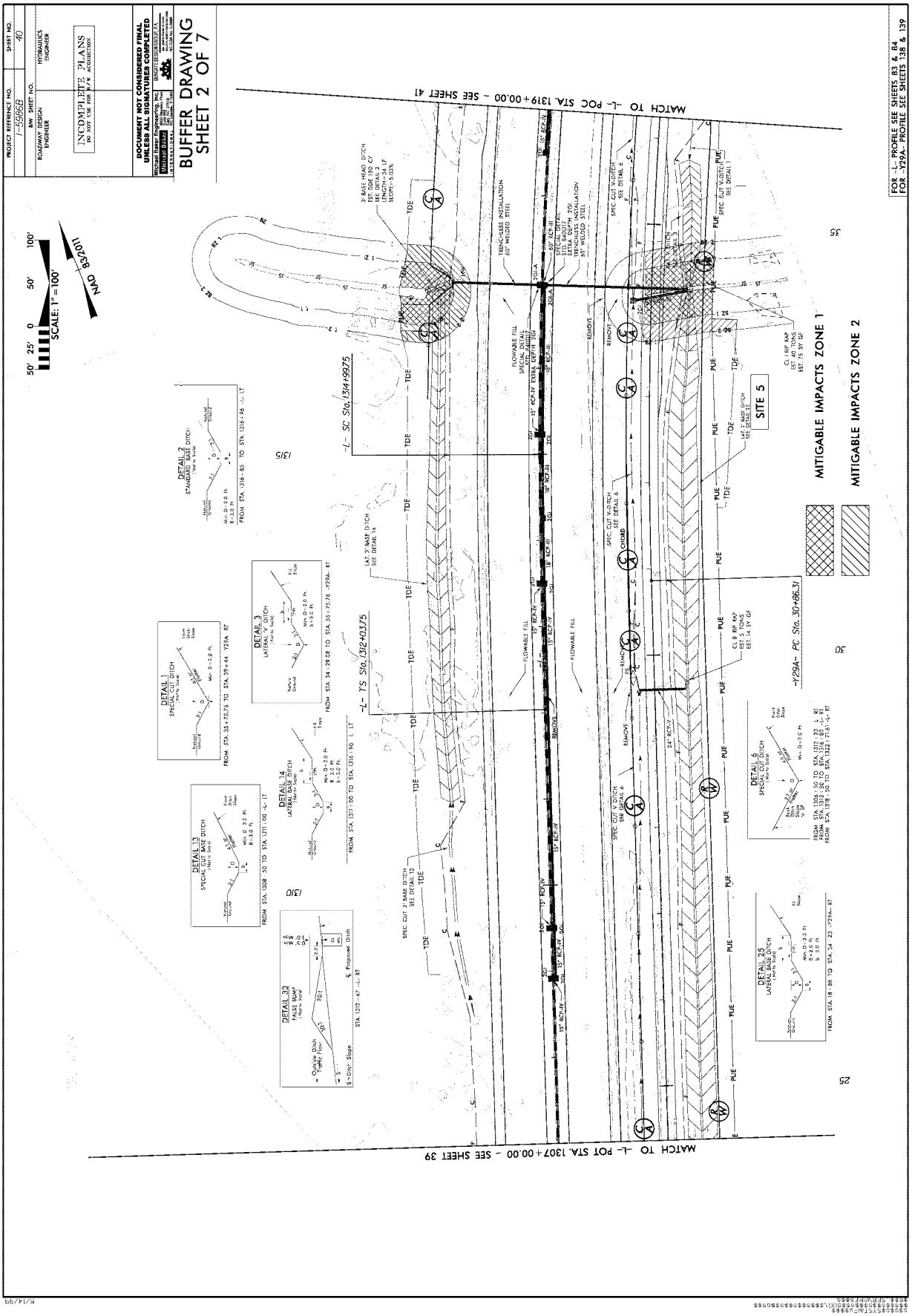
STEVE D. KENDALL, PE
NCDOT CONTACT

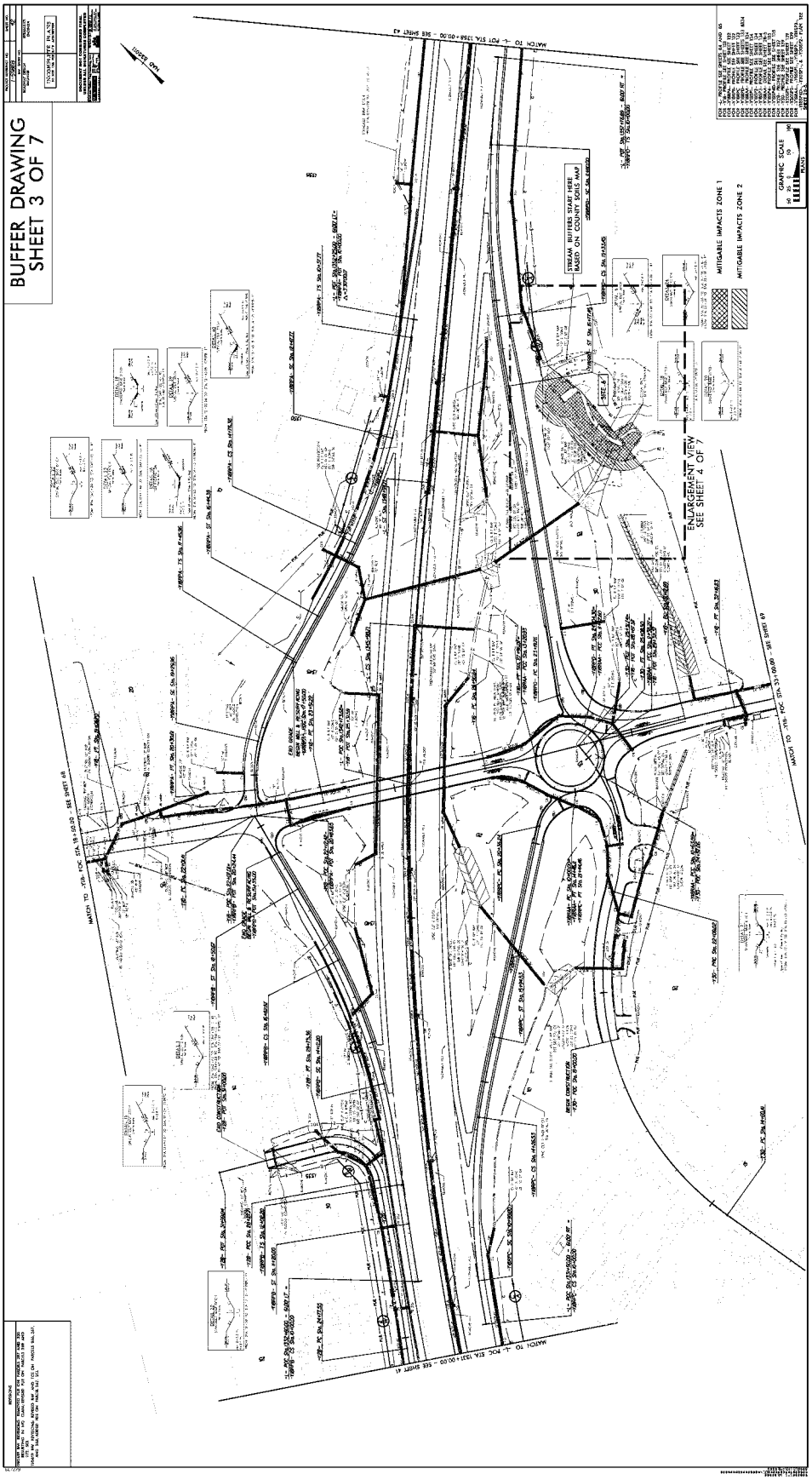
HYDRAULICS ENGINEER
SIGNATURE: P.E.
ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

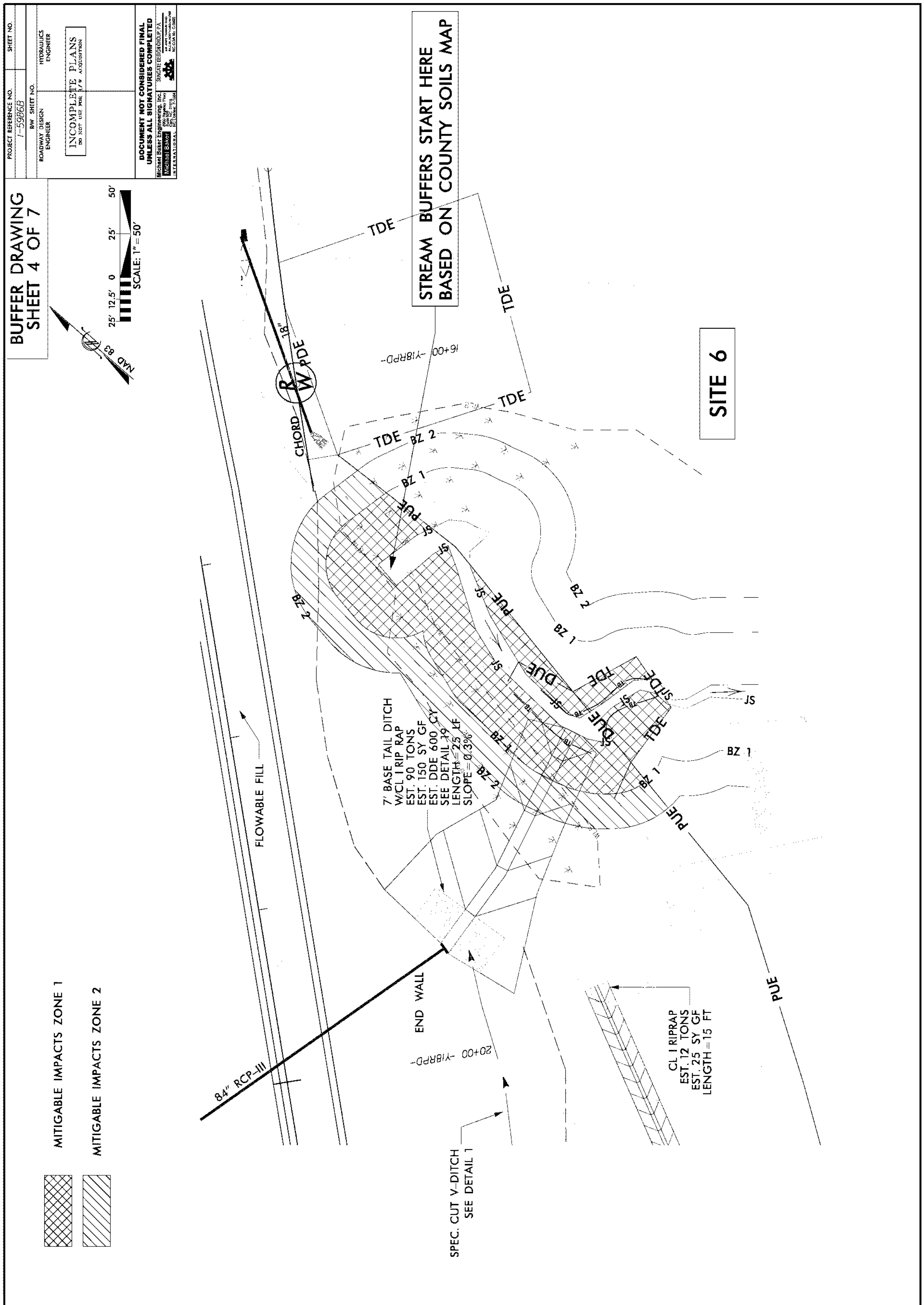
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

P-161

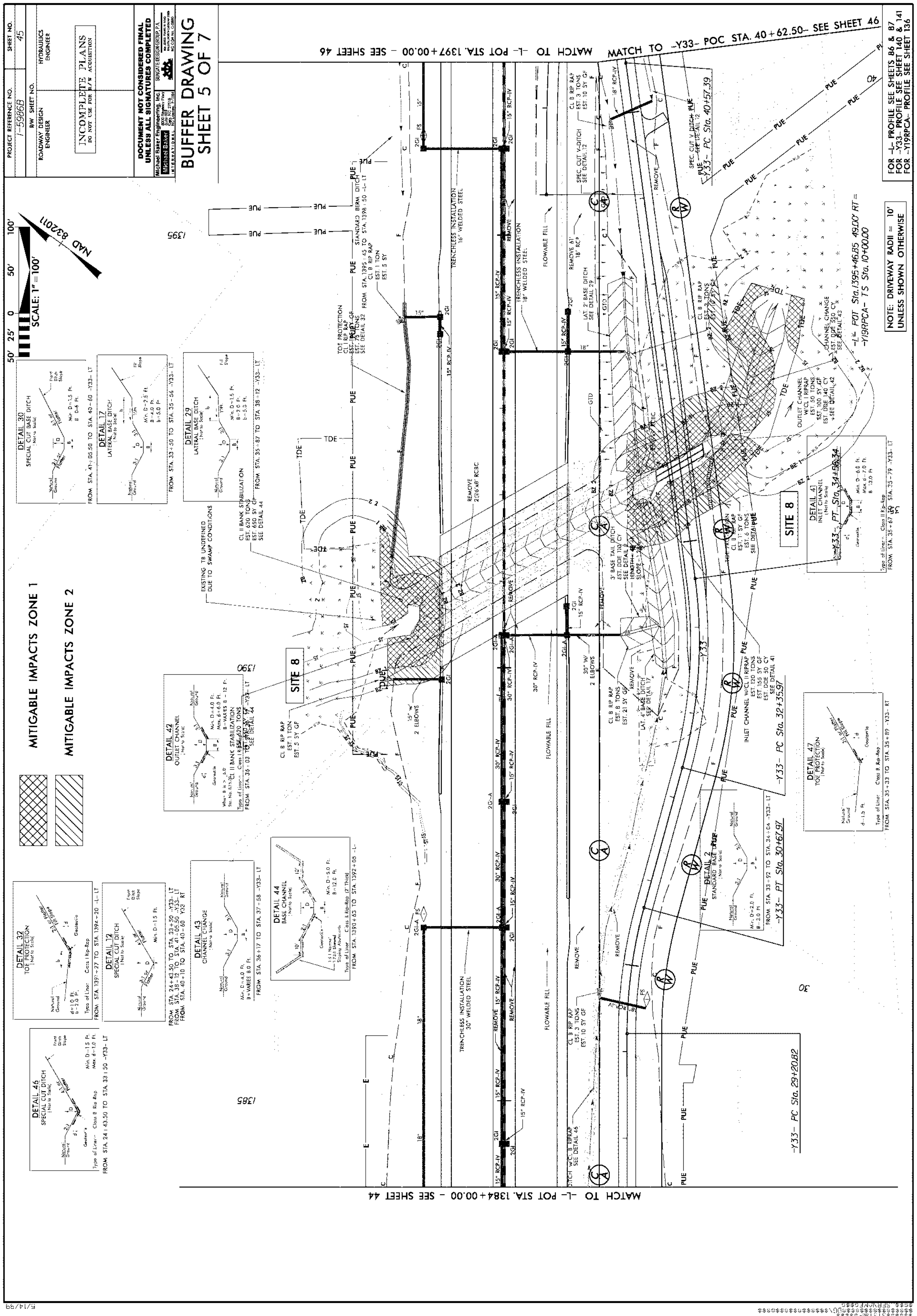
P-162


PROJECT REFERENCE NO.
1-5968
SHEET NO.
40
ROADWAY DESIGN ENGINEER
BW SHEET NO.
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
Michael Baker
BUFFER DRAWING
SHEET 2 OF 7
SCALE: 1"=100'
NAD 83/2011
MATCH TO -L- POC STA. 1319+00.00 - SEE SHEET 41
MATCH TO -L- POT STA. 1307+00.00 - SEE SHEET 39
-L- SC Sta. 1314+19.75
-L- TS Sta. 1312+40.75
-Y29A- PC Sta. 30+86.31
SITE 5
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2
FOR -L- PROFILE SEE SHEETS 83 & 84
FOR -Y29A- PROFILE SEE SHEETS 138 & 139
DETAIL 1
DETAIL 2
DETAIL 3
DETAIL 6
DETAIL 13
DETAIL 14
DETAIL 25
DETAIL 33


BUFFER DRAWING
SHEET 3 OF 7
ENLARGEMENT VIEW
SEE SHEET 4 OF 7
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2
STREAM BUFFERS START HERE
BASED ON COUNTY SOILS MAP
GRAPHIC SCALE


PROJECT REFERENCE NO.
I-5986B
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Michael Baker Engineering, Inc.
BUFFER DRAWING
SHEET 4 OF 7
NAD 83
SCALE: 1" = 50'
STREAM BUFFERS START HERE
BASED ON COUNTY SOILS MAP
SITE 6
TDE
PDE
18"
CHORD
16+00 -Y18RPD-
BZ 1
BZ 2
PUE
JS
DUE
7' BASE TAIL DITCH
W/CL I RIP RAP
EST. 90 TONS
EST. 150 SY GF
EST. DDE 600 CY
SEE DETAIL 19
LENGTH = 25 LF
SLOPE = 0.3%
FLOWABLE FILL
END WALL
84" RCP-III
20+00 -Y18RPD-
CL I RIPRAP
EST. 12 TONS
EST. 25 SY GF
LENGTH = 15 FT
SPEC. CUT V-DITCH
SEE DETAIL 1
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2

P-165


BUFFER DRAWING
SHEET 5 OF 7
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
INCOMPLETE PLANS
MITIGABLE IMPACTS ZONE 1
MITIGABLE IMPACTS ZONE 2
SCALE: 1" = 100'
NAD 83/2011
SITE 8
SITE 8
MATCH TO -L- POT STA. 1397+00.00 - SEE SHEET 46
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 44
MATCH TO -Y33- POC STA. 40+62.50 - SEE SHEET 46
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE

RIPARIAN BUFFER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	IMPACTS									BUFFER REPLACEMENT	
			TYPE			ALLOWABLE			MITIGABLE				
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
5	1316+27 to 1317+55-L-	ROADWAY FILL	X						8305	7395	15700		
6	16+61 to 18+88-Y18RPD-LT	ROADWAY FILL			X				10843	6639	17482		
8	1389+81 to 1391+84-L-LT	ROADWAY FILL	X						6408	3708	10116		
	35+01 to 37+97-Y33-	ROADWAY FILL	X						15346	6199	21545		
TOTALS*:						**0**	**0**	**0**	**40902**	**23941**	**64843**	**0**	**0**

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-5-2020
HARNETT/JOHNSON COUNTIES
I-5986B SECTION 4
47532.2.3
SHEET 6 OF 7

Revised 2018 Feb

P-166

WETLANDS IN BUFFER IMPACTS SUMMARY

SITE NO.	STATION (FROM/TO)		WETLANDS IN BUFFERS ZONE 1 (ft^2)	WETLANDS IN BUFFERS ZONE 2 (ft^2)
6	16+61 to 18+88-Y18RPD-LT		3034	3224
8	1389+81 to 1391+84-L-LT		2040	66
	35+01 to 37+97-Y33-		13411	6810
TOTAL:			**18485**	**10100**

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
3-5-2020
HARNETT/JOHNSON COUNTIES
I-5986B SECTION 4
47532.2.3
SHEET 7 OF 7

Revised 2018 Feb

P-167

Rev. Jan 2009

CONTRACT: TIP PROJECT: I-5986B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

BUFFER DRAWING
SHEET 1 OF 6

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5986B	1	

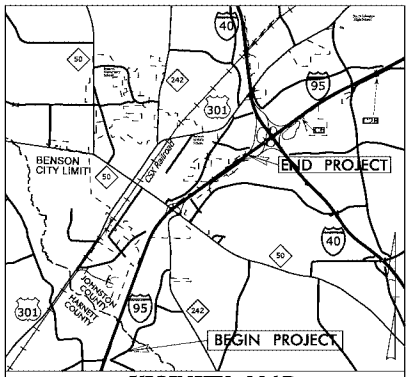
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
47532.1.3	?	P.E.
47532.2.3	?	R/W & UTIL.

I-5986B
FINAL RIGHT OF WAY PLANS

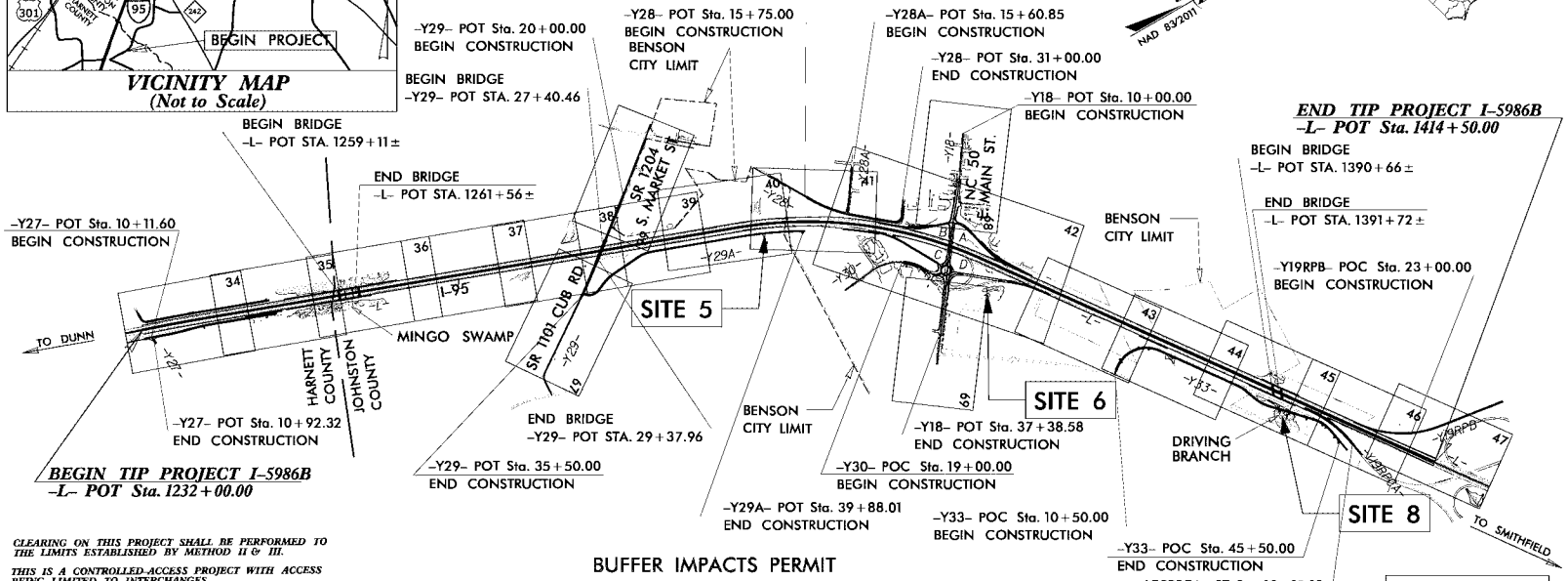
HARNETT AND JOHNSTON COUNTIES

LOCATION: IMPROVE I-95 INTERCHANGES AND WIDEN TO EIGHT LANES FROM NORTH OF SR 1709 (HODGES CHAPEL ROAD) (EXIT 77) TO I-40) (EXIT 81).

TYPE OF WORK: GRADING, PAVING, DRAINAGE, SIGNALS, CULVERT AND STRUCTURES



VICINITY MAP
(Not to Scale)



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A PORTION OF THIS PROJECT IS WITHIN BENSON MUNICIPAL BOUNDARIES

BUFFER IMPACTS PERMIT

UTILITY SECTION 4 (NORTH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2020 = 66,700
ADT 2040 = 92,900
K = 7 %
D = 55 %
T = 18 % *
V = 70 MPH
* (TTST 13% + DUAL 5%)
FUNC CLASS = INTERSTATE
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT I-5986B ..... 3.390 MILES
LENGTH STRUCTURES TIP PROJECT I-5986B ..... 0.066 MILES
TOTAL LENGTH OF TIP PROJECT I-5986B ..... 3.456 MILES

Prepared In the Office of:
Michael Baker INTERNATIONAL
Michael Baker Engineering, Inc.
8000 Regency Parkway, Suite 600
Cary, NC 27518
Professional Corporation License Number: F-1084
FOR DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: August 30, 2019

LETTING DATE: July 21, 2020

SUSAN C. LANCASTER, P.E.
PROJECT ENGINEER

RICK STATON
PROJECT DESIGN ENGINEER

STEVE D. KENDALL, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

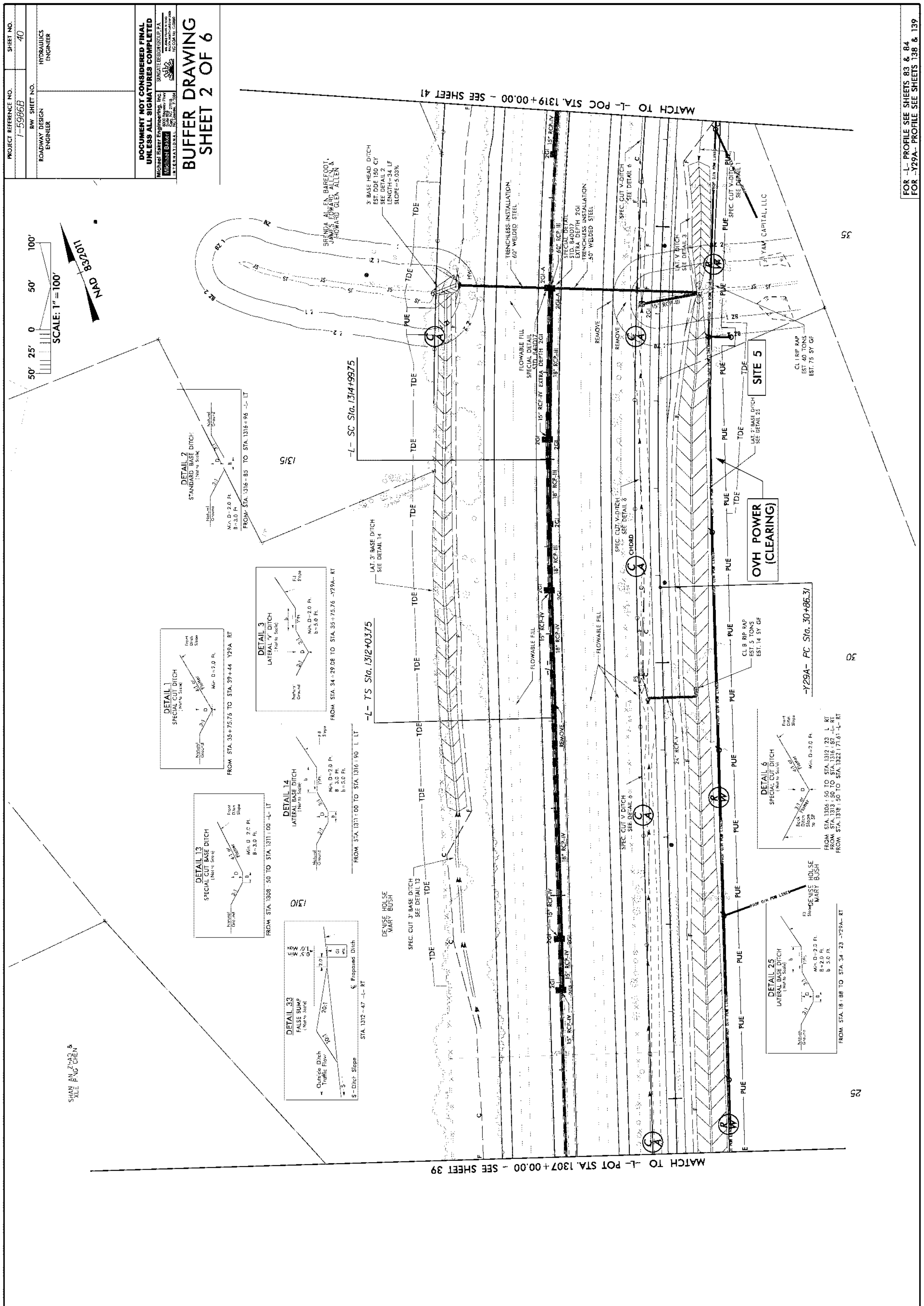
ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

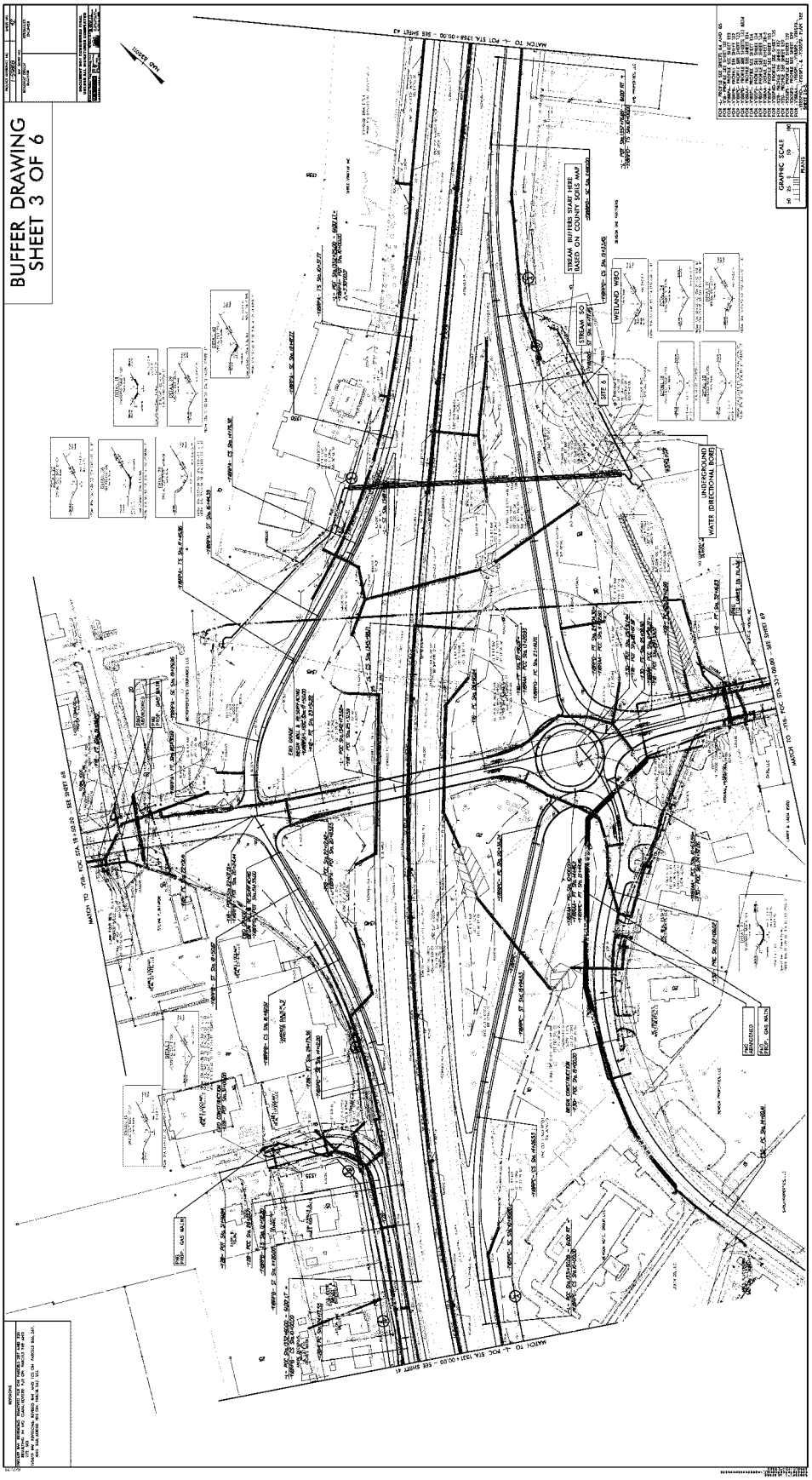
P-168

P-169

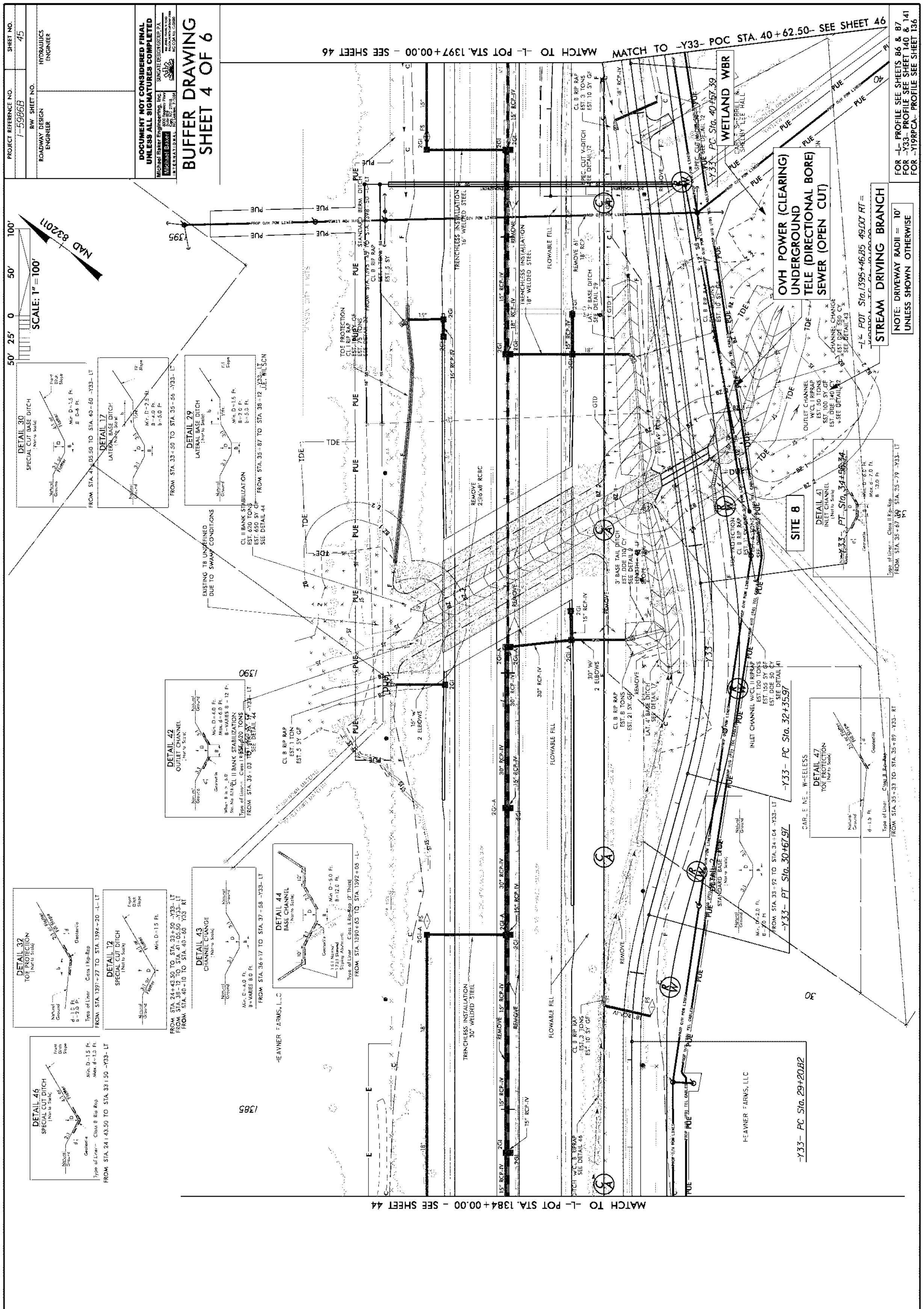


PROJECT REFERENCE NO.
I-5986B
SHEET NO.
40
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
BUFFER DRAWING
SHEET 2 OF 6
SCALE: 1"=100'
NAD 83/2011
MATCH TO -L- POC STA. 1319+00.00 - SEE SHEET 41
MATCH TO -L- POT STA. 1307+00.00 - SEE SHEET 39
SITE 5
OVH POWER (CLEARING)
-L- SC Sta. 1314+99.75
-L- TS Sta. 1312+03.75
-Y29A- PC Sta. 30+86.31
FOR -L- PROFILE SEE SHEETS 83 & 84
FOR -Y29A- PROFILE SEE SHEETS 138 & 139

P-170


BUFFER DRAWING
SHEET 3 OF 6
STREAM BUFFERS START HERE
BASED ON COUNTY SOILS MAP
STREAM (S)
WETLAND W(S)
UNDERGROUND
WATER (DIRECTIONAL BORE)
GRAPHIC SCALE

P-171


BUFFER DRAWING
SHEET 4 OF 6
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. I-5986B
SHEET NO. 45
SCALE: 1" = 100'
NAD 83/2011
MATCH TO -L- POT STA. 1397+00.00 - SEE SHEET 46
MATCH TO -Y33- POC STA. 40+62.50- SEE SHEET 46
MATCH TO -L- POT STA. 1384+00.00 - SEE SHEET 44
OVH POWER (CLEARING)
UNDERGROUND
TELE (DIRECTIONAL BORE)
SEWER (OPEN CUT)
STREAM DRIVING BRANCH
WETLAND WBR
SITE 8
NOTE: DRIVEWAY RADII = 10' UNLESS SHOWN OTHERWISE
FOR -L- PROFILE SEE SHEETS 86 & 87
FOR -Y33- PROFILE SEE SHEET 140 & 141
FOR -Y19RPCA- PROFILE SEE SHEET 136
HEAVNER FARMS, LLC
-Y33- PC Sta. 29+20.82
-Y33- PT Sta. 30+67.97
-Y33- PC Sta. 32+35.97
TRENCHLESS INSTALLATION 30" WELDED STEEL
FLOWABLE FILL

RIPARIAN BUFFER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	IMPACTS									BUFFER REPLACEMENT	
			TYPE			ALLOWABLE			MITIGABLE				
			ROAD CROSSING	BRIDGE	PARALLEL IMPACT	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)	TOTAL (ft^2)	ZONE 1 (ft^2)	ZONE 2 (ft^2)
5	1316+27 to 1317+55-L-	UTILITIES											
6	16+61 to 18+88-Y18RPD-LT	UTILITIES											
8	35+01 to 37+97-Y33-	UTILITIES											
TOTALS*:						0	0	0	0	0	0	0	0

NOTES:

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
12-28-2020
HARNETT/JOHNSON COUNTIES
I-5986B SECTION 4
47532.2.3
SHEET 5 OF 6

Revised 2018 Feb

WETLANDS IN BUFFER IMPACTS SUMMARY

SITE NO.	STATION (FROM/TO)		WETLANDS IN BUFFERS ZONE 1 (ft^2)	WETLANDS IN BUFFERS ZONE 2 (ft^2)
8	35+01 to 37+97-Y33-			
TOTAL:			**0**	**0**

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
12-28-2020
HARNETT/JOHNSON COUNTIES
I-5986B SECTION 4
47532.2.3
SHEET 6 OF 6

Revised 2018 Feb

P-173

Rev. Jan 2009

County : Harnett, Johnston

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	3 ACR		
0005	0022000000-E	225	UNCLASSIFIED EXCAVATION	503,000 CY		
0006	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (1260+34.00 -L-)	Lump Sum	L.S.	
0007	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (1391+19.65 -L-)	Lump Sum	L.S.	
0008	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (1002+79.68 -L REV-)	Lump Sum	L.S.	
0009	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (26+05.28 -Y14-)	Lump Sum	L.S.	
0010	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (26+80.73 -Y17-)	Lump Sum	L.S.	
0011	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (27+09.19 -Y16-)	Lump Sum	L.S.	
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (28+39.21 -Y29-)	Lump Sum	L.S.	
0013	0036000000-E	225	UNDERCUT EXCAVATION	73,700 CY		
0014	0106000000-E	230	BORROW EXCAVATION	780,000 CY		
0015	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	4 EA		
0016	0134000000-E	240	DRAINAGE DITCH EXCAVATION	37,470 CY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0017	0141000000-E	240	BERM DITCH CONSTRUCTION	2,055 LF		
0018	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	291,890 SY		
0019	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	44,225 SY		
0020	0192000000-N	260	PROOF ROLLING	175 HR		
0021	0194000000-E	265	SELECT GRANULAR MATERIAL, CLASS III	64,500 CY		
0022	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	671,200 SY		
0023	0199000000-E	SP	TEMPORARY SHORING	42,070 SF		
0024	0220000000-E	SP	ROCK EMBANKMENTS	1,925 TON		
0025	0222000000-E	SP	GEOTEXTILE FOR ROCK EMBANKMENTS	1,660 SY		
0026	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETROLEUM CONTAMINATED SOIL	550 TON		
0027	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	13,420 TON		
0028	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	51,497 SY		
0029	0342000000-E	310	**" SIDE DRAIN PIPE (30")	1,096 LF		
0030	0342000000-E	310	**" SIDE DRAIN PIPE (36")	596 LF		
0031	0342000000-E	310	**" SIDE DRAIN PIPE (42")	496 LF		
0032	0342000000-E	310	**" SIDE DRAIN PIPE (48")	256 LF		
0033	0342000000-E	310	**" SIDE DRAIN PIPE (54")	52 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0034	0342000000-E	310	**" SIDE DRAIN PIPE (60")	48 LF		
0035	0342000000-E	310	**" SIDE DRAIN PIPE (66")	372 LF		
0036	0342000000-E	310	**" SIDE DRAIN PIPE (84")	76 LF		
0037	0343000000-E	310	15" SIDE DRAIN PIPE	14,576 LF		
0038	0344000000-E	310	18" SIDE DRAIN PIPE	7,876 LF		
0039	0345000000-E	310	24" SIDE DRAIN PIPE	5,324 LF		
0040	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (15", V)	180 LF		
0041	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (18", V)	300 LF		
0042	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (24", V)	1,068 LF		
0043	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (36", V)	44 LF		
0044	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (42", V)	592 LF		
0045	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (48", V)	48 LF		
0046	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (54", V)	164 LF		
0047	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	356 LF		
0048	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	820 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0049	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	172 LF		
0050	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	1,228 LF		
0051	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	876 LF		
0052	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	112 LF		
0053	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	368 LF		
0054	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	8 LF		
0055	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	476 LF		
0056	0438000000-E	310	84" RC PIPE CULVERTS, CLASS III	208 LF		
0057	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	608 LF		
0058	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	476 LF		
0059	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	776 LF		
0060	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (66")	404 LF		
0061	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	28,164 LF		
0062	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	9,528 LF		
0063	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	11,676 LF		
0064	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	3,012 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0065	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	1,560 LF		
0066	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	3,056 LF		
0067	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	88 EA		
0068	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	9 EA		
0069	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (24", 0.064")	6 EA		
0070	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (30", 0.079")	4 EA		
0071	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (16", 0.281")	318 LF		
0072	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (18", 0.312")	258 LF		
0073	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (24", 0.375")	376 LF		
0074	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (30", 0.469")	290 LF		
0075	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (36", 0.532")	478 LF		
0076	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (42", 0.625")	394 LF		
0077	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (48", 0.688")	910 LF		
0078	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (54", 0.781")	54 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0079	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (60", 0.844")	636 LF		
0080	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (66", 0.938")	466 LF		
0081	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (84", 1.000")	122 LF		
0082	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (16", 0.281")	318 LF		
0083	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (18", 0.312")	258 LF		
0084	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (24", 0.375")	376 LF		
0085	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (30", 0.469")	290 LF		
0086	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (36", 0.532")	478 LF		
0087	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (42", 0.625")	394 LF		
0088	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (48", 0.688")	910 LF		
0089	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (54", 0.781")	54 LF		
0090	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (60", 0.844")	636 LF		
0091	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (66", 0.938")	466 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0092	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (84", 1.000")	122 LF		
0093	0986000000-E	SP	GENERIC PIPE ITEM 16" SEALED DIP, CLASS 250	284 LF		
0094	0986000000-E	SP	GENERIC PIPE ITEM 18" SEALED DIP, CLASS 250	216 LF		
0095	0986000000-E	SP	GENERIC PIPE ITEM 36" SEALED DIP, CLASS 150	704 LF		
0096	0986000000-E	SP	GENERIC PIPE ITEM 60" SEALED DIP, CLASS 150	580 LF		
0097	0995000000-E	340	PIPE REMOVAL	36,706 LF		
0098	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0099	1077000000-E	SP	#57 STONE	760 TON		
0100	1099500000-E	505	SHALLOW UNDERCUT	218,700 CY		
0101	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	368,350 TON		
0102	1121000000-E	520	AGGREGATE BASE COURSE	96,340 TON		
0103	1220000000-E	545	INCIDENTAL STONE BASE	5,000 TON		
0104	1275000000-E	600	PRIME COAT	29,540 GAL		
0105	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (1-1/2")	112,800 SY		
0106	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (3")	24,050 SY		
0107	1330000000-E	607	INCIDENTAL MILLING	5,130 SY		
0108	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	415,610 TON		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0109	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	215,170 TON		
0110	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	23,990 TON		
0111	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	52,510 TON		
0112	1524200000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5D	127,120 TON		
0113	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	33,920 TON		
0114	1577000000-E	620	POLYMER MODIFIED ASPHALT BINDER FOR PLANT MIX	7,250 TON		
0115	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	6,168 TON		
0116	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	279,320 LF		
0117	1891000000-E	SP	GENERIC PAVING ITEM 12" CONCRETE TRUCK APRON	1,755 SY		
0118	2022000000-E	815	SUBDRAIN EXCAVATION	27,165.4 CY		
0119	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	80,849.5 SY		
0120	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	13,582.7 CY		
0121	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	80,849.5 LF		
0122	2070000000-N	815	SUBDRAIN PIPE OUTLET	163 EA		
0123	2077000000-E	815	6" OUTLET PIPE	978 LF		
0124	2099000000-E	816	SHOULDER DRAIN	106,480 LF		
0125	2110000000-E	816	4" SHOULDER DRAIN PIPE	106,480 LF		
0126	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	3,450 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0127	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	190 EA		
0128	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	24 EA		
0129	2209000000-E	838	ENDWALLS	349.5 CY		
0130	2220000000-E	838	REINFORCED ENDWALLS	90.6 CY		
0131	2253000000-E	840	PIPE COLLARS	2.2 CY		
0132	2264000000-E	840	PIPE PLUGS	0.9 CY		
0133	2275000000-E	SP	FLOWABLE FILL	2,296 CY		
0134	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	844 EA		
0135	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	216.4 CY		
0136	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	364.4 LF		
0137	2354200000-N	840	FRAME WITH GRATE, STD 840.24	3 EA		
0138	2355000000-N	840	FRAME WITH GRATE, STD 840.29	4 EA		
0139	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	69 EA		
0140	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	120 EA		
0141	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	122 EA		
0142	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	23 EA		
0143	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	49 EA		
0144	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	26 EA		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0145	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	51 EA		
0146	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	63 EA		
0147	2396000000-N	840	FRAME WITH COVER, STD 840.54	45 EA		
0148	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	304 EA		
0149	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	49 EA		
0150	2473000000-N	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	5 EA		
0151	2484000000-E	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	9.3 LF		
0152	2495000000-E	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	25.1 CY		
0153	2535000000-E	846	**"X **" CONCRETE CURB (8" X 18")	875 LF		
0154	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	1,195 LF		
0155	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	15,885 LF		
0156	2556000000-E	846	SHOULDER BERM GUTTER	7,575 LF		
0157	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	1,510 LF		
0158	2591000000-E	848	4" CONCRETE SIDEWALK	4,200 SY		
0159	2605000000-N	848	CONCRETE CURB RAMPS	70 EA		
0160	2619000000-E	850	4" CONCRETE PAVED DITCH	700 SY		
0161	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	5,335 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0162	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T)	35,754 LF		
0163	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	18,446 LF		
0164	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	2,141 LF		
0165	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	8 EA		
0166	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	4,599 LF		
0167	2738000000-E	SP	GENERIC PAVING ITEM 6" CONCRETE DRIVEWAY	1,915 SY		
0168	2752000000-E	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	818 LF		
0169	2830000000-N	858	ADJUSTMENT OF MANHOLES	10 EA		
0170	2845000000-N	858	ADJUSTMENT OF METER BOXES OR VALVE BOXES	21 EA		
0171	3001000000-N	SP	IMPACT ATTENUATOR UNITS, TYPE TL-3	2 EA		
0172	3030000000-E	862	STEEL BEAM GUARDRAIL	22,887.5 LF		
0173	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	887.5 LF		
0174	3060000000-E	862	STEEL BEAM GUARDRAIL, DOUBLE FACED	400 LF		
0175	3105000000-N	862	STEEL BEAM GUARDRAIL TERMINAL SECTIONS	2 EA		
0176	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	75 EA		
0177	3180000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)	1 EA		
0178	3195000000-N	862	GUARDRAIL END UNITS, TYPE AT-1	2 EA		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0179	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	29 EA		
0180	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	6 EA		
0181	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	58 EA		
0182	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	20 EA		
0183	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	44 EA		
0184	3360000000-E	863	REMOVE EXISTING GUARDRAIL	66,522 LF		
0185	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	152 LF		
0186	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	6 EA		
0187	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	1 EA		
0188	3389200000-E	865	CABLE GUIDERAIL	1,100 LF		
0189	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	4 EA		
0190	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	64,275 LF		
0191	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	4,118 EA		
0192	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	872 EA		
0193	3566000000-E	867	WOVEN WIRE FENCE RESET	5,170 LF		
0194	3628000000-E	876	RIP RAP, CLASS I	2,920 TON		
0195	3635000000-E	876	RIP RAP, CLASS II	5,795 TON		
0196	3642000000-E	876	RIP RAP, CLASS A	650 TON		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0197	3649000000-E	876	RIP RAP, CLASS B	3,760 TON		
0198	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	22,360 SY		
0199	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	29 CY		
0200	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	11 CY		
0201	4057000000-E	SP	OVERHEAD FOOTING	344 CY		
0202	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	44,263 LB		
0203	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	8,107 LF		
0204	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1019+50 -L-)	Lump Sum	L.S.	
0205	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1034+40 -L-)	Lump Sum	L.S.	
0206	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1044+00 -L-)	Lump Sum	L.S.	
0207	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1060+60 -L-)	Lump Sum	L.S.	
0208	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1070+50 -L-)	Lump Sum	L.S.	
0209	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1087+00 -L-)	Lump Sum	L.S.	
0210	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1117+00 -L-)	Lump Sum	L.S.	
0211	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1136+00 -L-)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0212	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1141+00 -L-)	Lump Sum	L.S.	
0213	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1162+00 -L-)	Lump Sum	L.S.	
0214	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1167+00 -L-)	Lump Sum	L.S.	
0215	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1188+75 -L-)	Lump Sum	L.S.	
0216	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1220+56 -L-)	Lump Sum	L.S.	
0217	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1247+00 -L-)	Lump Sum	L.S.	
0218	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1272+50 -L-)	Lump Sum	L.S.	
0219	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1278+50 -L-)	Lump Sum	L.S.	
0220	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1305+00 -L-)	Lump Sum	L.S.	
0221	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1331+50 -L-)	Lump Sum	L.S.	
0222	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1351+00 -L-)	Lump Sum	L.S.	
0223	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1367+00 -L-)	Lump Sum	L.S.	
0224	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1377+00 -L-)	Lump Sum	L.S.	

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0225	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1393+50 -L-)	Lump Sum	L.S.	
0226	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (956+67 -L-)	Lump Sum	L.S.	
0227	4096000000-N	904	SIGN ERECTION, TYPE D	39 EA		
0228	4102000000-N	904	SIGN ERECTION, TYPE E	367 EA		
0229	4108000000-N	904	SIGN ERECTION, TYPE F	60 EA		
0230	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	25 EA		
0231	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	24 EA		
0232	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	20 EA		
0233	4114000000-N	904	SIGN ERECTION, MILEMARKERS	18 EA		
0234	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	48 EA		
0235	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (E)	3 EA		
0236	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	48 EA		
0237	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	4 EA		
0238	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	76 EA		
0239	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	317 EA		
0240	4158000000-N	907	DISPOSAL OF SIGN SYSTEM, WOOD	4 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0241	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	7,483 SF		
0242	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	2,791 SF		
0243	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	1,930 SF		
0244	4415000000-N	1115	FLASHING ARROW BOARD	10 EA		
0245	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	16 EA		
0246	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	10 EA		
0247	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	28 EA		
0248	4432000000-N	SP	HIGH VISIBILITY DRUMS	4,143 EA		
0249	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	58 EA		
0250	4435000000-N	1135	CONES	300 EA		
0251	4445000000-E	1145	BARRICADES (TYPE III)	3,142 LF		
0252	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	72 LF		
0253	4455000000-N	1150	FLAGGER	776 DAY		
0254	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	59 EA		
0255	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	12 EA		
0256	4480000000-N	1165	TMA	4 EA		
0257	4485000000-E	1170	PORTABLE CONCRETE BARRIER	112,861 LF		
0258	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	79,428 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0259	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	158,004 LF		
0260	4505000000-E	1170	REMOVE & RESET PORTABLE CONCRETE BARRIER (ANCHORED)	16,701 LF		
0261	4510000000-N	1190	LAW ENFORCEMENT	588 HR		
0262	4570000000-E	SP	TEMPORARY GLARE SCREEN	6,148 LF		
0263	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	18 EA		
0264	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8 EA		
0265	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	11,269 EA		
0266	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	258,127 LF		
0267	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	288,842 LF		
0268	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	3,970 LF		
0269	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	5,155 LF		
0270	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	2 EA		
0271	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	163 EA		
0272	4805000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II)	28 EA		
0273	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	331,970 LF		
0274	4815000000-E	1205	PAINT PAVEMENT MARKING LINES (6")	1,512,354 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0275	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	1,370 LF		
0276	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	99,176 LF		
0277	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	2,900 LF		
0278	4840000000-N	1205	PAINT PAVEMENT MARKING CHARAC-TER	83 EA		
0279	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	570 EA		
0280	4847400000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 4"	622,310 LF		
0281	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	1,477,687 LF		
0282	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	99,172 LF		
0283	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	29,920 LF		
0284	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	743,244 LF		
0285	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	49,586 LF		
0286	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	53 LF		
0287	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	27 EA		
0288	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12", 20 MILS (STANDARD GLASS BEADS)	100 LF		
0289	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 20 MILS (STANDARD GLASS BEADS)	5,156 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0290	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 20 MILS (STANDARD GLASS BEADS)	1,450 LF		
0291	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 24"	5,755 LF		
0292	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 8"	2,722 LF		
0293	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVMENT MARKING LINES (24", 90 MILS)	2,072 LF		
0294	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS	12,000 EA		
0295	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING CHARACTER	560 EA		
0296	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING SYMBOL	303 EA		
0297	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	6,000 EA		
0298	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA		
0299	5015000000-E	1401	120' HIGH MOUNT STANDARD	17 EA		
0300	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA		
0301	5025000000-E	SP	HIGH MOUNT FOUNDATIONS	204 CY		
0302	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)	24 EA		
0303	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M1)	18 EA		
0304	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M2)	6 EA		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0305	5120000000-N	1407	ELECTRIC SERVICE POLE **** ******** (30' CLASS 4)	5 EA		
0306	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 #1/0 USE)	125 LF		
0307	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	14,418 LF		
0308	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	485 LF		
0309	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")	423 LF		
0310	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")	1,236 LF		
0311	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")	809 LF		
0312	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (6")	215 LF		
0313	5170000000-E	1410	** #8 W/G FEEDER CIRCUIT (2)	2,603 LF		
0314	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2)	2,619 LF		
0315	5180000000-E	1410	** #4 W/G FEEDER CIRCUIT (2)	759 LF		
0316	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	15,362 LF		
0317	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	7,109 LF		
0318	5215000000-E	1410	** #4 W/G FEEDER CIRCUIT IN ******" CONDUIT (2, 1.5")	5,407 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0319	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (BR18)	8 EA		
0320	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (CS36)	5 EA		
0321	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM18)	18 EA		
0322	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM30)	1 EA		
0323	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM36)	1 EA		
0324	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG18)	44 EA		
0325	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG30)	10 EA		
0326	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG36)	6 EA		
0327	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0328	5260000000-N	SP	GENERIC LIGHTING ITEM LUMINAIRE STORAGE	Lump Sum	L.S.	
0329	5265000000-E	SP	GENERIC LIGHTING ITEM STREET LIGHTING CONDUIT IN-STALLATION (2" PVC)	4,320 LF		
0330	5270000000-N	SP	GENERIC LIGHTING ITEM 100' HIGH MOUNT LUMINAIRE - LED	18 EA		
0331	5270000000-N	SP	GENERIC LIGHTING ITEM 120' HIGH MOUNT LUMINAIRE - LED	128 EA		
0332	5270000000-N	SP	GENERIC LIGHTING ITEM COMMUNICATION GATEWAY	4 EA		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0333	5270000000-N	SP	GENERIC LIGHTING ITEM CONTROL NODE	174 EA		
0334	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE RW, 240/480V	4 EA		
0335	5270000000-N	SP	GENERIC LIGHTING ITEM REINSTALL COBRAHEAD LUMINAIRE	20 EA		
0336	5270000000-N	SP	GENERIC LIGHTING ITEM REINSTALL HIGH MAST LUMINAIRE	8 EA		
0337	5270000000-N	SP	GENERIC LIGHTING ITEM RELOCATE CONTROL SYSTEM	1 EA		
0338	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STANDARD FOUNDATION	2 EA		
0339	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STANDARD	2 EA		
0340	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE LIGHT STANDARD FOUNDATION	20 EA		
0341	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STANDARD - DISPOSE	10 EA		
0342	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STANDARD - SALVAGE	10 EA		
0343	5270000000-N	SP	GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMINAIRE - 285W LED	28 EA		
0344	5325200000-E	1510	2" WATER LINE	187 LF		
0345	5325600000-E	1510	6" WATER LINE	22,499 LF		
0346	5325800000-E	1510	8" WATER LINE	4,239 LF		
0347	5326200000-E	1510	12" WATER LINE	19,081 LF		
0348	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	62,845 LB		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0349	5536000000-E	1515	2" VALVE	3 EA		
0350	5540000000-E	1515	6" VALVE	53 EA		
0351	5546000000-E	1515	8" VALVE	9 EA		
0352	5558000000-E	1515	12" VALVE	20 EA		
0353	5571600000-E	1515	6" TAPPING SLEEVE & VALVE	12 EA		
0354	5571800000-E	1515	8" TAPPING SLEEVE & VALVE	6 EA		
0355	5572200000-E	1515	12" TAPPING SLEEVE & VALVE	16 EA		
0356	5573000000-E	1515	20" TAPPING SLEEVE & VALVE	2 EA		
0357	5589200000-E	1515	2" AIR RELEASE VALVE	7 EA		
0358	5606000000-E	1515	2" BLOW OFF	7 EA		
0359	5648000000-N	1515	RELOCATE WATER METER	53 EA		
0360	5649000000-N	1515	RECONNECT WATER METER	22 EA		
0361	5656000000-E	1515	**" RPZ BACKFLOW PREVENTION ASSEMBLY (1")	1 EA		
0362	5656200000-E	1515	2" RPZ BACKFLOW PREVENTION ASSEMBLY	2 EA		
0363	5666000000-N	1515	FIRE HYDRANT	1 EA		
0364	5672000000-N	1515	RELOCATE FIRE HYDRANT	25 EA		
0365	5673000000-E	1515	FIRE HYDRANT LEG	8 LF		
0366	5678400000-E	1515	6" LINE STOP	6 EA		
0367	5678600000-E	1515	8" LINE STOP	4 EA		
0368	5679000000-E	1515	12" LINE STOP	12 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0369	5679400000-E	1515	20" LINE STOP	2 EA		
0370	5686000000-E	1515	**" WATER SERVICE LINE (2")	197 LF		
0371	5686500000-E	1515	WATER SERVICE LINE	2,323 LF		
0372	5691000000-E	1520	**" SANITARY GRAVITY SEWER (15")	40 LF		
0373	5691300000-E	1520	8" SANITARY GRAVITY SEWER	4,306 LF		
0374	5691400000-E	1520	10" SANITARY GRAVITY SEWER	195 LF		
0375	5691500000-E	1520	12" SANITARY GRAVITY SEWER	1,928 LF		
0376	5691600000-E	1520	16" SANITARY GRAVITY SEWER	3,992 LF		
0377	5691700000-E	1520	18" SANITARY GRAVITY SEWER	1,352 LF		
0378	5709100000-E	1520	2" FORCE MAIN SEWER	1,029 LF		
0379	5709300000-E	1520	6" FORCE MAIN SEWER	709 LF		
0380	5709400000-E	1520	8" FORCE MAIN SEWER	2,545 LF		
0381	5709800000-E	1520	20" FORCE MAIN SEWER	988 LF		
0382	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	18 EA		
0383	5768500000-E	1520	SEWER SERVICE LINE	486 LF		
0384	5769000000-E	1520	DUCTILE IRON SEWER PIPE FITTINGS	1,285 LB		
0385	5775000000-E	1525	4' DIA UTILITY MANHOLE	63 EA		
0386	5776000000-E	1525	5' DIA UTILITY MANHOLE	5 EA		
0387	5777000000-E	1525	6' DIA UTILITY MANHOLE	4 EA		
0388	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	318 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0389	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	20 LF		
0390	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	38 LF		
0391	5798000000-E	1530	ABANDON **" UTILITY PIPE (15")	3,170 LF		
0392	5798000000-E	1530	ABANDON **" UTILITY PIPE (4")	683 LF		
0393	5800000000-E	1530	ABANDON 6" UTILITY PIPE	1,615 LF		
0394	5801000000-E	1530	ABANDON 8" UTILITY PIPE	2,639 LF		
0395	5802000000-E	1530	ABANDON 10" UTILITY PIPE	48 LF		
0396	5804000000-E	1530	ABANDON 12" UTILITY PIPE	10,691 LF		
0397	5805000000-E	1530	ABANDON 14" UTILITY PIPE	1,335 LF		
0398	5812000000-E	1530	ABANDON 20" UTILITY PIPE	947 LF		
0399	5815000000-N	1530	REMOVE WATER METER	6 EA		
0400	5816000000-N	1530	ABANDON UTILITY MANHOLE	39 EA		
0401	5828000000-N	1530	REMOVE UTILITY MANHOLE	1 EA		
0402	5835400000-E	1540	6" ENCASEMENT PIPE	216 LF		
0403	5835700000-E	1540	16" ENCASEMENT PIPE	1,327 LF		
0404	5835800000-E	1540	18" ENCASEMENT PIPE	248 LF		
0405	5835900000-E	1540	20" ENCASEMENT PIPE	122 LF		
0406	5836000000-E	1540	24" ENCASEMENT PIPE	2,422 LF		
0407	5836200000-E	1540	30" ENCASEMENT PIPE	1,045 LF		
0408	5836400000-E	1540	36" ENCASEMENT PIPE	661 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0409	5872500000-E	1550	BORE AND JACK OF **" (16")	800 LF		
0410	5872500000-E	1550	BORE AND JACK OF **" (18")	125 LF		
0411	5872500000-E	1550	BORE AND JACK OF **" (20")	122 LF		
0412	5872500000-E	1550	BORE AND JACK OF **" (24")	1,440 LF		
0413	5872500000-E	1550	BORE AND JACK OF **" (30")	550 LF		
0414	5872500000-E	1550	BORE AND JACK OF **" (36")	325 LF		
0415	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (20")	899 LF		
0416	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (6")	1,380 LF		
0417	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (8")	477 LF		
0418	5876000000-N	SP	STEEL PILE PIERS	6 EA		
0419	5882000000-N	SP	GENERIC UTILITY ITEM 12" INSERT VALVE	4 EA		
0420	5882000000-N	SP	GENERIC UTILITY ITEM 6" INSERT VALVE	6 EA		
0421	5882000000-N	SP	GENERIC UTILITY ITEM 8" INSERT VALVE	4 EA		
0422	5882000000-N	SP	GENERIC UTILITY ITEM REMOVE EXISTING VAULT, BYPASS AND STOCKPILE VALVES	1 EA		
0423	5912000000-N	SP	GENERIC UTILITY ITEM RELOCATE MASTER METER AND INSTALL NEW VAULT	Lump Sum	L.S.	
0424	6000000000-E	1605	TEMPORARY SILT FENCE	184,105 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0425	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	7,900 TON		
0426	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	25,330 TON		
0427	6012000000-E	1610	SEDIMENT CONTROL STONE	21,750 TON		
0428	6015000000-E	1615	TEMPORARY MULCHING	396.5 ACR		
0429	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	20,500 LB		
0430	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	104.5 TON		
0431	6024000000-E	1622	TEMPORARY SLOPE DRAINS	17,100 LF		
0432	6029000000-E	SP	SAFETY FENCE	8,640 LF		
0433	6030000000-E	1630	SILT EXCAVATION	132,360 CY		
0434	6036000000-E	1631	MATTING FOR EROSION CONTROL	580,800 SY		
0435	6037000000-E	SP	COIR FIBER MAT	2,825 SY		
0436	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	355 SY		
0437	6042000000-E	1632	1/4" HARDWARE CLOTH	37,675 LF		
0438	6043000000-E	SP	LOW PERMEABILITY GEOTEXTILE	8,725 SY		
0439	6045000000-E	SP	**" TEMPORARY PIPE (18")	390 LF		
0440	6045000000-E	SP	**" TEMPORARY PIPE (24")	150 LF		
0441	6045000000-E	SP	**" TEMPORARY PIPE (30")	360 LF		
0442	6045000000-E	SP	**" TEMPORARY PIPE (36")	120 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0443	6045000000-E	SP	**" TEMPORARY PIPE (48")	1,200 LF		
0444	6045000000-E	SP	**" TEMPORARY PIPE (54")	391 LF		
0445	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	750 SY		
0446	6070000000-N	1639	SPECIAL STILLING BASINS	38 EA		
0447	6071012000-E	SP	COIR FIBER WATTLE	41,360 LF		
0448	6071020000-E	SP	POLYACRYLAMIDE (PAM)	23,160 LB		
0449	6071030000-E	1640	COIR FIBER BAFFLE	25,740 LF		
0450	6071050000-E	SP	**" SKIMMER (1-1/2")	18 EA		
0451	6071050000-E	SP	**" SKIMMER (2")	26 EA		
0452	6071050000-E	SP	**" SKIMMER (2-1/2")	18 EA		
0453	6071050000-E	SP	**" SKIMMER (3")	8 EA		
0454	6084000000-E	1660	SEEDING & MULCHING	360 ACR		
0455	6087000000-E	1660	MOWING	235 ACR		
0456	6090000000-E	1661	SEED FOR REPAIR SEEDING	4,300 LB		
0457	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	13.25 TON		
0458	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	8,050 LB		
0459	6108000000-E	1665	FERTILIZER TOPDRESSING	241 TON		
0460	6111000000-E	SP	IMPERVIOUS DIKE	1,573 LF		
0461	6114500000-N	1667	SPECIALIZED HAND MOWING	110 MHR		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0462	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	300 EA		
0463	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	24 EA		
0464	6120000000-E	SP	CULVERT DIVERSION CHANNEL	69 CY		
0465	6123000000-E	1670	REFORESTATION	0.25 ACR		
0466	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	210 EA		
0467	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	35 EA		
0468	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	18 EA		
0469	7060000000-E	1705	SIGNAL CABLE	7,540 LF		
0470	7108000000-E	1705	VEHICLE SIGNAL HEAD (12", 1 SECTION)	6 EA		
0471	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	34 EA		
0472	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	3 EA		
0473	7180000000-N	1706	BACKPLATE	43 EA		
0474	7252000000-E	1710	MESSENGER CABLE (1/4")	2,430 LF		
0475	7264000000-E	1710	MESSENGER CABLE (3/8")	2,160 LF		
0476	7279000000-E	1715	TRACER WIRE	700 LF		
0477	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	6,700 LF		
0478	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	270 LF		
0479	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,360 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0480	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	78 EA		
0481	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)	14 EA		
0482	7360000000-N	1720	WOOD POLE	4 EA		
0483	7372000000-N	1721	GUY ASSEMBLY	7 EA		
0484	7384000000-E	1722	***" RISER WITH ********** (1-1/2", WEATHERHEAD)	2 EA		
0485	7384000000-E	1722	***" RISER WITH ********** (1-1/4", WEATHERHEAD)	12 EA		
0486	7408000000-E	1722	1" RISER WITH WEATHERHEAD	33 EA		
0487	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	2 EA		
0488	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	3,460 LF		
0489	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	8,160 LF		
0490	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (24)	3,425 LF		
0491	7528000000-E	1730	DROP CABLE	320 LF		
0492	7540000000-N	1731	SPLICE ENCLOSURE	3 EA		
0493	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	1 EA		
0494	7552000000-N	1731	INTERCONNECT CENTER	3 EA		
0495	7575000000-N	SP	FIBER-OPTIC TRAINING	Lump Sum	L.S.	
0496	7575142010-N	1736	900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO	3 EA		
0497	7575142060-N	SP	MODIFY RADIO INSTALLATION	7 EA		
0498	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	2,795 LF		

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0499	7576000000-N	SP	METAL STRAIN SIGNAL POLE	16 EA		
0500	7613000000-N	SP	SOIL TEST	16 EA		
0501	7614100000-E	SP	DRILLED PIER FOUNDATION	149 CY		
0502	7636000000-N	1745	SIGN FOR SIGNALS	8 EA		
0503	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	18 EA		
0504	7684000000-N	1750	SIGNAL CABINET FOUNDATION	4 EA		
0505	7686000000-N	1752	CONDUIT ENTRANCE INTO EXISTING FOUNDATION	3 EA		
0506	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070LX, BASE MOUNTED)	4 EA		
0507	7744000000-N	1751	DETECTOR CARD (TYPE 170)	22 EA		
0508	7901000000-N	1753	CABINET BASE EXTENDER	4 EA		
0509	7912000000-N	1755	BEACON CONTROLLER ASSEMBLY & CABINET (********) (TYPE F3)	1 EA		
0510	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	1 EA		
0511	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	17 EA		
0512	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET	17 EA		
0513	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	16 EA		
0514	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	23 EA		
0515	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	4 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0516	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	4 EA		
0517	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)	4 EA		
0518	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	17 EA		
0519	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	25 EA		
0520	7980000000-N	SP	GENERIC SIGNAL ITEM EXISTING CCTV CAMERA REMOVAL	6 EA		
0521	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX MARKER	6 EA		
0522	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA- TION PANEL	17 EA		
0523	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES	1 EA		
0524	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE EQUIPMENT	2 EA		
0525	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE 900 MHZ RADIO	5 EA		
0526	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 324	Lump Sum	L.S.	
0527	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 331	Lump Sum	L.S.	
0528	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-95 MM 78	Lump Sum	L.S.	
0529	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTOR	2,000 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0530	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC- TORS	6,150 LF		
0531	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC- TORS	100 LF		
			CULVERT ITEMS			
0532	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1042+08.93 -L-)	Lump Sum	L.S.	
0533	8126000000-N	414	CULVERT EXCAVATION, STA ****** (1042+08.93 -L-)	Lump Sum	L.S.	
0534	8126000000-N	414	CULVERT EXCAVATION, STA ****** (1220+34.00 -L-)	Lump Sum	L.S.	
0535	8126000000-N	414	CULVERT EXCAVATION, STA ****** (15+47.41 -NBCD-)	Lump Sum	L.S.	
0536	8126000000-N	414	CULVERT EXCAVATION, STA ****** (35+91.00 -Y33-)	Lump Sum	L.S.	
0537	8133000000-E	414	FOUNDATION CONDITIONING MATER- IAL, BOX CULVERT	1,008 TON		
0538	8196000000-E	420	CLASS A CONCRETE (CULVERT)	1,303.6 CY		
0539	8245000000-E	425	REINFORCING STEEL (CULVERT)	170,843 LB		
0540	8804000000-N	SP	GENERIC CULVERT ITEM ASBESTO ASSESSMENT	Lump Sum	L.S.	
			WALL ITEMS			
0541	8504000000-E	460	CONCRETE BARRIER RAIL WITH MOMENT SLAB	158.74 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0542	8801000000-E	SP	MSE RETAINING WALL NO **** (W3)	4,063 SF		
0543	8801000000-E	SP	MSE RETAINING WALL NO **** (W6)	791 SF		
0544	8801000000-E	SP	MSE RETAINING WALL NO **** (W8)	917 SF		
0545	8801000000-E	SP	MSE RETAINING WALL NO **** (W9)	316 SF		
0546	8801000000-E	SP	MSE RETAINING WALL NO **** W1-1 (I-5878)	8,300 SF		
0547	8801000000-E	SP	MSE RETAINING WALL NO **** W1-1 (I-5883)	3,800 SF		
0548	8801000000-E	SP	MSE RETAINING WALL NO **** W1-2 (I-5878)	4,275 SF		
0549	8801000000-E	SP	MSE RETAINING WALL NO **** W1-2 (I-5883)	3,400 SF		
0550	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5878)	5,750 SF		
0551	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5883)	3,500 SF		
0552	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5986B)	2,830 SF		
0553	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5878)	4,880 SF		
0554	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5883)	3,800 SF		
0555	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5986B)	2,770 SF		
0556	8802030000-E	454	SEGMENTAL GRAVITY RETAINING WALLS	450 SF		
0557	8802040000-E	453	CIP GRAVITY RETAINING WALLS	6,180 SF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0558	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT	41,169 SF		
0559	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT	37,450 SF		
0560	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW29-1	3,720 SF		
0561	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW32-1	7,570 SF		
0562	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW33-1	16,160 SF		
			STRUCTURE ITEMS			
0563	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1260+34.00 -L-)	Lump Sum	L.S.	
0564	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1391+19.65 -L-)	Lump Sum	L.S.	
0565	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (25+31.59 -Y18-)	Lump Sum	L.S.	
0566	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+05.28 -Y14-)	Lump Sum	L.S.	
0567	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+80.73 -Y17-)	Lump Sum	L.S.	
0568	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (27+09.19 -Y16-)	Lump Sum	L.S.	
0569	8042000000-N	402	REMOVAL OF EXISTING STRUCTURES AT STATION ********** (1002+79.68 -L REV-)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0570	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0571	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+05.28 -Y14-)	Lump Sum	L.S.	
0572	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+80.73 -Y17-)	Lump Sum	L.S.	
0573	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 27+09.19 -Y16-)	Lump Sum	L.S.	
0574	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 28+39.21 -Y29-)	Lump Sum	L.S.	
0575	8112730000-N	450	PDA TESTING	16 EA		
0576	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (1260+34.00 -L-)	Lump Sum	L.S.	
0577	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (1391+19.65 -L-)	Lump Sum	L.S.	
0578	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+05.28 -Y14-)	Lump Sum	L.S.	
0579	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+80.73 -Y17-)	Lump Sum	L.S.	
0580	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	104,193 SF		
0581	8161000000-E	420	GROOVING BRIDGE FLOORS	122,423 SF		
0582	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	205.7 CY		
0583	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	2,445.1 CY		
0584	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1002+79.68 -L REV-)	Lump Sum	L.S.	

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0585	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1260+34.00 -L-)	Lump Sum	L.S.	
0586	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1391+19.65 -L-)	Lump Sum	L.S.	
0587	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+05.28 -Y14-)	Lump Sum	L.S.	
0588	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+80.73 -Y17-)	Lump Sum	L.S.	
0589	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (27+09.19 -Y16-)	Lump Sum	L.S.	
0590	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (28+39.21 -Y29-)	Lump Sum	L.S.	
0591	8217000000-E	425	REINFORCING STEEL (BRIDGE)	392,154 LB		
0592	8224000000-E	425	EPOXY COATED REINFORCING STEEL (BRIDGE)	9,487 LB		
0593	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	4,743 LB		
0594	8265000000-E	430	54" PRESTRESSED CONCRETE GIRDERS	1,874.6 LF		
0595	8274000000-E	430	MODIFIED 63" PRESTRESSED CONC GIRDERS	2,137.5 LF		
0596	8296000000-N	442	POLLUTION CONTROL	Lump Sum	L.S.	
0597	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	381 EA		
0598	8328400000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** GALVANIZED STEEL PILES (PP 30 X 0.50)	32 EA		
0599	8364000000-E	450	HP12X53 STEEL PILES	26,470 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0600	8385200000-E	450	PP ** X **** GALVANIZED STEEL PILES (PP 30 X 0.50)	2,560 LF		
0601	8392000000-N	450	PIPE PILE PLATES	32 EA		
0602	8393000000-N	450	PILE REDRIVES	211 EA		
0603	8475000000-E	460	TWO BAR METAL RAIL	437.96 LF		
0604	8482000000-E	460	THREE BAR METAL RAIL	431 LF		
0605	8503000000-E	460	CONCRETE BARRIER RAIL	2,287.74 LF		
0606	8510000000-E	460	CONCRETE MEDIAN BARRIER	599.2 LF		
0607	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 3'-7")	453.67 LF		
0608	8531000000-E	462	4" SLOPE PROTECTION	245 SY		
0609	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	2,196 TON		
0610	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,428 SY		
0611	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0612	8692000000-N	SP	FOAM JOINT SEALS	Lump Sum	L.S.	
0613	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum	L.S.	
0614	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+05.28 -Y14-)	Lump Sum	L.S.	
0615	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+80.73 -Y17-)	Lump Sum	L.S.	
0616	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (27+09.19 -Y16-)	Lump Sum	L.S.	

County : Harnett, Johnston

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0617	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (28+39.21 -Y29-)	Lump Sum	L.S.	
0618	8860000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE NO 500051	Lump Sum	L.S.	
0619	8860000000-N	SP	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE NO 500051	Lump Sum	L.S.	
0620	8867000000-E	SP	GENERIC STRUCTURE ITEM 45" PREST CONC FLORIDA I-BEAM	7,090.17 LF		
0621	8867000000-E	SP	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT	149.47 LF		
0622	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATING	464 SF		
0623	8893000000-E	SP	GENERIC STRUCTURE ITEM PLACING & FINISHING PC OVERLAY	1,156 SY		
0624	8893000000-E	SP	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK	1,156 SY		
0625	8893000000-E	SP	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK	1,192 SY		
			******* BEGIN SCHEDULE AA ******* ******* (2 ALTERNATES) *******			
0626 AA1	8881000000-E	SP	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS	32 CY		
			*** OR ***			
0627 AA2	8881000000-E	SP	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIAL (ALTERNATE)	32 CY		
			***** END SCHEDULE AA *****			

DBE Goal Advertised: 9.00%
DBE Goal Obtained: 9.00%

Vendor 1 of 2: FLATIRON-FRED SMITH COMPANY JV (19178)
Call Order 002 (Proposal: C204543)

Bid Information

Proposal County: JOHNSTON HARNETT
Vendor Address: 860 AVIATION PARKWAY SUITE 1000
MORRISVILLE , NC , 27560
Signature Check: James Alan Schneiderman
Time Bid Received: July 20, 2021 01:57 PM
Amendment Count: 0

Bid Checksum: 24EA7AED27
Bid Total: $236,460,093.76
Items Total: $236,460,093.76
Time Total: $0.00

Bidding Errors:

Item Number: 8881000000-E [Line Number 0626]: Multiple options bid in group 'AA'.
Item Number: 8881000000-E [Line Number 0627]: Multiple options bid in group 'AA'.
HIATT & MASON ENTERPRISES INC/DBE: 0539 Price is over committed.
HIATT & MASON ENTERPRISES INC/DBE: 0591 Price is over committed.

Vendor 1 of 2: FLATIRON-FRED SMITH COMPANY JV (19178)
Call Order 002 (Proposal: C204543)

Bid Bond Information

Projects:		**Bond Maximum:**	
Counties:		**State of Incorporation:**	
Bond ID:	SNC21399402	**Agency Execution Date:**	07/19/2021 12
Paid by Check:	No	**Surety Name:**	Surety2000
Bond Percent:	5%	**Bond Agency Name:**	Liberty Mutual Insurance Company

DBE Load Information

Letting ID: L210720
Letting Date: 07/20/2021
Call Order: 002
Contract ID: C204543
Project: STATE FUNDEDSTATE FUNDEDSTATE FUNDEDSTATE FUNDED
Bid Total: $236,460,093.76
DBE Goal: 9.00% ($21,281,408.44)

Vendor ID: 19178
Vendor Name: Flatiron-Fred smith Company JV
DBE Entered: 9.01% ($21,303,594.68)

Vendor ID	DBE Name	Is Supplier?	City/State	Goods/Service	Amount
12278	CLIFTON CONSTRUCTION CO INC	False	1435 GIDDENSVILLE ROAD , FAISON, NC 28341	SubContractor committed	3,810,185.50
3304	FULFORD AND JONES ASPHALT INC	False	5509 HORNES CHURCH ROAD , WILSON, NC 27896	SubContractor committed	1,871,166.50
2676	PAUL D WILLIAMS DBA PAUL D. WILLIAMS HAULING	False	POST OFFICE BOX 1385 , DUNN, NC 28335	SubContractor committed	8,057,332.50
4247	SEAL BROTHERS CONTRACTING LLC	False	131 W. CLEVE STREET , MOUNT AIRY, NC 27030	SubContractor committed	284,206.50
4142	JERRY T BUNN TRUCKING LLC	False	6839 FLAT ROCK RD. , SIMS, NC 27880	SubContractor	2,224,334.76
3230	HIATT & MASON ENTERPRISES INC	False	POST OFFICE BOX 1378 , MOUNT AIRY, NC 27030	SubContractor committed	XX,XXX,XXX.XX $2,425,248.11
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607	SubContractor	277,367.58
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114	SubContractor committed	2,394,753.23

BondID: SNC21399402
Surety Registry Agency: Surety2000
Verified?: 1
Surety Agency: Liberty Mutual Insurance Company
Bond Execution Date: 07/19/2021 12:03:59 PM

Line Number	Item Number	Quantity	Unit	Unit Price	Extension Price
Section 0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$11,823,000.0000	$11,823,000.00
0002	0000400000-N CONSTRUCTION SURVEYING	1.000	LS	$2,500,000.0000	$2,500,000.00
0003	0001000000-E CLEARING & GRUBBING .. ACRE(S)	1.000	LS	$7,679,000.0000	$7,679,000.00
0004	0008000000-E SUPPLEMENTARY CLEARING & GRUB-BING	3.000	ACR	$12,000.0000	$36,000.00
0005	0022000000-E UNCLASSIFIED EXCAVATION	503000.000	CY	$9.0000	$4,527,000.00
0006	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (1260+34.00 -L-)	1.000	LS	$75,000.0000	$75,000.00
0007	0028000000-N TYPE I STANDARD APPROACH FILL STATION ********** (1391+19.65 -L-)	1.000	LS	$125,000.0000	$125,000.00
0008	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (1002+79.68 -L REV-)	1.000	LS	$105,000.0000	$105,000.00
0009	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (26+05.28 -Y14-)	1.000	LS	$100,000.0000	$100,000.00
0010	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (26+80.73 -Y17-)	1.000	LS	$65,000.0000	$65,000.00
0011	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (27+09.19 -Y16-)	1.000	LS	$75,000.0000	$75,000.00
0012	0029000000-N TYPE III REINFORCED APPROACH FILL, STATION ******* (28+39.21 -Y29-)	1.000	LS	$35,000.0000	$35,000.00
0013	0036000000-E UNDERCUT EXCAVATION	73700.000	CY	$10.0000	$737,000.00
0014	0106000000-E BORROW EXCAVATION	780000.000	CY	$10.0000	$7,800,000.00
0015	0127000000-N EMBANKMENT SETTLEMENT GAUGES	4.000	EA	$2,000.0000	$8,000.00
0016	0134000000-E DRAINAGE DITCH EXCAVATION	37470.000	CY	$18.0000	$674,460.00
0017	0141000000-E BERM DITCH CONSTRUCTION	2055.000	LF	$8.0000	$16,440.00
0018	0156000000-E REMOVAL OF EXISTING ASPHALT PAVEMENT	291890.000	SY	$12.0000	$3,502,680.00
0019	0177000000-E BREAKING OF EXISTING ASPHALT PAVEMENT	44225.000	SY	$3.0000	$132,675.00
0020	0192000000-N PROOF ROLLING	175.000	HR	$225.0000	$39,375.00
0021	0194000000-E SELECT GRANULAR MATERIAL, CLASS III	64500.000	CY	$13.0000	$838,500.00
0022	0196000000-E GEOTEXTILE FOR SOIL STABILIZA-TION	671200.000	SY	$1.5000	$1,006,800.00
0023	0199000000-E	42070.000	SF	$45.0000	$1,893,150.00

		TEMPORARY SHORING			
0024	0220000000-E	1925.000	TON	$62.0000	$119,350.00
		ROCK EMBANKMENTS			
0025	0222000000-E	1660.000	SY	$3.2000	$5,312.00
		GEOTEXTILE FOR ROCK EMBANK- MENTS			
0026	0255000000-E	550.000	TON	$85.0000	$46,750.00
		GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO- LEUM CONTAMINATED SOIL			
0027	0318000000-E	13420.000	TON	$46.0000	$617,320.00
		FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES			
0028	0320000000-E	51497.000	SY	$3.0000	$154,491.00
		FOUNDATION CONDITIONING GEO- TEXTILE			
0029	0342000000-E	1096.000	LF	$90.0000	$98,640.00
		**" SIDE DRAIN PIPE (30")			
0030	0342000000-E	596.000	LF	$115.0000	$68,540.00
		**" SIDE DRAIN PIPE (36")			
0031	0342000000-E	496.000	LF	$140.0000	$69,440.00
		**" SIDE DRAIN PIPE (42")			
0032	0342000000-E	256.000	LF	$175.0000	$44,800.00
		**" SIDE DRAIN PIPE (48")			
0033	0342000000-E	52.000	LF	$230.0000	$11,960.00
		**" SIDE DRAIN PIPE (54")			
0034	0342000000-E	48.000	LF	$250.0000	$12,000.00
		**" SIDE DRAIN PIPE (60")			
0035	0342000000-E	372.000	LF	$350.0000	$130,200.00
		**" SIDE DRAIN PIPE (66")			
0036	0342000000-E	76.000	LF	$450.0000	$34,200.00
		**" SIDE DRAIN PIPE (84")			
0037	0343000000-E	14576.000	LF	$48.0000	$699,648.00
		15" SIDE DRAIN PIPE			
0038	0344000000-E	7876.000	LF	$58.0000	$456,808.00
		18" SIDE DRAIN PIPE			
0039	0345000000-E	5324.000	LF	$72.0000	$383,328.00
		24" SIDE DRAIN PIPE			
0040	0354000000-E	180.000	LF	$50.0000	$9,000.00
		" RC PIPE CULVERTS, CLASS ** (15", V)			
0041	0354000000-E	300.000	LF	$55.0000	$16,500.00
		" RC PIPE CULVERTS, CLASS ** (18", V)			
0042	0354000000-E	1068.000	LF	$80.0000	$85,440.00
		" RC PIPE CULVERTS, CLASS ** (24", V)			
0043	0354000000-E	44.000	LF	$170.0000	$7,480.00
		" RC PIPE CULVERTS, CLASS ** (36", V)			
0044	0354000000-E	592.000	LF	$190.0000	$112,480.00
		" RC PIPE CULVERTS, CLASS ** (42", V)			
0045	0354000000-E	48.000	LF	$290.0000	$13,920.00
		" RC PIPE CULVERTS, CLASS ** (48", V)			
0046	0354000000-E	164.000	LF	$320.0000	$52,480.00
		" RC PIPE CULVERTS, CLASS ** (54", V)			
0047	0366000000-E	356.000	LF	$50.0000	$17,800.00
		15" RC PIPE CULVERTS, CLASS III			

0048	0372000000-E	820.000	LF	$55.0000	$45,100.00
	18" RC PIPE CULVERTS, CLASS III				
0049	0378000000-E	172.000	LF	$70.0000	$12,040.00
	24" RC PIPE CULVERTS, CLASS III				
0050	0384000000-E	1228.000	LF	$90.0000	$110,520.00
	30" RC PIPE CULVERTS, CLASS III				
0051	0390000000-E	876.000	LF	$115.0000	$100,740.00
	36" RC PIPE CULVERTS, CLASS III				
0052	0396000000-E	112.000	LF	$145.0000	$16,240.00
	42" RC PIPE CULVERTS, CLASS III				
0053	0402000000-E	368.000	LF	$185.0000	$68,080.00
	48" RC PIPE CULVERTS, CLASS III				
0054	0408000000-E	8.000	LF	$400.0000	$3,200.00
	54" RC PIPE CULVERTS, CLASS III				
0055	0414000000-E	476.000	LF	$125.0000	$59,500.00
	60" RC PIPE CULVERTS, CLASS III				
0056	0438000000-E	208.000	LF	$550.0000	$114,400.00
	84" RC PIPE CULVERTS, CLASS III				
0057	0448000000-E	608.000	LF	$220.0000	$133,760.00
	****" RC PIPE CULVERTS, CLASS IV (48")				
0058	0448000000-E	476.000	LF	$280.0000	$133,280.00
	****" RC PIPE CULVERTS, CLASS IV (54")				
0059	0448000000-E	776.000	LF	$350.0000	$271,600.00
	****" RC PIPE CULVERTS, CLASS IV (60")				
0060	0448000000-E	404.000	LF	$490.0000	$197,960.00
	****" RC PIPE CULVERTS, CLASS IV (66")				
0061	0448200000-E	28164.000	LF	$60.0000	$1,689,840.00
	15" RC PIPE CULVERTS, CLASS IV				
0062	0448300000-E	9528.000	LF	$65.0000	$619,320.00
	18" RC PIPE CULVERTS, CLASS IV				
0063	0448400000-E	11676.000	LF	$80.0000	$934,080.00
	24" RC PIPE CULVERTS, CLASS IV				
0064	0448500000-E	3012.000	LF	$95.0000	$286,140.00
	30" RC PIPE CULVERTS, CLASS IV				
0065	0448600000-E	1560.000	LF	$145.0000	$226,200.00
	36" RC PIPE CULVERTS, CLASS IV				
0066	0448700000-E	3056.000	LF	$125.0000	$382,000.00
	42" RC PIPE CULVERTS, CLASS IV				
0067	0636000000-E	88.000	EA	$670.0000	$58,960.00
	" CS PIPE ELBOWS, ***" THICK (15", 0.064")				
0068	0636000000-E	9.000	EA	$650.0000	$5,850.00
	" CS PIPE ELBOWS, ***" THICK (18", 0.064")				
0069	0636000000-E	6.000	EA	$450.0000	$2,700.00
	" CS PIPE ELBOWS, ***" THICK (24", 0.064")				
0070	0636000000-E	4.000	EA	$900.0000	$3,600.00
	" CS PIPE ELBOWS, ***" THICK (30", 0.079")				
0071	0973100000-E	318.000	LF	$355.0000	$112,890.00
	" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (16", 0.281")				
0072	0973100000-E	258.000	LF	$410.0000	$105,780.00

		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (18", 0.312")			
0073	0973100000-E	376.000	LF	$496.0000	$186,496.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (24", 0.375")			
0074	0973100000-E	290.000	LF	$516.0000	$149,640.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (30", 0.469")			
0075	0973100000-E	478.000	LF	$623.0000	$297,794.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (36", 0.532")			
0076	0973100000-E	394.000	LF	$735.0000	$289,590.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (42", 0.625")			
0077	0973100000-E	910.000	LF	$868.0000	$789,880.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (48", 0.688")			
0078	0973100000-E	54.000	LF	$1,150.0000	$62,100.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (54", 0.781")			
0079	0973100000-E	636.000	LF	$1,235.0000	$785,460.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (60", 0.844")			
0080	0973100000-E	466.000	LF	$1,886.0000	$878,876.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (66", 0.938")			
0081	0973100000-E	122.000	LF	$2,370.0000	$289,140.00
		" WELDED STEEL PIPE, **" THICK, GRADE B IN SOIL (84", 1.000")			
0082	0973300000-E	318.000	LF	$0.0100	$3.18
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (16", 0.281")			
0083	0973300000-E	258.000	LF	$0.0100	$2.58
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (18", 0.312")			
0084	0973300000-E	376.000	LF	$0.0100	$3.76
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (24", 0.375")			
0085	0973300000-E	290.000	LF	$0.0100	$2.90
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (30", 0.469")			
0086	0973300000-E	478.000	LF	$0.0100	$4.78
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (36", 0.532")			
0087	0973300000-E	394.000	LF	$0.0100	$3.94
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (42", 0.625")			
0088	0973300000-E	910.000	LF	$0.0100	$9.10
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (48", 0.688")			
0089	0973300000-E	54.000	LF	$0.0100	$0.54
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (54", 0.781")			
0090	0973300000-E	636.000	LF	$0.0100	$6.36
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (60", 0.844")			
0091	0973300000-E	466.000	LF	$0.0100	$4.66
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (66", 0.938")			
0092	0973300000-E	122.000	LF	$0.0100	$1.22
		" WELDED STEEL PIPE, **" THICK, GRADE B NOT IN SOIL (84", 1.000")			
0093	0986000000-E	284.000	LF	$120.0000	$34,080.00
		GENERIC PIPE ITEM 16" SEALED DIP, CLASS 250			
0094	0986000000-E	216.000	LF	$150.0000	$32,400.00
		GENERIC PIPE ITEM 18" SEALED DIP, CLASS 250			
0095	0986000000-E	704.000	LF	$220.0000	$154,880.00
		GENERIC PIPE ITEM 36" SEALED DIP, CLASS 150			
0096	0986000000-E	580.000	LF	$150.0000	$87,000.00
		GENERIC PIPE ITEM 60" SEALED DIP, CLASS 150			

0097	0995000000-E PIPE REMOVAL	36706.000	LF	$20.0000	$734,120.00
0098	1011000000-N FINE GRADING	1.000	LS	$5,028,000.0000	$5,028,000.00
0099	1077000000-E #57 STONE	760.000	TON	$60.0000	$45,600.00
0100	1099500000-E SHALLOW UNDERCUT	218700.000	CY	$10.4300	$2,281,041.00
0101	1099700000-E CLASS IV SUBGRADE STABILIZA- TION	368350.000	TON	$22.6500	$8,343,127.50
0102	1121000000-E AGGREGATE BASE COURSE	96340.000	TON	$41.0000	$3,949,940.00
0103	1220000000-E INCIDENTAL STONE BASE	5000.000	TON	$52.0000	$260,000.00
0104	1275000000-E PRIME COAT	29540.000	GAL	$5.0000	$147,700.00
0105	1297000000-E MILLING ASPHALT PAVEMENT, ***"DEPTH (1-1/2")	112800.000	SY	$1.6000	$180,480.00
0106	1297000000-E MILLING ASPHALT PAVEMENT, ***"DEPTH (3")	24050.000	SY	$1.9500	$46,897.50
0107	1330000000-E INCIDENTAL MILLING	5130.000	SY	$6.9500	$35,653.50
0108	1491000000-E ASPHALT CONC BASE COURSE, TYPE B25.0C	415610.000	TON	$41.5000	$17,247,815.00
0109	1503000000-E ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	215170.000	TON	$52.5000	$11,296,425.00
0110	1519000000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5B	23990.000	TON	$63.5000	$1,523,365.00
0111	1523000000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5C	52510.000	TON	$53.5000	$2,809,285.00
0112	1524200000-E ASPHALT CONC SURFACE COURSE, TYPE S9.5D	127120.000	TON	$63.5000	$8,072,120.00
0113	1575000000-E ASPHALT BINDER FOR PLANT MIX	33920.000	TON	$460.0000	$15,603,200.00
0114	1577000000-E POLYMER MODIFIED ASPHALT BIN- DER FOR PLANT MIX	7250.000	TON	$700.0000	$5,075,000.00
0115	1693000000-E ASPHALT PLANT MIX, PAVEMENT REPAIR	6168.000	TON	$200.0000	$1,233,600.00
0116	1840000000-E MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	279320.000	LF	$0.1400	$39,104.80
0117	1891000000-E GENERIC PAVING ITEM 12" CONCRETE TRUCK APRON	1755.000	SY	$105.0000	$184,275.00
0118	2022000000-E SUBDRAIN EXCAVATION	27165.400	CY	$31.0000	$842,127.40
0119	2026000000-E GEOTEXTILE FOR SUBSURFACE DRAINS	80849.500	SY	$9.5000	$768,070.25
0120	2036000000-E SUBDRAIN COARSE AGGREGATE	13582.700	CY	$61.0000	$828,544.70
0121	2044000000-E	80849.500	LF	$16.5000	$1,334,016.75

	6" PERFORATED SUBDRAIN PIPE				
0122	2070000000-N	163.000	EA	$355.0000	$57,865.00
	SUBDRAIN PIPE OUTLET				
0123	2077000000-E	978.000	LF	$41.0000	$40,098.00
	6" OUTLET PIPE				
0124	2099000000-E	106480.000	LF	$14.5000	$1,543,960.00
	SHOULDER DRAIN				
0125	2110000000-E	106480.000	LF	$2.6000	$276,848.00
	4" SHOULDER DRAIN PIPE				
0126	2121000000-E	3450.000	LF	$15.5000	$53,475.00
	4" OUTLET PIPE FOR SHOULDER DRAINS				
0127	2132000000-N	190.000	EA	$354.0000	$67,260.00
	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET				
0128	2190000000-N	24.000	EA	$2,800.0000	$67,200.00
	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE				
0129	2209000000-E	349.500	CY	$1,500.0000	$524,250.00
	ENDWALLS				
0130	2220000000-E	90.600	CY	$1,700.0000	$154,020.00
	REINFORCED ENDWALLS				
0131	2253000000-E	2.200	CY	$500.0000	$1,100.00
	PIPE COLLARS				
0132	2264000000-E	0.900	CY	$2,440.0000	$2,196.00
	PIPE PLUGS				
0133	2275000000-E	2296.000	CY	$300.0000	$688,800.00
	FLOWABLE FILL				
0134	2286000000-N	844.000	EA	$3,100.0000	$2,616,400.00
	MASONRY DRAINAGE STRUCTURES				
0135	2297000000-E	216.400	CY	$1,900.0000	$411,160.00
	MASONRY DRAINAGE STRUCTURES				
0136	2308000000-E	364.400	LF	$600.0000	$218,640.00
	MASONRY DRAINAGE STRUCTURES				
0137	2354200000-N	3.000	EA	$900.0000	$2,700.00
	FRAME WITH GRATE, STD 840.24				
0138	2355000000-N	4.000	EA	$750.0000	$3,000.00
	FRAME WITH GRATE, STD 840.29				
0139	2364000000-N	69.000	EA	$900.0000	$62,100.00
	FRAME WITH TWO GRATES, STD 840.16				
0140	2364200000-N	120.000	EA	$900.0000	$108,000.00
	FRAME WITH TWO GRATES, STD 840.20				
0141	2365000000-N	122.000	EA	$900.0000	$109,800.00
	FRAME WITH TWO GRATES, STD 840.22				
0142	2366000000-N	23.000	EA	$900.0000	$20,700.00
	FRAME WITH TWO GRATES, STD 840.24				
0143	2367000000-N	49.000	EA	$900.0000	$44,100.00
	FRAME WITH TWO GRATES, STD 840.29				
0144	2374000000-N	26.000	EA	$1,000.0000	$26,000.00
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)				
0145	2374000000-N	51.000	EA	$1,150.0000	$58,650.00
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)				

0146	2374000000-N	63.000	EA	$1,200.0000	$75,600.00
	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)				
0147	2396000000-N	45.000	EA	$900.0000	$40,500.00
	FRAME WITH COVER, STD 840.54				
0148	2407000000-N	304.000	EA	$2,200.0000	$668,800.00
	STEEL FRAME WITH TWO GRATES, STD 840.37				
0149	2451000000-N	49.000	EA	$1,250.0000	$61,250.00
	CONCRETE TRANSITIONAL SECTION FOR DROP INLET				
0150	2473000000-N	5.000	EA	$3,000.0000	$15,000.00
	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE				
0151	2484000000-E	9.300	LF	$650.0000	$6,045.00
	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE				
0152	2495000000-E	25.100	CY	$2,000.0000	$50,200.00
	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE				
0153	2535000000-E	875.000	LF	$30.0000	$26,250.00
	**"X **" CONCRETE CURB (8" X 18")				
0154	2542000000-E	1195.000	LF	$33.0000	$39,435.00
	1'-6" CONCRETE CURB & GUTTER				
0155	2549000000-E	15885.000	LF	$35.0000	$555,975.00
	2'-6" CONCRETE CURB & GUTTER				
0156	2556000000-E	7575.000	LF	$35.0000	$265,125.00
	SHOULDER BERM GUTTER				
0157	2577000000-E	1510.000	LF	$48.0000	$72,480.00
	CONCRETE EXPRESSWAY GUTTER				
0158	2591000000-E	4200.000	SY	$65.0000	$273,000.00
	4" CONCRETE SIDEWALK				
0159	2605000000-N	70.000	EA	$2,600.0000	$182,000.00
	CONCRETE CURB RAMPS				
0160	2619000000-E	700.000	SY	$287.0000	$200,900.00
	4" CONCRETE PAVED DITCH				
0161	2655000000-E	5335.000	SY	$72.0000	$384,120.00
	5" MONOLITHIC CONCRETE ISLANDS(KEYED IN)				
0162	2703000000-E	35754.000	LF	$113.0000	$4,040,202.00
	CONCRETE BARRIER, TYPE ******* (T)				
0163	2703000000-E	18446.000	LF	$135.0000	$2,490,210.00
	CONCRETE BARRIER, TYPE ******* (T1)				
0164	2703000000-E	2141.000	LF	$300.0000	$642,300.00
	CONCRETE BARRIER, TYPE ******* (T2)				
0165	2710000000-N	8.000	EA	$25,000.0000	$200,000.00
	CONCRETE BARRIER TRANSITION SECTION				
0166	2724000000-E	4599.000	LF	$85.0000	$390,915.00
	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED				
0167	2738000000-E	1915.000	SY	$224.0000	$428,960.00
	GENERIC PAVING ITEM 6" CONCRETE DRIVEWAY				
0168	2752000000-E	818.000	LF	$200.0000	$163,600.00
	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION				
0169	2830000000-N	10.000	EA	$1,250.0000	$12,500.00
	ADJUSTMENT OF MANHOLES				
0170	2845000000-N	21.000	EA	$1,250.0000	$26,250.00

		ADJUSTMENT OF METER BOXES OR VALVE BOXES			
0171	3001000000-N	2.000	EA	$24,500.0000	$49,000.00
	IMPACT ATTENUATOR UNITS, TYPE TL-3				
0172	3030000000-E	22887.500	LF	$24.0000	$549,300.00
	STEEL BEAM GUARDRAIL				
0173	3045000000-E	887.500	LF	$25.0000	$22,187.50
	STEEL BEAM GUARDRAIL, SHOP CURVED				
0174	3060000000-E	400.000	LF	$35.0000	$14,000.00
	STEEL BEAM GUARDRAIL, DOUBLE FACED				
0175	3105000000-N	2.000	EA	$76.0000	$152.00
	STEEL BEAM GUARDRAIL TERMINAL SECTIONS				
0176	3150000000-N	75.000	EA	$46.0000	$3,450.00
	ADDITIONAL GUARDRAIL POSTS				
0177	3180000000-N	1.000	EA	$1,895.0000	$1,895.00
	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)				
0178	3195000000-N	2.000	EA	$710.0000	$1,420.00
	GUARDRAIL END UNITS, TYPE AT-1				
0179	3210000000-N	29.000	EA	$910.0000	$26,390.00
	GUARDRAIL END UNITS, TYPE CAT-1				
0180	3215000000-N	6.000	EA	$1,820.0000	$10,920.00
	GUARDRAIL ANCHOR UNITS, TYPE III				
0181	3287000000-N	58.000	EA	$3,050.0000	$176,900.00
	GUARDRAIL END UNITS, TYPE TL-3				
0182	3288000000-N	20.000	EA	$2,830.0000	$56,600.00
	GUARDRAIL END UNITS, TYPE TL-2				
0183	3317000000-N	44.000	EA	$2,225.0000	$97,900.00
	GUARDRAIL ANCHOR UNITS, TYPE B-77				
0184	3360000000-E	66522.000	LF	$1.0000	$66,522.00
	REMOVE EXISTING GUARDRAIL				
0185	3380000000-E	152.000	LF	$12.0000	$1,824.00
	TEMPORARY STEEL BEAM GUARDRAIL				
0186	3387000000-N	6.000	EA	$1,450.0000	$8,700.00
	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)				
0187	3389150000-N	1.000	EA	$1,650.0000	$1,650.00
	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)				
0188	3389200000-E	1100.000	LF	$12.0000	$13,200.00
	CABLE GUIDERAIL				
0189	3389600000-N	4.000	EA	$2,830.0000	$11,320.00
	CABLE GUIDERAIL ANCHOR UNITS				
0190	3503000000-E	64275.000	LF	$2.5000	$160,687.50
	WOVEN WIRE FENCE, 47" FABRIC				
0191	3509000000-E	4118.000	EA	$19.0000	$78,242.00
	4" TIMBER FENCE POSTS, 7'-6" LONG				
0192	3515000000-E	872.000	EA	$25.0000	$21,800.00
	5" TIMBER FENCE POSTS, 8'-0" LONG				
0193	3566000000-E	5170.000	LF	$6.0000	$31,020.00
	WOVEN WIRE FENCE RESET				
0194	3628000000-E	2920.000	TON	$75.0000	$219,000.00
	RIP RAP, CLASS I				

0195	3635000000-E	5795.000	TON		$85.0000	$492,575.00
	RIP RAP, CLASS II					
0196	3642000000-E	650.000	TON		$100.0000	$65,000.00
	RIP RAP, CLASS A					
0197	3649000000-E	3760.000	TON		$70.0000	$263,200.00
	RIP RAP, CLASS B					
0198	3656000000-E	22360.000	SY		$3.5000	$78,260.00
	GEOTEXTILE FOR DRAINAGE					
0199	4048000000-E	29.000	CY		$877.0000	$25,433.00
	REINFORCED CONCRETE SIGN FOUN-DATIONS					
0200	4054000000-E	11.000	CY		$877.0000	$9,647.00
	PLAIN CONCRETE SIGN FOUNDA- TIONS					
0201	4057000000-E	344.000	CY		$1,550.0000	$533,200.00
	OVERHEAD FOOTING					
0202	4060000000-E	44263.000	LB		$6.2000	$274,430.60
	SUPPORTS, BREAKAWAY STEEL BEAM					
0203	4072000000-E	8107.000	LF		$7.2500	$58,775.75
	SUPPORTS, 3-LB STEEL U-CHANNEL					
0204	4082100000-N	1.000	LS		$40,000.0000	$40,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1019+50 -L-)					
0205	4082100000-N	1.000	LS		$47,000.0000	$47,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1034+40 -L-)					
0206	4082100000-N	1.000	LS		$49,000.0000	$49,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1044+00 -L-)					
0207	4082100000-N	1.000	LS		$47,000.0000	$47,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1060+60 -L-)					
0208	4082100000-N	1.000	LS		$48,000.0000	$48,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1070+50 -L-)					
0209	4082100000-N	1.000	LS		$43,000.0000	$43,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1087+00 -L-)					
0210	4082100000-N	1.000	LS		$40,000.0000	$40,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1117+00 -L-)					
0211	4082100000-N	1.000	LS		$43,500.0000	$43,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1136+00 -L-)					
0212	4082100000-N	1.000	LS		$44,000.0000	$44,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1141+00 -L-)					
0213	4082100000-N	1.000	LS		$41,000.0000	$41,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1162+00 -L-)					
0214	4082100000-N	1.000	LS		$44,000.0000	$44,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1167+00 -L-)					
0215	4082100000-N	1.000	LS		$48,000.0000	$48,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1188+75 -L-)					
0216	4082100000-N	1.000	LS		$57,000.0000	$57,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1220+56 -L-)					
0217	4082100000-N	1.000	LS		$44,000.0000	$44,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1247+00 -L-)					
0218	4082100000-N	1.000	LS		$51,000.0000	$51,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1272+50 -L-)					
0219	4082100000-N	1.000	LS		$54,000.0000	$54,000.00

		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1278+50 -L-)			
0220	4082100000-N	1.000	LS	$54,000.0000	$54,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1305+00 -L-)			
0221	4082100000-N	1.000	LS	$101,000.0000	$101,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1331+50 -L-)			
0222	4082100000-N	1.000	LS	$58,000.0000	$58,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1351+00 -L-)			
0223	4082100000-N	1.000	LS	$58,000.0000	$58,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1367+00 -L-)			
0224	4082100000-N	1.000	LS	$54,000.0000	$54,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1377+00 -L-)			
0225	4082100000-N	1.000	LS	$96,000.0000	$96,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1393+50 -L-)			
0226	4082100000-N	1.000	LS	$44,000.0000	$44,000.00
		SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (956+67 -L-)			
0227	4096000000-N	39.000	EA	$129.0000	$5,031.00
		SIGN ERECTION, TYPE D			
0228	4102000000-N	367.000	EA	$67.0000	$24,589.00
		SIGN ERECTION, TYPE E			
0229	4108000000-N	60.000	EA	$129.0000	$7,740.00
		SIGN ERECTION, TYPE F			
0230	4109000000-N	25.000	EA	$928.0000	$23,200.00
		SIGN ERECTION, TYPE *** (OVER-HEAD) (A)			
0231	4109000000-N	24.000	EA	$516.0000	$12,384.00
		SIGN ERECTION, TYPE *** (OVER-HEAD) (B)			
0232	4110000000-N	20.000	EA	$516.0000	$10,320.00
		SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)			
0233	4114000000-N	18.000	EA	$77.0000	$1,386.00
		SIGN ERECTION, MILEMARKERS			
0234	4116100000-N	48.000	EA	$774.0000	$37,152.00
		SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)			
0235	4116100000-N	3.000	EA	$258.0000	$774.00
		SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (E)			
0236	4138000000-N	48.000	EA	$516.0000	$24,768.00
		DISPOSAL OF SUPPORT, STEEL BEAM			
0237	4149000000-N	4.000	EA	$7,750.0000	$31,000.00
		DISPOSAL OF SIGN SYSTEM, OVER-HEAD			
0238	4152000000-N	76.000	EA	$516.0000	$39,216.00
		DISPOSAL OF SIGN SYSTEM, STEELBEAM			
0239	4155000000-N	317.000	EA	$1.3000	$412.10
		DISPOSAL OF SIGN SYSTEM, U- CHANNEL			
0240	4158000000-N	4.000	EA	$1.6500	$6.60
		DISPOSAL OF SIGN SYSTEM, WOOD			
0241	4402000000-E	7483.000	SF	$16.5000	$123,469.50
		HIGH VISIBILITY STATIONARY SIGNS			
0242	4407000000-E	2791.000	SF	$13.1000	$36,562.10
		HIGH VISIBILITY PORTABLE SIGNS			
0243	4410000000-E	1930.000	SF	$16.0000	$30,880.00
		WORK ZONE SIGNS (BARRICADE MOUNTED)			

0244	4415000000-N FLASHING ARROW BOARD	10.000	EA	$4,100.0000	$41,000.00
0245	4420000000-N PORTABLE CHANGEABLE MESSAGE SIGN	16.000	EA	$15,600.0000	$249,600.00
0246	4423000000-N WORK ZONE DIGITAL SPEED LIMIT SIGNS	10.000	EA	$11,000.0000	$110,000.00
0247	4424000000-N WORK ZONE PRESENCE LIGHTING	28.000	EA	$3,000.0000	$84,000.00
0248	4432000000-N HIGH VISIBILITY DRUMS	4143.000	EA	$39.0000	$161,577.00
0249	4434000000-N SEQUENTIAL FLASHING WARNING LIGHTS	58.000	EA	$120.0000	$6,960.00
0250	4435000000-N CONES	300.000	EA	$22.0000	$6,600.00
0251	4445000000-E BARRICADES (TYPE III)	3142.000	LF	$53.0000	$166,526.00
0252	4447000000-E PEDESTRIAN CHANNELIZING DE- VICES	72.000	LF	$28.0000	$2,016.00
0253	4455000000-N FLAGGER	776.000	DAY	$350.0000	$271,600.00
0254	4465000000-N TEMPORARY CRASH CUSHIONS	59.000	EA	$9,500.0000	$560,500.00
0255	4470000000-N REMOVE & RESET TEMPORARY CRASH CUSHION	12.000	EA	$3,000.0000	$36,000.00
0256	4480000000-N TMA	4.000	EA	$89,000.0000	$356,000.00
0257	4485000000-E PORTABLE CONCRETE BARRIER	112861.000	LF	$44.0000	$4,965,884.00
0258	4490000000-E PORTABLE CONCRETE BARRIER (ANCHORED)	79428.000	LF	$75.0000	$5,957,100.00
0259	4500000000-E REMOVE AND RESET PORTABLE CON-CRETE BARRIER	158004.000	LF	$5.0000	$790,020.00
0260	4505000000-E REMOVE & RESET PORTABLE CONC-	16701.000	LF	$9.0000	$150,309.00
0261	4510000000-N LAW ENFORCEMENT	588.000	HR	$60.0000	$35,280.00
0262	4570000000-E TEMPORARY GLARE SCREEN	6148.000	LF	$25.0000	$153,700.00
0263	4600000000-N GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	18.000	EA	$110.0000	$1,980.00
0264	4600000000-N GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8.000	EA	$3,810.0000	$30,480.00
0265	4650000000-N TEMPORARY RAISED PAVEMENT MARKERS	11269.000	EA	$4.1000	$46,202.90
0266	4685000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (4", 90 MILS)	258127.000	LF	$0.7500	$193,595.25
0267	4688000000-E THERMOPLASTIC PAVEMENT MARKINGLINES (6", 90 MILS)	288842.000	LF	$1.0000	$288,842.00
0268	4695000000-E	3970.000	LF	$3.1000	$12,307.00

		THERMOPLASTIC PAVEMENT MARKINGLINES (8", 90 MILS)			
0269	4700000000-E	5155.000	LF	$3.6000	$18,558.00
		THERMOPLASTIC PAVEMENT MARKINGLINES (12", 90 MILS)			
0270	4720000000-E	2.000	EA	$102.0000	$204.00
		THERMOPLASTIC PAVEMENT MARKINGCHARACTER (90 MILS)			
0271	4725000000-E	163.000	EA	$153.0000	$24,939.00
		THERMOPLASTIC PAVEMENT MARKINGSYMBOL (90 MILS)			
0272	4805000000-N	28.000	EA	$254.0000	$7,112.00
		COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II)			
0273	4810000000-E	331970.000	LF	$0.1500	$49,795.50
		PAINT PAVEMENT MARKING LINES (4")			
0274	4815000000-E	1512354.000	LF	$0.1500	$226,853.10
		PAINT PAVEMENT MARKING LINES (6")			
0275	4820000000-E	1370.000	LF	$0.7600	$1,041.20
		PAINT PAVEMENT MARKING LINES (8")			
0276	4825000000-E	99176.000	LF	$0.7600	$75,373.76
		PAINT PAVEMENT MARKING LINES (12")			
0277	4835000000-E	2900.000	LF	$1.0200	$2,958.00
		PAINT PAVEMENT MARKING LINES (24")			
0278	4840000000-N	83.000	EA	$15.5000	$1,286.50
		PAINT PAVEMENT MARKING CHARAC-TER			
0279	4845000000-N	570.000	EA	$15.5000	$8,835.00
		PAINT PAVEMENT MARKING SYMBOL			
0280	4847400000-E	622310.000	LF	$0.2500	$155,577.50
		WORK ZONE PERFORMANCE PAVEMENTMARKING LINES, 4"			
0281	4847500000-E	1477687.000	LF	$0.5200	$768,397.24
		WORK ZONE PERFORMANCE PAVEMENTMARKING LINES, 6"			
0282	4847600000-E	99172.000	LF	$0.8600	$85,287.92
		WORK ZONE PERFORMANCE PAVEMENTMARKING LINES, 12"			
0283	4850000000-E	29920.000	LF	$0.3600	$10,771.20
		REMOVAL OF PAVEMENT MARKING LINES (4")			
0284	4855000000-E	743244.000	LF	$0.3600	$267,567.84
		REMOVAL OF PAVEMENT MARKING LINES (6")			
0285	4865000000-E	49586.000	LF	$0.7100	$35,206.06
		REMOVAL OF PAVEMENT MARKING LINES (12")			
0286	4870000000-E	53.000	LF	$5.1000	$270.30
		REMOVAL OF PAVEMENT MARKING LINES (24")			
0287	4875000000-N	27.000	EA	$51.0000	$1,377.00
		REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS			
0288	4890000000-E	100.000	LF	$11.0000	$1,100.00
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12", 20 MILS (STANDARD GLASS BEADS)			
0289	4890000000-E	5156.000	LF	$2.5500	$13,147.80
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 20 MILS (STANDARD GLASS BEADS)			
0290	4890000000-E	1450.000	LF	$3.5500	$5,147.50
		GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 20 MILS (STANDARD GLASS BEADS)			
0291	4890000000-E	5755.000	LF	$1.0200	$5,870.10
		GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 24"			

0292	4890000000-E	2722.000	LF	$1.0200	$2,776.44
	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 8"				
0293	4891000000-E	2072.000	LF	$11.0000	$22,792.00
	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVMENT MARKING LINES (24", 90 MILS)				
0294	4895000000-N	12000.000	EA	$32.0000	$384,000.00
	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS				
0295	4895000000-N	560.000	EA	$15.5000	$8,680.00
	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING CHARACTER				
0296	4895000000-N	303.000	EA	$15.5000	$4,696.50
	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING SYMBOL				
0297	4900000000-N	6000.000	EA	$4.1000	$24,600.00
	PERMANENT RAISED PAVEMENT MARKERS				
0298	5010000000-E	3.000	EA	$33,500.0000	$100,500.00
	100' HIGH MOUNT STANDARD				
0299	5015000000-E	17.000	EA	$34,250.0000	$582,250.00
	120' HIGH MOUNT STANDARD				
0300	5020000000-N	1.000	EA	$28,000.0000	$28,000.00
	PORTABLE DRIVE UNIT				
0301	5025000000-E	204.000	CY	$1,100.0000	$224,400.00
	HIGH MOUNT FOUNDATIONS				
0302	5050000000-N	24.000	EA	$4,800.0000	$115,200.00
	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)				
0303	5070000000-N	18.000	EA	$1,500.0000	$27,000.00
	STANDARD FOUNDATION ********* (TYPE M1)				
0304	5070000000-N	6.000	EA	$1,850.0000	$11,100.00
	STANDARD FOUNDATION ********* (TYPE M2)				
0305	5120000000-N	5.000	EA	$3,100.0000	$15,500.00
	ELECTRIC SERVICE POLE ********** (30' CLASS 4)				
0306	5125000000-E	125.000	LF	$51.0000	$6,375.00
	ELECTRIC SERVICE LATERAL ********** (3 #1/0 USE)				
0307	5155000000-E	14418.000	LF	$8.1000	$116,785.80
	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")				
0308	5155000000-E	485.000	LF	$19.0000	$9,215.00
	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")				
0309	5155000000-E	423.000	LF	$28.0000	$11,844.00
	ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")				
0310	5160000000-E	1236.000	LF	$24.0000	$29,664.00
	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")				
0311	5160000000-E	809.000	LF	$27.0000	$21,843.00
	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")				
0312	5160000000-E	215.000	LF	$41.0000	$8,815.00
	ELECTRICAL DUCT, TYPE JA, SIZE ***** (6")				
0313	5170000000-E	2603.000	LF	$3.0000	$7,809.00
	** #8 W/G FEEDER CIRCUIT (2)				
0314	5175000000-E	2619.000	LF	$4.0000	$10,476.00
	** #6 W/G FEEDER CIRCUIT (2)				
0315	5180000000-E	759.000	LF	$7.0000	$5,313.00
	** #4 W/G FEEDER CIRCUIT (2)				

0316	5205000000-E	15362.000	LF		$11.0000	$168,982.00
	** #8 W/G FEEDER CIRCUIT IN ***** CONDUIT (2, 1.5")					
0317	5210000000-E	7109.000	LF		$12.0000	$85,308.00
	** #6 W/G FEEDER CIRCUIT IN ***** CONDUIT (2, 1.5")					
0318	5215000000-E	5407.000	LF		$12.5000	$67,587.50
	** #4 W/G FEEDER CIRCUIT IN ***** CONDUIT (2, 1.5")					
0319	5240000000-N	8.000	EA		$3,500.0000	$28,000.00
	ELECTRICAL JUNCTION BOXES ********** (BR18)					
0320	5240000000-N	5.000	EA		$895.0000	$4,475.00
	ELECTRICAL JUNCTION BOXES ********** (CS36)					
0321	5240000000-N	18.000	EA		$325.0000	$5,850.00
	ELECTRICAL JUNCTION BOXES ********** (HM18)					
0322	5240000000-N	1.000	EA		$610.0000	$610.00
	ELECTRICAL JUNCTION BOXES ********** (HM30)					
0323	5240000000-N	1.000	EA		$895.0000	$895.00
	ELECTRICAL JUNCTION BOXES ********** (HM36)					
0324	5240000000-N	44.000	EA		$365.0000	$16,060.00
	ELECTRICAL JUNCTION BOXES ********** (IG18)					
0325	5240000000-N	10.000	EA		$556.0000	$5,560.00
	ELECTRICAL JUNCTION BOXES ********** (IG30)					
0326	5240000000-N	6.000	EA		$1,100.0000	$6,600.00
	ELECTRICAL JUNCTION BOXES ********** (IG36)					
0327	5255000000-N	1.000	LS		$350,000.0000	$350,000.00
	PORTABLE LIGHTING					
0328	5260000000-N	1.000	LS		$6,100.0000	$6,100.00
	GENERIC LIGHTING ITEM LUMINAIRE STORAGE					
0329	5265000000-E	4320.000	LF		$7.5000	$32,400.00
	GENERIC LIGHTING ITEM STREET LIGHTING CONDUIT IN- STALLATION (2" PVC)					
0330	5270000000-N	18.000	EA		$1,800.0000	$32,400.00
	GENERIC LIGHTING ITEM 100' HIGH MOUNT LUMINAIRE - LED					
0331	5270000000-N	128.000	EA		$1,800.0000	$230,400.00
	GENERIC LIGHTING ITEM 120' HIGH MOUNT LUMINAIRE - LED					
0332	5270000000-N	4.000	EA		$6,100.0000	$24,400.00
	GENERIC LIGHTING ITEM COMMUNICATION GATEWAY					
0333	5270000000-N	174.000	EA		$305.0000	$53,070.00
	GENERIC LIGHTING ITEM CONTROL NODE					
0334	5270000000-N	4.000	EA		$14,200.0000	$56,800.00
	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE RW, 240/480V					
0335	5270000000-N	20.000	EA		$155.0000	$3,100.00
	GENERIC LIGHTING ITEM REINSTALL COBRAHEAD LUMINAIRE					
0336	5270000000-N	8.000	EA		$175.0000	$1,400.00
	GENERIC LIGHTING ITEM REINSTALL HIGH MAST LUMINAIRE					
0337	5270000000-N	1.000	EA		$5,100.0000	$5,100.00
	GENERIC LIGHTING ITEM RELOCATE CONTROL SYSTEM					
0338	5270000000-N	2.000	EA		$2,600.0000	$5,200.00
	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STAND- ARD FOUNDATION					
0339	5270000000-N	2.000	EA		$2,900.0000	$5,800.00
	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STANDARD					
0340	5270000000-N	20.000	EA		$510.0000	$10,200.00

	GENERIC LIGHTING ITEM REMOVE LIGHT STANDARD FOUND- ATION				
0341	5270000000-N GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STAND- ARD - DISPOSE	10.000	EA	$280.0000	$2,800.00
0342	5270000000-N GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STAND- ARD - SALVAGE	10.000	EA	$230.0000	$2,300.00
0343	5270000000-N GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMI- NAIRE - 285W LED	28.000	EA	$1,265.0000	$35,420.00
0344	5325200000-E 2" WATER LINE	187.000	LF	$10.0000	$1,870.00
0345	5325600000-E 6" WATER LINE	22499.000	LF	$36.0000	$809,964.00
0346	5325800000-E 8" WATER LINE	4239.000	LF	$37.0000	$156,843.00
0347	5326200000-E 12" WATER LINE	19081.000	LF	$63.0000	$1,202,103.00
0348	5329000000-E DUCTILE IRON WATER PIPE FITTINGS	62845.000	LB	$16.0000	$1,005,520.00
0349	5536000000-E 2" VALVE	3.000	EA	$1,270.0000	$3,810.00
0350	5540000000-E 6" VALVE	53.000	EA	$1,860.0000	$98,580.00
0351	5546000000-E 8" VALVE	9.000	EA	$3,560.0000	$32,040.00
0352	5558000000-E 12" VALVE	20.000	EA	$3,805.0000	$76,100.00
0353	5571600000-E 6" TAPPING SLEEVE & VALVE	12.000	EA	$4,860.0000	$58,320.00
0354	5571800000-E 8" TAPPING SLEEVE & VALVE	6.000	EA	$6,110.0000	$36,660.00
0355	5572200000-E 12" TAPPING SLEEVE & VALVE	16.000	EA	$7,100.0000	$113,600.00
0356	5573000000-E 20" TAPPING SLEEVE & VALVE	2.000	EA	$46,100.0000	$92,200.00
0357	5589200000-E 2" AIR RELEASE VALVE	7.000	EA	$18,500.0000	$129,500.00
0358	5606000000-E 2" BLOW OFF	7.000	EA	$16,800.0000	$117,600.00
0359	5648000000-N RELOCATE WATER METER	53.000	EA	$785.0000	$41,605.00
0360	5649000000-N RECONNECT WATER METER	22.000	EA	$1,850.0000	$40,700.00
0361	5656000000-E **" RPZ BACKFLOW PREVENTION ASSEMBLY (1")	1.000	EA	$2,280.0000	$2,280.00
0362	5656200000-E 2" RPZ BACKFLOW PREVENTION ASSEMBLY	2.000	EA	$2,100.0000	$4,200.00
0363	5666000000-N FIRE HYDRANT	1.000	EA	$4,900.0000	$4,900.00
0364	5672000000-N RELOCATE FIRE HYDRANT	25.000	EA	$505.0000	$12,625.00

0365	5673000000-E FIRE HYDRANT LEG	8.000	LF	$110.0000	$880.00
0366	5678400000-E 6" LINE STOP	6.000	EA	$7,050.0000	$42,300.00
0367	5678600000-E 8" LINE STOP	4.000	EA	$7,510.0000	$30,040.00
0368	5679000000-E 12" LINE STOP	12.000	EA	$10,400.0000	$124,800.00
0369	5679400000-E 20" LINE STOP	2.000	EA	$21,750.0000	$43,500.00
0370	5686000000-E **" WATER SERVICE LINE (2")	197.000	LF	$8.7000	$1,713.90
0371	5686500000-E WATER SERVICE LINE	2323.000	LF	$20.5000	$47,621.50
0372	5691000000-E **" SANITARY GRAVITY SEWER (15")	40.000	LF	$310.0000	$12,400.00
0373	5691300000-E 8" SANITARY GRAVITY SEWER	4306.000	LF	$49.0000	$210,994.00
0374	5691400000-E 10" SANITARY GRAVITY SEWER	195.000	LF	$70.0000	$13,650.00
0375	5691500000-E 12" SANITARY GRAVITY SEWER	1928.000	LF	$77.0000	$148,456.00
0376	5691600000-E 16" SANITARY GRAVITY SEWER	3992.000	LF	$84.0000	$335,328.00
0377	5691700000-E 18" SANITARY GRAVITY SEWER	1352.000	LF	$171.0000	$231,192.00
0378	5709100000-E 2" FORCE MAIN SEWER	1029.000	LF	$25.0000	$25,725.00
0379	5709300000-E 6" FORCE MAIN SEWER	709.000	LF	$46.0000	$32,614.00
0380	5709400000-E 8" FORCE MAIN SEWER	2545.000	LF	$36.0000	$91,620.00
0381	5709800000-E 20" FORCE MAIN SEWER	988.000	LF	$48.0000	$47,424.00
0382	5768000000-N SANITARY SEWER CLEAN-OUT	18.000	EA	$1,375.0000	$24,750.00
0383	5768500000-E SEWER SERVICE LINE	486.000	LF	$18.5000	$8,991.00
0384	5769000000-E DUCTILE IRON SEWER PIPE FITTINGS	1285.000	LB	$19.7000	$25,314.50
0385	5775000000-E 4' DIA UTILITY MANHOLE	63.000	EA	$3,620.0000	$228,060.00
0386	5776000000-E 5' DIA UTILITY MANHOLE	5.000	EA	$5,100.0000	$25,500.00
0387	5777000000-E 6' DIA UTILITY MANHOLE	4.000	EA	$6,450.0000	$25,800.00
0388	5781000000-E UTILITY MANHOLE WALL 4' DIA	318.000	LF	$105.0000	$33,390.00
0389	5782000000-E	20.000	LF	$200.0000	$4,000.00

		UTILITY MANHOLE WALL 5' DIA			
0390	5783000000-E	38.000	LF	$195.0000	$7,410.00
	UTILITY MANHOLE WALL 6' DIA				
0391	5798000000-E	3170.000	LF	$11.0000	$34,870.00
	ABANDON **" UTILITY PIPE (15")				
0392	5798000000-E	683.000	LF	$12.0000	$8,196.00
	ABANDON **" UTILITY PIPE (4")				
0393	5800000000-E	1615.000	LF	$12.0000	$19,380.00
	ABANDON 6" UTILITY PIPE				
0394	5801000000-E	2639.000	LF	$12.0000	$31,668.00
	ABANDON 8" UTILITY PIPE				
0395	5802000000-E	48.000	LF	$22.0000	$1,056.00
	ABANDON 10" UTILITY PIPE				
0396	5804000000-E	10691.000	LF	$11.0000	$117,601.00
	ABANDON 12" UTILITY PIPE				
0397	5805000000-E	1335.000	LF	$12.0000	$16,020.00
	ABANDON 14" UTILITY PIPE				
0398	5812000000-E	947.000	LF	$12.0000	$11,364.00
	ABANDON 20" UTILITY PIPE				
0399	5815000000-N	6.000	EA	$366.0000	$2,196.00
	REMOVE WATER METER				
0400	5816000000-N	39.000	EA	$995.0000	$38,805.00
	ABANDON UTILITY MANHOLE				
0401	5828000000-N	1.000	EA	$955.0000	$955.00
	REMOVE UTILITY MANHOLE				
0402	5835400000-E	216.000	LF	$139.0000	$30,024.00
	6" ENCASEMENT PIPE				
0403	5835700000-E	1327.000	LF	$85.0000	$112,795.00
	16" ENCASEMENT PIPE				
0404	5835800000-E	248.000	LF	$97.0000	$24,056.00
	18" ENCASEMENT PIPE				
0405	5835900000-E	122.000	LF	$122.0000	$14,884.00
	20" ENCASEMENT PIPE				
0406	5836000000-E	2422.000	LF	$110.0000	$266,420.00
	24" ENCASEMENT PIPE				
0407	5836200000-E	1045.000	LF	$138.0000	$144,210.00
	30" ENCASEMENT PIPE				
0408	5836400000-E	661.000	LF	$216.0000	$142,776.00
	36" ENCASEMENT PIPE				
0409	5872500000-E	800.000	LF	$208.0000	$166,400.00
	BORE AND JACK OF **" (16")				
0410	5872500000-E	125.000	LF	$257.0000	$32,125.00
	BORE AND JACK OF **" (18")				
0411	5872500000-E	122.000	LF	$257.0000	$31,354.00
	BORE AND JACK OF **" (20")				
0412	5872500000-E	1440.000	LF	$277.0000	$398,880.00
	BORE AND JACK OF **" (24")				
0413	5872500000-E	550.000	LF	$391.0000	$215,050.00
	BORE AND JACK OF **" (30")				

0414	5872500000-E	325.000	LF	$461.0000	$149,825.00
	BORE AND JACK OF **" (36")				
0415	5872600000-E	899.000	LF	$434.0000	$390,166.00
	DIRECTIONAL DRILLING OF **" (20")				
0416	5872600000-E	1380.000	LF	$111.0000	$153,180.00
	DIRECTIONAL DRILLING OF **" (6")				
0417	5872600000-E	477.000	LF	$133.0000	$63,441.00
	DIRECTIONAL DRILLING OF **" (8")				
0418	5876000000-N	6.000	EA	$84.0000	$504.00
	STEEL PILE PIERS				
0419	5882000000-N	4.000	EA	$15,350.0000	$61,400.00
	GENERIC UTILITY ITEM 12" INSERT VALVE				
0420	5882000000-N	6.000	EA	$9,100.0000	$54,600.00
	GENERIC UTILITY ITEM 6" INSERT VALVE				
0421	5882000000-N	4.000	EA	$10,500.0000	$42,000.00
	GENERIC UTILITY ITEM 8" INSERT VALVE				
0422	5882000000-N	1.000	EA	$5,200.0000	$5,200.00
	GENERIC UTILITY ITEM REMOVE EXISTING VAULT, BYPASS AND STOCKPILE VALVES				
0423	5912000000-N	1.000	LS	$52,200.0000	$52,200.00
	GENERIC UTILITY ITEM RELOCATE MASTER METER AND INSTALL NEW VAULT				
0424	6000000000-E	184105.000	LF	$2.3000	$423,441.50
	TEMPORARY SILT FENCE				
0425	6006000000-E	7900.000	TON	$50.0000	$395,000.00
	STONE FOR EROSION CONTROL, CLASS A				
0426	6009000000-E	25330.000	TON	$60.0000	$1,519,800.00
	STONE FOR EROSION CONTROL, CLASS B				
0427	6012000000-E	21750.000	TON	$48.0000	$1,044,000.00
	SEDIMENT CONTROL STONE				
0428	6015000000-E	396.500	ACR	$1,150.0000	$455,975.00
	TEMPORARY MULCHING				
0429	6018000000-E	20500.000	LB	$1.0500	$21,525.00
	SEED FOR TEMPORARY SEEDING				
0430	6021000000-E	104.500	TON	$820.0000	$85,690.00
	FERTILIZER FOR TEMPORARY SEED-ING				
0431	6024000000-E	17100.000	LF	$22.0000	$376,200.00
	TEMPORARY SLOPE DRAINS				
0432	6029000000-E	8640.000	LF	$2.6000	$22,464.00
	SAFETY FENCE				
0433	6030000000-E	132360.000	CY	$6.0000	$794,160.00
	SILT EXCAVATION				
0434	6036000000-E	580800.000	SY	$1.4000	$813,120.00
	MATTING FOR EROSION CONTROL				
0435	6037000000-E	2825.000	SY	$4.1000	$11,582.50
	COIR FIBER MAT				
0436	6038000000-E	355.000	SY	$7.2000	$2,556.00
	PERMANENT SOIL REINFORCEMENT MAT				
0437	6042000000-E	37675.000	LF	$4.0500	$152,583.75
	1/4" HARDWARE CLOTH				
0438	6043000000-E	8725.000	SY	$5.0000	$43,625.00

		LOW PERMEABILITY GEOTEXTILE			
0439	6045000000-E	390.000	LF	$50.0000	$19,500.00
	**" TEMPORARY PIPE (18")				
0440	6045000000-E	150.000	LF	$70.0000	$10,500.00
	**" TEMPORARY PIPE (24")				
0441	6045000000-E	360.000	LF	$85.0000	$30,600.00
	**" TEMPORARY PIPE (30")				
0442	6045000000-E	120.000	LF	$115.0000	$13,800.00
	**" TEMPORARY PIPE (36")				
0443	6045000000-E	1200.000	LF	$90.0000	$108,000.00
	**" TEMPORARY PIPE (48")				
0444	6045000000-E	391.000	LF	$130.0000	$50,830.00
	**" TEMPORARY PIPE (54")				
0445	6048000000-E	750.000	SY	$35.0000	$26,250.00
	FLOATING TURBIDITY CURTAIN				
0446	6070000000-N	38.000	EA	$650.0000	$24,700.00
	SPECIAL STILLING BASINS				
0447	6071012000-E	41360.000	LF	$6.2000	$256,432.00
	COIR FIBER WATTLE				
0448	6071020000-E	23160.000	LB	$3.6000	$83,376.00
	POLYACRYLAMIDE (PAM)				
0449	6071030000-E	25740.000	LF	$4.4000	$113,256.00
	COIR FIBER BAFFLE				
0450	6071050000-E	18.000	EA	$900.0000	$16,200.00
	**" SKIMMER (1-1/2")				
0451	6071050000-E	26.000	EA	$1,100.0000	$28,600.00
	**" SKIMMER (2")				
0452	6071050000-E	18.000	EA	$1,200.0000	$21,600.00
	**" SKIMMER (2-1/2")				
0453	6071050000-E	8.000	EA	$1,500.0000	$12,000.00
	**" SKIMMER (3")				
0454	6084000000-E	360.000	ACR	$1,940.0000	$698,400.00
	SEEDING & MULCHING				
0455	6087000000-E	235.000	ACR	$143.0000	$33,605.00
	MOWING				
0456	6090000000-E	4300.000	LB	$8.2000	$35,260.00
	SEED FOR REPAIR SEEDING				
0457	6093000000-E	13.250	TON	$1,000.0000	$13,250.00
	FERTILIZER FOR REPAIR SEEDING				
0458	6096000000-E	8050.000	LB	$6.2000	$49,910.00
	SEED FOR SUPPLEMENTAL SEEDING				
0459	6108000000-E	241.000	TON	$820.0000	$197,620.00
	FERTILIZER TOPDRESSING				
0460	6111000000-E	1573.000	LF	$55.0000	$86,515.00
	IMPERVIOUS DIKE				
0461	6114500000-N	110.000	MHR	$130.0000	$14,300.00
	SPECIALIZED HAND MOWING				
0462	6117000000-N	300.000	EA	$105.0000	$31,500.00
	RESPONSE FOR EROSION CONTROL				

0463	6117500000-N	24.000	EA	$1,100.0000	$26,400.00
	CONCRETE WASHOUT STRUCTURE				
0464	6120000000-E	69.000	CY	$15.0000	$1,035.00
	CULVERT DIVERSION CHANNEL				
0465	6123000000-E	0.250	ACR	$12,500.0000	$3,125.00
	REFORESTATION				
0466	6132000000-N	210.000	EA	$130.0000	$27,300.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT				
0467	6132000000-N	35.000	EA	$150.0000	$5,250.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTIONDEVICE				
0468	7048500000-E	18.000	EA	$785.0000	$14,130.00
	PEDESTRIAN SIGNAL HEAD (16", 1SECTION W/COUNTDOWN)				
0469	7060000000-E	7540.000	LF	$3.0000	$22,620.00
	SIGNAL CABLE				
0470	7108000000-E	6.000	EA	$575.0000	$3,450.00
	VEHICLE SIGNAL HEAD (12", 1 SECTION)				
0471	7120000000-E	34.000	EA	$805.0000	$27,370.00
	VEHICLE SIGNAL HEAD (12", 3 SECTION)				
0472	7132000000-E	3.000	EA	$950.0000	$2,850.00
	VEHICLE SIGNAL HEAD (12", 4 SECTION)				
0473	7180000000-N	43.000	EA	$125.0000	$5,375.00
	BACKPLATE				
0474	7252000000-E	2430.000	LF	$2.8000	$6,804.00
	MESSENGER CABLE (1/4")				
0475	7264000000-E	2160.000	LF	$4.3000	$9,288.00
	MESSENGER CABLE (3/8")				
0476	7279000000-E	700.000	LF	$2.0000	$1,400.00
	TRACER WIRE				
0477	7300000000-E	6700.000	LF	$8.6000	$57,620.00
	UNPAVED TRENCHING (**********) (1, 2")				
0478	7300000000-E	270.000	LF	$13.2000	$3,564.00
	UNPAVED TRENCHING (**********) (2, 2")				
0479	7301000000-E	1360.000	LF	$24.0000	$32,640.00
	DIRECTIONAL DRILL (**********) (1, 2")				
0480	7324000000-N	78.000	EA	$305.0000	$23,790.00
	JUNCTION BOX (STANDARD SIZE)				
0481	7348000000-N	14.000	EA	$627.0000	$8,778.00
	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)				
0482	7360000000-N	4.000	EA	$1,115.0000	$4,460.00
	WOOD POLE				
0483	7372000000-N	7.000	EA	$708.0000	$4,956.00
	GUY ASSEMBLY				
0484	7384000000-E	2.000	EA	$607.0000	$1,214.00
	" RISER WITH ******* (1-1/2", WEATHERHEAD)				
0485	7384000000-E	12.000	EA	$607.0000	$7,284.00
	" RISER WITH ******* (1-1/4", WEATHERHEAD)				
0486	7408000000-E	33.000	EA	$379.0000	$12,507.00
	1" RISER WITH WEATHERHEAD				
0487	7432000000-E	2.000	EA	$73.8000	$147.60

	2" RISER WITH HEAT SHRINK TUBING				
0488	7444000000-E	3460.000	LF	$10.0000	$34,600.00
	INDUCTIVE LOOP SAWCUT				
0489	7456000000-E	8160.000	LF	$2.0000	$16,320.00
	LEAD-IN CABLE (**********) (14-2)				
0490	7516000000-E	3425.000	LF	$2.7000	$9,247.50
	COMMUNICATIONS CABLE (**FIBER) (24)				
0491	7528000000-E	320.000	LF	$2.7000	$864.00
	DROP CABLE				
0492	7540000000-N	3.000	EA	$1,650.0000	$4,950.00
	SPLICE ENCLOSURE				
0493	7541000000-N	1.000	EA	$900.0000	$900.00
	MODIFY SPLICE ENCLOSURE				
0494	7552000000-N	3.000	EA	$1,200.0000	$3,600.00
	INTERCONNECT CENTER				
0495	7575000000-N	1.000	LS	$7,000.0000	$7,000.00
	FIBER-OPTIC TRAINING				
0496	7575142010-N	3.000	EA	$4,100.0000	$12,300.00
	900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO				
0497	7575142060-N	7.000	EA	$1,350.0000	$9,450.00
	MODIFY RADIO INSTALLATION				
0498	7575160000-E	2795.000	LF	$0.8000	$2,236.00
	REMOVE EXISTING COMMUNICATIONSCABLE				
0499	7576000000-N	16.000	EA	$15,250.0000	$244,000.00
	METAL STRAIN SIGNAL POLE				
0500	7613000000-N	16.000	EA	$840.0000	$13,440.00
	SOIL TEST				
0501	7614100000-E	149.000	CY	$1,100.0000	$163,900.00
	DRILLED PIER FOUNDATION				
0502	7636000000-N	8.000	EA	$365.0000	$2,920.00
	SIGN FOR SIGNALS				
0503	7642200000-N	18.000	EA	$1,920.0000	$34,560.00
	TYPE II PEDESTAL WITH FOUND- ATION				
0504	7684000000-N	4.000	EA	$2,425.0000	$9,700.00
	SIGNAL CABINET FOUNDATION				
0505	7686000000-N	3.000	EA	$760.0000	$2,280.00
	CONDUIT ENTRANCE INTO EXISTINGFOUNDATION				
0506	7696000000-N	4.000	EA	$14,700.0000	$58,800.00
	CONTROLLERS WITH CABINET (**********) (TYPE 2070LX, BASE MOUNTED)				
0507	7744000000-N	22.000	EA	$135.0000	$2,970.00
	DETECTOR CARD (TYPE 170)				
0508	7901000000-N	4.000	EA	$660.0000	$2,640.00
	CABINET BASE EXTENDER				
0509	7912000000-N	1.000	EA	$6,600.0000	$6,600.00
	BEACON CONTROLLER ASSEMBLY & CABINET (********) (TYPE F3)				
0510	7948000000-N	1.000	EA	$10,500.0000	$10,500.00
	TRAFFIC SIGNAL REMOVAL				
0511	7980000000-N	17.000	EA	$230.0000	$3,910.00

	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE			
0512	7980000000-N	17.000 EA	$5,300.0000	$90,100.00
	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET			
0513	7980000000-N	16.000 EA	$2,500.0000	$40,000.00
	GENERIC SIGNAL ITEM CCTV WOOD POLE			
0514	7980000000-N	23.000 EA	$4,100.0000	$94,300.00
	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY			
0515	7980000000-N	4.000 EA	$7,700.0000	$30,800.00
	GENERIC SIGNAL ITEM DMS ACCESS LADDER			
0516	7980000000-N	4.000 EA	$43,000.0000	$172,000.00
	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE			
0517	7980000000-N	4.000 EA	$111,000.0000	$444,000.00
	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)			
0518	7980000000-N	17.000 EA	$1,200.0000	$20,400.00
	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT			
0519	7980000000-N	25.000 EA	$1,500.0000	$37,500.00
	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH			
0520	7980000000-N	6.000 EA	$305.0000	$1,830.00
	GENERIC SIGNAL ITEM EXISTING CCTV CAMERA REMOVAL			
0521	7980000000-N	6.000 EA	$120.0000	$720.00
	GENERIC SIGNAL ITEM JUNCTION BOX MARKER			
0522	7980000000-N	17.000 EA	$1,500.0000	$25,500.00
	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA- TION PANEL			
0523	7980000000-N	1.000 EA	$13,700.0000	$13,700.00
	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES			
0524	7980000000-N	2.000 EA	$1,100.0000	$2,200.00
	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE EQUIPMENT			
0525	7980000000-N	5.000 EA	$52.0000	$260.00
	GENERIC SIGNAL ITEM REMOVE 900 MHZ RADIO			
0526	7985000000-N	1.000 LS	$5,200.0000	$5,200.00
	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 324			
0527	7985000000-N	1.000 LS	$5,200.0000	$5,200.00
	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 331			
0528	7985000000-N	1.000 LS	$5,200.0000	$5,200.00
	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-95 MM 78			
0529	7990000000-E	2000.000 LF	$6.5000	$13,000.00
	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTOR			
0530	7990000000-E	6150.000 LF	$4.5000	$27,675.00
	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC- TORS			
0531	7990000000-E	100.000 LF	$12.5000	$1,250.00
	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC- TORS			
Section 0001 Total				$206,520,474.73

Section 0002
CULVERT ITEMS

0532	8056000000-N	1.000 LS	$125,000.0000	$125,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1042+08.93 -L-)			

0533	8126000000-N	1.000	LS	$80,000.0000	$80,000.00
	CULVERT EXCAVATION, STA ****** (1042+08.93 -L-)				
0534	8126000000-N	1.000	LS	$200,000.0000	$200,000.00
	CULVERT EXCAVATION, STA ****** (1220+34.00 -L-)				
0535	8126000000-N	1.000	LS	$30,000.0000	$30,000.00
	CULVERT EXCAVATION, STA ****** (15+47.41 -NBCD-)				
0536	8126000000-N	1.000	LS	$35,000.0000	$35,000.00
	CULVERT EXCAVATION, STA ****** (35+91.00 -Y33-)				
0537	8133000000-E	1008.000	TON	$75.0000	$75,600.00
	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT				
0538	8196000000-E	1303.600	CY	$925.0000	$1,205,830.00
	CLASS A CONCRETE (CULVERT)				
0539	8245000000-E	170843.000	LB	$1.5000	$256,264.50
	REINFORCING STEEL (CULVERT)				
0540	8804000000-N	1.000	LS	$4,500.0000	$4,500.00
	GENERIC CULVERT ITEM ASBESTO ASSESSMENT				
Section 0002 Total					$2,012,194.50

Section 0003
WALL ITEMS

0541	8504000000-E	158.740	LF	$600.0000	$95,244.00
	CONCRETE BARRIER RAIL WITH MOMENT SLAB				
0542	8801000000-E	4063.000	SF	$64.0000	$260,032.00
	MSE RETAINING WALL NO **** (W3)				
0543	8801000000-E	791.000	SF	$66.0000	$52,206.00
	MSE RETAINING WALL NO **** (W6)				
0544	8801000000-E	917.000	SF	$69.0000	$63,273.00
	MSE RETAINING WALL NO **** (W8)				
0545	8801000000-E	316.000	SF	$93.0000	$29,388.00
	MSE RETAINING WALL NO **** (W9)				
0546	8801000000-E	8300.000	SF	$67.0000	$556,100.00
	MSE RETAINING WALL NO **** W1-1 (I-5878)				
0547	8801000000-E	3800.000	SF	$68.0000	$258,400.00
	MSE RETAINING WALL NO **** W1-1 (I-5883)				
0548	8801000000-E	4275.000	SF	$70.0000	$299,250.00
	MSE RETAINING WALL NO **** W1-2 (I-5878)				
0549	8801000000-E	3400.000	SF	$68.0000	$231,200.00
	MSE RETAINING WALL NO **** W1-2 (I-5883)				
0550	8801000000-E	5750.000	SF	$69.0000	$396,750.00
	MSE RETAINING WALL NO **** W2-1 (I-5878)				
0551	8801000000-E	3500.000	SF	$70.0000	$245,000.00
	MSE RETAINING WALL NO **** W2-1 (I-5883)				
0552	8801000000-E	2830.000	SF	$70.0000	$198,100.00
	MSE RETAINING WALL NO **** W2-1 (I-5986B)				
0553	8801000000-E	4880.000	SF	$71.0000	$346,480.00
	MSE RETAINING WALL NO **** W2-2 (I-5878)				
0554	8801000000-E	3800.000	SF	$67.0000	$254,600.00
	MSE RETAINING WALL NO **** W2-2 (I-5883)				

0555	8801000000-E	2770.000	SF	$70.0000	$193,900.00
	MSE RETAINING WALL NO **** W2-2 (I-5986B)				
0556	8802030000-E	450.000	SF	$225.0000	$101,250.00
	SEGMENTAL GRAVITY RETAINING WALLS				
0557	8802040000-E	6180.000	SF	$125.0000	$772,500.00
	CIP GRAVITY RETAINING WALLS				
0558	8847000000-E	41169.000	SF	$5.4000	$222,312.60
	GENERIC RETAINING WALL ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT				
0559	8847000000-E	37450.000	SF	$3.0000	$112,350.00
	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT				
0560	8847000000-E	3720.000	SF	$50.0000	$186,000.00
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW29-1				
0561	8847000000-E	7570.000	SF	$45.0000	$340,650.00
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW32-1				
0562	8847000000-E	16160.000	SF	$45.0000	$727,200.00
	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW33-1				
Section 0003 Total					$5,942,185.60

Section 0004
STRUCTURE ITEMS

0563	8035000000-N	1.000	LS	$115,000.0000	$115,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1260+34.00 -L-)				
0564	8035000000-N	1.000	LS	$90,000.0000	$90,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1391+19.65 -L-)				
0565	8035000000-N	1.000	LS	$140,000.0000	$140,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (25+31.59 -Y18-)				
0566	8035000000-N	1.000	LS	$115,000.0000	$115,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+05.28 -Y14-)				
0567	8035000000-N	1.000	LS	$175,000.0000	$175,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+80.73 -Y17-)				
0568	8035000000-N	1.000	LS	$105,000.0000	$105,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (27+09.19 -Y16-)				
0569	8042000000-N	1.000	LS	$190,000.0000	$190,000.00
	REMOVAL OF EXISTING STRUCTURESAT STATION ********** (1002+79.68 -L REV-)				
0570	8065000000-N	1.000	LS	$7,500.0000	$7,500.00
	ASBESTOS ASSESSMENT				
0571	8091000000-N	1.000	LS	$8,000.0000	$8,000.00
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 26+05.28 -Y14-)				
0572	8091000000-N	1.000	LS	$9,000.0000	$9,000.00
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 26+80.73 -Y17-)				
0573	8091000000-N	1.000	LS	$7,000.0000	$7,000.00
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 27+09.19 -Y16-)				
0574	8091000000-N	1.000	LS	$5,000.0000	$5,000.00
	FOUNDATION EXCAVATION FOR BENT** AT STATION ********** (1, 28+39.21 -Y29-)				
0575	8112730000-N	16.000	EA	$5,500.0000	$88,000.00
	PDA TESTING				
0576	8121000000-N	1.000	LS	$80,000.0000	$80,000.00

		UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (1260+34.00 -L-)			
0577	8121000000-N	1.000	LS	$75,000.0000	$75,000.00
		UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (1391+19.65 -L-)			
0578	8121000000-N	1.000	LS	$6,000.0000	$6,000.00
		UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (26+05.28 -Y14-)			
0579	8121000000-N	1.000	LS	$5,000.0000	$5,000.00
		UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (26+80.73 -Y17-)			
0580	8147000000-E	104193.000	SF	$45.0000	$4,688,685.00
		REINFORCED CONCRETE DECK SLAB			
0581	8161000000-E	122423.000	SF	$1.1500	$140,786.45
		GROOVING BRIDGE FLOORS			
0582	8175000000-E	205.700	CY	$550.0000	$113,135.00
		CLASS AA CONCRETE (BRIDGE)			
0583	8182000000-E	2445.100	CY	$945.0000	$2,310,619.50
		CLASS A CONCRETE (BRIDGE)			
0584	8210000000-N	1.000	LS	$220,000.0000	$220,000.00
		BRIDGE APPROACH SLABS, STATION********** (1002+79.68 -L REV-)			
0585	8210000000-N	1.000	LS	$220,000.0000	$220,000.00
		BRIDGE APPROACH SLABS, STATION********** (1260+34.00 -L-)			
0586	8210000000-N	1.000	LS	$220,000.0000	$220,000.00
		BRIDGE APPROACH SLABS, STATION********** (1391+19.65 -L-)			
0587	8210000000-N	1.000	LS	$95,000.0000	$95,000.00
		BRIDGE APPROACH SLABS, STATION********** (26+05.28 -Y14-)			
0588	8210000000-N	1.000	LS	$55,000.0000	$55,000.00
		BRIDGE APPROACH SLABS, STATION********** (26+80.73 -Y17-)			
0589	8210000000-N	1.000	LS	$87,000.0000	$87,000.00
		BRIDGE APPROACH SLABS, STATION********** (27+09.19 -Y16-)			
0590	8210000000-N	1.000	LS	$34,000.0000	$34,000.00
		BRIDGE APPROACH SLABS, STATION********** (28+39.21 -Y29-)			
0591	8217000000-E	392154.000	LB	$1.6000	$627,446.40
		REINFORCING STEEL (BRIDGE)			
0592	8224000000-E	9487.000	LB	$3.0000	$28,461.00
		EPOXY COATED REINFORCING STEEL(BRIDGE)			
0593	8238000000-E	4743.000	LB	$3.0000	$14,229.00
		SPIRAL COLUMN REINFORCING STEEL (BRIDGE)			
0594	8265000000-E	1874.600	LF	$375.0000	$702,975.00
		54" PRESTRESSED CONCRETE GIR- DERS			
0595	8274000000-E	2137.500	LF	$450.0000	$961,875.00
		MODIFIED 63" PRESTRESSED CONC GIRDERS			
0596	8296000000-N	1.000	LS	$5,076.1400	$5,076.14
		POLLUTION CONTROL			
0597	8328200000-E	381.000	EA	$1,100.0000	$419,100.00
		PILE DRIVING EQUIPMENT SETUP (HP 12 X 53)			
0598	8328400000-E	32.000	EA	$12,500.0000	$400,000.00
		PILE DRIVING EQUIPMENT SETUP (PP 30 X 0.50)			
0599	8364000000-E	26470.000	LF	$90.0000	$2,382,300.00
		HP12X53 STEEL PILES			
0600	8385200000-E	2560.000	LF	$330.0000	$844,800.00
		PP ** X **** GALVANIZED STEEL PILES (PP 30 X 0.50)			

0601	8392000000-N	32.000	EA	$700.0000	$22,400.00
	PIPE PILE PLATES				
0602	8393000000-N	211.000	EA	$300.0000	$63,300.00
	PILE REDRIVES				
0603	8475000000-E	437.960	LF	$150.0000	$65,694.00
	TWO BAR METAL RAIL				
0604	8482000000-E	431.000	LF	$210.0000	$90,510.00
	THREE BAR METAL RAIL				
0605	8503000000-E	2287.740	LF	$122.0000	$279,104.28
	CONCRETE BARRIER RAIL				
0606	8510000000-E	599.200	LF	$93.0000	$55,725.60
	CONCRETE MEDIAN BARRIER				
0607	8517000000-E	453.670	LF	$176.0000	$79,845.92
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 3'-7")				
0608	8531000000-E	245.000	SY	$110.0000	$26,950.00
	4" SLOPE PROTECTION				
0609	8608000000-E	2196.000	TON	$72.0000	$158,112.00
	RIP RAP CLASS II (2'-0" THICK)				
0610	8622000000-E	2428.000	SY	$3.5000	$8,498.00
	GEOTEXTILE FOR DRAINAGE				
0611	8657000000-N	1.000	LS	$120,000.0000	$120,000.00
	ELASTOMERIC BEARINGS				
0612	8692000000-N	1.000	LS	$35,000.0000	$35,000.00
	FOAM JOINT SEALS				
0613	8706000000-N	1.000	LS	$1,150,000.0000	$1,150,000.00
	EXPANSION JOINT SEALS				
0614	8727000000-N	1.000	LS	$67,000.0000	$67,000.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+05.28 -Y14-)				
0615	8727000000-N	1.000	LS	$66,000.0000	$66,000.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+80.73 -Y17-)				
0616	8727000000-N	1.000	LS	$65,000.0000	$65,000.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (27+09.19 -Y16-)				
0617	8727000000-N	1.000	LS	$65,000.0000	$65,000.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (28+39.21 -Y29-)				
0618	8860000000-N	1.000	LS	$104,114.7200	$104,114.72
	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE NO 500051				
0619	8860000000-N	1.000	LS	$85,184.7700	$85,184.77
	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE NO 500051				
0620	8867000000-E	7090.170	LF	$475.0000	$3,367,830.75
	GENERIC STRUCTURE ITEM 45" PREST CONC FLORIDA I-BEAM				
0621	8867000000-E	149.470	LF	$40.0000	$5,978.80
	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT				
0622	8892000000-E	464.000	SF	$10.1500	$4,709.60
	GENERIC STRUCTURE ITEM EPOXY COATING				
0623	8893000000-E	1156.000	SY	$72.0000	$83,232.00
	GENERIC STRUCTURE ITEM PLACING & FINISHING PC OVERLAY				
0624	8893000000-E	1156.000	SY	$37.0000	$42,772.00
	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK				

0625	8893000000-E	1192.000	SY	$14.0000	$16,688.00
	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK				
0626	8881000000-E	32.000	CY	$2,050.0000	$65,600.00
AA1	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS				
0627	8881000000-E	32.000	CY	$0.0000	$0.00
AA2	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIAL (ALTERNATE)				

Section 0004 Total $21,985,238.93

Item Total $236,460,093.76

ELECTRONIC BID SUBMISSION

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

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NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION

The prequalified bidder declares (or certifies, verifies, or states) under penalty of perjury under the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating N.C.G.S. §133-24 within the last three years, and that the prequalified bidder intends to do the work with his own bonafide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. §133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

DEBARMENT CERTIFICATION OF PREQUALIFIED BIDDER

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.

2. The terms covered transaction, debarred, suspended, ineligible, lower tier

covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal- Aid Provision titled Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or

commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder’s bid being considered non-responsive.

EXPLANATION:

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Award Limits on Multiple Projects

By answering YES to this statement, the bidder acknowleges that they are using the award limits on multiple projects? **Yes** ○**No** ◉

A bidder who desires to bid on more than one project on which bids are to be opened on the same date, and who also desires to avoid receiving an award of more projects than he is equipped to handle, may bid on any number of projects but may limit the total amount of work awarded to him on selected projects by completing the AWARD LIMITS ON MULTIPLE PROJECTS.

The Award Limits on Multiple Projects must be filled in on each project bid for which the Bidder desires protection.

It is the desire of the Bidder to be awarded contracts, the value of which

will not exceed a total of for those

projects indicated herein, for which bids will be opened on (MM/DD/YY)

The Award Limits shall apply to the following projects:

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

Contract Number
County

It is agreed that if I am (we are) the low Bidder(s) on indicated projects, the total value of which is more than the above stipulated award limits, the Board of Transportation will award me (us) projects from among those indicated

that have a total value not to exceed the award limit and will result in the lowest total bids to the Department of Transportation.

DBE List Summary

Project: STATE FUNDED
Bid Total: 236,460,093.76

Goal: 9.00% (21,281,408.44)
Total Entered: 9.01% (21,303,594.68)

Bidder ID: 19178
Business Name: Flatiron-Fred smith Company JV

ID	Name	Is Supplier?	Item Count	Amount	Is Complete?
12278	CLIFTON CONSTRUCTION CO INC	False	7	3,810,185.50	True
3304	FULFORD AND JONES ASPHALT INC	False	11	1,871,166.50	True
2676	PAUL D WILLIAMS DBA PAUL D. WILLIAMS HAULING	False	7	8,057,332.50	True
4247	SEAL BROTHERS CONTRACTING LLC	False	5	284,206.50	True
4142	JERRY T BUNN TRUCKING LLC	False	13	2,224,334.76	True
3230	HIATT & MASON ENTERPRISES INC	False	5	2,384,248.11	True
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	5	277,367.58	True
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	43	2,394,753.23	True

Name: CLIFTON CONSTRUCTION CO INC ID: 12278

Address: 1435 GIDDENSVILLE ROAD , FAISON, NC 28341

Used As: SubContractor DBE Items Total:$3,810,185.50

Items for CLIFTON CONSTRUCTION CO INC

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$62,854.0000	$62,854.00
0118	2022000000-E SUBDRAIN EXCAVATION	27165.400	CY	$30.0000	$814,962.00
0119	2026000000-E GEOTEXTILE FOR SUBSURFACE DRAINS	80849.500	SY	$9.0000	$727,645.50
0120	2036000000-E SUBDRAIN COARSE AGGREGATE	13582.700	CY	$60.0000	$814,962.00
0121	2044000000-E 6" PERFORATED SUBDRAIN PIPE	80849.500	LF	$16.0000	$1,293,592.00
0122	2070000000-N SUBDRAIN PIPE OUTLET	163.000	EA	$350.0000	$57,050.00
0123	2077000000-E 6" OUTLET PIPE	978.000	LF	$40.0000	$39,120.00
Section 0001 Total					$3,810,185.50
Item Total					$3,810,185.50

Name: FULFORD AND JONES ASPHALT INC ID: 3304

Address: 5509 HORNES CHURCH ROAD , WILSON, NC 27896

Used As: SubContractor DBE Items Total:$1,871,166.50

Items for FULFORD AND JONES ASPHALT INC

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$94,000.0000	$94,000.00
0153	2535000000-E **"X **" CONCRETE CURB (8" X 18")	875.000	LF	$29.7000	$25,987.50
0154	2542000000-E 1'-6" CONCRETE CURB & GUTTER	1195.000	LF	$29.7000	$35,491.50
0155	2549000000-E 2'-6" CONCRETE CURB & GUTTER	15885.000	LF	$29.5000	$468,607.50
0156	2556000000-E SHOULDER BERM GUTTER	7575.000	LF	$27.5000	$208,312.50
0157	2577000000-E CONCRETE EXPRESSWAY GUTTER	1510.000	LF	$38.5000	$58,135.00
0158	2591000000-E 4" CONCRETE SIDEWALK	4200.000	SY	$49.0000	$205,800.00
0159	2605000000-N CONCRETE CURB RAMPS	70.000	EA	$2,300.0000	$161,000.00
0160	2619000000-E 4" CONCRETE PAVED DITCH	700.000	SY	$135.0000	$94,500.00
0161	2655000000-E 5" MONOLITHIC CONCRETE ISLANDS(KEYED IN)	5335.000	SY	$71.5000	$381,452.50
0167	2738000000-E GENERIC PAVING ITEM 6" CONCRETE DRIVEWAY	1915.000	SY	$72.0000	$137,880.00
Section 0001 Total					$1,871,166.50
Item Total					$1,871,166.50

Name: PAUL D WILLIAMS DBA PAUL D. WILLIAMS HAULING ID: 2676

Address: POST OFFICE BOX 1385 , DUNN, NC 28335

Used As: SubContractor DBE Items Total:$8,057,332.50

Items for PAUL D WILLIAMS DBA PAUL D. WILLIAMS HAULING

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$50,000.0000	$50,000.00
0005	0022000000-E UNCLASSIFIED EXCAVATION	503000.000	CY	$2.9500	$1,483,850.00
0013	0036000000-E UNDERCUT EXCAVATION	73700.000	CY	$3.1700	$233,629.00
0014	0106000000-E BORROW EXCAVATION	780000.000	CY	$4.7500	$3,705,000.00
0016	0134000000-E DRAINAGE DITCH EXCAVATION	37470.000	CY	$3.8300	$143,510.10
0018	0156000000-E REMOVAL OF EXISTING ASPHALT PAVEMENT	291890.000	SY	$4.7600	$1,389,396.40
0100	1099500000-E SHALLOW UNDERCUT	218700.000	CY	$4.8100	$1,051,947.00
Section 0001 Total					$8,057,332.50
Item Total					$8,057,332.50

Name: SEAL BROTHERS CONTRACTING LLC ID: 4247

Address: 131 W. CLEVE STREET , MOUNT AIRY, NC 27030

Used As: SubContractor DBE Items Total:$284,206.50

Items for SEAL BROTHERS CONTRACTING LLC

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$5,684.0000	$5,684.00
0190	3503000000-E WOVEN WIRE FENCE, 47" FABRIC	64275.000	LF	$2.4000	$154,260.00
0191	3509000000-E 4" TIMBER FENCE POSTS, 7'-6" LONG	4118.000	EA	$18.0000	$74,124.00
0192	3515000000-E 5" TIMBER FENCE POSTS, 8'-0" LONG	872.000	EA	$24.0000	$20,928.00
0193	3566000000-E WOVEN WIRE FENCE RESET	5170.000	LF	$5.6500	$29,210.50
Section 0001 Total					$284,206.50
Item Total					$284,206.50

Name: JERRY T BUNN TRUCKING LLC ID: 4142

Address: 6839 FLAT ROCK RD. , SIMS, NC 27880

Used As: SubContractor DBE Items Total:$2,224,334.76

Items for JERRY T BUNN TRUCKING LLC

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0024	0220000000-E ROCK EMBANKMENTS	1925.000	TON	$5.0625	$9,745.31
0099	1077000000-E #57 STONE	760.000	TON	$4.0000	$3,040.00
0101	1099700000-E CLASS IV SUBGRADE STABILIZA- TION	368350.000	TON	$4.0000	$1,473,400.00
0102	1121000000-E AGGREGATE BASE COURSE	96340.000	TON	$4.0000	$385,360.00
0103	1220000000-E INCIDENTAL STONE BASE	5000.000	TON	$4.0000	$20,000.00
0194	3628000000-E RIP RAP, CLASS I	2920.000	TON	$5.0625	$14,782.50
0195	3635000000-E RIP RAP, CLASS II	5795.000	TON	$5.0625	$29,337.19
0196	3642000000-E RIP RAP, CLASS A	650.000	TON	$5.0625	$3,290.63
0197	3649000000-E RIP RAP, CLASS B	3760.000	TON	$5.0625	$19,035.00
0425	6006000000-E STONE FOR EROSION CONTROL, CLASS A	7900.000	TON	$5.0625	$39,993.75
0426	6009000000-E STONE FOR EROSION CONTROL, CLASS B	25330.000	TON	$5.0625	$128,233.13
0427	6012000000-E SEDIMENT CONTROL STONE	21750.000	TON	$4.0000	$87,000.00
Section 0001 Total					$2,213,217.51
0004 STRUCTURE ITEMS					
0609	8608000000-E RIP RAP CLASS II (2'-0" THICK)	2196.000	TON	$5.0625	$11,117.25
Section 0004 Total					$11,117.25
Item Total					$2,224,334.76

Name: HIATT & MASON ENTERPRISES INC ID: 3230

Address: POST OFFICE BOX 1378 , MOUNT AIRY, NC 27030

Used As: SubContractor DBE Items Total:$2,384,248.11

Items for HIATT & MASON ENTERPRISES INC

0002 CULVERT ITEMS					
0539	8245000000-E	170842.998	LB	$1.8410	$314,521.96
	REINFORCING STEEL (CULVERT)				
Section 0002 Total					$314,521.96
0004 STRUCTURE ITEMS					
0580	8147000000-E	104193.000	SF	$13.5326	$1,410,002.19
	REINFORCED CONCRETE DECK SLAB				
0591	8217000000-E	392153.999	LB	$1.6280	$638,426.71
	REINFORCING STEEL (BRIDGE)				
0592	8224000000-E	9487.000	LB	$1.1800	$11,194.66
	EPOXY COATED REINFORCING STEEL(BRIDGE)				
0593	8238000000-E	4743.000	LB	$2.1300	$10,102.59
	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)				
Section 0004 Total					$2,069,726.15
Item Total					$2,384,248.11

Name: GOSALIA CONCRETE CONSTRUCTORS INC. ID: 15755

Address: SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607

Used As: SubContractor DBE Items Total:$277,367.58

Items for GOSALIA CONCRETE CONSTRUCTORS INC.

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$4,141.0000	$4,141.00
Section 0001 Total					$4,141.00
0003 WALL ITEMS					
0541	8504000000-E CONCRETE BARRIER RAIL WITH MOMENT SLAB	158.740	LF	$125.0000	$19,842.50
Section 0003 Total					$19,842.50
0004 STRUCTURE ITEMS					
0605	8503000000-E CONCRETE BARRIER RAIL	2287.740	LF	$78.2500	$179,015.66
0606	8510000000-E CONCRETE MEDIAN BARRIER	599.200	LF	$59.0000	$35,352.80
0607	8517000000-E 1'-**"X *****" CONCRETE PARA- PET (1'-2" X 3'-7")	453.670	LF	$86.0000	$39,015.62
Section 0004 Total					$253,384.08
Item Total					$277,367.58

Name: TRAFFIC CONTROL SAFETY SERVICES, INC. ID: 4761

Address: POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114

Used As: SubContractor DBE Items Total:$2,394,753.23

Items for TRAFFIC CONTROL SAFETY SERVICES, INC.

0001 ROADWAY ITEMS - NPAR (CITY OF DUNN)					
0001	0000100000-N MOBILIZATION	1.000	LS	$152,000.0000	$152,000.00
0199	4048000000-E REINFORCED CONCRETE SIGN FOUN-DATIONS	29.000	CY	$850.0000	$24,650.00
0200	4054000000-E PLAIN CONCRETE SIGN FOUNDA- TIONS	11.000	CY	$850.0000	$9,350.00
0201	4057000000-E OVERHEAD FOOTING	344.000	CY	$1,500.0000	$516,000.00
0202	4060000000-E SUPPORTS, BREAKAWAY STEEL BEAM	44263.000	LB	$6.0000	$265,578.00
0203	4072000000-E SUPPORTS, 3-LB STEEL U-CHANNEL	8107.000	LF	$7.0000	$56,749.00
0204	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1019+50 -L-)	1.000	LS	$38,500.0000	$38,500.00
0205	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1034+40 -L-)	1.000	LS	$45,000.0000	$45,000.00
0206	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1044+00 -L-)	1.000	LS	$47,000.0000	$47,000.00
0207	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1060+60 -L-)	1.000	LS	$45,000.0000	$45,000.00
0208	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1070+50 -L-)	1.000	LS	$46,250.0000	$46,250.00
0209	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1087+00 -L-)	1.000	LS	$41,500.0000	$41,500.00
0210	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1117+00 -L-)	1.000	LS	$38,500.0000	$38,500.00
0211	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1136+00 -L-)	1.000	LS	$41,850.0000	$41,850.00
0212	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1141+00 -L-)	1.000	LS	$42,000.0000	$42,000.00
0213	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1162+00 -L-)	1.000	LS	$38,900.0000	$38,900.00
0214	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1167+00 -L-)	1.000	LS	$42,000.0000	$42,000.00
0215	4082100000-N SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1188+75 -L-)	1.000	LS	$46,300.0000	$46,300.00

0216	4082100000-N	1.000	LS	$55,000.0000	$55,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1220+56 -L-)				
0217	4082100000-N	1.000	LS	$42,400.0000	$42,400.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1247+00 -L-)				
0218	4082100000-N	1.000	LS	$49,250.0000	$49,250.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1272+50 -L-)				
0219	4082100000-N	1.000	LS	$52,150.0000	$52,150.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1278+50 -L-)				
0220	4082100000-N	1.000	LS	$52,150.0000	$52,150.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1305+00 -L-)				
0221	4082100000-N	1.000	LS	$97,500.0000	$97,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1331+50 -L-)				
0222	4082100000-N	1.000	LS	$55,800.0000	$55,800.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1351+00 -L-)				
0223	4082100000-N	1.000	LS	$55,500.0000	$55,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1367+00 -L-)				
0224	4082100000-N	1.000	LS	$52,150.0000	$52,150.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1377+00 -L-)				
0225	4082100000-N	1.000	LS	$92,500.0000	$92,500.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (1393+50 -L-)				
0226	4082100000-N	1.000	LS	$42,000.0000	$42,000.00
	SUPPORTS, OVERHEAD SIGN STRUC-TURE AT STA ****** (956+67 -L-)				
0227	4096000000-N	39.000	EA	$125.0000	$4,875.00
	SIGN ERECTION, TYPE D				
0228	4102000000-N	367.000	EA	$65.0000	$23,855.00
	SIGN ERECTION, TYPE E				
0229	4108000000-N	60.000	EA	$125.0000	$7,500.00
	SIGN ERECTION, TYPE F				
0230	4109000000-N	25.000	EA	$900.0000	$22,500.00
	SIGN ERECTION, TYPE *** (OVER-HEAD) (A)				
0231	4109000000-N	24.000	EA	$500.0000	$12,000.00
	SIGN ERECTION, TYPE *** (OVER-HEAD) (B)				
0232	4110000000-N	20.000	EA	$500.0000	$10,000.00
	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)				
0233	4114000000-N	18.000	EA	$75.0000	$1,350.00
	SIGN ERECTION, MILEMARKERS				
0234	4116100000-N	48.000	EA	$750.0000	$36,000.00
	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)				
0235	4116100000-N	3.000	EA	$250.0000	$750.00
	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (E)				
0236	4138000000-N	48.000	EA	$500.0000	$24,000.00
	DISPOSAL OF SUPPORT, STEEL BEAM				
0237	4149000000-N	4.000	EA	$7,500.0000	$30,000.00
	DISPOSAL OF SIGN SYSTEM, OVER-HEAD				
0238	4152000000-N	76.000	EA	$500.0000	$38,000.00
	DISPOSAL OF SIGN SYSTEM, STEELBEAM				
0239	4155000000-N	317.000	EA	$1.2300	$389.91
	DISPOSAL OF SIGN SYSTEM, U- CHANNEL				
0240	4158000000-N	4.000	EA	$1.5800	$6.32

DISPOSAL OF SIGN SYSTEM, WOOD

Section 0001 Total	$2,394,753.23

Item Total	$2,394,753.23

THIS PROPOSAL CONTAINS THE FOLLOWING ERRORS/WARNINGS (IF ANY)

Item Number: 8881000000-E [Line Number 0626]: Multiple options bid in group 'AA'.
Item Number: 8881000000-E [Line Number 0627]: Multiple options bid in group 'AA'.
HIATT & MASON ENTERPRISES INC/DBE: 0539 Price is over committed.
HIATT & MASON ENTERPRISES INC/DBE: 0591 Price is over committed.

This Bid contains 0 amendment files

Electronic Bid Submission

By submitting this bid electronically, I hereby acknowledge that all requirements included in the hard copy proposal, addendum, amendments, plans, standard specifications, supplemental specifications and special provisions are part of the bid and contract. Further, I acknowledge that I have read, understand, accept, acknowledge and agree to comply with all statements in this electronic bid.

I hereby certify that I have the authority to submit this bid.

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Signature _____

Agency _____

Date _____

Attachments

Failure to complete and attach the Fuel Usage Factor Adjustment Form will result in using 2.90 gallons per ton as the Fuel Usage Factor for Diesel for the asphalt items included on the form. The contractor will not be permitted to change the option after the bids are submitted.

NOTE: The maximum upload limit is 5 MB. ☐ Verify

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum LS	11,823,000.00	11,823,000.00
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum LS	2,500,000.00	2,500,000.00
0003	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum LS	7,679,000.00	7,679,000.00
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUB-BING	3 ACR	12,000.00	36,000.00
0005	0022000000-E	225	UNCLASSIFIED EXCAVATION	503,000 CY	9.00	4,527,000.00
0006	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (1260+34.00 -L-)	Lump Sum LS	75,000.00	75,000.00
0007	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (1391+19.65 -L-)	Lump Sum LS	125,000.00	125,000.00
0008	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (1002+79.68 -L REV-)	Lump Sum LS	105,000.00	105,000.00
0009	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (26+05.28 -Y14-)	Lump Sum LS	100,000.00	100,000.00
0010	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (26+80.73 -Y17-)	Lump Sum LS	65,000.00	65,000.00
0011	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (27+09.19 -Y16-)	Lump Sum LS	75,000.00	75,000.00
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (28+39.21 -Y29-)	Lump Sum LS	35,000.00	35,000.00
0013	0036000000-E	225	UNDERCUT EXCAVATION	73,700 CY	10.00	737,000.00
0014	0106000000-E	230	BORROW EXCAVATION	780,000 CY	10.00	7,800,000.00
0015	0127000000-N	235	EMBANKMENT SETTLEMENT GAUGES	4 EA	2,000.00	8,000.00
0016	0134000000-E	240	DRAINAGE DITCH EXCAVATION	37,470 CY	18.00	674,460.00
0017	0141000000-E	240	BERM DITCH CONSTRUCTION	2,055 LF	8.00	16,440.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0018	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	291,890 SY	12.00	3,502,680.00
0019	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	44,225 SY	3.00	132,675.00
0020	0192000000-N	260	PROOF ROLLING	175 HR	225.00	39,375.00
0021	0194000000-E	265	SELECT GRANULAR MATERIAL, CLASS III	64,500 CY	13.00	838,500.00
0022	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA-TION	671,200 SY	1.50	1,006,800.00
0023	0199000000-E	SP	TEMPORARY SHORING	42,070 SF	45.00	1,893,150.00
0024	0220000000-E	SP	ROCK EMBANKMENTS	1,925 TON	62.00	119,350.00
0025	0222000000-E	SP	GEOTEXTILE FOR ROCK EMBANK-MENTS	1,660 SY	3.20	5,312.00
0026	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO-LEUM CONTAMINATED SOIL	550 TON	85.00	46,750.00
0027	0318000000-E	300	FOUNDATION CONDITIONING MATE-RIAL, MINOR STRUCTURES	13,420 TON	46.00	617,320.00
0028	0320000000-E	300	FOUNDATION CONDITIONING GEO-TEXTILE	51,497 SY	3.00	154,491.00
0029	0342000000-E	310	**" SIDE DRAIN PIPE (30")	1,096 LF	90.00	98,640.00
0030	0342000000-E	310	**" SIDE DRAIN PIPE (36")	596 LF	115.00	68,540.00
0031	0342000000-E	310	**" SIDE DRAIN PIPE (42")	496 LF	140.00	69,440.00
0032	0342000000-E	310	**" SIDE DRAIN PIPE (48")	256 LF	175.00	44,800.00
0033	0342000000-E	310	**" SIDE DRAIN PIPE (54")	52 LF	230.00	11,960.00
0034	0342000000-E	310	**" SIDE DRAIN PIPE (60")	48 LF	250.00	12,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0035	0342000000-E	310	**" SIDE DRAIN PIPE (66")	372 LF	350.00	130,200.00
0036	0342000000-E	310	**" SIDE DRAIN PIPE (84")	76 LF	450.00	34,200.00
0037	0343000000-E	310	15" SIDE DRAIN PIPE	14,576 LF	48.00	699,648.00
0038	0344000000-E	310	18" SIDE DRAIN PIPE	7,876 LF	58.00	456,808.00
0039	0345000000-E	310	24" SIDE DRAIN PIPE	5,324 LF	72.00	383,328.00
0040	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (15", V)	180 LF	50.00	9,000.00
0041	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (18", V)	300 LF	55.00	16,500.00
0042	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (24", V)	1,068 LF	80.00	85,440.00
0043	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (36", V)	44 LF	170.00	7,480.00
0044	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (42", V)	592 LF	190.00	112,480.00
0045	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (48", V)	48 LF	290.00	13,920.00
0046	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (54", V)	164 LF	320.00	52,480.00
0047	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	356 LF	50.00	17,800.00
0048	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	820 LF	55.00	45,100.00
0049	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	172 LF	70.00	12,040.00
0050	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	1,228 LF	90.00	110,520.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0051	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	876 LF	115.00	100,740.00
0052	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	112 LF	145.00	16,240.00
0053	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	368 LF	185.00	68,080.00
0054	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	8 LF	400.00	3,200.00
0055	0414000000-E	310	60" RC PIPE CULVERTS, CLASS III	476 LF	125.00	59,500.00
0056	0438000000-E	310	84" RC PIPE CULVERTS, CLASS III	208 LF	550.00	114,400.00
0057	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	608 LF	220.00	133,760.00
0058	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	476 LF	280.00	133,280.00
0059	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	776 LF	350.00	271,600.00
0060	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (66")	404 LF	490.00	197,960.00
0061	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	28,164 LF	60.00	1,689,840.00
0062	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	9,528 LF	65.00	619,320.00
0063	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	11,676 LF	80.00	934,080.00
0064	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	3,012 LF	95.00	286,140.00
0065	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	1,560 LF	145.00	226,200.00
0066	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	3,056 LF	125.00	382,000.00
0067	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	88 EA	670.00	58,960.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0068	0636000000-E	310	**" CS PIPE ELBOWS, ******" THICK (18", 0.064")	9 EA	650.00	5,850.00
0069	0636000000-E	310	**" CS PIPE ELBOWS, ******" THICK (24", 0.064")	6 EA	450.00	2,700.00
0070	0636000000-E	310	**" CS PIPE ELBOWS, ******" THICK (30", 0.079")	4 EA	900.00	3,600.00
0071	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (16", 0.281")	318 LF	355.00	112,890.00
0072	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (18", 0.312")	258 LF	410.00	105,780.00
0073	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (24", 0.375")	376 LF	496.00	186,496.00
0074	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (30", 0.469")	290 LF	516.00	149,640.00
0075	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (36", 0.532")	478 LF	623.00	297,794.00
0076	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (42", 0.625")	394 LF	735.00	289,590.00
0077	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (48", 0.688")	910 LF	868.00	789,880.00
0078	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (54", 0.781")	54 LF	1,150.00	62,100.00
0079	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (60", 0.844")	636 LF	1,235.00	785,460.00
0080	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (66", 0.938")	466 LF	1,886.00	878,876.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0081	0973100000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B IN SOIL (84", 1.000")	122 LF	2,370.00	289,140.00
0082	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (16", 0.281")	318 LF	0.01	3.18
0083	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (18", 0.312")	258 LF	0.01	2.58
0084	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (24", 0.375")	376 LF	0.01	3.76
0085	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (30", 0.469")	290 LF	0.01	2.90
0086	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (36", 0.532")	478 LF	0.01	4.78
0087	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (42", 0.625")	394 LF	0.01	3.94
0088	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (48", 0.688")	910 LF	0.01	9.10
0089	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (54", 0.781")	54 LF	0.01	0.54
0090	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (60", 0.844")	636 LF	0.01	6.36
0091	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (66", 0.938")	466 LF	0.01	4.66
0092	0973300000-E	330	**" WELDED STEEL PIPE, *****" THICK, GRADE B NOT IN SOIL (84", 1.000")	122 LF	0.01	1.22
0093	0986000000-E	SP	GENERIC PIPE ITEM 16" SEALED DIP, CLASS 250	284 LF	120.00	34,080.00
0094	0986000000-E	SP	GENERIC PIPE ITEM 18" SEALED DIP, CLASS 250	216 LF	150.00	32,400.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0095	0986000000-E	SP	GENERIC PIPE ITEM 36" SEALED DIP, CLASS 150	704 LF	220.00	154,880.00
0096	0986000000-E	SP	GENERIC PIPE ITEM 60" SEALED DIP, CLASS 150	580 LF	150.00	87,000.00
0097	0995000000-E	340	PIPE REMOVAL	36,706 LF	20.00	734,120.00
0098	1011000000-N	500	FINE GRADING	Lump Sum LS	5,028,000.00	5,028,000.00
0099	1077000000-E	SP	#57 STONE	760 TON	60.00	45,600.00
0100	1099500000-E	505	SHALLOW UNDERCUT	218,700 CY	10.43	2,281,041.00
0101	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	368,350 TON	22.65	8,343,127.50
0102	1121000000-E	520	AGGREGATE BASE COURSE	96,340 TON	41.00	3,949,940.00
0103	1220000000-E	545	INCIDENTAL STONE BASE	5,000 TON	52.00	260,000.00
0104	1275000000-E	600	PRIME COAT	29,540 GAL	5.00	147,700.00
0105	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (1-1/2")	112,800 SY	1.60	180,480.00
0106	1297000000-E	607	MILLING ASPHALT PAVEMENT, ***" DEPTH (3")	24,050 SY	1.95	46,897.50
0107	1330000000-E	607	INCIDENTAL MILLING	5,130 SY	6.95	35,653.50
0108	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	415,610 TON	41.50	17,247,815.00
0109	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	215,170 TON	52.50	11,296,425.00
0110	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	23,990 TON	63.50	1,523,365.00
0111	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	52,510 TON	53.50	2,809,285.00
0112	1524200000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5D	127,120 TON	63.50	8,072,120.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0113	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	33,920 TON	460.00	15,603,200.00
0114	1577000000-E	620	POLYMER MODIFIED ASPHALT BINDER FOR PLANT MIX	7,250 TON	700.00	5,075,000.00
0115	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	6,168 TON	200.00	1,233,600.00
0116	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	279,320 LF	0.14	39,104.80
0117	1891000000-E	SP	GENERIC PAVING ITEM 12" CONCRETE TRUCK APRON	1,755 SY	105.00	184,275.00
0118	2022000000-E	815	SUBDRAIN EXCAVATION	27,165.4 CY	31.00	842,127.40
0119	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	80,849.5 SY	9.50	768,070.25
0120	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	13,582.7 CY	61.00	828,544.70
0121	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	80,849.5 LF	16.50	1,334,016.75
0122	2070000000-N	815	SUBDRAIN PIPE OUTLET	163 EA	355.00	57,865.00
0123	2077000000-E	815	6" OUTLET PIPE	978 LF	41.00	40,098.00
0124	2099000000-E	816	SHOULDER DRAIN	106,480 LF	14.50	1,543,960.00
0125	2110000000-E	816	4" SHOULDER DRAIN PIPE	106,480 LF	2.60	276,848.00
0126	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	3,450 LF	15.50	53,475.00
0127	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	190 EA	354.00	67,260.00
0128	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	24 EA	2,800.00	67,200.00
0129	2209000000-E	838	ENDWALLS	349.5 CY	1,500.00	524,250.00
0130	2220000000-E	838	REINFORCED ENDWALLS	90.6 CY	1,700.00	154,020.00
0131	2253000000-E	840	PIPE COLLARS	2.2 CY	500.00	1,100.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0132	2264000000-E	840	PIPE PLUGS	0.9 CY	2,440.00	2,196.00
0133	2275000000-E	SP	FLOWABLE FILL	2,296 CY	300.00	688,800.00
0134	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	844 EA	3,100.00	2,616,400.00
0135	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	216.4 CY	1,900.00	411,160.00
0136	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	364.4 LF	600.00	218,640.00
0137	2354200000-N	840	FRAME WITH GRATE, STD 840.24	3 EA	900.00	2,700.00
0138	2355000000-N	840	FRAME WITH GRATE, STD 840.29	4 EA	750.00	3,000.00
0139	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	69 EA	900.00	62,100.00
0140	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	120 EA	900.00	108,000.00
0141	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	122 EA	900.00	109,800.00
0142	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	23 EA	900.00	20,700.00
0143	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	49 EA	900.00	44,100.00
0144	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	26 EA	1,000.00	26,000.00
0145	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	51 EA	1,150.00	58,650.00
0146	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	63 EA	1,200.00	75,600.00
0147	2396000000-N	840	FRAME WITH COVER, STD 840.54	45 EA	900.00	40,500.00
0148	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	304 EA	2,200.00	668,800.00
0149	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	49 EA	1,250.00	61,250.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0150	2473000000-N	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	5 EA	3,000.00	15,000.00
0151	2484000000-E	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	9.3 LF	650.00	6,045.00
0152	2495000000-E	SP	GENERIC DRAINAGE ITEM SEALED PRECAST DRAINAGE STRUCTURE	25.1 CY	2,000.00	50,200.00
0153	2535000000-E	846	**"X **" CONCRETE CURB (8" X 18")	875 LF	30.00	26,250.00
0154	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	1,195 LF	33.00	39,435.00
0155	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	15,885 LF	35.00	555,975.00
0156	2556000000-E	846	SHOULDER BERM GUTTER	7,575 LF	35.00	265,125.00
0157	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	1,510 LF	48.00	72,480.00
0158	2591000000-E	848	4" CONCRETE SIDEWALK	4,200 SY	65.00	273,000.00
0159	2605000000-N	848	CONCRETE CURB RAMPS	70 EA	2,600.00	182,000.00
0160	2619000000-E	850	4" CONCRETE PAVED DITCH	700 SY	287.00	200,900.00
0161	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	5,335 SY	72.00	384,120.00
0162	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T)	35,754 LF	113.00	4,040,202.00
0163	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T1)	18,446 LF	135.00	2,490,210.00
0164	2703000000-E	854	CONCRETE BARRIER, TYPE ******* (T2)	2,141 LF	300.00	642,300.00
0165	2710000000-N	854	CONCRETE BARRIER TRANSITION SECTION	8 EA	25,000.00	200,000.00
0166	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	4,599 LF	85.00	390,915.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0167	2738000000-E	SP	GENERIC PAVING ITEM 6" CONCRETE DRIVEWAY	1,915 SY	224.00	428,960.00
0168	2752000000-E	SP	GENERIC PAVING ITEM MEDIAN HAZARD PROTECTION	818 LF	200.00	163,600.00
0169	2830000000-N	858	ADJUSTMENT OF MANHOLES	10 EA	1,250.00	12,500.00
0170	2845000000-N	858	ADJUSTMENT OF METER BOXES OR VALVE BOXES	21 EA	1,250.00	26,250.00
0171	3001000000-N	SP	IMPACT ATTENUATOR UNITS, TYPE TL-3	2 EA	24,500.00	49,000.00
0172	3030000000-E	862	STEEL BEAM GUARDRAIL	22,887.5 LF	24.00	549,300.00
0173	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	887.5 LF	25.00	22,187.50
0174	3060000000-E	862	STEEL BEAM GUARDRAIL, DOUBLE FACED	400 LF	35.00	14,000.00
0175	3105000000-N	862	STEEL BEAM GUARDRAIL TERMINAL SECTIONS	2 EA	76.00	152.00
0176	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	75 EA	46.00	3,450.00
0177	3180000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77 MODIFIED)	1 EA	1,895.00	1,895.00
0178	3195000000-N	862	GUARDRAIL END UNITS, TYPE AT-1	2 EA	710.00	1,420.00
0179	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	29 EA	910.00	26,390.00
0180	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	6 EA	1,820.00	10,920.00
0181	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	58 EA	3,050.00	176,900.00
0182	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	20 EA	2,830.00	56,600.00
0183	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	44 EA	2,225.00	97,900.00
0184	3360000000-E	863	REMOVE EXISTING GUARDRAIL	66,522 LF	1.00	66,522.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0185	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	152 LF	12.00	1,824.00
0186	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	6 EA	1,450.00	8,700.00
0187	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	1 EA	1,650.00	1,650.00
0188	3389200000-E	865	CABLE GUIDERAIL	1,100 LF	12.00	13,200.00
0189	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	4 EA	2,830.00	11,320.00
0190	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	64,275 LF	2.50	160,687.50
0191	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	4,118 EA	19.00	78,242.00
0192	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	872 EA	25.00	21,800.00
0193	3566000000-E	867	WOVEN WIRE FENCE RESET	5,170 LF	6.00	31,020.00
0194	3628000000-E	876	RIP RAP, CLASS I	2,920 TON	75.00	219,000.00
0195	3635000000-E	876	RIP RAP, CLASS II	5,795 TON	85.00	492,575.00
0196	3642000000-E	876	RIP RAP, CLASS A	650 TON	100.00	65,000.00
0197	3649000000-E	876	RIP RAP, CLASS B	3,760 TON	70.00	263,200.00
0198	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	22,360 SY	3.50	78,260.00
0199	4048000000-E	902	REINFORCED CONCRETE SIGN FOUNDATIONS	29 CY	877.00	25,433.00
0200	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDATIONS	11 CY	877.00	9,647.00
0201	4057000000-E	SP	OVERHEAD FOOTING	344 CY	1,550.00	533,200.00
0202	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	44,263 LB	6.20	274,430.60
0203	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	8,107 LF	7.25	58,775.75

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0204	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1019+50 -L-)	Lump Sum LS	40,000.00	40,000.00
0205	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1034+40 -L-)	Lump Sum LS	47,000.00	47,000.00
0206	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1044+00 -L-)	Lump Sum LS	49,000.00	49,000.00
0207	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1060+60 -L-)	Lump Sum LS	47,000.00	47,000.00
0208	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1070+50 -L-)	Lump Sum LS	48,000.00	48,000.00
0209	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1087+00 -L-)	Lump Sum LS	43,000.00	43,000.00
0210	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1117+00 -L-)	Lump Sum LS	40,000.00	40,000.00
0211	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1136+00 -L-)	Lump Sum LS	43,500.00	43,500.00
0212	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1141+00 -L-)	Lump Sum LS	44,000.00	44,000.00
0213	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1162+00 -L-)	Lump Sum LS	41,000.00	41,000.00
0214	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1167+00 -L-)	Lump Sum LS	44,000.00	44,000.00
0215	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1188+75 -L-)	Lump Sum LS	48,000.00	48,000.00
0216	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1220+56 -L-)	Lump Sum LS	57,000.00	57,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0217	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1247+00 -L-)	Lump Sum LS	44,000.00	44,000.00
0218	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1272+50 -L-)	Lump Sum LS	51,000.00	51,000.00
0219	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1278+50 -L-)	Lump Sum LS	54,000.00	54,000.00
0220	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1305+00 -L-)	Lump Sum LS	54,000.00	54,000.00
0221	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1331+50 -L-)	Lump Sum LS	101,000.00	101,000.00
0222	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1351+00 -L-)	Lump Sum LS	58,000.00	58,000.00
0223	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1367+00 -L-)	Lump Sum LS	58,000.00	58,000.00
0224	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1377+00 -L-)	Lump Sum LS	54,000.00	54,000.00
0225	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (1393+50 -L-)	Lump Sum LS	96,000.00	96,000.00
0226	4082100000-N	906	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (956+67 -L-)	Lump Sum LS	44,000.00	44,000.00
0227	4096000000-N	904	SIGN ERECTION, TYPE D	39 EA	129.00	5,031.00
0228	4102000000-N	904	SIGN ERECTION, TYPE E	367 EA	67.00	24,589.00
0229	4108000000-N	904	SIGN ERECTION, TYPE F	60 EA	129.00	7,740.00
0230	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	25 EA	928.00	23,200.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0231	4109000000-N	904	SIGN ERECTION, TYPE *** (OVER-HEAD) (B)	24 EA	516.00	12,384.00
0232	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	20 EA	516.00	10,320.00
0233	4114000000-N	904	SIGN ERECTION, MILEMARKERS	18 EA	77.00	1,386.00
0234	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	48 EA	774.00	37,152.00
0235	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (E)	3 EA	258.00	774.00
0236	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	48 EA	516.00	24,768.00
0237	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVER-HEAD	4 EA	7,750.00	31,000.00
0238	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	76 EA	516.00	39,216.00
0239	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	317 EA	1.30	412.10
0240	4158000000-N	907	DISPOSAL OF SIGN SYSTEM, WOOD	4 EA	1.65	6.60
0241	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	7,483 SF	16.50	123,469.50
0242	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	2,791 SF	13.10	36,562.10
0243	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	1,930 SF	16.00	30,880.00
0244	4415000000-N	1115	FLASHING ARROW BOARD	10 EA	4,100.00	41,000.00
0245	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	16 EA	15,600.00	249,600.00
0246	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	10 EA	11,000.00	110,000.00
0247	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	28 EA	3,000.00	84,000.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0248	4432000000-N	SP	HIGH VISIBILITY DRUMS	4,143 EA	39.00	161,577.00
0249	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	58 EA	120.00	6,960.00
0250	4435000000-N	1135	CONES	300 EA	22.00	6,600.00
0251	4445000000-E	1145	BARRICADES (TYPE III)	3,142 LF	53.00	166,526.00
0252	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	72 LF	28.00	2,016.00
0253	4455000000-N	1150	FLAGGER	776 DAY	350.00	271,600.00
0254	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	59 EA	9,500.00	560,500.00
0255	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	12 EA	3,000.00	36,000.00
0256	4480000000-N	1165	TMA	4 EA	89,000.00	356,000.00
0257	4485000000-E	1170	PORTABLE CONCRETE BARRIER	112,861 LF	44.00	4,965,884.00
0258	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	79,428 LF	75.00	5,957,100.00
0259	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	158,004 LF	5.00	790,020.00
0260	4505000000-E	1170	REMOVE & RESET PORTABLE CONCRETE BARRIER (ANCHORED)	16,701 LF	9.00	150,309.00
0261	4510000000-N	1190	LAW ENFORCEMENT	588 HR	60.00	35,280.00
0262	4570000000-E	SP	TEMPORARY GLARE SCREEN	6,148 LF	25.00	153,700.00
0263	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	18 EA	110.00	1,980.00
0264	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	8 EA	3,810.00	30,480.00
0265	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	11,269 EA	4.10	46,202.90

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0266	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	258,127 LF	0.75	193,595.25
0267	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	288,842 LF	1.00	288,842.00
0268	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	3,970 LF	3.10	12,307.00
0269	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	5,155 LF	3.60	18,558.00
0270	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	2 EA	102.00	204.00
0271	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	163 EA	153.00	24,939.00
0272	4805000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II)	28 EA	254.00	7,112.00
0273	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	331,970 LF	0.15	49,795.50
0274	4815000000-E	1205	PAINT PAVEMENT MARKING LINES (6")	1,512,354 LF	0.15	226,853.10
0275	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	1,370 LF	0.76	1,041.20
0276	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	99,176 LF	0.76	75,373.76
0277	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	2,900 LF	1.02	2,958.00
0278	4840000000-N	1205	PAINT PAVEMENT MARKING CHARAC-TER	83 EA	15.50	1,286.50
0279	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	570 EA	15.50	8,835.00
0280	4847400000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 4"	622,310 LF	0.25	155,577.50
0281	4847500000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 6"	1,477,687 LF	0.52	768,397.24
0282	4847600000-E	SP	WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 12"	99,172 LF	0.86	85,287.92

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0283	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	29,920 LF	0.36	10,771.20
0284	4855000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (6")	743,244 LF	0.36	267,567.84
0285	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	49,586 LF	0.71	35,206.06
0286	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	53 LF	5.10	270.30
0287	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	27 EA	51.00	1,377.00
0288	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 12", 20 MILS (STANDARD GLASS BEADS)	100 LF	11.00	1,100.00
0289	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 20 MILS (STANDARD GLASS BEADS)	5,156 LF	2.55	13,147.80
0290	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 6", 20 MILS (STANDARD GLASS BEADS)	1,450 LF	3.55	5,147.50
0291	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 24"	5,755 LF	1.02	5,870.10
0292	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING LINES, 8"	2,722 LF	1.02	2,776.44
0293	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVMENT MARKING LINES (24", 90 MILS)	2,072 LF	11.00	22,792.00
0294	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS	12,000 EA	32.00	384,000.00
0295	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING CHARACTER	560 EA	15.50	8,680.00
0296	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM WORK ZONE PERFORMANCE PAVEMENT MARKING SYMBOL	303 EA	15.50	4,696.50

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0297	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	6,000 EA	4.10	24,600.00
0298	5010000000-E	1401	100' HIGH MOUNT STANDARD	3 EA	33,500.00	100,500.00
0299	5015000000-E	1401	120' HIGH MOUNT STANDARD	17 EA	34,250.00	582,250.00
0300	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA	28,000.00	28,000.00
0301	5025000000-E	SP	HIGH MOUNT FOUNDATIONS	204 CY	1,100.00	224,400.00
0302	5050000000-N	1404	LIGHT STANDARDS, TYPE MTLT ********** (45' TA, 15' ARM)	24 EA	4,800.00	115,200.00
0303	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M1)	18 EA	1,500.00	27,000.00
0304	5070000000-N	SP	STANDARD FOUNDATION ********* (TYPE M2)	6 EA	1,850.00	11,100.00
0305	5120000000-N	1407	ELECTRIC SERVICE POLE **** ******** (30' CLASS 4)	5 EA	3,100.00	15,500.00
0306	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 #1/0 USE)	125 LF	51.00	6,375.00
0307	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	14,418 LF	8.10	116,785.80
0308	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	485 LF	19.00	9,215.00
0309	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (4")	423 LF	28.00	11,844.00
0310	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (3")	1,236 LF	24.00	29,664.00
0311	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")	809 LF	27.00	21,843.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0312	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (6")	215 LF	41.00	8,815.00
0313	5170000000-E	1410	** #8 W/G FEEDER CIRCUIT (2)	2,603 LF	3.00	7,809.00
0314	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2)	2,619 LF	4.00	10,476.00
0315	5180000000-E	1410	** #4 W/G FEEDER CIRCUIT (2)	759 LF	7.00	5,313.00
0316	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5")	15,362 LF	11.00	168,982.00
0317	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5")	7,109 LF	12.00	85,308.00
0318	5215000000-E	1410	** #4 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5")	5,407 LF	12.50	67,587.50
0319	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (BR18)	8 EA	3,500.00	28,000.00
0320	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (CS36)	5 EA	895.00	4,475.00
0321	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM18)	18 EA	325.00	5,850.00
0322	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM30)	1 EA	610.00	610.00
0323	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (HM36)	1 EA	895.00	895.00
0324	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG18)	44 EA	365.00	16,060.00
0325	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG30)	10 EA	556.00	5,560.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0326	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (IG36)	6 EA	1,100.00	6,600.00
0327	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum LS	350,000.00	350,000.00
0328	5260000000-N	SP	GENERIC LIGHTING ITEM LUMINAIRE STORAGE	Lump Sum LS	6,100.00	6,100.00
0329	5265000000-E	SP	GENERIC LIGHTING ITEM STREET LIGHTING CONDUIT IN-STALLATION (2" PVC)	4,320 LF	7.50	32,400.00
0330	5270000000-N	SP	GENERIC LIGHTING ITEM 100' HIGH MOUNT LUMINAIRE - LED	18 EA	1,800.00	32,400.00
0331	5270000000-N	SP	GENERIC LIGHTING ITEM 120' HIGH MOUNT LUMINAIRE - LED	128 EA	1,800.00	230,400.00
0332	5270000000-N	SP	GENERIC LIGHTING ITEM COMMUNICATION GATEWAY	4 EA	6,100.00	24,400.00
0333	5270000000-N	SP	GENERIC LIGHTING ITEM CONTROL NODE	174 EA	305.00	53,070.00
0334	5270000000-N	SP	GENERIC LIGHTING ITEM LIGHT CONTROL EQUIPMENT, TYPE RW, 240/480V	4 EA	14,200.00	56,800.00
0335	5270000000-N	SP	GENERIC LIGHTING ITEM REINSTALL COBRAHEAD LUMINAIRE	20 EA	155.00	3,100.00
0336	5270000000-N	SP	GENERIC LIGHTING ITEM REINSTALL HIGH MAST LUMINAIRE	8 EA	175.00	1,400.00
0337	5270000000-N	SP	GENERIC LIGHTING ITEM RELOCATE CONTROL SYSTEM	1 EA	5,100.00	5,100.00
0338	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STAND-ARD FOUNDATION	2 EA	2,600.00	5,200.00
0339	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE 100' HIGH MAST STANDARD	2 EA	2,900.00	5,800.00
0340	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE LIGHT STANDARD FOUND-ATION	20 EA	510.00	10,200.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0341	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STANDARD - DISPOSE	10 EA	280.00	2,800.00
0342	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE SINGLE ARM LIGHT STANDARD - SALVAGE	10 EA	230.00	2,300.00
0343	5270000000-N	SP	GENERIC LIGHTING ITEM ROADWAY LIGHT STANDARD LUMINAIRE - 285W LED	28 EA	1,265.00	35,420.00
0344	5325200000-E	1510	2" WATER LINE	187 LF	10.00	1,870.00
0345	5325600000-E	1510	6" WATER LINE	22,499 LF	36.00	809,964.00
0346	5325800000-E	1510	8" WATER LINE	4,239 LF	37.00	156,843.00
0347	5326200000-E	1510	12" WATER LINE	19,081 LF	63.00	1,202,103.00
0348	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	62,845 LB	16.00	1,005,520.00
0349	5536000000-E	1515	2" VALVE	3 EA	1,270.00	3,810.00
0350	5540000000-E	1515	6" VALVE	53 EA	1,860.00	98,580.00
0351	5546000000-E	1515	8" VALVE	9 EA	3,560.00	32,040.00
0352	5558000000-E	1515	12" VALVE	20 EA	3,805.00	76,100.00
0353	5571600000-E	1515	6" TAPPING SLEEVE & VALVE	12 EA	4,860.00	58,320.00
0354	5571800000-E	1515	8" TAPPING SLEEVE & VALVE	6 EA	6,110.00	36,660.00
0355	5572200000-E	1515	12" TAPPING SLEEVE & VALVE	16 EA	7,100.00	113,600.00
0356	5573000000-E	1515	20" TAPPING SLEEVE & VALVE	2 EA	46,100.00	92,200.00
0357	5589200000-E	1515	2" AIR RELEASE VALVE	7 EA	18,500.00	129,500.00
0358	5606000000-E	1515	2" BLOW OFF	7 EA	16,800.00	117,600.00
0359	5648000000-N	1515	RELOCATE WATER METER	53 EA	785.00	41,605.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0360	5649000000-N	1515	RECONNECT WATER METER	22 EA	1,850.00	40,700.00
0361	5656000000-E	1515	**" RPZ BACKFLOW PREVENTION ASSEMBLY (1")	1 EA	2,280.00	2,280.00
0362	5656200000-E	1515	2" RPZ BACKFLOW PREVENTION ASSEMBLY	2 EA	2,100.00	4,200.00
0363	5666000000-N	1515	FIRE HYDRANT	1 EA	4,900.00	4,900.00
0364	5672000000-N	1515	RELOCATE FIRE HYDRANT	25 EA	505.00	12,625.00
0365	5673000000-E	1515	FIRE HYDRANT LEG	8 LF	110.00	880.00
0366	5678400000-E	1515	6" LINE STOP	6 EA	7,050.00	42,300.00
0367	5678600000-E	1515	8" LINE STOP	4 EA	7,510.00	30,040.00
0368	5679000000-E	1515	12" LINE STOP	12 EA	10,400.00	124,800.00
0369	5679400000-E	1515	20" LINE STOP	2 EA	21,750.00	43,500.00
0370	5686000000-E	1515	**" WATER SERVICE LINE (2")	197 LF	8.70	1,713.90
0371	5686500000-E	1515	WATER SERVICE LINE	2,323 LF	20.50	47,621.50
0372	5691000000-E	1520	**" SANITARY GRAVITY SEWER (15")	40 LF	310.00	12,400.00
0373	5691300000-E	1520	8" SANITARY GRAVITY SEWER	4,306 LF	49.00	210,994.00
0374	5691400000-E	1520	10" SANITARY GRAVITY SEWER	195 LF	70.00	13,650.00
0375	5691500000-E	1520	12" SANITARY GRAVITY SEWER	1,928 LF	77.00	148,456.00
0376	5691600000-E	1520	16" SANITARY GRAVITY SEWER	3,992 LF	84.00	335,328.00
0377	5691700000-E	1520	18" SANITARY GRAVITY SEWER	1,352 LF	171.00	231,192.00
0378	5709100000-E	1520	2" FORCE MAIN SEWER	1,029 LF	25.00	25,725.00
0379	5709300000-E	1520	6" FORCE MAIN SEWER	709 LF	46.00	32,614.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0380	5709400000-E	1520	8" FORCE MAIN SEWER	2,545 LF	36.00	91,620.00
0381	5709800000-E	1520	20" FORCE MAIN SEWER	988 LF	48.00	47,424.00
0382	5768000000-N	1520	SANITARY SEWER CLEAN-OUT	18 EA	1,375.00	24,750.00
0383	5768500000-E	1520	SEWER SERVICE LINE	486 LF	18.50	8,991.00
0384	5769000000-E	1520	DUCTILE IRON SEWER PIPE FITTINGS	1,285 LB	19.70	25,314.50
0385	5775000000-E	1525	4' DIA UTILITY MANHOLE	63 EA	3,620.00	228,060.00
0386	5776000000-E	1525	5' DIA UTILITY MANHOLE	5 EA	5,100.00	25,500.00
0387	5777000000-E	1525	6' DIA UTILITY MANHOLE	4 EA	6,450.00	25,800.00
0388	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	318 LF	105.00	33,390.00
0389	5782000000-E	1525	UTILITY MANHOLE WALL 5' DIA	20 LF	200.00	4,000.00
0390	5783000000-E	1525	UTILITY MANHOLE WALL 6' DIA	38 LF	195.00	7,410.00
0391	5798000000-E	1530	ABANDON **" UTILITY PIPE (15")	3,170 LF	11.00	34,870.00
0392	5798000000-E	1530	ABANDON **" UTILITY PIPE (4")	683 LF	12.00	8,196.00
0393	5800000000-E	1530	ABANDON 6" UTILITY PIPE	1,615 LF	12.00	19,380.00
0394	5801000000-E	1530	ABANDON 8" UTILITY PIPE	2,639 LF	12.00	31,668.00
0395	5802000000-E	1530	ABANDON 10" UTILITY PIPE	48 LF	22.00	1,056.00
0396	5804000000-E	1530	ABANDON 12" UTILITY PIPE	10,691 LF	11.00	117,601.00
0397	5805000000-E	1530	ABANDON 14" UTILITY PIPE	1,335 LF	12.00	16,020.00
0398	5812000000-E	1530	ABANDON 20" UTILITY PIPE	947 LF	12.00	11,364.00
0399	5815000000-N	1530	REMOVE WATER METER	6 EA	366.00	2,196.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0400	5816000000-N	1530	ABANDON UTILITY MANHOLE	39 EA	995.00	38,805.00
0401	5828000000-N	1530	REMOVE UTILITY MANHOLE	1 EA	955.00	955.00
0402	5835400000-E	1540	6" ENCASEMENT PIPE	216 LF	139.00	30,024.00
0403	5835700000-E	1540	16" ENCASEMENT PIPE	1,327 LF	85.00	112,795.00
0404	5835800000-E	1540	18" ENCASEMENT PIPE	248 LF	97.00	24,056.00
0405	5835900000-E	1540	20" ENCASEMENT PIPE	122 LF	122.00	14,884.00
0406	5836000000-E	1540	24" ENCASEMENT PIPE	2,422 LF	110.00	266,420.00
0407	5836200000-E	1540	30" ENCASEMENT PIPE	1,045 LF	138.00	144,210.00
0408	5836400000-E	1540	36" ENCASEMENT PIPE	661 LF	216.00	142,776.00
0409	5872500000-E	1550	BORE AND JACK OF **" (16")	800 LF	208.00	166,400.00
0410	5872500000-E	1550	BORE AND JACK OF **" (18")	125 LF	257.00	32,125.00
0411	5872500000-E	1550	BORE AND JACK OF **" (20")	122 LF	257.00	31,354.00
0412	5872500000-E	1550	BORE AND JACK OF **" (24")	1,440 LF	277.00	398,880.00
0413	5872500000-E	1550	BORE AND JACK OF **" (30")	550 LF	391.00	215,050.00
0414	5872500000-E	1550	BORE AND JACK OF **" (36")	325 LF	461.00	149,825.00
0415	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (20")	899 LF	434.00	390,166.00
0416	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (6")	1,380 LF	111.00	153,180.00
0417	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (8")	477 LF	133.00	63,441.00
0418	5876000000-N	SP	STEEL PILE PIERS	6 EA	84.00	504.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0419	5882000000-N	SP	GENERIC UTILITY ITEM 12" INSERT VALVE	4 EA	15,350.00	61,400.00
0420	5882000000-N	SP	GENERIC UTILITY ITEM 6" INSERT VALVE	6 EA	9,100.00	54,600.00
0421	5882000000-N	SP	GENERIC UTILITY ITEM 8" INSERT VALVE	4 EA	10,500.00	42,000.00
0422	5882000000-N	SP	GENERIC UTILITY ITEM REMOVE EXISTING VAULT, BYPASS AND STOCKPILE VALVES	1 EA	5,200.00	5,200.00
0423	5912000000-N	SP	GENERIC UTILITY ITEM RELOCATE MASTER METER AND INSTALL NEW VAULT	Lump Sum LS	52,200.00	52,200.00
0424	6000000000-E	1605	TEMPORARY SILT FENCE	184,105 LF	2.30	423,441.50
0425	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	7,900 TON	50.00	395,000.00
0426	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	25,330 TON	60.00	1,519,800.00
0427	6012000000-E	1610	SEDIMENT CONTROL STONE	21,750 TON	48.00	1,044,000.00
0428	6015000000-E	1615	TEMPORARY MULCHING	396.5 ACR	1,150.00	455,975.00
0429	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	20,500 LB	1.05	21,525.00
0430	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	104.5 TON	820.00	85,690.00
0431	6024000000-E	1622	TEMPORARY SLOPE DRAINS	17,100 LF	22.00	376,200.00
0432	6029000000-E	SP	SAFETY FENCE	8,640 LF	2.60	22,464.00
0433	6030000000-E	1630	SILT EXCAVATION	132,360 CY	6.00	794,160.00
0434	6036000000-E	1631	MATTING FOR EROSION CONTROL	580,800 SY	1.40	813,120.00
0435	6037000000-E	SP	COIR FIBER MAT	2,825 SY	4.10	11,582.50
0436	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	355 SY	7.20	2,556.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0437	6042000000-E	1632	1/4" HARDWARE CLOTH	37,675 LF	4.05	152,583.75
0438	6043000000-E	SP	LOW PERMEABILITY GEOTEXTILE	8,725 SY	5.00	43,625.00
0439	6045000000-E	SP	**" TEMPORARY PIPE (18")	390 LF	50.00	19,500.00
0440	6045000000-E	SP	**" TEMPORARY PIPE (24")	150 LF	70.00	10,500.00
0441	6045000000-E	SP	**" TEMPORARY PIPE (30")	360 LF	85.00	30,600.00
0442	6045000000-E	SP	**" TEMPORARY PIPE (36")	120 LF	115.00	13,800.00
0443	6045000000-E	SP	**" TEMPORARY PIPE (48")	1,200 LF	90.00	108,000.00
0444	6045000000-E	SP	**" TEMPORARY PIPE (54")	391 LF	130.00	50,830.00
0445	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	750 SY	35.00	26,250.00
0446	6070000000-N	1639	SPECIAL STILLING BASINS	38 EA	650.00	24,700.00
0447	6071012000-E	SP	COIR FIBER WATTLE	41,360 LF	6.20	256,432.00
0448	6071020000-E	SP	POLYACRYLAMIDE (PAM)	23,160 LB	3.60	83,376.00
0449	6071030000-E	1640	COIR FIBER BAFFLE	25,740 LF	4.40	113,256.00
0450	6071050000-E	SP	**" SKIMMER (1-1/2")	18 EA	900.00	16,200.00
0451	6071050000-E	SP	**" SKIMMER (2")	26 EA	1,100.00	28,600.00
0452	6071050000-E	SP	**" SKIMMER (2-1/2")	18 EA	1,200.00	21,600.00
0453	6071050000-E	SP	**" SKIMMER (3")	8 EA	1,500.00	12,000.00
0454	6084000000-E	1660	SEEDING & MULCHING	360 ACR	1,940.00	698,400.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0455	6087000000-E	1660	MOWING	235 ACR	143.00	33,605.00
0456	6090000000-E	1661	SEED FOR REPAIR SEEDING	4,300 LB	8.20	35,260.00
0457	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	13.25 TON	1,000.00	13,250.00
0458	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	8,050 LB	6.20	49,910.00
0459	6108000000-E	1665	FERTILIZER TOPDRESSING	241 TON	820.00	197,620.00
0460	6111000000-E	SP	IMPERVIOUS DIKE	1,573 LF	55.00	86,515.00
0461	6114500000-N	1667	SPECIALIZED HAND MOWING	110 MHR	130.00	14,300.00
0462	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	300 EA	105.00	31,500.00
0463	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	24 EA	1,100.00	26,400.00
0464	6120000000-E	SP	CULVERT DIVERSION CHANNEL	69 CY	15.00	1,035.00
0465	6123000000-E	1670	REFORESTATION	0.25 ACR	12,500.00	3,125.00
0466	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	210 EA	130.00	27,300.00
0467	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	35 EA	150.00	5,250.00
0468	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	18 EA	785.00	14,130.00
0469	7060000000-E	1705	SIGNAL CABLE	7,540 LF	3.00	22,620.00
0470	7108000000-E	1705	VEHICLE SIGNAL HEAD (12", 1 SECTION)	6 EA	575.00	3,450.00
0471	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	34 EA	805.00	27,370.00
0472	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	3 EA	950.00	2,850.00
0473	7180000000-N	1706	BACKPLATE	43 EA	125.00	5,375.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0474	7252000000-E	1710	MESSENGER CABLE (1/4")	2,430 LF	2.80	6,804.00
0475	7264000000-E	1710	MESSENGER CABLE (3/8")	2,160 LF	4.30	9,288.00
0476	7279000000-E	1715	TRACER WIRE	700 LF	2.00	1,400.00
0477	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	6,700 LF	8.60	57,620.00
0478	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	270 LF	13.20	3,564.00
0479	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,360 LF	24.00	32,640.00
0480	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	78 EA	305.00	23,790.00
0481	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	14 EA	627.00	8,778.00
0482	7360000000-N	1720	WOOD POLE	4 EA	1,115.00	4,460.00
0483	7372000000-N	1721	GUY ASSEMBLY	7 EA	708.00	4,956.00
0484	7384000000-E	1722	***" RISER WITH ********** (1-1/2", WEATHERHEAD)	2 EA	607.00	1,214.00
0485	7384000000-E	1722	***" RISER WITH ********** (1-1/4", WEATHERHEAD)	12 EA	607.00	7,284.00
0486	7408000000-E	1722	1" RISER WITH WEATHERHEAD	33 EA	379.00	12,507.00
0487	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	2 EA	73.80	147.60
0488	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	3,460 LF	10.00	34,600.00
0489	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	8,160 LF	2.00	16,320.00
0490	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (24)	3,425 LF	2.70	9,247.50
0491	7528000000-E	1730	DROP CABLE	320 LF	2.70	864.00
0492	7540000000-N	1731	SPLICE ENCLOSURE	3 EA	1,650.00	4,950.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0493	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	1 EA	900.00	900.00
0494	7552000000-N	1731	INTERCONNECT CENTER	3 EA	1,200.00	3,600.00
0495	7575000000-N	SP	FIBER-OPTIC TRAINING	Lump Sum LS	7,000.00	7,000.00
0496	7575142010-N	1736	900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO	3 EA	4,100.00	12,300.00
0497	7575142060-N	SP	MODIFY RADIO INSTALLATION	7 EA	1,350.00	9,450.00
0498	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	2,795 LF	0.80	2,236.00
0499	7576000000-N	SP	METAL STRAIN SIGNAL POLE	16 EA	15,250.00	244,000.00
0500	7613000000-N	SP	SOIL TEST	16 EA	840.00	13,440.00
0501	7614100000-E	SP	DRILLED PIER FOUNDATION	149 CY	1,100.00	163,900.00
0502	7636000000-N	1745	SIGN FOR SIGNALS	8 EA	365.00	2,920.00
0503	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	18 EA	1,920.00	34,560.00
0504	7684000000-N	1750	SIGNAL CABINET FOUNDATION	4 EA	2,425.00	9,700.00
0505	7686000000-N	1752	CONDUIT ENTRANCE INTO EXISTING FOUNDATION	3 EA	760.00	2,280.00
0506	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070LX, BASE MOUNTED)	4 EA	14,700.00	58,800.00
0507	7744000000-N	1751	DETECTOR CARD (TYPE 170)	22 EA	135.00	2,970.00
0508	7901000000-N	1753	CABINET BASE EXTENDER	4 EA	660.00	2,640.00
0509	7912000000-N	1755	BEACON CONTROLLER ASSEMBLY & CABINET (********) (TYPE F3)	1 EA	6,600.00	6,600.00
0510	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	1 EA	10,500.00	10,500.00
0511	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	17 EA	230.00	3,910.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0512	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET	17 EA	5,300.00	90,100.00
0513	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	16 EA	2,500.00	40,000.00
0514	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	23 EA	4,100.00	94,300.00
0515	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	4 EA	7,700.00	30,800.00
0516	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	4 EA	43,000.00	172,000.00
0517	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 2C)	4 EA	111,000.00	444,000.00
0518	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	17 EA	1,200.00	20,400.00
0519	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	25 EA	1,500.00	37,500.00
0520	7980000000-N	SP	GENERIC SIGNAL ITEM EXISTING CCTV CAMERA REMOVAL	6 EA	305.00	1,830.00
0521	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX MARKER	6 EA	120.00	720.00
0522	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA-TION PANEL	17 EA	1,500.00	25,500.00
0523	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES	1 EA	13,700.00	13,700.00
0524	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE EQUIPMENT	2 EA	1,100.00	2,200.00
0525	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE 900 MHZ RADIO	5 EA	52.00	260.00
0526	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 324	Lump Sum LS	5,200.00	5,200.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0527	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-40 MM 331	Lump Sum LS	5,200.00	5,200.00
0528	7985000000-N	SP	GENERIC SIGNAL ITEM REMOVE DMS AND STRUCTURE AT I-95 MM 78	Lump Sum LS	5,200.00	5,200.00
0529	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTOR	2,000 LF	6.50	13,000.00
0530	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUC-TORS	6,150 LF	4.50	27,675.00
0531	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUC-TORS	100 LF	12.50	1,250.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0532	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1042+08.93 -L-)	Lump Sum LS	125,000.00	125,000.00
0533	8126000000-N	414	CULVERT EXCAVATION, STA ****** (1042+08.93 -L-)	Lump Sum LS	80,000.00	80,000.00
0534	8126000000-N	414	CULVERT EXCAVATION, STA ****** (1220+34.00 -L-)	Lump Sum LS	200,000.00	200,000.00
0535	8126000000-N	414	CULVERT EXCAVATION, STA ****** (15+47.41 -NBCD-)	Lump Sum LS	30,000.00	30,000.00
0536	8126000000-N	414	CULVERT EXCAVATION, STA ****** (35+91.00 -Y33-)	Lump Sum LS	35,000.00	35,000.00
0537	8133000000-E	414	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	1,008 TON	75.00	75,600.00
0538	8196000000-E	420	CLASS A CONCRETE (CULVERT)	1,303.6 CY	925.00	1,205,830.00
0539	8245000000-E	425	REINFORCING STEEL (CULVERT)	170,843 LB	1.50	256,264.50
0540	8804000000-N	SP	GENERIC CULVERT ITEM ASBESTO ASSESSMENT	Lump Sum LS	4,500.00	4,500.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0541	8504000000-E	460	CONCRETE BARRIER RAIL WITH MOMENT SLAB	158.74 LF	600.00	95,244.00
0542	8801000000-E	SP	MSE RETAINING WALL NO **** (W3)	4,063 SF	64.00	260,032.00
0543	8801000000-E	SP	MSE RETAINING WALL NO **** (W6)	791 SF	66.00	52,206.00
0544	8801000000-E	SP	MSE RETAINING WALL NO **** (W8)	917 SF	69.00	63,273.00
0545	8801000000-E	SP	MSE RETAINING WALL NO **** (W9)	316 SF	93.00	29,388.00
0546	8801000000-E	SP	MSE RETAINING WALL NO **** W1-1 (I-5878)	8,300 SF	67.00	556,100.00
0547	8801000000-E	SP	MSE RETAINING WALL NO **** W1-1 (I-5883)	3,800 SF	68.00	258,400.00
0548	8801000000-E	SP	MSE RETAINING WALL NO **** W1-2 (I-5878)	4,275 SF	70.00	299,250.00
0549	8801000000-E	SP	MSE RETAINING WALL NO **** W1-2 (I-5883)	3,400 SF	68.00	231,200.00
0550	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5878)	5,750 SF	69.00	396,750.00
0551	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5883)	3,500 SF	70.00	245,000.00
0552	8801000000-E	SP	MSE RETAINING WALL NO **** W2-1 (I-5986B)	2,830 SF	70.00	198,100.00
0553	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5878)	4,880 SF	71.00	346,480.00
0554	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5883)	3,800 SF	67.00	254,600.00
0555	8801000000-E	SP	MSE RETAINING WALL NO **** W2-2 (I-5986B)	2,770 SF	70.00	193,900.00
0556	8802030000-E	454	SEGMENTAL GRAVITY RETAINING WALLS	450 SF	225.00	101,250.00
0557	8802040000-E	453	CIP GRAVITY RETAINING WALLS	6,180 SF	125.00	772,500.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0558	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL CONCRETE SURFACE TREATMENT	41,169 SF	5.40	222,312.60
0559	8847000000-E	SP	GENERIC RETAINING WALL ITEM ARCHITECTURAL SURFACE TREATMENT	37,450 SF	3.00	112,350.00
0560	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW29-1	3,720 SF	50.00	186,000.00
0561	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW32-1	7,570 SF	45.00	340,650.00
0562	8847000000-E	SP	GENERIC RETAINING WALL ITEM SOUND BARRIER WALL NO. NW33-1	16,160 SF	45.00	727,200.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0563	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1260+34.00 -L-)	Lump Sum LS	115,000.00	115,000.00
0564	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (1391+19.65 -L-)	Lump Sum LS	90,000.00	90,000.00
0565	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (25+31.59 -Y18-)	Lump Sum LS	140,000.00	140,000.00
0566	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+05.28 -Y14-)	Lump Sum LS	115,000.00	115,000.00
0567	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+80.73 -Y17-)	Lump Sum LS	175,000.00	175,000.00
0568	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (27+09.19 -Y16-)	Lump Sum LS	105,000.00	105,000.00
0569	8042000000-N	402	REMOVAL OF EXISTING STRUCTURES AT STATION ********** (1002+79.68 -L REV-)	Lump Sum LS	190,000.00	190,000.00
0570	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum LS	7,500.00	7,500.00
0571	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+05.28 -Y14-)	Lump Sum LS	8,000.00	8,000.00
0572	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+80.73 -Y17-)	Lump Sum LS	9,000.00	9,000.00
0573	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 27+09.19 -Y16-)	Lump Sum LS	7,000.00	7,000.00
0574	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 28+39.21 -Y29-)	Lump Sum LS	5,000.00	5,000.00
0575	8112730000-N	450	PDA TESTING	16 EA	5,500.00	88,000.00
0576	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (1260+34.00 -L-)	Lump Sum LS	80,000.00	80,000.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0577	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (1391+19.65 -L-)	Lump Sum LS	75,000.00	75,000.00
0578	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+05.28 -Y14-)	Lump Sum LS	6,000.00	6,000.00
0579	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+80.73 -Y17-)	Lump Sum LS	5,000.00	5,000.00
0580	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	104,193 SF	45.00	4,688,685.00
0581	8161000000-E	420	GROOVING BRIDGE FLOORS	122,423 SF	1.15	140,786.45
0582	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	205.7 CY	550.00	113,135.00
0583	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	2,445.1 CY	945.00	2,310,619.50
0584	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1002+79.68 -L REV-)	Lump Sum LS	220,000.00	220,000.00
0585	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1260+34.00 -L-)	Lump Sum LS	220,000.00	220,000.00
0586	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (1391+19.65 -L-)	Lump Sum LS	220,000.00	220,000.00
0587	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+05.28 -Y14-)	Lump Sum LS	95,000.00	95,000.00
0588	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+80.73 -Y17-)	Lump Sum LS	55,000.00	55,000.00
0589	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (27+09.19 -Y16-)	Lump Sum LS	87,000.00	87,000.00
0590	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (28+39.21 -Y29-)	Lump Sum LS	34,000.00	34,000.00
0591	8217000000-E	425	REINFORCING STEEL (BRIDGE)	392,154 LB	1.60	627,446.40

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0592	8224000000-E	425	EPOXY COATED REINFORCING STEEL (BRIDGE)	9,487 LB	3.00	28,461.00
0593	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	4,743 LB	3.00	14,229.00
0594	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	1,874.6 LF	375.00	702,975.00
0595	8274000000-E	430	MODIFIED 63" PRESTRESSED CONC GIRDERS	2,137.5 LF	450.00	961,875.00
0596	8296000000-N	442	POLLUTION CONTROL	Lump Sum LS	5,076.14	5,076.14
0597	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	381 EA	1,100.00	419,100.00
0598	8328400000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** GALVANIZED STEEL PILES (PP 30 X 0.50)	32 EA	12,500.00	400,000.00
0599	8364000000-E	450	HP12X53 STEEL PILES	26,470 LF	90.00	2,382,300.00
0600	8385200000-E	450	PP ** X **** GALVANIZED STEEL PILES (PP 30 X 0.50)	2,560 LF	330.00	844,800.00
0601	8392000000-N	450	PIPE PILE PLATES	32 EA	700.00	22,400.00
0602	8393000000-N	450	PILE REDRIVES	211 EA	300.00	63,300.00
0603	8475000000-E	460	TWO BAR METAL RAIL	437.96 LF	150.00	65,694.00
0604	8482000000-E	460	THREE BAR METAL RAIL	431 LF	210.00	90,510.00
0605	8503000000-E	460	CONCRETE BARRIER RAIL	2,287.74 LF	122.00	279,104.28
0606	8510000000-E	460	CONCRETE MEDIAN BARRIER	599.2 LF	93.00	55,725.60
0607	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 3'-7")	453.67 LF	176.00	79,845.92
0608	8531000000-E	462	4" SLOPE PROTECTION	245 SY	110.00	26,950.00
0609	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	2,196 TON	72.00	158,112.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0610	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,428 SY	3.50	8,498.00
0611	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum LS	120,000.00	120,000.00
0612	8692000000-N	SP	FOAM JOINT SEALS	Lump Sum LS	35,000.00	35,000.00
0613	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum LS	1,150,000.00	1,150,000.00
0614	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+05.28 -Y14-)	Lump Sum LS	67,000.00	67,000.00
0615	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+80.73 -Y17-)	Lump Sum LS	66,000.00	66,000.00
0616	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (27+09.19 -Y16-)	Lump Sum LS	65,000.00	65,000.00
0617	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (28+39.21 -Y29-)	Lump Sum LS	65,000.00	65,000.00
0618	8860000000-N	SP	GENERIC STRUCTURE ITEM CLEANING AND PAINTING EXISTING WEATHERING STEEL FOR BRIDGE NO 500051	Lump Sum LS	104,114.72	104,114.72
0619	8860000000-N	SP	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE NO 500051	Lump Sum LS	85,184.77	85,184.77
0620	8867000000-E	SP	GENERIC STRUCTURE ITEM 45" PREST CONC FLORIDA I-BEAM	7,090.17 LF	475.00	3,367,830.75
0621	8867000000-E	SP	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT	149.47 LF	40.00	5,978.80
0622	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATING	464 SF	10.15	4,709.60
0623	8893000000-E	SP	GENERIC STRUCTURE ITEM PLACING & FINISHING PC OVERLAY	1,156 SY	72.00	83,232.00
0624	8893000000-E	SP	GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK	1,156 SY	37.00	42,772.00

Contract Item Sheets For C204543

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0625	8893000000-E	SP	GENERIC STRUCTURE ITEM SHOTBLASTING BRIDGE DECK	1,192 SY	14.00	16,688.00
			******* BEGIN SCHEDULE AA ******* ******* (2 ALTERNATES) *******			
0626 **AA1**	8881000000-E	SP	GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS	32 CY	2,050.00	65,600.00
			*** OR ***			
0627 **AA2**	8881000000-E	SP	GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERIAL (ALTERNATE)	32 CY		
			***** END SCHEDULE AA *****			
			TOTAL AMOUNT OF BID FOR ENTIRE PROJECT			**$236,460,093.76**

1254/Jul29/Q13950388.45/D2999001956070/E627

Contract No. C204543 Rev. 1-16-18

County Harnett/Johnston

EXECUTION OF CONTRACT
NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION
JOINT VENTURE (2) or (3)

The Contractor declares (or certifies, verifies, or states) under penalty of perjury under the laws of the United States that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with this Contract, that the Contractor has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Contractor intends to do the work with its own bonafide employees or subcontractors and did not bid for the benefit of another contractor.

By submitting this Execution of Contract, Non-Collusion and Debarment Certification, the Contractor is certifying his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTORS

Instructions: **2 Joint Venturers** Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3) and (4) and execute. On Line (1), fill in the name of the Joint Venture Company. On Line (2), fill in the name of one of the joint venturers and execute below in the appropriate manner. On Line (3), print or type the name of the other joint venturer and execute below in the appropriate manner. On Line (4), fill in the name of the third joint venturer, if applicable and execute below in the appropriate manner.

(1) Flatiron-Fred Smith Company JV
Name of Joint Venture

(2) Flatiron Constructors, Inc.
Name of Contractor

860 Aviation Parkway, Suite 1000 Morrisville, NC 27560
Address as Prequalified

FLATIRON CONSTRUCTORS, INC. CORPORATE SEAL DELAWARE

Signature of Witness or Attest — By — Signature of Contractor

Linda Brumfield — Jim Schneiderman

Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal and

(3) FSC II LLC dba Fred Smith Company
Name of Contractor

701 Corporate Center Drive Raleigh, NC 27607
Address as Prequalified

Signature of Witness or Attest — By — Signature of Contractor

Melissa Lawson — Brent E. Wood, Vice President

Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal and

(4) _____
Name of Contractor *(for 3 Joint Venture only)*

_____
Address as Prequalified

_____ — By — _____
Signature of Witness or Attest — Signature of Contractor

_____ — _____
Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal

Contract No. C204543 Rev. 1-16-18

County Harnett/Johnston

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal,* and *voluntarily excluded,* as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR* 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

Contract No. C204543 Rev. 1-16-18

County Harnett/Johnston

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

Contract No. **C204543**

County (ies): **Harnett, Johnston**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Ronald E. Davenport, Jr.
F81B6038A47A442...
Contract Officer

8/18/2021
Date

Execution of Contract and Bonds
Approved as to Form:

DocuSigned by:
Scott Beaver
55FE7B40AA93401...
Attorney General

8/18/2021
Date

Flatiron Bond Numbers
Liberty Bond # 015214579, Travelers Bond # 107433019 F&D/Zurich Bond # 9374482
Federal Bond # K40270085 Continental Bond # 30125120 BH Bond # 47-SUR-300033-01-0544

Fred Smith Bond Numbers
Liberty Bond # 016231515
Western Bond # 30136190

Executed in Duplicate

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PAYMENT BOND

Date of Payment Bond Execution	August 4, 2021
Name of Principal Contractor	Flatiron - Fred Smith Company, JV
Name of Surety:	Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America, Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company Continental Insurance Company, Berkshire Hathaway Specialty Insurance Company, Western Surety Company
Name of Contracting Body:	**North Carolina Department of Transportation**
	Raleigh, North Carolina
Amount of Bond:	$236,460,093.76
Contract ID No.:	C204543
County Name:	Harnett/Johnston

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PAYMENT BOND

Affix Seal of Surety Company

Liberty Mutual Insurance Company, Travelers Casualty and Surety Companyof America Fidelity and Deposit Company of Maryland Zurich American Insurance Company, Federal Insurance Company, Continental Insurance Company, Berkshire Hathaway Specialty Insurance Company, Western Surety Company

Print or type Surety Company Name

By Elliott W Wolffe

Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

John F Surano

Print or type Signer's name

250 Pehle Avenue, Suite 311, Saddle Brook, NJ 07663

Address of Attorney-in-Fact

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PAYMENT BOND
JOINT VENTURE (2) or (3)
SIGNATURE OF CONTRACTORS (Principal)

Instructions to Bidders: **2 Joint Ventures**, Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3), (4) and execute. On Line (1), print or type the name of Joint Venture. On line (2), print or type the name of one of the joint venturers and execute below in the appropriate manner required by Article 102-8 of the *Specifications*. On Line (3), print or type the name of second joint venturer and execute below in the appropriate manner required by said article of the Specifications. On Line (4), print or type the name of the third joint venturer, if applicable and execute below in the appropriate manner required by said article of the Specifications. This form of execution must be strictly followed.

(1) Flatiron-Fred Smith Company, JV
Name of Joint Venture

(2) Flatiron Constructors, Inc
Name of Contractor

8600 Aviation Pkwy, Ste. 1000 Morrisville, NC 27560
Address as prequalified

Signature of Witness or Attest

Linda Brumfield
Print or type Signer's name

By

Signature of Contractor

Jim Schneiderman
Print or type Signer's name

FLATIRON CONSTRUCTORS, INC. CORPORATE SEAL DELAWARE

If Corporation, affix Corporate Seal

and

(3) FSC II LLC dba Fred Smith Company
Name of Contractor

701 Corporate Center Drive Raleigh, NC 27607
Address as prequalified

Signature of Witness or Attest

Janet Castleberry Clarke
Print or type Signer's name

By

Signature of Contractor

W. Reade Dawson, VP
Print or type Signer's name

If Corporation, affix Corporate Seal

and

(4) _____
Name of Contractor *(for 3 Joint Venture only)*

_____
Address as prequalified

_____
Signature of Witness or Attest

By

_____
Signature of Contractor

_____
Print or type Signer's name

_____
Print or type Signer's name

If Corporation, affix Corporate Seal

Flatiron Bond Numbers
Liberty Bond # 015214579 Travelers Bond # 107433019 F&D/Zurich Bond # 9374482 Federal Bond # K40270085 Continental Bond # 30125120 BH Bond # 47-SUR-300033-01-0544

Fred Smith Bond Numbers
Liberty Bond # 016231515
Western Bond # 30136190

Executed in Duplicate

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Date of Performance Bond Execution:	August 4, 2021
Name of Principal Contractor:	Flatiron - Fred Smith Company, JV
Name of Surety:	Liberty Mutual Insurance Company, Travelers Casualty and Surety Company of America, Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company, Continental Insurance Company, Berkshire Hathaway Specialty Insurance Company, Western Surety Company
Name of Contracting Body:	**North Carolina Department of Transportation**
	Raleigh, North Carolina
Amount of Bond:	$236,460,093.76
Contract ID No.:	C204543
County Name:	Harnett/Johnston

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the Contracting Body, numbered as shown above and hereto attached:

NOW THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PERFORMANCE BOND

Affix Seal of Surety Company

Liberty Mutual Insurance Company, Travelers Casualty and Surety Company, Fidelity and Deposit Company of Maryland, Zurich American Insurance Company, Federal Insurance Company, Continental Insurance Company, Berkshire Hathaway Specialty Insurance Company, Western Surety Company

Print or type Surety Company Name

By Elliott W Wolffe

Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

John F Surano

Print or type Signer's name

250 Pehle Avenue, Suite 311, Saddle Brook, NJ 07663

Address of Attorney-in-Fact

Contract No. C204543
County Harnett/Johnston

Rev 5-17-11

CONTRACT PAYMENT BOND
JOINT VENTURE (2) or (3)
SIGNATURE OF CONTRACTORS (Principal)

Instructions to Bidders: **2 Joint Ventures**, Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3), (4) and execute. On Line (1), print or type the name of Joint Venture. On line (2), print or type the name of one of the joint venturers and execute below in the appropriate manner required by Article 102-8 of the *Specifications*. On Line (3), print or type the name of second joint venturer and execute below in the appropriate manner required by said article of the Specifications. On Line (4), print or type the name of the third joint venturer, if applicable and execute below in the appropriate manner required by said article of the Specifications. This form of execution must be strictly followed.

(1) Flatiron - Fred Smith Company, JV
Name of Joint Venture

(2) Flatiron Constructors, Inc
Name of Contractor

8160 Aviation Pkwy, Ste. 1000 Morrisville, NC 27560
Address as prequalified

Signature of Witness or Attest — By — Signature of Contractor

Linda Brumfield
Print or type Signer's name

Jim Schneiderman
Print or type Signer's name

FLATIRON CONSTRUCTORS, INC. CORPORATE SEAL DELAWARE

If Corporation, affix Corporate Seal

and

(3) FSC II LLC dba Fred Smith Company
Name of Contractor

761 Corporate Center Drive Raleigh, NC 27607
Address as prequalified

Signature of Witness or Attest — By — Signature of Contractor

Janice Castleberry Clarke
Print or type Signer's name

W. Reade Dawson, VP
Print or type Signer's name

If Corporation, affix Corporate Seal

and

(4) _____
Name of Contractor *(for 3 Joint Venture only)*

_____
Address as prequalified

_____ — By — _____
Signature of Witness or Attest — Signature of Contractor

_____ — _____
Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8204080-974450

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Charo J. Rosemond; Elliott W. Wolffe; James Baldassare Jr.; John F. Surano; Krista A. Burke; Lisa M. Scavetta; Maria L. Spadaccini; Nicholas F. Walsh; Sherryanne M. DePirro

all of the city of Saddle Brook state of NJ each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 3rd day of August, 2020.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 3rd day of August, 2020 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys in fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 4th day of August, 2021.

By: _____
Renee C. Llewellyn, Assistant Secretary

LMS-12873 LMIC OCIC WAIC Multi Co_12/19

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

TRAVELERS

Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Elliott W. Wolffe** of **SADDLE BROOK**, **New Jersey**, their true and lawful Attorney-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **17th** day of **January, 2019.**

State of Connecticut

City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the **17th** day of **January, 2019**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June, 2021**

_____
Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this 4th day of August 2021

_____
Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney-in-Fact and the details of the bond to which this Power of Attorney is attached.

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray**, Vice President, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint, Krista A. BURKE, Charo J. ROSEMOND, Maria L. SPADACCINI, Sherryanne M. DEPIRRO, Nicholas F. WALSH, Lisa M. SCAVETTA, Elliott W. WOLFFE, James BALDASSARE, JR. And John F. SURANO, of Saddle Brook, New Jersey, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons. The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 28th day of July A.D. 2020.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 28th day of July, 2020, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 6th day of August, 2021.

Brian M Hodges

Brian M. Hodges, Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
surety.claims@zurichna.com

CHUBB

Power of Attorney

Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, **PACIFIC INDEMNITY COMPANY**, a Wisconsin corporation, **WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** corporations of the Commonwealth of Pennsylvania, do each hereby constitute and appoint James Baldassare Jr., Krista A. Burke, Sherryanne M. DePirro, Charo J. Rosemond, Lisa M. Scavetta, Maria L. Spadaccini, John F. Surano, Nicholas F. Walsh and Elliott W. Wolffe of Saddle Brook, New Jersey ----------

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY** and **ACE AMERICAN INSURANCE COMPANY** have each executed and attested these presents and affixed their corporate seals on this **29th** day of **July, 2020**.

Dawn M. Chloros, Assistant Secretary

Stephen M. Haney, Vice President

STATE OF NEW JERSEY
County of Hunterdon ss.

On this **29th** day of **July, 2020** before me, a Notary Public of New Jersey, personally came Dawn M. Chloros and Stephen M. Haney, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros and Stephen M. Haney, being by me duly sworn, severally and each for herself and himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by like authority.

Notarial Seal

KATHERINE J. ADELAAR
NOTARY PUBLIC OF NEW JERSEY
No. 2316855
Commission Expires July 18, 2024

Notary Public

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2016; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009:

"RESOLVED, that the following authorizations relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment"):

(1) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such person's written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company is hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested."

I, Dawn M. Chloros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(i) the foregoing Resolutions adopted by the Board of Directors of the Companies are true, correct and in full force and effect,
(ii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, NJ, this 4th day of August 2021

Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 903-2483 Fax (908) 903-3656 e-mail: surety@chubb.com

Combined: FED-VIG-PI-WFIC-AAIC (rev. 11-19)

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That The Continental Insurance Company, a Pennsylvania insurance company, is a duly organized and existing insurance company having its principal office in the City of Chicago, and State of Illinois, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Elliott Wolffe, Maria L Spadaccini, James Baldassare Jr, Krista A Burke, Sherryanne M DePirro, Lisa M Scavetta, Nicholas F Walsh, Charo J Rosemond, John F Surano, Individually

of Saddle Brook, NJ, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind them thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the insurance company and all the acts of said Attorney, pursuant to the authority hereby given is hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law and Resolutions, printed on the reverse hereof, duly adopted, as indicated, by the Board of Directors of the insurance company.

In Witness Whereof, The Continental Insurance Company has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 27th day of June, 2021.

The Continental Insurance Company

Paul T. Bruflat — Vice President

State of South Dakota, County of Minnehaha, ss:

On this 27th day of June, 2021, before me personally came Paul T. Bruflat to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is a Vice President of The Continental Insurance Company, a Pennsylvania insurance company, described in and which executed the above instrument; that he knows the seal of said insurance company; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said insurance company and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said insurance company.

M. BENT NOTARY PUBLIC SOUTH DAKOTA

My Commission Expires March 2, 2026

M. Bent — Notary Public

CERTIFICATE

I, D. Johnson, Assistant Secretary of The Continental Insurance Company, a Pennsylvania insurance company, do hereby certify that the Power of Attorney herein above set forth is still in force, and further certify that the By-Law and Resolution of the Board of Directors of the insurance company printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said insurance company this 4th day of August . 2021

The Continental Insurance Company

D. Johnson — Assistant Secretary

Form F6850-4/2012

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.

Berkshire Hathaway Specialty Insurance

Power Of Attorney

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY
NATIONAL INDEMNITY COMPANY / NATIONAL LIABILITY & FIRE INSURANCE COMPANY

Know all men by these presents, that **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at One Lincoln Street, 23rd Floor, Boston, Massachusetts 02111, **NATIONAL INDEMNITY COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at 3024 Harney Street, Omaha, Nebraska 68131 and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Connecticut and having an office at 100 First Stamford Place, Stamford, Connecticut 06902 (hereinafter collectively the "Companies"), pursuant to and by the authority granted as set forth herein, do hereby name, constitute and appoint: **Krista A. Burke, Sherryanne M. DePirro, Charo J. Rosemond, Andrew Waterbury, James Baldassare, Jr., Maria L. Spadaccini, Nicholas F. Walsh, John F. Surano, Elliott W. Wolffe, Lisa M. Scavetta, 250 Pehle Avenue, Suite 311 of the city of Saddle Brook, State of New Jersey,** their true and lawful attorney(s)-in-fact to make, execute, seal, acknowledge, and deliver, for and on their behalf as surety and as their act and deed, any and all undertakings, bonds, or other such writings obligatory in the nature thereof, in pursuance of these presents, the execution of which shall be as binding upon the Companies as if it has been duly signed and executed by their regularly elected officers in their own proper persons. **This authority for the Attorney-in-Fact shall be limited to the execution of the attached bond(s) or other such writings obligatory in the nature thereof.**

In witness whereof, this Power of Attorney has been subscribed by an authorized officer of the Companies, and the corporate seals of the Companies have been affixed hereto this date of December 20, 2018. This Power of Attorney is made and executed pursuant to and by authority of the Bylaws, Resolutions of the Board of Directors, and other Authorizations of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, which are in full force and effect, each reading as appears on the back page of this Power of Attorney, respectively. **The following signature by an authorized officer of the Company may be a facsimile, which shall be deemed the equivalent of and constitute the written signature of such officer of the Company for all purposes regarding this Power of Attorney, including satisfaction of any signature requirements on any and all undertakings, bonds, or other such writings obligatory in the nature thereof, to which this Power of Attorney applies.**

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY,

By: _____
David Fields, Executive Vice President

NATIONAL INDEMNITY COMPANY, NATIONAL LIABILITY & FIRE INSURANCE COMPANY,

By: _____
David Fields, Vice President

NOTARY
State of Massachusetts, County of Suffolk, ss:
On this 20th day of December, 2018, before me appeared David Fields, Executive Vice President of BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY and Vice President of NATIONAL INDEMNITY COMPANY and NATIONAL LIABILITY & FIRE INSURANCE COMPANY, who being duly sworn, says that his capacity is as designated above for such Companies; that he knows the corporate seals of the Companies; that the seals affixed to the foregoing instrument are such corporate seals; that they were affixed by order of the board of directors or other governing body of said Companies pursuant to its Bylaws, Resolutions and other Authorizations, and that he signed said instrument in that capacity of said Companies.

[Notary Seal]

GEOFFERY A. DELISIO
Notary Public
Commonwealth of Massachusetts
My Comm. Expires November 29, 2024

_____
Notary Public

I, Ralph Tortorella, the undersigned, Officer of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies which is in full force and effect and has not been revoked. IN TESTIMONY WHEREOF, see hereunto affixed the seals of said Companies this August 4, 2021

_____ Officer

To verify the authenticity of this Power of Attorney please contact us at: BHSI Surety Department, Berkshire Hathaway Specialty Insurance Company, One Lincoln Street, 23rd Floor Boston, MA 02111 | (770) 625-2516 or by email at jennifer.Porter@bhspecialty.com *THIS POWER OF ATTORNEY IS VOID IF ALTERED*

To notify us of a claim please contact us on our 24-hour toll free number at (855) 453-9675, via email at claimsnotice@bhspecialty.com, via fax to (617) 507-8259, or via mail.

Western Surety Company

POWER OF ATTORNEY APPOINTING INDIVIDUAL ATTORNEY-IN-FACT

Know All Men By These Presents, That WESTERN SURETY COMPANY, a South Dakota corporation, is a duly organized and existing corporation having its principal office in the City of Sioux Falls, and State of South Dakota, and that it does by virtue of the signature and seal herein affixed hereby make, constitute and appoint

Elliott Wolffe, Maria L Spadaccini, James Baldassare Jr, Krista A Burke, Sherryanne M DePirro, Lisa M Scavetta, Nicholas F Walsh, Charo J Rosemond, John F Surano, Individually

of Saddle Brook, NJ, its true and lawful Attorney(s)-in-Fact with full power and authority hereby conferred to sign, seal and execute for and on its behalf bonds, undertakings and other obligatory instruments of similar nature

- In Unlimited Amounts -

and to bind it thereby as fully and to the same extent as if such instruments were signed by a duly authorized officer of the corporation and all the acts of said Attorney, pursuant to the authority hereby given, are hereby ratified and confirmed.

This Power of Attorney is made and executed pursuant to and by authority of the By-Law printed on the reverse hereof, duly adopted, as indicated, by the shareholders of the corporation.

In Witness Whereof, WESTERN SURETY COMPANY has caused these presents to be signed by its Vice President and its corporate seal to be hereto affixed on this 27th day of June, 2021.

WESTERN SURETY COMPANY

Paul T. Bruflat, Vice President

State of South Dakota
County of Minnehaha } ss

On this 27th day of June, 2021, before me personally came Paul T. Bruflat, to me known, who, being by me duly sworn, did depose and say: that he resides in the City of Sioux Falls, State of South Dakota; that he is the Vice President of WESTERN SURETY COMPANY described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporation and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporation.

My commission expires

March 2, 2026

M. BENT
NOTARY PUBLIC
SOUTH DAKOTA

M. Bent, Notary Public

CERTIFICATE

I, L. Nelson, Assistant Secretary of WESTERN SURETY COMPANY do hereby certify that the Power of Attorney hereinabove set forth is still in force, and further certify that the By-Law of the corporation printed on the reverse hereof is still in force. In testimony whereof I have hereunto subscribed my name and affixed the seal of the said corporation this 4th day of August 2021

WESTERN SURETY COMPANY

L. Nelson, Assistant Secretary

Form F4280-7-2012

Go to www.cnasurety.com > Owner / Obligee Services > Validate Bond Coverage, if you want to verify bond authenticity.