STATE OF NORTH CAROLINA C204123
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

CONTRACT AND
CONTRACT BONDS

FOR CONTRACT NO. C204123

WBS	41582.3.1 STP-0211(021)
T.I.P NO.	R-5021
COUNTY OF	BRUNSWICK
THIS IS THE	ROADWAY & STRUCTURE CONTRACT
ROUTE NUMBER	NC 211 LENGTH 7.244 MILES
LOCATION	NC-211 FROM SR-1500 (MIDWAY RD) TO NC-87.
CONTRACTOR	BARNHILL CONTRACTING CO
ADDRESS	P.O. BOX 7948 ROCKY MOUNT, NC 27804
BIDS OPENED	DECEMBER 07, 2021
CONTRACT EXECUTION	01/10/2022

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

PROPOSAL

INCLUDES ADDENDUM No. 1 DATED 11-18-2021

DATE AND TIME OF BID OPENING: **DECEMBER 7, 2021 AT 2:00 PM**

CONTRACT ID	C204123
WBS	41582.3.1

FEDERAL-AID NO.	STP-0211(021)
COUNTY	BRUNSWICK
T.I.P. NO.	R-5021
MILES	7.244
ROUTE NO.	NC 211
LOCATION	NC-211 FROM SR-1500 (MIDWAY RD) TO NC-87.

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 ROADWAY & STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C204123 IN BRUNSWICK COUNTY, 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. **C204123** 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. **C204123** in **Brunswick County**, 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.
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11/18/2021

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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 **January 24, 2022, except from -L- Sta. 47+50 (+/-) RT to -L- Sta. 78+00 (+/-) RT and from -L- Sta. 227+00 (+/-) to the end of the project is July 26, 2023**, 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 **March 30, 2027**.

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 **January 24, 2022, except from -L- Sta. 47+50 (+/-) RT to -L- Sta. 78+00 (+/-) RT and from -L- Sta. 227+00 (+/-) to the end of the project is July 26, 2023**.

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

The liquidated damages for this intermediate contract time are **Seven Thousand Dollars ($ 7,000.00)** 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 **NC 211 (-L-/-LREV-), NC 906 (-YREV-), NC 133 (-Y14A-), SR 1969 (-Y14C-/-Y14D-), Dosher Cut Off (-Y19REV-), and/or NC 87 (-Y22-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Peak Season – from two (2) weeks prior to Easter thru September 15:
Monday thru Thursday
6:00 AM to 7:00 PM
&
6:00 AM Friday thru 7:00 PM Sunday

Off Season – from September 16 thru two (2) weeks prior to Easter
Monday thru Sunday
6:00 AM to 7:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **NC 211 (-L-/-LREV-), NC 906 (-YREV-), NC 133 (-Y14A-), SR 1969 (-Y14C-/-Y14D-), Dosher Cut Off (-Y19REV-), and/or NC 87 (-Y22-)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

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

2. For **New Year's Day**, between the hours of **6:00 A.M.** December 31st and **7:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **7:00 P.M.** the following Tuesday.

3. For **Easter**, between the hours of **6:00 A.M.** Thursday and **7:00 P.M.** Monday.

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

5. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **7:00 P.M.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 A.M.** the Thursday before Independence Day and **7:00 P.M.** the Tuesday after Independence Day.

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

7. For **Thanksgiving**, between the hours of **6:00 A.M.** Tuesday and **7:00 P.M.** Monday.

8. For **Christmas**, between the hours of **6:00 A.M.** the Friday before the week of Christmas Day and **7:00 P.M.** the following Tuesday after the week of Christmas Day.

9. For **King Mackerel Tournament**, between the hours of **6:00 A.M.** the **Thursday** before the **King Mackerel Tournament** and **7:00 P.M.** the following **Sunday** after the **King Mackerel Tournament**.

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 **Five Hundred Dollars ($ 500.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 3 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 **NC 211 (-L-/-LREV-), NC 906 (-YREV-), NC 133 (-Y14A-), and/or SR 1969 (-Y14C-/-Y14D-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday thru Sunday
5:00 AM to 12:00 AM (midnight)

The maximum allowable time for girder installation is **thirty (30)** minutes for **NC 211 (-L- / -LREV-)**. The maximum allowable time for signal mast arms removal or installation is **thirty (30)** minutes for **NC 211 (-L-/-LREV-), NC 906 (-YREV-), NC 133 (-Y14A-), and/or SR 1969 (-Y14C-/-Y14D-)**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

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 **One Thousand Dollars ($ 1,000.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **Phase I, Step #5.4** as shown on Sheet **TMP-3** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time is the **Friday** at **7:00 PM** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the following **Monday** at **6:00 AM** after the time of availability.

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

INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **Phase IB, Steps #13.2 thru #13.6** as shown on Sheet **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 **thirty (30)** 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 6 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **Phase I, Step #16.2** as shown on Sheet **TMP-3B** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time is the **Sunday** at **7:00 PM, during the off-season as defined in Intermediate Contract #2,** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the following **Friday** at **6:00 AM during the off-season,** after the time of availability.

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

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 **Phase I, Step #16.4** as shown on Sheet **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, **during the off season as defined in Intermediate Contract #2 but no later than fourteen (14) consecutive calendar days prior to the end of the off season**.

The completion date for this intermediate contract time is the date, **during the off-season,** 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 8 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **Phase IB, Step #16.5** as shown on Sheet **TMP-3B** and shall place and maintain traffic on same.

The work shall be completed in two (2) consecutive weekends of the Contractor's choosing, beginning at 7:00 P.M. on a Friday and ending at 6:00 A.M. the following Monday for each weekend.

The time of availability for this intermediate contract time is the **Friday** at **7:00 PM of the first weekend** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the date which is the **Monday** at **6:00 AM of the second weekend** after the time of availability.

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

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

The Contractor shall complete the work required of **Phase II, Steps #3.2 thru #3.4** as shown on Sheet **TMP-3C** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is **September 16th of any year the Contractor elects to begin work after the Date of Availability, as defined in the Contract Time and Liquidated Damages provision for this area**.

The completion date for this intermediate contract time is **August 15th of the following year after the date of availability for this intermediate contract time**.

The liquidated damages are **Two Thousand Dollars ($ 2,000.00)** 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 **Phase II, Steps #4.3 thru #4.6** as shown on Sheet **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, **during the off season as defined in Intermediate Contract #2 but no later than eighteen (18) consecutive calendar days prior to the end of the off season**.

The completion date for this intermediate contract time is the date, **during the off-season,** which is **eighteen (18)** consecutive calendar days after and including the date of availability.

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

CONSTRUCTION MORATORIUM (In-Water Work):

(7-15-14) SP1 G18B

No in-water work will be allowed from **April 1** through **September 30** of any year **(for Dutchman Creek only)**.

CONSTRUCTION MORATORIUM (Bats):

(1-19-16) SP1 G18C

No tree cutting will be allowed when **temperature is 40 degrees or less**.

DELAY IN RIGHT OF ENTRY:
(7-1-95) 108 SP1 G22 A

The Contractor will not be allowed right of entry to the parcels listed below before November 1, 2021 unless otherwise permitted by the Engineer.

Parcel No.	Property Owner
186	TRI-CITY, INC.
186A	TRI-CITY OF SOUTHPORT, LLC
191	CAMERON PROPERTIES TIMBER CO.

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
15	Borrow Excavation
68	Asphalt Conc Base Course, Type B25.0C
69	Asphalt Conc Intermediate Course, Type I19.0C

SPECIALTY ITEMS:
(7-1-95)(Rev. 7-20-21) 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
119-135	Guardrail
136-138	Fencing
144-165	Signing
190-194, 205-207	Long-Life Pavement Markings
208-209	Permanent Pavement Markers
211-310	Utility Construction
311-347, 349-350	Erosion Control
348	Reforestation
351-420	Signals/ITS System

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 **$ 2.1926** 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)	**14**% of Total Amount Bid
2023	(7/01/22 - 6/30/23)	**24**% of Total Amount Bid
2024	(7/01/23 - 6/30/24)	**23**% of Total Amount Bid
2025	(7/01/24 - 6/30/25)	**22**% of Total Amount Bid
2026	(7/01/25 - 6/30/26)	**14**% of Total Amount Bid
2027	(7/01/26 - 6/30/27)	**3**% 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.

DISADVANTAGED BUSINESS ENTERPRISE:

(10-16-07)(Rev. 8-17-21) 102-15(J) SP1 G61

Description

The purpose of this Special Provision is to carry out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with Federal funds. This provision is guided by 49 CFR Part 26.

Definitions

Additional DBE Subcontractors - Any DBE submitted at the time of bid that will not be used to meet the DBE goal. No submittal of a Letter of Intent is required.

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

Contract Goal Requirement - The approved DBE participation at time of award, but not greater than the advertised contract goal.

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

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

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

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) DBE firm.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for DBE certification, such that an applicant is required to apply only once for a DBE certification that will be honored by all recipients of USDOT funds in the state and not limited to the Department of Transportation only. The Certification Program is 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.

Forms and Websites Referenced in this Provision

DBE Payment Tracking System - On-line system in which the Contractor enters the payments made to DBE 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 DBE 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 *DBE Replacement Request Form* - Form for replacing a committed DBE. 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 DBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed DBE 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 DBE Subcontractors Form - Form for entering DBE subcontractors on a project that will meet this DBE goal. This form is for paper bids only.
http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20(Federal).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where DBEs 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

DBE Goal

The following DBE goal for participation by Disadvantaged Business Enterprises is established for this contract:

Disadvantaged Business Enterprises **10.0** %

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

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

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as DBE certified shall be used to meet the DBE 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 DBE Subcontractors

At the time of bid, bidders shall submit all DBE participation that they anticipate to use during the life of the contract. Only those identified to meet the DBE goal will be considered committed, even though the listing shall include both committed DBE subcontractors and additional DBE subcontractors. Additional DBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goal. Only those firms with current DBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of DBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of DBE participation in the appropriate section of the electronic submittal file.

(1) Submit the names and addresses of DBE firms identified to participate in the contract. If the bidder uses the updated listing of DBE firms shown in the electronic submittal file, the bidder may use the dropdown menu to access the name and address of the DBE firm.

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

(3) The bidder shall be responsible for ensuring that the DBE 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 DBE's participation will not count towards achieving the DBE goal.

(B) Paper Bids

(1) *If the DBE goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of *DBE* participation, including the names and addresses on *Listing of DBE 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 DBE participation for the contract.

(b) If bidders have no DBE participation, they shall indicate this on the *Listing of DBE 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 DBE 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 DBE 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 DBE's participation will not count towards achieving the corresponding goal.

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

DBE Prime Contractor

When a certified DBE firm bids on a contract that contains a DBE goal, the DBE 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 DBE bidder on a contract will meet the DBE goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the DBE bidder and any other DBE subcontractors will count toward the DBE goal. The DBE bidder shall list itself along with any DBE subcontractors, if any, in order to receive credit toward the DBE goal.

For example, if the DBE goal is 45% and the DBE bidder will only perform 40% of the contract work, the prime will list itself at 40%, and the additional 5% shall be obtained through additional DBE participation with DBE subcontractors or documented through a good faith effort.

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

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each DBE that will be used to meet the DBE goal of the contract, indicating the bidder's commitment to use the DBE 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 DBE to be used toward the DBE goal, or if the form is incomplete (i.e. both signatures are not present), the DBE participation will not count toward meeting the DBE goal. If the lack of this participation drops the commitment below the DBE goal, the Contractor shall submit evidence of good faith efforts, 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.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the DBE goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach the DBE 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 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 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 DBE 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 DBE Goals More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient DBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought DBE 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 goal 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 DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.

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

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

(C) Providing interested DBEs 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 DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs 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 DBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE 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 DBEs if the price difference is excessive or unreasonable.

(E) Not rejecting DBEs 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 DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested DBEs 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 DBEs. 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 DBE quotes.

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

(2) The bidders' past performance in meeting the DBE goals.

(3) The performance of other bidders in meeting the DBE goal. For example, when the apparent successful bidder fails to meet the DBE 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 DBE goal, but meets or exceeds the average DBE 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 DBE goal can be met or that an adequate good faith effort has been made to meet the DBE 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 DBE Participation Toward Meeting DBE Goal

(A) Participation

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

(B) Joint Checks

Prior notification of joint check use shall be required when counting DBE 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 DBE may enter into subcontracts. Work that a DBE subcontracts to another DBE firm may be counted toward the contract goal requirement. Work that a DBE subcontracts to a non-DBE firm does not count toward the contract goal requirement. If a DBE 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 DBE is not performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption is subject to review by the Federal Highway Administration but is not administratively appealable to USDOT.

(D) Joint Venture

When a DBE 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 DBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the DBE performs with its forces.

(E) Suppliers

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

(F) Manufacturers and Regular Dealers

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

(1) The fees or commissions charged by a DBE 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 DBE, 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) DBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to DBEs that perform a commercially useful function in the work of a contract. A DBE 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 DBE 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 DBE 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 DBE credit claimed for its performance of the work, and any other relevant factors.

(B) DBE Utilization in Trucking

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

(1) The DBE 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 DBE goals.

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

(3) The DBE 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 DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.

(5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE 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 DBE and the Contractor will not count towards the DBE contract requirement.

(6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE 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 DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the DBE 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.

DBE Replacement

When a Contractor has relied on a commitment to a DBE subcontractor (or an approved substitute DBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE 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 DBE subcontractor, a non-DBE 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 DBE 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 DBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the DBE subcontractor objects to the intended termination/substitution, the DBE, 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 DBE subcontractor.

A committed DBE 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 DBE subcontractor fails or refuses to execute a written contract;
(b) The listed DBE 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 DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
(c) The listed DBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
(d) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;

(e) The listed DBE 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 DBE subcontractor is not a responsible contractor;
(g) The listed DBE voluntarily withdraws from the project and provides written notice of withdrawal;
(h) The listed DBE is ineligible to receive DBE credit for the type of work required;
(i) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;
(j) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime contractor can self-perform the work for which the DBE contractor was engaged or so that the prime contractor can substitute another DBE or non-DBE contractor after contract award.

The Contractor shall comply with the following for replacement of a committed DBE:

(A) Performance Related Replacement

When a committed DBE is terminated for good cause as stated above, an additional DBE that was submitted at the time of bid may be used to fulfill the DBE commitment. A good faith effort will only be required for removing a committed DBE if there were no additional DBEs submitted at the time of bid to cover the same amount of work as the DBE that was terminated.

If a replacement DBE is not found that can perform at least the same amount of work as the terminated DBE, 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 DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.

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

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

(3) A list of reasons why DBE quotes were not accepted.

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

(B) Decertification Replacement

(1) When a committed DBE 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 DBE 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 DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Contractor shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the DBE goal requirement. If a DBE 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).

(3) Exception: If the DBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract, the Department will not require the Contractor to solicit replacement DBE 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 and overall goal.

All requests for replacement of a committed DBE 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 DBE, 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 DBE based upon the Contractor's commitment, the DBE shall participate in additional work to the same extent as the DBE 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 DBEs 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 DBE, the Contractor shall seek participation by DBEs 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 DBE, the Contractor shall seek additional participation by DBEs equal to the reduced DBE 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 DBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving DBE 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 DBE 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 DBE credit.

Reporting Disadvantaged Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all DBE 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 DBEs, 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-DBE 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 DBE 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.

CERTIFICATION FOR FEDERAL-AID CONTRACTS:

(3-21-90) SP1 G85

The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(A) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(B) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by *Section 1352, Title 31, U.S. Code*. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such subrecipients shall certify and disclose accordingly.

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.

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:

(11-22-94) 108-5 SP1 G100

To report bid rigging activities call: **1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free hotline Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the hotline to report such activities.

The hotline is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

CARGO PREFERENCE ACT:

(2-16-16)

Privately owned United States-flag commercial vessels transporting cargoes are subject to the Cargo Preference Act (CPA) of 1954 requirements and regulations found in 46 CFR 381.7. Contractors are directed to clause (b) of 46 CFR 381.7 as follows:

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

" (1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract."

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.

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.

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.

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.

NOTE TO CONTRACTOR (Residential Fences):

Install Proposed Woven Wire Fence before removing any wood privacy fencing on residential lots.

NOTE TO CONTRACTOR (Salvage Metal Signal Poles):

All metal traffic signal utility poles and related hardware removed from the project limits shall be delivered by the contractor to the NCDOT Division 3 Traffic Services Maintenance Yard located

at 5504 Barbados Blvd. Castle Hayne, NC 28429. Please notify Mr. Ross Kimbro with NCDOT Division 3 Traffic Services at 910-341-2200 a minimum of 48 hours prior to transporting the metal poles. No compensation will be made for the delivery of the metal poles and shall be considered incidental to other contract line items.

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING – MODIFIED METHOD III:

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

Perform clearing on this project to the limits established by Modified Method "III" shown on Sheet 2C-9 of the plans. Conventional clearing methods may be used unless permit drawings or conditions have been included in the proposal which require certain areas to be cleared by hand methods.

DEWATERING:

Description

The work covered by this section consists of furnishing, installing, maintaining and removing any and all dewatering systems used on this project. The Contractor shall install a dewatering system in locations as noted on the plans and in other locations approved by the Engineer. The dewatering system shall remove the standing water around the work area during the undercut and grading operations at stations 118+00 to 123+00 and 133+50 and in other locations approved by the Engineer.

The quantity of dewatering 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.

Materials

Item	Section
Special Stilling Basin	1639

Impervious Dike shall meet the specifications as provided elsewhere in this contract.

Floating Turbidity Curtain shall meet the specifications as provided elsewhere in this contract.

Pumps shall be of sufficient size and number to remove the standing water around the work area, as approved by the Engineer.

Construction Methods

Install *impervious dike(s)* and *Floating Turbidity Curtain* as directed. Pump water around the work area. 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)*, *floating turbidity curtain, special stilling basin,* and pump system, and stabilize the area as directed by the Engineer.

Measurement and Payment

Impervious Dike will be measured and paid for as provided elsewhere in this contract.

Floating Turbidity Curtain 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*.

Dewatering will be paid at the contract lump sum price for all dewatering systems installed on the project.

The dewatering operations shall include but not be limited to, removing the standing water around the work area and pumping runoff from the work area into a special stilling basin or other sediment control device. No additional payment will be made for furnishing materials or maintenance of the dewatering operations.

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, floating turbidity curtain, special stilling basin and dewatering system.

Payment will be made under:

Pay Item	**Pay Unit**
Dewatering	Lump Sum

BUILDING REMOVAL (Removal Inside ROW):

(1-1-02) (Rev. 4-16-13) 215 SP2 R15 A

Remove the buildings, underground storage tanks and appurtenances listed below in accordance with Section 215 of the *2018 Standard Specifications*:

Parcel 64B– left of survey station 311+80, survey line -L-
One Story Frame Business

BUILDING REMOVAL (Removal On Both Sides of ROW):

(1-1-02) (Rev. 11-15-16) 215 SP2 R15 C

Remove the buildings and appurtenances listed below in accordance with Section 215 of the *2018 Standard Specifications*:

Parcel 86 – right of survey station 352+00, survey line -L-
One Story Frame Dwelling

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

DUCTILE IRON PIPE & DUCTILE IRON PIPE ELBOW:

Description

Furnish and install ductile iron pipe and elbows at locations and size called for in the contract documents and as directed by the Engineer.

Materials

Ductile iron pipe shall meet the requirements of Article 1034-4 (A) of the *Standard Specifications*.

Ductile iron pipe elbows shall meet the requirements of Article 1034-4 (A) of the *Standard Specifications*.

Construction

Install ductile iron pipe and elbows in accordance with the requirements of Section 300 of the *Standard Specifications*.

Measurement and Payment

__*" Ductile Iron Pipe* will be measured and paid as the actual number of linear feet of pipe that has been incorporated into the completed and accepted work. Measurement of pipe will be made by counting the number of joints used and multiplying by the length of the joint to obtain the number of linear feet of pipe installed and accepted. Measurements of partial joints will be made along the longest length of the partial joint to the nearest 0.1 ft. Select bedding and backfill material will be included in the cost of the installed pipe.

__*" Ductile Iron Pipe Elbow* will be measured and paid as the actual number of each of these items incorporated into the completed work.

Payment will be made under:

Pay Item	**Pay Unit**
__" Ductile Iron Pipe	Linear Foot
__" Ductile Iron Pipe Elbow	Each

60" X 38" HORIZONTAL ELLPITICAL R.C. PIPE (CLASS IV):

Description

Furnish and install horizontal elliptical reinforced concrete pipe at locations and size called for in the contract documents and as directed by the Engineer.

Materials

60" x 38" Horizontal Elliptical pipe shall meet the requirements of Article 1032-6 of the *Standard Specifications* except in the following.

Page 10-59, Article 1032-6, Reinforced Concrete Pipe, lines 9-10, replace the first sentence with the following:

Horizontal Elliptical Reinforced Concrete Pipe shall meet AASHTO M 207 for the class of pipe called in the plans except as follows:

Page 10-59, Article 1032-6, Reinforced Concrete Pipe, lines 16-18, replace the first sentence with the following:

The design wall thickness shall be either the wall thickness shown in AASHTO M 207 for the applicable class and wall or the wall thickness shown in a modified design that has been approved by the Engineer.

Page 10-59, Article 1032-, Precast Concrete Pipe End Sections, lines 25-26, replace the first sentence with the following:

Precast concrete pipe end sections shall meet AASHTO M 207 and Section 1077 except those requirements pertaining to design.

Construction

Install horizontal elliptical reinforced concrete in accordance with the requirements of Section 300 of the *Standard Specifications*.

Measurement and Payment

60" x 38" Horizontal Elliptical RCP will be measured and paid as the actual number of linear feet of pipe that has been incorporated into the completed and accepted work. Measurement of pipe will be made by counting the number of joints used and multiplying by the length of the joint to obtain the number of linear feet of pipe installed and accepted. Measurements of partial joints will be made along the longest length of the partial joint to the nearest 0.1 ft. Select bedding and backfill material will be included in the cost of the installed pipe.

Payment will be made under:

Pay Item	**Pay Unit**
60" x 38" Horizontal Elliptical RCP-IV	Linear Foot

EMERGENCY VEHICLE ACCESS FOR CONCRETE ISLAND:

Construct Emergency Vehicle Access at locations shown in the plans, in accordance with the detail in the plans and as directed by the Engineer.

Emergency vehicle access will be measured and paid for in units of each for "Emergency Vehicle Access For Concrete Island". Such price and payment will be full compensation for all work associated with this provision.

TEMPORARY PAVEMENT:

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

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

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

Earth material and aggregate base course 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 Asphalt Pavement*. Pipe culverts removed from the pavement 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 pavement will be made at the contract unit prices for the various items involved.

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

SHOULDER AND FILL SLOPE MATERIAL:

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

Description

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

CORRUGATED ALUMINUM ALLOY CULVERT PIPE:

(9-21-21) 305, 310 SP3 R34

Revise the *Standard Specifications* as follows:

Page 3-1, Article 305-2, MATERIALS, add the following after line 16:

Item	**Section**
Waterborne Paint	1080-9
Hot Bitumen	1081-3

Page 3-1, Article 305-3, CONSTRUCTION METHODS, add the following after line 24:

Coating must be applied to the aluminum when in contact with concrete. Immediately prior to coating, aluminum surfaces to be coated shall be cleaned by a method that will remove all dirt, oil, grease, chips, and other foreign substances. Aluminum to be coated shall be given one coat of suitable quality coating such as:

Approved waterborne paint (Section 1080-9)
Approved Hot Bitumen (Section 1081-3)

Other coating materials may be submitted to the Engineer for approval.

Page 3-7, Article 310-6, MEASUREMENT AND PAYMENT, lines 6-11, delete the fourth sentence and replace with the following:

Select bedding and backfill material and coating will be included in the cost of the installed pipe. Such price and payment will be full compensation for all materials, labor, equipment, and other incidentals necessary to complete the work.

CORRUGATED ALUMINUM ALLOY PIPE ARCH CULVERT:

(9-21-21) SPI 10-08

Description

Furnish and install corrugated aluminum pipe arch at locations and size called for in the contract documents and as directed by the Engineer.

Materials

Corrugated Aluminum Alloy Pipe Arch Culvert shall meet the requirements of Article 1032-2 of the *Standard Specifications* except in the following.

Page 10-55, Article 1032-2, Corrugated Aluminum Alloy Culvert Pipe, lines 37-38, replace the first sentence with the following:

Corrugated Aluminum Alloy Pipe Culvert and Corrugated Aluminum Alloy Pipe Arch Culvert shall meet AASHTO M 196, except that Type IA and Type IIA pipe will not be permitted.

Page 10-56, Article 1032-2, Corrugated Aluminum Alloy Culvert Pipe, lines 17-18, replace the first sentence with the following:

Corrugated aluminum alloy pipe and corrugated aluminum alloy pipe arch tees and elbows shall meet all applicable requirements of AASHTO M 196.

Construction Methods

Install corrugated aluminum alloy pipe arch culvert in accordance with Section 300 of the *Standard Specifications* and as directed by the Engineer.

Measurement and Payment

___ " x ___ " Corrugated Aluminum Alloy Pipe Arch Culvert, ___" Thick will be measured and paid as the actual number of linear feet of pipe that has been incorporated into the completed and accepted work. Measurement of pipe will be made by counting the number of joints used and multiplying by the length of the joint to obtain the number of linear feet of pipe installed and accepted. Measurements of partial joints will be made along the longest length of the partial joint to the nearest 0.1 ft. Select bedding and backfill material and coating will be included in the cost of the installed pipe. Such price and payment will be full compensation for all materials, labor, equipment, and other incidentals necessary to complete the work.

Pipe End Sections, Tees, Elbows and Eccentric Reducers will be measured and paid as the actual number of each of these items incorporated into the completed and accepted work.

Payment will be made under:

Pay Item	Pay Unit
__" x ___" C.A.A. Pipe Arch Culvert, ___" Thick	Linear Foot
__" x __" x __" C.A.A. Pipe Arch Tees, __" Thick	Each
__" C.A.A. Pipe Arch Elbows, __" Thick	Each

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

ALTERNATE BRIDGE APPROACH FILLS FOR INTEGRAL ABUTMENTS:

(1-16-18) 422 SP4 R02B

Description

At the Contractors option, use Type A Alternate Bridge Approach Fills instead of Type I or II Bridge Approach Fills to support bridge approach slabs for integral bridge abutments. An alternate bridge approach fill consists of constructing an approach fill with a temporary geotextile wall before placing all or a portion of the concrete for the backwall and wing walls of the integral end bent cap. The temporary geotextile wall is designed for a crane surcharge, remains in place and aligned so the wall face functions as a form for the end bent cap backwall and wing walls. Install drains, welded wire facing and geotextiles and backfill approach fills and temporary walls with select material as required. Define "geotextiles" as separation or reinforcement geotextiles, "temporary wall" as a temporary geotextile wall and "alternate approach fill" as a Type A Alternate Bridge Approach Fill in accordance with 2018 Roadway Standard Drawing No. 422.03.

Materials

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

Item	Section
Geotextiles	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044
Welded Wire Reinforcement	1070-3

For temporary walls, use welded wire reinforcement for welded wire facing and Type 5 geotextile for reinforcement geotextiles. Use Type 5 geotextile with lengths and an ultimate tensile strength as shown in 2018 Roadway Standard Drawing No. 422.03. Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for alternate approach fills and temporary walls. 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 alternate approach fills and temporary walls in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geotextiles until approach fill dimensions and foundation material are approved.

Install geotextiles as shown in 2018 Roadway Standard Drawing No. 422.03. Attach separation geotextiles to end bent cap backwalls and wing walls as needed with adhesives, tapes or other approved methods. Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geotextiles.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with 2018 Roadway Standard Drawing No. 422.03. 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.

At the Contractor's option, construct bottom portion of integral end bents before temporary walls as shown in 2018 Roadway Standard Drawings No. 422.03. Erect and set welded wire facing so facing functions as a form for the end bent cap backwall. Place welded wire facing adjacent to each other in the horizontal and vertical directions to completely cover the temporary wall face. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap reinforcement geotextiles at the temporary wall face in accordance with 2018 Roadway Standard Drawing No. 422.03 and cover geotextiles with at least 3" of select material. Place layers of reinforcement geotextiles within 3" of locations shown in 2018 Roadway Standard Drawing No. 422.03. Before placing select material, pull reinforcement geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Install reinforcement geotextiles with the direction shown in 2018 Roadway Standard Drawing No. 422.03. Do not splice or overlap reinforcement geotextiles so seams are parallel to the temporary wall face.

Place select material in 8" to 10" thick lifts and compact select material with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geotextiles or drains when placing and compacting select material. End dumping directly on geotextiles is not permitted. Do not operate heavy equipment on geotextiles or drain pipes until they are covered with at least 8" of select material. Replace any damaged geotextiles or drains to the satisfaction of the Engineer. When alternate approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material as shown in 2018 Roadway Standard Drawing No. 422.03.

Temporary walls are designed for a surcharge pressure in accordance with 2018 Roadway Standard Drawing No. 422.03. If the crane surcharge will exceed the wall design, contact the Engineer before positioning the crane over reinforcement geotextiles.

Measurement and Payment

Alternate approach fills will be paid at the contract lump sum for either *Type I Standard Approach Fill, Station* ____ or *Type II Modified Approach Fill, Station* ____ based on the approach fill type that the alternate approach fill is replacing. The lump sum price for each approach fill will be full compensation for providing labor, tools, equipment and alternate approach fill materials, excavating, backfilling, hauling and removing excavated materials, constructing temporary walls, installing wall facing, geotextiles and drains, compacting backfill and supplying select material, separation and reinforcement geotextiles, welded wire facing, drain pipes, pipe sleeves, outlet pipes and pads and any incidentals necessary to construct alternate approach fills for integral abutments.

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.

STABILIZATION OF COASTAL PLAIN SANDS:
(11-18-14) 510 SP5 R12

Description

As directed by the Engineer, stabilize sandy subgrade material with Class IV aggregate to prevent rutting of the subgrade prior to paving directly on the subgrade. Remove material as needed in cut areas prior to placing the Class IV aggregate.

Materials

Refer to Division 10.

Item	Section
Select Material, Class IV	1016

Use Class IV Select Material for Class IV Aggregate Stabilization.

Construction Methods

Class IV Aggregate Stabilization

As directed by the Engineer, place aggregate by end dumping aggregate on approved subgrade soils to provide a working platform and reduce wheel rutting of subgrade material. Place the Class IV aggregate stabilization to a thickness of 2 to 3 inches.

Maintenance

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

Measurement and Payment

Class IV Aggregate Stabilization will be measured and paid in tons. Aggregate will be measured by weighing in trucks in accordance with Article 106-7. The contract unit price for *Class IV Aggregate Stabilization* will be full compensation for furnishing, hauling, handling, placing, mixing, compacting and maintaining aggregate.

The work to excavate material to place Class IV Aggregate Stabilization below subgrade is considered incidental to the work of placing the aggregate and no separate payment will be made.

Payment will be made under:

Pay Item	Pay Unit
Class IV Aggregate Stabilization	Ton

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 **$ 507.27** per ton.

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

FIELD OFFICE:

(6-1-07)(Rev. 8-31-21 Div3) SPI 8-01

Description

This work consists of furnishing, erecting, equipping, and maintaining a field office for the exclusive use of Department Engineers and Inspectors at a location on the project approved by the Engineer. Provide a field office that complies with the current ADA Design and Accessibility Standards, the National Electric Code, local, state, and federal regulations, and the following requirements.

Procedures

The field office and equipment will remain the property of the Contractor upon completion of the contract. The field office shall be separated from buildings and trailers used by the Contractor and shall be erected and functional as an initial operation. Failure to have the field office functional when work first begins on the project will result in withholding payment of the Contractor's monthly progress estimate. The field office shall be operational throughout the duration of the project and shall be removed upon completion and final acceptance of the project. Failure to have the field office functional and maintained, as determined by the Engineer, throughout the life of the project will result in withholding payment of the Contractor's monthly progress estimate.

Provide a field office that is weatherproof, tightly floored and roofed, constructed with an air space above the ceiling for ventilation, supported above the ground, has a width of at least 40 feet, and the floor-to-ceiling height that is at least 7 feet 6 inches. Provide inside walls and a ceiling constructed of plywood, fiber board, gypsum board, or other suitable materials. Have the exterior walls, ceiling, and floor insulated.

Provide a triple wide modular trailer capable of supporting up 15 inspection staff members including individual offices, common/conference area, kitchenette and multi sex bathrooms. The field office shall have at least 3100 square feet of floor space and that is equipped with the following:

Number	Item
1	Double-pedestal desk (approximately 60 by 34 inches
5	Plan and drafting table (approximately 30 by 96 inches) with adjustable stool
14	Computer table at least 48 by 30 by 29 inches
5	Plan rack for 24 by 36 inch drawings with 6 plan clamps.
4	4-drawer fire protection file, 15 inch drawer width, minimum UL rating of Class 350
15	Office chairs with casters.
1	Wastebasket per room
1	Copy / Scanning / Fax machine (11 inch x 17 inch copies)
1	Internet Connection Service (modem for Wi-Fi).
-	2 Data ports in all rooms (with exception of kitchenette and bathrooms)
1	70" Class TV mounted in conference room with 20' cord for Laptop Display / Audio connections. Location in conference room to be approved by the Engineer
1	Kitchenette with fridge, microwave, counter space, cabinets, etc.
1	Conference room to support 20 people with chairs

Windows and Doors
Provide a field office with at least ten windows with blinds, each having an area of at least 540 square inches, capable of being easily opened and secured from the inside and having at least two exterior passage doors. Provide doors at least 30 inches in width and 78 inches in height. Provide screens for windows and doors. Equip exterior passage doors with locks, and furnish at least twenty keys to the Engineer.

Steps

Provide accessibility in compliance with the current ADA Design and Accessibility Standards, and the State Building Code and maintain them free from obstructions.

Storage Facility For Nuclear Gage

Furnish the field office with an outside storage facility for the Department's nuclear gage. The storage facility shall not be located within 10 feet of any other structure including the field office.

Lighting, Heating, and Air Conditioning

The field office shall have satisfactory lighting, electrical outlets, heating equipment, an exhaust fan, and an air conditioner connected to an operational power source. Provide at least one of the light fixtures that is a fluorescent light situated over the plan and drafting table. Furnish electrical current and fuel for heating equipment.

Fire Extinguishers

Furnish and maintain one fire extinguisher for each required exterior passage door. Fire extinguisher may be chemical or dry powder. UL Classification 10-B:C (minimum), suitable for Type A:B:C: fires. Mount and maintain fire extinguishers in accordance with OSHA Safety and Health Standards.

Toilets

Provide a toilet conforming to the requirements of the state and local boards of health or other bodies or courts having jurisdiction in the area. When separate facilities for men and women are not available, place a sign with the words "Rest Room" (with letters at least 1 inch in height) over the doorway, and provide an adequate positive locking system on the inside of the doorway. Maintain responsibility for the water and sewer connections or the installation and connection of a water well and septic tank and drain field. These facilities shall conform to all local and state permits.

Utilities

Except for telephone service, make necessary utility and internet connections, maintain utilities and internet connections, pay internet and utility service fees and bills, and handle final

disconnection of internet and utilities. Furnish a telephone in each field office and permit the work necessary to install it.

Storage Facility for Test Equipment

Provide the field office with a storage facility, separate from the office for storage of test equipment, other than the nuclear gage. Provide a facility that has at least 64 square feet of floor space, is weatherproof, tightly floored and roofed, and has a tamper resistant key operated lock.

Miscellaneous Items

The field office shall also include the following:

1. A certification that the office is free of asbestos and other hazardous materials.
2. A broom, dust pan, mop and bucket, and general cleaning supplies.
3. Provide and maintain an all weather parking area for six vehicles, including graveled access to the paved surface.

Measurement and Payment

Payment at the contract lump sum bid price for *Field Office* will be full compensation for all work covered by this provision including but not limited to furnishing, erecting, maintaining, and removing the field office as outlined in this provision.

Installation and service fees for the telephone will be paid for by the Department.

Payment will be made under:

Pay Item	**Pay Unit**
Field Office	Lump Sum

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] % Minimum**	**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.

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

CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX:

(1-1-02) (Rev. 7-18-06) 840, 859 SP8 R50

At the proper phase of construction, convert the existing Catch Basin at locations indicated in the plans or where directed, to Traffic Bearing Junction Box in accordance with the details in the plans and the applicable requirements of Sections 840 and 859 of the *2018 Standard Specifications*.

Convert Existing Catch Basin to Traffic Bearing Junction Box will be measured and paid as each, completed and accepted. Such price and payment is considered full compensation for all equipment, materials, labor, tools, and incidentals necessary to complete each conversion satisfactorily.

Payment will be made under:

Pay Item	Pay Unit
Convert Existing Catch Basin to Traffic Bearing Junction Box	Each

CONVERT EXISTING DROP INLET TO TRAFFIC BEARING JUNCTION BOX:

(1-1-02) (Rev. 7-18-06) 840, 859 SP8 R50

At the proper phase of construction, convert the existing Drop Inlet at locations indicated in the plans or where directed, to Traffic Bearing Junction Box in accordance with the details in the plans and the applicable requirements of Sections 840 and 859 of the *2018 Standard Specifications*.

Convert Existing Drop Inlet to Traffic Bearing Junction Box will be measured and paid as each, completed and accepted. Such price and payment is considered full compensation for all equipment, materials, labor, tools, and incidentals necessary to complete each conversion satisfactorily.

Payment will be made under:

Pay Item	Pay Unit
Convert Existing Drop Inlet to Traffic Bearing Junction Box	Each

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 END UNITS AND TEMPORARY GUARDRAIL END UNITS:

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

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____	Each
Temporary Guardrail End Units, Type____	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
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]	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 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.

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 ≥ 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.

NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKERS:

10-19-21 1086, 1250, 1253 SP10 R08

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.

Pages 12-16, Subarticle 1253-1 DESCRIPTION, lines 4-5, delete and replace with the following:

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

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.

Pages 12-17, Subarticle 1253-4 MAINTENANCE, lines 5, delete and replace with the following:

Maintain all installed non-cast iron snowplowable pavement markers until acceptance.

Pages 12-17, Subarticle 1253-5 MEASUREMENT AND PAYMENT, lines 7-8, delete and replace with the following:

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.

Pages 12-17, Subarticle 1253-5 MEASUREMENT AND PAYMENT, lines 11, delete and replace with the following:

Payment will be made under:

Pay Item	**Pay Unit**
Non-Cast Iron Snowplowable Pavement Marker	Each
Replace Snowplowable Pavement Marker Reflector	Each

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. 10-19-21) 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, geostrip, welded wire grid or metallic strip reinforcement.

Temporary geosynthetic walls consist of geotextiles or geogrids wrapped behind welded wire facing or geostrips connected to welded wire facing. Define "temporary geotextile wall" as a temporary geosynthetic wall with geotextile reinforcement, "temporary geogrid wall" as a temporary geosynthetic wall with geogrid reinforcement and "temporary geostrip wall" as a temporary geosynthetic wall with geostrip 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 embedment below the grade at the wall face.

(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
Grout, Type 1	1003
Portland Cement	1024-1
Portland Cement Concrete	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2

Item	Section
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Water	1024-4
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 and 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*.

Use neat cement grout that only contains cement and water with a water cement ratio of 0.4 to 0.5 which is approximately 5.5 gallons of water per 94 pounds of Portland cement. Provide grout with a compressive strength at 3 and 28 days of at least 1,500 and 4,000 psi, respectively.

(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 and Geostrip Reinforcement

Use geogrids with a roll width of at least 4 feet. Use geogrids for geogrid reinforcement and geostrips for geostrip reinforcement with an "approved" status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids and geostrips is available from: connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Provide geogrids and geostrips with design strengths in accordance with the accepted submittals. Geogrids and geostrips are approved for short-term design strengths (3-year design life) in the machine direction (MD) and cross-machine direction (CD) 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 or flood 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. Design temporary shoring for a traffic (live load) surcharge in accordance with Article 11.5.6 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 Type 1 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. 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 and geostrip reinforcement, use approved geosynthetic reinforcement properties available from the website shown elsewhere in this provision. 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 geosynthetic 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. Attach geostrip reinforcement to welded wire facing with a connection approved by the Department.

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, geostrip 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 Type 1 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) Mix and place neat cement grout in accordance with Subarticles 1003-5, 1003-6 and 1003-7 of the *2018 Standard Specifications*. 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.

Attach geostrip reinforcement to welded wire facing and wrap geotextile reinforcement and retention geotextiles behind welded wire facing as shown in the plans and accepted submittals. 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 geosynthetic 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 geosynthetics 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

WORK ZONE INSTALLER:

(7-20-21) 1101, 1150 SP11 R04

Provide the service of at least one qualified work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way. The qualified work zone installer shall serve as crew leader and shall be on site and directing the installation and removal of temporary traffic control. If multiple temporary traffic control installations or removals are occurring simultaneously, then each shall have a qualified work zone installer.

The work zone installer shall be qualified by an NCDOT approved training agency in the safe and competent set up of temporary traffic control. For a complete listing of approved training agencies, see the Work Zone Safety Training webpage.

A work zone supervisor, in accordance with Article 1101-13 of the *Standard Specifications*, may fulfill the role of the work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way provided they are on site and directing the installation and removal of temporary traffic control.

All other individuals participating in the setup, installation, and removal of temporary traffic control within the highway right of way shall be certified as a qualified flagger in accordance with Article 1150-3 of the *Standard Specifications*, even if flagging is not being performed as part of the traffic control.

Provide the name and contact information of all qualified work zone installers to the Engineer prior to or at the preconstruction conference. Additionally, provide a qualification statement that all other individuals participating in the setup, installation, and removal of temporary traffic control are qualified flaggers that have been properly trained through an NCDOT approved training

agency.

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

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.

7" JOINTED CONCRETE TRUCK APRON:

Description

Construct 7" Jointed 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 *Standard Specifications*.

Wire mesh reinforcement shall be W3.5xW3.5 or W4xW4 welded wire fabric meeting the requirements of Section 1070 of the *2018 Standard Specifications*. The wire mesh reinforcement shall be centered in the 7" slab.

Construction Methods

Construct joints as directed by the Engineer.

Measurement and Payment

7" Concrete Truck Apron will be measured and paid for in square yards of 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**
7" Concrete Truck Apron	Square Yard

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

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

MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS

Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations *in 41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

Area 023 29.7%
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%
Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%
Buncombe County
Madison County

Area 030 6.3%
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%
Currituck County

Area 9200 20.7%
Brunswick County
New Hanover County

Area 2560 24.2%
Cumberland County

Area 6640 22.8%
Durham County
Orange County
Wake County

Area 1300 16.2%
Alamance County

Area 3120 16.4%
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%
Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION

REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS

FHWA - 1273 Electronic Version - May 1, 2012 Z-8

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
   a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
   b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
   c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
6. **Training and Promotion:**
   a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
   c The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
   d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
   a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
   b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
   c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
   a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
   b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
   a. The records kept by the contractor shall document the following:
      (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
   b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. **Minimum wages**
   a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

      Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(ii) The classification is utilized in the area by the construction industry; and
(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. **Payrolls and basic records**

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/ wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. **Apprentices and trainees**

a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. **Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
   a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees

from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;
(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. **Instructions for Certification – First Tier Participants:**
   a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
   b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
   c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
   d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
   e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
   f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
   g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.
   h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.
   i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
   j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction 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 to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**
   a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
      (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
      (2) 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;
      (3) 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 (a)(2) of this certification; and
      (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
   b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **Instructions for Certification - Lower Tier Participants:**
(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)
   a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
   b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
   c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
   d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of

Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

h. 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 clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction 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 to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

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.

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC20210090 01/01/2021 NC90

Z-090

Date: January 1, 2021

General Decision Number: NC20210090 01/01/2021 NC90

Superseded General Decision Numbers: NC20200090

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

Brunswick	Greene	Onslow
Cumberland	Hoke	Pender
Currituck	Johnston	Pitt
Edgecombe	Nash	Wake
Franklin	New Hanover	Wayne

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract for calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR.5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2) – (60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021

SUNC2014-005 11/17/2014

	Rates	Fringes
BLASTER	21.04	
CARPENTER	13.72	
CEMENT MASON/CONCRETE FINISHER	14.48	
ELECTRICIAN		
Electrician	17.97	
Telecommunications Technician	16.79	.63

	Rates	Fringes
IRONWORKER	16.02	
LABORER		
Asphalt Raker and Spreader	12.46	
Asphalt Screed/Jackman	14.33	
Carpenter Tender	12.88	
Cement Mason/Concrete Finisher Tender	12.54	
Common or General	10.20	
Guardrail/Fence Installer	12.87	
Pipelayer	12.17	
Traffic Signal/Lighting Installer	14.89	
PAINTER		
Bridge	24.57	
POWER EQUIPMENT OPERATORS		
Asphalt Broom Tractor	11.85	
Bulldozer Fine	17.04	
Bulldozer Rough	14.34	
Concrete Grinder/Groover	20.34	2.30
Crane Boom Trucks	20.54	
Crane Other	20.08	
Crane Rough/All-Terrain	20.67	
Drill Operator Rock	14.38	
Drill Operator Structure	21.14	
Excavator Fine	16.60	
Excavator Rough	14.00	
Grader/Blade Fine	18.47	
Grader/Blade Rough	14.62	
Loader 2 Cubic Yards or Less	13.76	
Loader Greater Than 2 Cubic Yards	14.14	
Material Transfer Vehicle (Shuttle Buggy)	15.18	
Mechanic	17.55	
Milling Machine	15.36	
Off-Road Hauler/Water Tanker	11.36	
Oiler/Greaser	13.55	
Pavement Marking Equipment	12.11	
Paver Asphalt	15.59	
Paver Concrete	18.20	
Roller Asphalt Breakdown	12.45	
Roller Asphalt Finish	13.85	
Roller Other	11.36	
Scraper Finish	12.71	
Scraper Rough	11.35	
Slip Form Machine	16.50	
Tack Truck/Distributor Operator	14.52	
TRUCK DRIVER		
GVWR of 26,000 Lbs or Less	11.12	
GVWR of 26,001 Lbs or Greater	12.37	

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.
Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work,

up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.
Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, D.C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

PROJECT SPECIAL PROVISIONS

GEOTECHNICAL

DocuSigned by:
Geotechnical Engineering Unit
E06538624A11498...

8/24/2021

MECHANICALLY STABILIZED EARTH RETAINING WALLS (10-19-21)

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 Reinforcement – Polyester Type (PET), HDPE or Polypropylene (PP) geosynthetic grids, i.e., geogrid reinforcement or polymer straps, i.e., geostrip reinforcement,
Geogrid – PET, HDPE or PP geogrid,
Reinforcement – Steel or geosynthetic reinforcement,
Aggregate – Coarse or fine aggregate,
Panel – Precast concrete panel,
Coping – Precast or CIP concrete coping,
Design Height (H) – Wall height + wall embedment as shown in the plans,
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 MSE 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
Asphalt Concrete Base Course, Type B25.0C	620
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 geosynthetics in accordance with Article 1056-2 of the *Standard Specifications*. Load, transport, unload and store MSE wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

A. Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate 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 chemical 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	Geosynthetic	4.5 – 9

AGGREGATE ELECTROCHEMICAL REQUIREMENTS (Steel Reinforcement/Connector Materials Only)			
Aggregate Type (in reinforced zone)	**Resistivity**	**Chlorides**	**Sulfates**
Coarse	≥ 5,000 Ω · cm	≤ 100 ppm	≤ 200 ppm
Fine	≥ 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*.

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

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

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

Provide extruded geogrids produced in the United States and 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 B
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 preformed ethylene propylene diene monomer rubber bearing pads that meet ASTM D2000 Grade 2, Type A, Class A with a durometer hardness of 60 or 80 ± 5. Provide bearing pads with thicknesses that meet the following:

BEARING PAD THICKNESS	
Facing Area per Panel (A)	**Minimum Pad Thickness After Compression (based on 2 times panel weight above pads)**
$A \leq 30$ sf	1/2"
30 sf $< A \leq 75$ sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Use 10 gauge or heavier structural steel Grade 50 or higher for steel strip panel anchors and connectors. 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. For abutment walls only, design MSE walls for seismic if wall sites meet either or both of the following:

- Wall site is in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*,
- Wall site is classified as AASHTO Site Class E, as noted in the plans, and is in or west of Pender, Duplin, Wayne, Johnston, Wake, Durham or Person County.

Connect reinforcement to panels or SRW units with methods or devices approved for the chosen system. Use a uniform reinforcement length throughout the height of the

wall of at least 0.7H 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 geosynthetic 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 and geostrip 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 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 *FHWA Design and Construction of Mechanically Stabilized Earth Walls and*

Reinforced Soil Slopes – Volume I (Publication No. FHWA-NHI-10-024) except use the following for geosynthetic reinforcement rupture:

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

Where,

ϕ = resistance factor for tensile resistance in accordance with Section 7.2.1 of the FHWA MSE wall manual,

T_{al} = long-term geosynthetic design strength approved for chosen MSE wall system,

R_c = reinforcement coverage ratio = 1 for continuous geosynthetic reinforcement,

T_{max} = factored static load in accordance with Section 7.2 of the FHWA MSE wall manual,

T_I = factored impact load in accordance with Section 7.2 of the FHWA MSE wall manual and

RF_{CR} = creep reduction factor approved for chosen MSE wall system.

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:

WALL 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. H is the maximum design height per wall.

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 Height of Wall 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 sections. 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. When placing pavement sections directly on the reinforced zone, cap aggregate with 4" of asphalt concrete base course. 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 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 geosynthetic 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 geosynthetics is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of aggregate. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. If a drain is required, install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*. 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, hauling and removing excavated materials, placing and compacting aggregate and backfill material and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, aggregate concrete base course, 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

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STANDARD SHORING: **(10-19-21)**

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
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 Type 1 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 for geogrid reinforcement with a roll width of at least 4 ft and an "approved" status code in accordance with the NCDOT Geosynthetic Reinforcement Evaluation Program. The list of approved geogrids is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Based on actual wall height, groundwater or flood 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 approved for short-term design strengths (3-year design life) in the machine direction (MD) and cross-machine direction (CD) 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

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.

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PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL AND WATER (5/26/2021)

The Contractor's attention is directed to the fact that soil and groundwater contaminated with petroleum hydrocarbon may be encountered during construction within the project area. Groundwater is documented to be impacted at Parcel 4 (approximate Station 77 -L-, Left). The known area of groundwater contamination is 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", "Brunswick R-5021", "GeoEnv Postings":

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

Petroleum contaminated soil and groundwater may be encountered during any earthwork activities on the project.

WATER

Groundwater at Parcel 4 (approximate Station 77 -L-, Left) is contaminated according to the UST Closure and Initial Abatement Action Report dated October 16, 2017. 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.

SOIL

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 that is not required to be excavated is to remain in place and undisturbed. Undisturbed soil shall remain in place, whether contaminated or not.

In the event that the Contractor chooses to stockpile the soil temporarily, soil stockpiles shall be created within the property boundaries of the source material and in accordance with the NCDEQ, UST Section's stockpile construction guidelines. 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 stockpiling of contaminated soil will be paid under the Hauling and Disposal of Petroleum Contaminated Soil pay item below.

The quantity of contaminated soil disposed shall be the actual number of tons of material, which has been acceptably excavated, transported, and weighed with certified scales and shown on a waste disposal manifest. The quantity of contaminated soil shall be paid for at the contract unit price per ton for "Hauling and Disposal of Petroleum Contaminated Soil".

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

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5/26/2021

VERTICAL PANEL TYPE 3 OBJECT MARKER – OM3-C:

(07-23-18)

(A) General

Provid**e** a vertical marker with sheeting for a Type 3 Object Marker – OM3-C. The vertical marker post shall be affixed to a base capable of restoring the marker to the vertical position if struck by a vehicle.

(B) Crash Testing

The vertical panel shall be crash tested and meet requirements for a NCHRP 350 or MASH-16 Category II device. The vertical marker shall be capable of sustaining a minimum of twenty (20) direct wheel-over impacts at 55 MPH without damage to the vertical marker or reflective sheeting applied to the vertical marker.

(C) Construction

The vertical marker shall be composed of UV-stabilized high impact plastic. The vertical marker shall be a minimum of 12 inches wide and a minimum of 48 inches high when installed. The vertical marker will consist of a retro-reflective sheeting, flat panel, post and permanent base. The post shall be attached to the base with a flexible mount or similar device capable of restoring the marker to the vertical position if struck by a vehicle.

(D) Reflective Sheeting

The vertical marker flat panel shall accommodate a minimum of 12 inches x 36 inches of Grade C high intensity retro-reflective sheeting or better that meets the requirements of Section 1092. The retro-reflective sheeting shall meet the color and stripe patterns of a Type 3 Object Marker – OM3-C per requirements of the 2009 MUTCD.

(E) Installation

The vertical marker shall be installed per manufacturer's instructions.

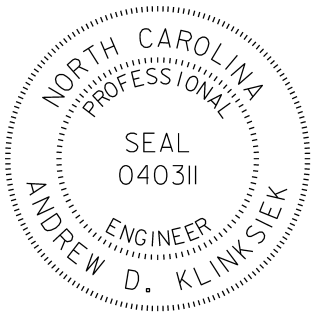
(F) Approval

All materials are subject to the approval of the Engineer.

(G) Measurement and Payment

Payment will be made under:

Pay Item	**Pay Unit**
Vertical Panel Type 3 Object Marker – OM3-C	each



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VERTICAL PANEL TYPE 3 OBJECT MARKER – OM3-L:
(07-23-18)

(A) General

Provid**e** a vertical marker with sheeting for a Type 3 Object Marker – OM3-L. The vertical marker post shall be affixed to a base capable of restoring the marker to the vertical position if struck by a vehicle.

(B) Crash Testing

The vertical panel shall be crash tested and meet requirements for a NCHRP 350 or MASH-16 Category II device. The vertical marker shall be capable of sustaining a minimum of twenty (20) direct wheel-over impacts at 55 MPH without damage to the vertical marker or reflective sheeting applied to the vertical marker.

(C) Construction

The vertical marker shall be composed of UV-stabilized high impact plastic. The vertical marker shall be a minimum of 12 inches wide and a minimum of 48 inches high when installed. The vertical marker will consist of a retro-reflective sheeting, flat panel, post and permanent base. The post shall be attached to the base with a flexible mount or similar device capable of restoring the marker to the vertical position if struck by a vehicle.

(D) Reflective Sheeting

The vertical marker flat panel shall accommodate a minimum of 12 inches x 36 inches of Grade C high intensity retro-reflective sheeting or better that meets the requirements of Section 1092. The retro-reflective sheeting shall meet the color and stripe patterns of a Type 3 Object Marker – OM3-L per requirements of the 2009 MUTCD.

(E) Installation

The vertical marker shall be installed per manufacturer's instructions.

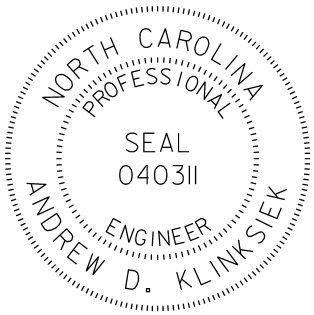
(F) Approval

All materials are subject to the approval of the Engineer.

(G) Measurement and Payment

Payment will be made under:

Pay Item	**Pay Unit**
Vertical Panel Type 3 Object Marker – OM3-L	each



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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

R-5021 Brunswick County

WORK ZONE TRAFFIC CONTROL
Project Special Provisions
Table of Contents

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, Audible Warning Devices and Temporary Curb Ramps.

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.

Temporary Curb Ramps shall be manufactured and assembled to meet all of the requirements for persons with walking disabilities, including wheelchair confinement, according to the ADA regulations and Roadway Standard Drawing 848.05. All detectable warning features are to be included with these installations.

Measurement and Payment

The measurement and payment for the ADA Compliant Pedestrian Traffic Control Devices shall be measured and paid on a per each basis for the Audible Warning Devices and Temporary Curb Ramps. Payment for Temporary Curb Ramps includes all necessary detectable warning features. 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
Temporary Curb Ramps	Each

Project: R-5021 **UC-1** County: Brunswick

PROJECT SPECIAL PROVISIONS
Utility Construction

Technical Services of North Carolina, Inc.
5438 Wade Park Boulevard, Suite 200
Raleigh, NC 27607
Project Numbers: 60660196 / 60428203
September 9, 2021

9/9/2021

NORTH CAROLINA PROFESSIONAL SEAL 10666 ENGINEER D. STEPHEN SCRUGGS

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

(Seal)

This Special Provisions applies to the utilities owned by Brunswick County Public Utilities.

The proposed utility construction shall meet the applicable requirements of the NC Department of Transportation's "Standard Specifications for Roads and Structures" dated January 2018, and the following Special Provisions:

Revise the 2018 NCDOT Standard Specifications as follows:

Page 10-61; Sub-article 1034-2(B), PVC Force Main Sewer Pipe
Add Sub-articles (3), (4) and (5) as follows:

(3) PVC sewer force main piping, 4 – 60 inches, shall be Polyvinyl Chloride (PVC), AWWA C-900 or C-905, DR-18 minimum, and factory dyed industry standard green to aid in field identification. PVC reuse effluent transmission piping shall be factory dyed industry standard purple to aid in field identification. All pipe used for force main construction shall be labeled or otherwise identified as conveying wastewater.

(4) Fusible Polyvinyl Chloride, (FPVC), ASTM cell classification 12454, Fusible C900 with minimum DR 18 for 4 – 12-inch diameter; Fusible C905 with minimum DR 18 for 14 – 24-inch diameter; Fusible C905 with DR 25 for 30-inch diameter; Fusible C905 with DR 32.5 for 36-inch diameter. Fusible PVC force mains shall be joined by the thermal butt fusion method in accordance with ASTM D638 and the manufacturer's installation recommendations.

(5) Restrained Joint PVC Force Main Piping, 4 – 24 inches, shall be Polyvinyl Chloride (PVC), AWWA C-900/RJ, DR-18 minimum, having an internal joint restraint system. The pipe shall be manufactured of 12454 compound per ASTM D1784,

with an integral bell with gasket meeting ASTM F477. The sewer pipe shall be factory dyed industry standard green to aid in field identification. PVC reuse effluent transmission piping shall be factory dyed industry standard purple to aid in field identification. All restrained joint pipe used for force main construction shall be labeled or otherwise identified as conveying wastewater.

Page 10-61; Sub-article 1034-2(C), Polyethylene (PE) Force Main Sewer Pipe

Add Sub-article (1) as follows:

(1) High Density Polyethylene, (HDPE), PE 4710, ASTM D2239, minimum DR-9. HDPE force mains shall be joined by the thermal butt fusion method in accordance with ASTM A2657 and the manufacturer's installation recommendations.

Page 10-61; Sub-article 1034-4(B), Ductile Iron Force Main Sewer Pipe

Delete the section in its entirety and replace with the following:

(1) Must have written permission of county staff to use DIP. Ductile Iron Pipe, (DIP), ANSI/AWWA C150/A21.50, ANSI/AWWA C151/A21.51 (only with express written permission of Brunswick County Utilities or Engineering Department).

(2) Fittings and specials shall be class 54 ductile iron, mechanical joint in accordance with ANSI/AWWA C111/A21.11, ANSI/AWWA CI53/A21.53, with a (200) pounds per square inch minimum pressure rating unless otherwise shown or specified. Ductile iron fittings and specials shall be lined on the interior with ceramic epoxy Protecto 401, Ceramapure PL90, or equal and coated on the exterior with a bituminous asphaltic coating for corrosion resistivity.

(3) Restrained joints shall be installed as shown on the approved plans or standard details. Concrete thrust blocking shall be installed as shown on the approved plans or standard details. All restrained joint systems shall have a pressure rating equal to or greater than that of the pipe on which they are installed. Restraint type gaskets that provide internal restraint by means of stainless-steel inserts embedded within the gasket are not permitted.

(4) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

(5) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

(a) All Mechanical Joint Restraints shall be considered incidental to the ____" Force Main pay item. No additional measurement or payment will be made.

(b) All miscellaneous connections to existing pipe shall be installed in accordance with Article 1036-8 (B) and shall be considered as incidental to the Project and no additional payment will be made.

(c) When noted on the plans to "Uncover and restrain a minimum of _____ feet of existing pipe with bell restraint harness," the work and materials shall be considered incidental to the ____" Force Main pay item. No additional measurement or payment will be made.

Page 10-61; Section 1034 Sanitary Sewer Pipe and Fittings; Add Sub-article 1034-5, Sewer Valves

Add the following Paragraphs (1) and (2):

(1) Plug Valves: Non-lubricated eccentric type with resilient faced plugs, furnished with flanged joint connections for above ground connection and mechanical joints for underground connections, ports shall be 100% port, with a minimum one-hundred fifty (150) psi pressure rating, cast iron body, plugs shall be cast iron or Ductile Iron, of one piece construction, resilient faced, with all exposed nuts, bolts, springs, washers, etc, a minimum Type 316 stainless steel.

(2) Payment for all Plug Valves shall be paid under:

Pay Item	**Pay Unit**
____" Sewer Valve	Each

Page 10-63; Sub-article 1036-5 Ductile Iron Pipe and Fittings

Add the following Paragraph (A):

(A) Restrained Joints, Piping and Fittings for Water Mains

(1) Restrained joints shall be installed as shown on the approved plans or standard details. Concrete thrust blocking shall be installed as shown on

the approved plans or standard details. All restrained joint systems shall have a pressure rating equal to or greater than that of the pipe on which they are installed. Restraint type gaskets that provide internal restraint by means of stainless-steel inserts embedded within the gasket are not permitted.

(2) All ductile iron horizontal directional drill and bore-and-jack installations shall use boltless, integral, positive locking restraint systems that allow for joint deflection and disassembly should the need arise.

(3) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

(4) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

(a) All Mechanical Joint Restraints shall be considered incidental to the "___" Water Line pay item. No additional measurement or payment will be made.

(b) All miscellaneous connections to existing pipe shall be installed in accordance with Article 1036-8 (B) and shall be considered as incidental to the Project and no additional payment will be made.

(c) When noted on the plans to "Uncover and restrain a minimum of _____ feet of existing pipe with bell restraint harness," the work and materials shall be considered incidental to the "____" Water Line pay item. No additional measurement or payment will be made.

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Page 10-63; Sub-article 1036-7 Water Valves

Add Sub-articles (D), (E), (F) and (G) as follows:

(D) Air Release Valves and Vaults

(1) The air and vacuum valve shall be a combination air / vacuum valve. The combination air / vacuum valve shall allow unrestricted venting or re- entry of air during filling or draining of pressurized mains. The valve shall have a large orifice for the air and vacuum function and a smaller orifice for the air release function contained within a single valve body. The small air release orifice shall be a Type 304 stainless steel orifice rated for working pressures up to two hundred (200) psi minimum. The valve body shall have a one (1) inch NPT tap near the bottom to permit cleanout of accumulated debris from the valve body.

(2) Valves shall be mounted on a stainless steel saddle with Type 304 stainless steel or better valve and nipples. Provide two (2) inch inlet, outlet, and blow-off valve, and one (1) inch flushing drain piping to include a one (1) inch flushing valve. Valve internals to be Type 304 stainless steel linkage with a single float design. Bronze or plastic internal components are not acceptable. The air and vacuum valve assembly shall have a stainless steel pressure gauge installed that is angled for ease of viewing from the manhole or box cover.

(3) The combination air / vacuum valve shall be installed in a 2-foot by 3-foot by 4-foot, polymer concrete box, Tier 22 rating for both the box and cover, with the box opening offset from the air and vacuum valve such that that air and vacuum valve is not directly underneath the access opening.

(4) Install air and vacuum release valves at the high point of pressurized pipelines. Installed the air and vacuum release valves in a polymer concrete box.

(5) *2" Air and Vacuum Release Valve* shall be paid per each. The line item shall include the air and vacuum release valve, polymer concrete box, tapping saddle, corporation stop, stone bedding, tubing, valves, fittings, supports, valve marker, excavation and backfill, and all appurtenances required for a complete and operable installation.

(6) Payment will be made under:

Pay Item	**Pay Unit**
2" Air and Vacuum Release Valve	Each

PROJECT SPECIAL PROVISIONS
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(E) Butterfly Valves:

(1) Butterfly valves shall be installed on water mains sixteen (16) inch diameter and larger. Butterfly valves shall meet the requirement of AWWA C504, latest revision. Valves shall have mechanical joints. Operating stem and nut shall be two (2) inch and open left only. Resilient and elastomer seats are to be synthetic rubber (EPDM). Shafts to be turned, ground and polished, constructed of 18-8 Type 304 stainless steel. Shafts to be of one piece design. Attach disc to shaft with stainless steel tapered pins and locking nuts. Provide operators with not less than maximum operator torque, as determined in accordance with Appendix A of AWWA C504, to operate valves under actual line pressures and velocities. Provide worm and gear, or traveling nut type, self-locking to prevent the valve disc from creeping or fluttering when it is in any intermediate position between open and closed. Gear operators to be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position. All exterior fasteners shall be minimum high strength alloy steel. Epoxy coated inside and outside conforming to AWWA C550. Rated for a two hundred (200) psi working pressure.

(2) All Butterfly Valves shall be paid as ____*" Valve*.

(F) 12" Check Valve and Vault

(1) Check Valve

(a) Check valve shall be of the swing type and shall comply with all applicable parts of ANSI/AWWA C508. The valve shall have a cast iron body, be fully bronze mounted with cast iron disc and ASTM D2000 rubber seat ring. Epoxy coated interior and exterior for corrosion resistance. The valve shall have an air cushion and weight lever arm capable of being mounted on either side of the valve. The valve shall have flanged ends meeting ANSI/AWWA C-110/A21.10.

(2) Valve Vault

(a) The vault shall be constructed of precast, reinforced concrete having a 28 day strength of 5,000 psi. The water to cement ratio shall be 0.45 or less. The vault shall be designed for an H-20 loading. Minimum wall thickness shall be 6-inches.

(b) Access hatches shall be fabricated from welded aluminum sections. Hatches shall be of the sizes shown on the Contract Drawings. All hatches

shall be reinforced for a 300 pound per square foot live load unless where called for on the contact drawings the hatches shall be rated for H20 loading. Each hatch shall be constructed with a ¼-inch aluminum channel frame with recessed anchors. The frame shall be equipped with a 1.5-inch drain and coupling. The Contractor shall make a connection to the drain coupling and install piping, of the same size or larger, so that the discharge is outside of the structure. Each hatch frame shall have a built-in EPDM or neoprene gasket. Hinged doors shall be fabricated from ¼-inch thick aluminum with non-skid diamond tread on upper surface. All hardware on access assembly shall be stainless steel with flush upper surface without protrusions. The door shall be fitted with a recessed latch requiring a special key for access. A recessed lifting handle shall also be provided for each door. Each door shall have an auto-lock hold open arm with a release handle and a stainless steel compression spring assist.

(c) Ladders shall be aluminum welded construction, Alloy 6063-T5, mill finish. Install ladders so that the distance from the rungs to the finished wall surface will not be less than 7 inches. Vertical ladders shall be designed to withstand a minimum of two loads of 250 pounds each, concentrated between any two consecutive attachments. Install aluminum ladder safety post on fixed ladders below hatch cover and design with a telescoping tubular section that locks automatically when fully extended.

(3) *12" Check Valve and Vault* shall be paid per each. The Contractor shall furnish and install the check valve and vault at the location shown on the Drawings and as specified herein. The line item shall include check valve, restrained flanged adapters, precast concrete valve vault, access hatch, ladder, pipe supports, excavation and backfill, crushed stone, and all appurtenances required for a complete and operable installation. All piping and fittings shall be ductile iron, unless otherwise shown on the Plans.

(f) Payment will be made under:

Pay Item	**Pay Unit**
12" Check Valve and Vault	Each

(G) 24" Pressure Sustaining Valve Assembly

(1) Pressure Sustaining Valve

(a) The main valve shall be hydraulically operated, single diaphragm actuated, globe pattern. The valve shall consist of three major components; the body with seat installed, the cover with bearing installed and the diaphragm

assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating the operating pressure from line pressure. Packing glands, stuffing boxes and/or rolling diaphragm technology will not be permitted and there shall be no pistons operating the main valve or pilot controls. No fabrication or welding shall be used in the manufacturing process. Y-pattern valves shall not be permitted. Main valve shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

(b) Main Valve Materials

i.	Body & Cover:	Ductile Iron-ASTM A536
ii.	Main Valve Trim:	Stainless Steel
iii.	Disc Retainer:	Cast Iron
iv.	Diaphragm Washer:	Cast Iron
v.	Seat:	Stainless Steel
vi.	Stem, Nut and Spring:	Stainless Steel
vii.	Seal Disc:	Buna-N Rubber
viii.	Diaphragm:	Nylon Reinforced Buna-N® Rubber
ix.	Internal Trim Parts:	Stainless Steel: Bronze; Brass
x.	Pressure Rating:	200psi
xi.	Temperature Range:	Water to 180°F
xii.	Any other wetted metallic parts:	Stainless Steel; Bronze; Brass
xiii.	Coating:	Fusion Bonded Epoxy Coating (Interior and Exterior); ANSI / NSF 61 Approved / AWWA coating specifications C116-03.

(c) End Connections for control valve shall be flanged per ASME/ANSI B16.42, Class 150.

(d) The pressure relief/sustaining pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds the adjustable spring setting. Pilot shall comply with NSF/ANSI 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component. The pilot control system shall include a strainer and needle valve, a fixed orifice closing speed and all required control accessories, equipment, control tubing and fittings. The pilot system shall include isolation ball valves, inlet and outlet pressure gauges, and drain to atmosphere. Pilots to be manufactured by control valve manufacturer. Material Specification for Pilot Control System:

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i.	Body & Cover:	Bronze, Low Lead or UNS C87850
ii.	Pilot Trim	Brass and Stainless Steel 303
iii.	Rubber:	Buna-N
iv.	Connections:	FNPT
v.	Pressure Rating:	400 psi Max.
vi.	Temperature Range:	Water to 180°F Max.
vii.	Control Tubing	Copper
viii.	Control Fittings	Brass

(2) Check Valve

(a) Check valve shall be of the swing type and shall comply with all applicable parts of ANSI/AWWA C508. The valve shall have a cast iron body, be fully bronze mounted with cast iron disc and ASTM D2000 rubber seat ring. Epoxy coated interior and exterior for corrosion resistance. The valve shall have an air cushion and weight lever arm capable of being mounted on either side of the valve. The valve shall have flanged ends meeting ANSI/AWWA C-110/A21.10.

(3) Valve Vault

(a) The vault shall be constructed of precast, reinforced concrete having a 28 day strength of 5,000 psi. The water to cement ratio shall be 0.45 or less. The vault shall be designed for an H-20 loading. Minimum wall thickness shall be 6-inches.

(b) Access hatches shall be fabricated from welded aluminum sections. Hatches shall be of the sizes shown on the Contract Drawings. All hatches shall be reinforced for a 300 pound per square foot live load unless where called for on the contact drawings the hatches shall be rated for H20 loading. Each hatch shall be constructed with a ¼-inch aluminum channel frame with recessed anchors. The frame shall be equipped with a 1.5-inch drain and coupling. The Contractor shall make a connection to the drain coupling and install piping, of the same size or larger, so that the discharge is outside of the structure. Each hatch frame shall have a built-in EPDM or neoprene gasket. Hinged doors shall be fabricated from ¼-inch thick aluminum with non-skid diamond tread on upper surface. All hardware on access assembly shall be stainless steel with flush upper surface without protrusions. The door shall be fitted with a recessed latch requiring a special key for access. A recessed lifting handle shall also be provided for each door. Each door shall have an auto-lock hold open arm with a release handle and a stainless steel compression spring assist.

(c) Ladders shall be aluminum welded construction, Alloy 6063-T5, mill finish. Install ladders so that the distance from the rungs to the finished wall surface will not be less than 7 inches. Vertical ladders shall be designed to withstand a minimum of two loads of 250 pounds each, concentrated between any two consecutive attachments. Install aluminum ladder safety post on fixed ladders below hatch cover and design with a telescoping tubular section that locks automatically when fully extended.

(4) *24" Pressure Sustaining Assembly* shall be paid per each. The Contractor shall furnish and install the pressure sustaining valve assembly at the location shown on the Drawings and as specified herein. The line item shall include the pressure sustaining valve, check valve, restrained flanged adapters, pipe supports, precast concrete valve vault, access hatches, ladder, excavation and backfill, crushed stone, and all appurtenances required for a complete and operable installation. All piping and fittings shall be ductile iron, unless otherwise shown on the Plans.

(5) Payment will be made under:

Pay Item	**Pay Unit**
24" Pressure Sustaining Valve Assembly	Each

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
Add the following sentences:

"The utility owner is Brunswick County Public Utilities. The contact person is Paul Biagiotti and he can be reached by phone at (910) 253-2627 and by email at paul.biagiotti@brunswickcountync.gov."

General Utility Requirements; Page 15-2; Sub-article 1500-8, Locating and Marking
Add paragraphs (A), (B) and (C) as follows after Line 35:

(A) Pipe Marking Tape and Locating Wire for Force Mains and Water Mains

(1) Marking tape shall be three (3) inches wide, made of plastic or other permanent material, and shall be buried continuously above the force main or water main at a depth of eighteen (18) inches below finished grade. For force mains, the tape shall be green in color, bearing continuous message "CAUTION SEWER LINE BURIED BELOW." For reuse water mains, the tape shall be purple in color, bearing continuous message "CAUTION REUSE LINE BURIED BELOW." For water mains, the tape shall be blue

in color, bearing continuous message "CAUTION WATER LINE BURIED BELOW."

(2) All force mains, reuse main and water mains shall have a #12 AWG, high strength copper clad steel conductor (HS –CCS) with HDPE insulation, and rated for direct burial. Underground connectors shall be used for all splices. The wire shall be brought up into a valve box at 1,000 feet maximum intervals to provide wire access points. The wire shall be taped to the top of the main at minimum ten (10) foot intervals.

(3) The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project.

(4) In addition to the tracing wire, electronic marker balls shall be installed on the force mains, reuse main and water mains.

(5) Individual water services shall have tracer wire installed from the main to the meter box.

(B) Valve Markers

Valve markers shall be installed in rights-of-way and utility easements as shown on the county standard details. Valve markers shall be concrete if located in the right-of-way, extend thirty-six (36) inches above finished grade, with the cast MV (main Valve), AV (air release valve), or BO (blow off) facing the nearest street. Refer to county standard details. Valve markers in utility easements shall be fiberglass, extend sixty (60) inches above finished grade, and be installed with the flat face facing the valve for installation of the marking decal on the valve marker. Valve marker shall be painted blue for water mains, green for sewer force mains and purple for reuse force mains. Concrete valve markers shall have a bronze, stamped, insert on top of marker per county standard detail.

(C) Electronic Marker Balls for Force Mains and Water Mains

(1) Electronic marker balls are also required for non-ferrous water mains and sewer force mains eight (8) inches in diameter and larger; and for ferrous water mains and sewer force mains greater than twelve (12) inches in diameter.

(2) The marker balls shall be 4-inch in diameter and be colored blue for water, green for sewer, and purple for reclaimed water.

(3) The markers consist of a sealed shell containing a passive antenna with

a low frequency resonance circuit tuned to a certain frequency depending upon the associated utility. For water and sewer systems the frequencies are:

(a)	Water:	145.7 kHz
(b)	Sewer:	121.6 kHz
(c)	Reclaimed Water:	66.3 kHz

(4) Electronic Marker Balls for Force Mains and Water Mains

Install Electronic Marker Balls as indicated below:

(a). Electronic marker balls shall be placed at:

i. Tees
ii. Bends
iii. Crosses
iv. Utility crossings
v. Casing ends
vi. Water crossings
vii. Repair points
vii. Service laterals
viii. Service stubs
ix. and at all changes in pipe diameter.

(b). Electronic Marker Installation, Spacing, and Depth

i.	Minimum depth of burial:	18 inches
ii.	Nominal depth of burial:	24 inches
iii.	Maximum depth of burial:	48 inches
iv.	Minimum height above the main:	6 inches
v.	Minimum distance between markers:	3.5 feet
vi.	Nominal distance between markers:	100 feet
vii.	Maximum distance between markers:	200 feet

viii On bends and lateral pipe deflections place one marker ball every (25) feet.

ix Markers to be installed above any installed main marking tape.

(5) Installation of Electronic Marker Balls shall be considered incidental to the ___" *Water Line* and ____" *Force Main Sewer* pay items respectively. No additional measurement or payment will be made.

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General Utility Requirements; Page 15-3; Sub-article 1500-12, Project Pre-construction Utility Meeting

Add Sub-article 1500-12 as follows:

(A) Description

Prior to beginning construction, the contractor shall conduct a project pre-construction utility meeting at the field office or at an alternate site. Required attendees are the utility contractor's project manager, utility contractor's field superintendent, the utility owners and NCDOT representative. The Contractor shall provide a minimum of forty-eight (48) hours notification to schedule. This is in addition to the Pre-construction Meeting required in Section 1550, Trenchless Installation of Utilities, Sub-article 1550-3(E).

(B) Measurement and Payment

Conducting the pre-construction meeting shall be considered incidental to project with no additional measurement or payment being made.

General Utility Requirements; Page 15-3; Sub-article 1500-13, Intermediate Completion Time (ICT)

Add Sub-article 1500-13 as follows:

(A) Plan Sheet UC-4

(1) Description

Reference the connection of the new 24-inch force main and the existing 16-inch force main shown on Utilities Plan Sheet UC-4: The connection shall be made within a 4-hour period, at night, on a weekend. The connection will not be allowed during the peak usage period from Memorial Day through Labor Day. Prior to making the connection, the Contractor shall provide and have on site at the River Mist Lift Station a tanker truck into which raw sewage shall be pumped into by way of the existing pumps and 6" emergency pump connection. Once the force main connection has been made and the force main operational, the Contractor shall return the stored sewage in the tanker truck to the pump station wet well.

(2) Measurement and Payment

The ICT shall be considered incidental to the 24" Force Main Sewer pay item. No additional measurement or payment will be made.

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Utility Construction

(B) Plan Sheet UC-15

(1) Description

Reference the connection of the new 12-inch force main and the existing 12-inch force main shown on Utilities Plan Sheet UC-15, Detail B: The connection shall be made within a 4-hour period, at night, on a weekend. The connection will not be allowed during the peak usage period from Memorial Day through Labor Day.

(2) Measurement and Payment

The ICT shall be considered incidental to the 12" Force Main Sewer pay item. No additional measurement or payment will be made.

(C) Plan Sheet UC-23

(1) Description

Reference the installation of the 24-inch water main by way of horizontal directional drilling (HDD) on Utilities Plan Sheet UC-23: The HDD shall be performed on the weekend when the existing businesses are closed. Work may begin at 6:00 p.m. on a Friday afternoon and be completed including repairing the gravel drive and make accessible by 7:00 a.m. the following Monday morning. An alternate plan proposed by the Contractor will be considered provided access to the local businesses can be maintained.

(2) Measurement and Payment

The ICT shall be considered incidental to the Directional Drilling of 24" pay item. No additional measurement or payment will be made.

Page 15-7; Sub-article 1510-3, Construction Methods
Add paragraphs (C) and (D) as follows:

(C) Hydrostatic Testing:

(1) Conduct hydrostatic testing in accordance with AWWA C600 (DIP) or AWWA C605 (PVC) as applicable. Conduct tests on each line or valved section of line. Water mains shall be tested to one-hundred and fifty (150) percent of the pipe working pressure, but in no case shall the hydrostatic test pressure be less than (150) psig for a minimum of two (2) hours and shall be witnessed and certified by county staff and / or the Engineer.

(2) Slowly fill the main to expel air from the main through the air release valves, fire hydrants, blow offs, or other appurtenances. If permanent air release valves are not located at all high points, the contractor shall install corporation cocks at such points so that air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed, and the test pressure applied. At the end of the pressure test, the corporation cocks shall be removed and plugged.

(3) Hydrostatic pressure testing shall not be made until seven (7) days after installation of piping to be tested is backfilled, and a minimum forty-eight (48) hour notice to county staff is required.

(4) Directionally drilled pipe must be pressure tested after any manufacturer's required pipe relaxation period, as applicable, to ascertain the successful completion of the directional drill. All directionally drilled piping shall be tested again with the complete system and witnessed by county staff and /or the engineer.

(5) A suitable test pump, furnished by the contractor, shall be connected to the line by means of a tap in the line, or other suitable methods, and the proper test pressure slowly applied to the line.

(D) Water Main Flushing and Chlorination

(1) Conduct disinfection in accordance with AWWA C651 and 15A NCAC 18C.1003 before placing a newly installed water main in service:

(a) Upon completion of construction thoroughly flush the water main to remove all sediment, stone, and other foreign matter.

(b) Hydrostatically pressures test the water main per Section (16) of this specification.

(c) The water main shall be disinfected by the addition and thorough dispersion of a chlorine solution in concentrations sufficient to produce a chlorine residual of at least fifty (50) milligrams per liter (or ppm) in the water throughout the water main system.

(d) All installed valves or other appurtenances shall be operated several times while line is filled with chlorinating agent to ensure proper filling of the entire system.

(e) The chlorine solution shall remain in contact with the interior surfaces of the piping system for a minimum period of twenty-four (24) hours.

(f) At end of retention period flush the system with potable water. At least (10) ppm of chlorine shall remain in the water at the extreme end of the system.

(g) If the initial disinfection procedure fails to produce satisfactory laboratory results the system must be disinfected again as needed by the contractor until satisfactory results are obtained.

(h) Originals of the laboratory test results shall be provided to county staff.

(2) Acceptance:

(a) Provide separate samples for each sample location free of coliform bacteria:

(i) Contractor shall submit water samples to an approved laboratory for testing.

(ii) Contact County Engineering or Public Utilities for assistance and verification of sampling – a minimum forty-eight (48) hour notice is required.

(iii) The sample results shall include the free chlorine residual at the time the samples were collected.

(iv) All sample locations are to be given an identifying label.

(v) The certified laboratory results shall indicate the absence of coliform bacteria in the water samples.

(b) At a minimum, sample locations shall be as required by NCDENR and the following:

(i) The tie-in location of new and existing water lines.

(ii) The end of all dead-end lines.

(iii) At intervals of no more than (1,200) feet for all new lines longer than (1,200) feet in length.

c) Disposal of Chlorinated Water

(3) The contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life.

Page 15-9; Sub-article 1515-3 Construction Methods

Add Sub-articles (H) and (I) as follows:

(H) Relocate Yard Hydrant

The line item shall include relocating the yard hydrant including tubing fittings, excavation and backfill, and all appurtenances required for a complete and operable installation.

Payment will be made under:

Pay Item	**Pay Unit**
Relocate Yard Hydrant	Each

(I) Flow Meter Vault

The work of Brunswick County shall include installation of a Flow Meter Vault. The line item shall include all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work, install the meter vault as required and shown in detail on Plan Sheet UC-3Q.

Payment will be made under:

Pay Item	**Pay Unit**
Flow Meter Vault	Each

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Page 15-13; Sub-article 1520-3, Construction Methods
Add paragraphs (3) and (4) as follows:

(3) Reconnect Force Main

The work of Brunswick County shall include several Reconnect Force Main. The line item shall include all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work, reconnecting existing private sanitary force main service lines to force main or gravity sewer main. Force main services may vary in sizes and length to make reconnection.

Payment will be made under:

Pay Item	**Pay Unit**
Reconnect Force Main	Each

(4) Hydrostatic Testing of Force Mains:

(1) All force mains shall be successfully hydrostatically pressure tested per AWWA standards at a pressure of one and one-half times the rated working pressure, but in no case shall the test pressure be less than one hundred fifty (150) psig for a minimum of two (2) hours.

(2) All force main pressure testing shall be witnessed and approved by county staff and / or the engineer.

(3) Minimum forty-eight (48) hours' notice is required to schedule a force main pressure test with county staff.

(4) Horizontal directional drills (HDD) shall be pressure tested as noted on the county HDD standard details and will be tested a second time as part of the overall system pressure test once the HDD force main has been connected to the installed force main system with the required valves in place at each end of the HDD.

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Page 15-17; Sub-article 1530-3(B), Abandon Manholes
Add the follow:

Remove the existing flow control valves, air release valves, tapping saddles, tubing, and other accessories. that are located in on the pressure pipe in the manholes. Removed valves and accessories become the property of the Contractor for proper disposal.

Owner and Owner's Requirements:
Add the follow:

1. The Contractor shall provide record drawings of water and sewer improvements to Brunswick County within 30 days of the certification of those improvements to the NC DEQ by the engineer of record for the water and sewer utility relocation project. As the project will be constructed and certified in phases, the record drawings will be of those improvements contained in the phase of work being certified to the NC DEQ.

2. Should the Contractor fail to provide the record drawings in a timely manner, the Contractor shall be responsible for all location requests associated with the installed improvements and liable for any damages that occur as a result of the failure to mark said improvements or the incorrect marking of said improvements.

3. The Contractor shall make every effort to keep existing Brunswick County Public Utilities Water and/or Sewer Customers in service at all times. If service disruption is required, the service disruption shall be no more than 4 hours during daylight hours and 10 hours at night. In all cases, the County and the County's customer must be notified a minimum of 48 hours prior to service disruption. If these times cannot be met, the Contractor must provide an alternate means of service to the customer.

4. Any revisions or deviation from the approved plans must be approved by the County. For minor field discovered changes, the County's Inspector for the project must be notified and concur with the change. Major changes must be submitted to Brunswick County Public Utilities in writing and in advance and must be approved in writing by Brunswick County Public Utilities prior to making the change.

5. The Contractor shall be responsible for developing a plan for each required shutdown of the potable water main, raw water main, sewer force main, and reclaimed water main. The plans must be submitted to the Engineer for review and approval. The Contractor's personnel shall not operate valves on existing mains and operate existing wastewater pump stations. County staff will coordinate with the Contractor to operate the valves and pump station based upon the approved shut down plans. No shutdowns will be permitted in peak seasons being the Friday before Memorial Day through Labor Day. No shutdowns will be permitted during high flow, high demand

times. No shutdowns will be permitted on Fridays. Night work may be required for most shutdowns.

6. For shutdowns and connections on the wastewater force main and reclaimed water main, the Contractor shall be responsible for having sufficient manpower and equipment necessary to transport the wastewater or reclaimed water to the designated pump station. In the event of any illegal wastewater discharge resulting from the Contractor's activities, the Contractor shall be responsible for all remediation required by the Engineer and NC DEQ and any fines imposed on the County by NC DEQ.

7. The Contractor will be working in area where utility service is currently being provided by Brunswick County Public Utilities. Brunswick County reserves the right to work in the project to operate and maintain the existing system including making repairs, installing new services, and installing mains. The County will coordinate its work efforts with the Contractor to minimize any potential conflicts during the project.

8. Where a shutdown of an active water main, raw water main and/or associated wells, sewer force main and/or associated sewer pump stations, and/or reclaimed water main is required by virtue of any state laws, instructions of the Designer, specifications, codes, or required as a part of the construction, the Contractor shall give adequate notice (minimum 48 hours) to the designated official representatives of the Owner, of the time set for said shut down. Said shutdowns shall be in accordance with the previously approved shut down plan developed by the contractor and approved by Brunswick County Public Utilities.

9. As the specification require that employees of Brunswick County operate and or exercising the valves on the active water main, raw water main, sewer force main, and/or reclaimed water main and the electrical controls at the sewer pump stations and raw water wells. The Contractor shall employ and pay for the services of the County employees required to execute the shutdown per the approved shut down plan. In the event it is discovered that an existing valve will not hold, the Contractor will be responsible to revise and resubmit the shutdown plan. Any revisions necessary will be at the Contractor's expense.

10. The following Approved Products List details specific brands for certain items preferred by the Owner in order to provide an overall cost savings and/or to maintain or improve the functioning of processes or systems affected by specific items.

Project: R-5021 **UC-21** County: Brunswick

PROJECT SPECIAL PROVISIONS
Utility Construction

ITEM	PREFERRED BRANDS	PERFORMANCE STANDARD	JUSTIFICATION
Air Release Valves for Sewer	• ARI D-025 Combination Air Release/ Vacuum Valve	Compatible with existing piping layout and space constraints.	Cost savings and improved process. Limits inventory, limits required staff training, and facilitates repairs.
Fire Hydrants	• Mueller "Centurion" • American Darling "MK-73" • Clow "Medallion"	Compatible with existing piping layout and space constraints. Immediately repairable with stocked inventory.	Cost savings and improved process. Limits inventory, limits required staff training, and facilitates repairs.
Water Meters	• Sensus • Elster	Compatible with billing software, Sensus RadioRead AMI software, and Sensus Protocol. Compatible with existing piping layout and space constraints.	Cost savings and improved process. Limits inventory, limits required staff training, facilitates repairs, and ensures compatibility with Sensus AMI system.
Meter Boxes (1" meter & Smaller)	• Ford • McDonald	Compatible with existing piping layout and space constraints (Sensus Remotely Read Meters).	Cost savings and improved process. Limits inventory and facilitates repairs.
Isolation Valves	• Mueller • American Flow Control • Clow • M & H • Spears -True Union	Compatible with existing piping layout and space constraints. Immediately repairable with stocked inventory.	Cost savings and improved process. Limits inventory, limits required staff training, and facilitates repairs.
Plug Valves	• Dezurik • Milliken	Compatible with existing piping layout and space constraints. Immediately repairable with stocked inventory.	Cost savings and improved process. Limits inventory, limits required staff training, and facilitates repairs.
Flow meters (Traditional-Magnetic, full pipe water & wastewater)	• Krohne • Siemens	Submergence IP68 rated. Nema 4X enclosure, UV resistant digital display, 120V 60Hz line power, 4-20mA output, relay and pulse outputs. HART communication protocol	Compatibility with electrical and control wiring and component spacing. Limits staff training. Cost savings due to minimizing inventory.

Project: R-5021 **UC-1A** County: Brunswick

PROJECT SPECIAL PROVISIONS
Utility Construction
09/09/2021

RK&K
8601 Six Forks Road
Forum 1, Suite 700
Raleigh, NC 27615

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The proposed utility construction shall meet the NCDOT 2018 "Standard Specifications for Roads and Structures" with amendments noted below.

Contractor shall coordinate closely with NCDOT and Utility owners during installation of water and sanitary sewer line for any necessary shutdowns or by-pass pumping.

Revise the 2018 Standard Specifications as follows:

Page 8-37; Section 858 Adjustment of Catch Basins, Manholes, Drop Inlets, Meter Boxes and Valve Boxes. The Contractor's attention is directed to this section for the adjustment of sanitary sewer cleanouts to finished grade.

Measurement and Payment:
Payment for adjustment of sanitary sewer cleanouts to finished grade shall be per each and paid for under the contract price for "Adjust Sanitary Sewer Cleanout To Finished Grade". Such price and payments will be full compensation for all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work. The adjustment of sanitary sewer cleanouts as required shall be adjusted such that cleanout stem is adjusted to finished grade. Adjustment of sanitary sewer cleanouts will be measured and paid for under the contract item "Adjust Sanitary Sewer Cleanout To Finished Grade".

Pay Item:	**Pay Unit**
Adjust Sanitary Sewer Cleanout To Finished Grade	Each

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
add the following sentences:

Some of the Sanitary Sewer is owned by Southeast Brunswick Sanitary District in Southport, NC. The contact person is Bryan McCabe with Southeast Brunswick Sanitary District, and he can be reached by phone at 910-471-1057.

The waterlines and some of the sanitary sewers are owned by the City of Southport in Southport, NC. The contact person is Tom Stanley with City of Southport, and he can be reached by phone at 910-233-4895.

Page 15-13; Section 1520 Sanitary Sewer. The Contractor's attention is directed to this section for the removal of Southeast Brunswick Sanitary District's existing pump station.

Measurement and Payment:
Payment for removal of existing pump station shall be per each and paid for under the contract price for "Remove Existing Pump Station". Such price and payments will be full compensation for all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work. The removal of the pumpstation as required and shown in detail on Plan Sheet UC-P13 in the Demolition Plan Notes. Removal of the pump station will be measured and paid for under the contract item "Remove Existing Pump Station".

Pay Item:	**Pay Unit**
Remove Existing Pump Station	Each

Page 15-8; Section 1515 Utility Controls. The Contractor's attention is directed to this section. City of Southport has a several check valves.

Measurement and Payment:
Payment for installing 2" Check Valve shall be per each and paid for under the contract price for " 2" Check Valve". Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work. Check valve shall be of the swing type and shall comply with all applicable parts of ANSI/AWWA C508. The valve shall have a cast iron body, be fully bronze mounted with cast iron disc and ASTM D2000 rubber seat ring. Installation of the 2" check valve will be measured and paid for under the contract item "2" Check Valve".

Pay Item:	**Pay Unit**
2" Check Valve	Each

Page 15-13; Section 1520 Sanitary Sewer. The Contractor's attention is directed to this section. City of Southport has a several Reconnect Force Main.

Measurement and Payment:
Payment for installing Reconnect Force Main shall be per each and paid for under the contract price for "Reconnect Force Main". Such price and payments will be full compensation for all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work, reconnecting existing private sanitary force main service lines to force main or gravity sewer main. Force main services may vary in sizes and length to make reconnection. Installation of the Reconnect Existing Services will be measured and paid for under the contract item "Reconnect Force Main".

Pay Item:	**Pay Unit**
Reconnect Force Main	Each

PROJECT SPECIAL PROVISIONS
Pump Station
02/28/2019

RK&K
900 Ridgefield Drive, Suite 350
Raleigh, NC 27609

NORTH CAROLINA PROFESSIONAL SEAL 045517 ENGINEER KEVIN W. NASH
DocuSigned by: Kevin Nash
DS KN
9/17/2021

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The proposed utility construction shall meet the more conservative requirements of the Southeast Brunswick Sanitary District "Standard Specifications and Details" dated June 2008 or the NCDOT 2018 "Standard Specifications for Roads and Structures" with amendments noted below.

Contractor shall coordinate closely with NCDOT and Utility owners during installation of Pump Station for any necessary shut downs or by-pass pumping.

Revise the 2018 Standard Specifications as follows:

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2: add the following sentences:

The Pump Station and Sanitary Sewer Owner is the Southeast Brunswick Sanitary District in Southport, NC. The contact person is Bryan McCabe with Southeast Brunswick Sanitary District, and he can be reached by phone at 910-471-1057.

Page 15-10; Section 1520 Sanitary Sewer. The Contractor's attention is directed to this section. The following special provision will pertain to the "Pump Station".

All references to "Engineer of Record" beginning on Sheet UC-P163 shall be construed to refer to the Engineer.

Measurement and Payment:
Payment for installing a Pump Station shall be lump sum and paid for under the contract price for "Pump Station". Such price and payments will be full compensation for all labor, materials, excavation, shoring, backfilling and any incidentals necessary to complete the work, install valves as required and shown on Pump Station Plan Sheets. Installation of the Pump Station will be measured and paid for under the contract item "Pump Station".

Pay Item:	**Pay Unit**
Pump Station	Each

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ELECTRICAL SPECIFICATIONS
DUPLEX SUBMERSIBLE WASTEWATER PUMP STATIONS
SOUTHEAST BRUNSWICK SANITARY DISTRICT

DIVISION 16 – ELECTRICAL

SECTION 02040

AUDIO-VIDEO COLOR TAPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment to furnish color audio video recording of the project site as specified herein.

B. Furnish to the Engineer an original and one copy of a continuous color audio video recording of the entire area within fifty (50) feet of the construction area. The recording shall be taken prior to any construction activity.

C. The Engineer reserves the right to reject the audio video recording because of poor quality, unintelligible audio or uncontrolled pan or zoom. Any recording rejected by the Engineer shall be rerecorded at no cost to the Owner. Under no circumstances shall construction begin until the Engineer has received and accepted the audio video DVD(s) by written acknowledgement.

D. The recording shall be performed by a qualified, established audio video recording firm knowledgeable in construction practices which has a minimum of one year of experience in the implementation of established inspection procedures.

E. The audio video recording firm shall submit three letters of recommendation from municipalities, and/or engineering firms indicating previous experience and ability to perform the work described in this contract. Data substantiating qualifications must be submitted and accepted prior to performing the survey.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 COLOR AUDIO VIDEO SURVEY

A. Furnish a continuous color audio-video recording of the entire area within fifty (50) feet of construction.

B. Complete coverage shall include all surface features within 50' of the work area to be utilized by Contractor and shall be supported by appropriate audio description made simultaneously with video coverage. Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts, headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults, handrails, etc. located within the aforementioned work zone. Video coverage shall extend to the maximum height of all structures within this zone.

C. All recording shall be done during times of good visibility. No recording shall be done during periods of visible precipitation, or when more than ten percent of the ground area is covered with standing water, unless otherwise authorized by Owner.

D. Audio video over six (6) months old before start of construction shall be re-performed unless specifically waived in writing by Engineer.

3.02 AUDIO AND VIDEO

A. Contractor shall furnish continuous color, audio-video DVD(s) of professional quality.

B. Each DVD shall begin with the Owner's name, Contract name and number, Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.

C. Information appearing on the DVD must be continuous and run simultaneously by computer generated transparent digital information. No editing or overlaying of information at a later date will be acceptable.

D. Digital information to appear in the upper left corner shall be as follows:

1. Name of Contractor
2. Day, date and time
3. Name of Project & Specification Number

E. Time must be accurate and continuously generated.

F. Written documentation must coincide with the information on the DVD so as to make easy retrieval of locations sought for at a later date.

G. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints or photographic negatives.

H. Audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.

Audio shall refer to plan sheet numbers for easy reference.

I. All DVDs and boxes shall bear labels with the following information:

1. DVD Number
2. Owner's Name
3. Date of Recording
4. Project Name and Number
5. Location and Standing Limit of DVD

J. Prior to commencement of audio video recording, Contractor shall notify the Engineer in writing when and where the audio video recording will begin. The Engineer may provide a designated representative to accompany and oversee coverage of all recording operations. Audio video recording completed without an Engineering representative present will be unacceptable unless specifically authorized by the Engineer.

END OF SECTION

SECTION 02210

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Limitations of Subsurface Information Indicated on Drawings:

1. Certain information regarding the reputed presence, size, character and location of existing underground structures, pipe and conduits has been indicated on the Drawings for the benefit of the Owner. There is no certainty of the accuracy of this information, and the location of underground structures indicated may be inaccurate and other obstructions than those indicated may be encountered.

2. The Contractor hereby distinctly agrees that neither the Owner nor the Engineer is responsible for the correctness or sufficiency of the information given:

a. That in no event is this information to be considered as a part of the Contract;

b. That he shall have no claim for delay or extra compensation or damage against the Owner or the Engineer on account of incorrectness of information given; or on account of the insufficiency or absence of information regarding obstructions either revealed or not revealed by the Drawings; and

c. That he shall have no claim for relief from any obligation or responsibility under the Contract, in case the location, size or character of any pipe, conduit or other underground structure is not as indicated on the Drawings, or in case any pipe, conduit or other underground structure is encountered that is not indicated on the Drawings.

1.02 EXISTING SUBSURFACE LINES

A. All known subsurface lines, pipes, and structures are shown on the plans and profiles. These lines are shown based upon the best available plans and maps. The locations have not been verified by test pits and the Owner assumes no responsibility for the accuracy of the Drawings. In any area where the Contractor must make connections to or cross existing lines it shall be his responsibility to test pit the lines and verify the locations to his satisfaction. The test pits shall be performed in advance of line installation sufficient to allow required adjustment or relocations. In the event that lines are not found located as shown on the plans the Contractor shall notify the Engineer so that an evaluation can be made as to the magnitude and method of any adjustments in the plans.

B. The Contractor shall make whatever exploration and/or test pits he deems necessary to determine the actual conditions and locations of underground utilities. The cost of these test pits shall be considered incidental to the various BID ITEMS unless specifically approved by the engineer.

END OF SECTION

SECTION 02230

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To:

1. Clearing

2. Grubbing

3. Stripping and stockpiling topsoil

4. Debris disposal

B. Related Work Specified Elsewhere

1. Section 02300 - Earthwork

2. Section 02311 - Finish Grading and Seeding

3. Section 02315 - Trenching, Backfilling & Compacting

C. Definitions

1. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, trash, any other vegetation, and objectionable material at or above original ground elevation not designated to be saved; clearing also includes removal of fences, walls, guard posts, guard rail, signs, and other obstructions interfering with the proposed work.

2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, organic materials, and debris.

1.02 JOB CONDITIONS

A. The Contractor may clear all obstructions within the property except those specifically indicated on the Contract Drawings or specified to be saved or restored.

B. Obstructions specifically designated to be saved or restored will be marked by the Engineer.

1.03 SUBMITTALS

A. Burning Permits: Burning is not allowed with Southeast Brunswick Sanitary District.

B. Permits for Disposal of Debris

1. Arrange for disposal of debris resulting from clearing and grubbing to locations outside the Owner’s property and obtain written agreements with the owners of the property where the debris will be deposited.

2. Submit two copies of the agreement with each property owner releasing the Owner from responsibility in connection with the disposal of the debris.

PART 2- PRODUCTS

2.01 MATERIALS

A. Temporary Fencing

1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable or other plastic fencing as approved by Engineer.

2. Soil-set fence posts, stubbed “T” type, 6' high.

PART 3 - EXECUTION

3.01 PREPARATION

A. Mark areas to be cleared, the areas to be grubbed, and items to be saved with stakes, flags, paint or plastic colored ribbon for the approval of the Engineer.

B. Protect benchmarks, property corners, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the Engineer.

C. No material shall be stored or construction operation carried on within 4 feet of any tree to be saved or within the tree protection fencing.

3.02 UTILITY RELOCATIONS

Inform utility companies, individuals and others owning or controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the Contractor’s operations.

3.03 CLEARING

A. Confine clearing to within the property.

B. Fell trees in a manner that will avoid damage to other trees, shrubs, and other installations which are to be retained.

C. Where stumps are not required to be grubbed, flush-cut to the ground elevation.

3.04 GRUBBING

A. Grub areas within the construction limits to remove roots and other objectionable material to a minimum depth of 12".

B. Remove all stumps within the cleared areas except those designated to be saved as indicated on the Plans.

3.05 STRIPPING AND STOCKPILING TOPSOIL

A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile at a location approved by the Engineer for use in finish grading.

B. The topsoil is the property of the Owner and shall not be used as backfill. Topsoil shall not be removed from the site unless otherwise authorized by the Engineer.

3.06 DEBRIS DISPOSAL

A. Trees, logs, branches, brush, stumps, trash, rubbish, and other debris resulting from clearing and grubbing operations shall become the property of the Contractor unless specified otherwise on plans or by Engineer and shall be legally disposed of.

B. Do not deposit or bury on the site debris, resulting from the clearing and grubbing work.

C. Debris may be burned on-site if local ordinances allow open-air burning, if required permits are obtained, and if burning operations are conducted in compliance with local ordinances and regulations.

3.07 RESTORATION

A. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved arboricultural practices and materials.

B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the project Owner.

C. Remove protective fences, enclosures and guards upon the completion of the project.

D. Restore guard posts, guard rail, signs and other interferences to the condition equal to that existing before construction operations.

END OF SECTION

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope

1. Work consists of all necessary provisions for designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of observation wells; and instrumentation for control of the system.

2. Dewatering includes lowering the water table and intersecting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; and preventing rupture or heaving of the bottom of an excavation.

3. All dewatering measures are to be designed as to not impact the water table or the existing environmental conditions outside the limits of the project site. Professional services, such as soil or geotechnical licensed engineers, shall be utilized by Contractor as warranted and cost of such services shall be incidental to project.

4. Instrumentation for control of the dewatering system includes required design by professional furnishing, installing and operating piezometers as well as reading and logging of water levels in the observation wells.

B. Related Work Specified Elsewhere May Include But Is Not Limited To:

1. Section 02300: Earthwork

2. Section 02315: Trenching, Backfilling and Compacting

1.02 QUALITY ASSURANCE

A. Codes, Regulations, Reference Standards and Specifications

1. Codes and regulations of the jurisdictional authorities.

2. ASTM: C33, D1785, D2466, D2564, and D3653.

B. Design a dewatering system which will:

1. Effectively reduce the hydrostatic pressure and lower the groundwater levels below excavation;

2. Develop a substantially dry and stable subgrade for the prosecution of subsequent operations;

3. Not result in damage to adjacent properties, building, structures, utilities and other work (any damage shall be the responsibility of the contractor and contractor shall pay for all repairs); and

4. Assure that after initial pumping, no soil particles will be present in the discharge.

C. Methods may include trenching, sump pumping, single or multiple stage well point systems, eductor and ejector type systems, deep wells, and combinations thereof.

D. Locate dewatering facilities only where they will not interfere with utilities and construction work to be done by others. Locate dewatering wells not less than 5 or more than 20-feet from the first observation well. Sumps shall be located outside of areas that will support structures.

E. Modify dewatering procedures, which cause, or threaten to cause, damage to new or existing facilities, so as to prevent further damage. The Contractor is responsible for determining the modifications to be made, which shall be at no additional expense to the Owner.

F. Comply with the requirements of Sediment Control promulgated by jurisdictions having authority. When water is to be diverted into a storm drain, provide settling basins or other approved apparatus as required to reduce the amount of fine particles, which may be carried into the drain. If a storm drain becomes blocked or its capacity restricted due to dewatering operations, make arrangements with the jurisdictional agency and clean the drain at no additional expense to the Owner.

1.03 SUBMITTALS

Submit the following for the approval by the Engineer in accordance with Section 01300 and with the additional requirements as follows, prior to installation of the system.

A. Certification: Signed and sealed by Professional Engineer licensed in the State of North Carolina specializing in this type of design, certifying that dewatering operations as designed and installed are in compliance with requirements of Contract Documents and governing codes. Professional Engineer shall schedule sufficient number of visits to the site to enable verification that the system as installed meets the requirements of the Contract Documents.

B. The proposed type of dewatering system, including relief of hydrostatic head and maintenance of the excavation in a dewatered and in a hydrostatically relieve condition.

C. Arrangement, location and depths of the components of the system.

D. A complete description of equipment to be used, with installation, operation, and maintenance procedures.

E. Standby equipment and power supply.

F. Location, details, and size of berms, dikes, observation wells/ piezometers, sumps and discharge lines, including their relation to water disposal ditches.

G. Types and sizes of filters.

H. Location, types, details and depths of well points if needed.

I. Signed and sealed design calculations demonstrating adequacy of the selected system and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Techniques: Contractor's option, as approved.

PART 3 - EXECUTION

3.01 DEWATERING

A. Accomplish dewatering in accordance with approved working drawings. Keep the Engineer advised of any changes made to accommodate field conditions and, on completion of the dewatering system installation, revise and resubmit working drawings.

B. Organize dewatering operations to lower the groundwater level in excavations as required for prosecution of the work, and to provide a stable, dry subgrade for the prosecution of subsequent operations. Remove ground water including water from such sources as springs, seepage, leakage, perched water and surface water from such sources as rain, snow, run-off, accident spillage and liquid mud, from whatever source.

C. Maintain the water level at such lower elevations until no danger to the structure can occur because of buildup of excessive hydrostatic pressure, and in any event maintain the water level a minimum of 2-feet below the bottom of the excavation, unless otherwise permitted by the Engineer. If "quick" condition destroys bearing capacity of soil strata, lower foundations and other building elements as needed and as directed by the Geotechnical Engineer to obtain suitable soil bearing strata at no additional cost to the owner.

D. If approved by the Engineer, the extent of dewatering may be reduced, for units designed to withstand uplift pressure, to maintain the water level a minimum of five feet below the prevailing level of backfill as it is being placed, provided such water level does not result in uplift pressures in excess of 80 percent of the downward pressure produced by the weight of the structure and backfill in place.

E. If required the Contractor will be required to construct temporary dikes that will surround open excavations to prevent inundation during precipitation events.

F. Pumps: Maintained in continuous operating condition with additional stand by equipment in event of malfunction or increased water conditions.

1. Pump discharge from dewatering operations shall be filtered through a portable sediment tank or other acceptable filtering method.

2. The pumped water from the excavation site area shall be disposed off the site at no additional cost to the owner.

3.02 OBSERVATION WELLS/ PIEZOMETERS

A. Observation wells maybe used as primary basis for determining compliance with the dewatering requirements of this section.

B. Install observation wells of the types shown on the approved work drawings at the locations, and to the depths, approved or required by the Engineer.

C. Drill holes for observation wells of the size and depth indicated, and case with temporary casing. Use water as the drilling fluid. Make a log of the soils encountered during drilling and deliver it to the Engineer.

D. Flush all cased holes with clean water through an approved bit. Flush until the discharge water is free of soil particles.

E. Maintenance of observation wells is the responsibility of the Contractor.

F. Replace damaged or destroyed observation wells within 48 hours, unless otherwise approved by the Engineer, at no additional expense to the Owner.

G. Expose and cut off observation wells within the excavation area as excavation proceeds, but continue to maintain them as specified.

H. Removal of Observation Wells

1. Remove observation wells only when so required by the Engineer.

2. Remove observation wells outside the excavation area to an elevation five feet below finished surface grade. Backfill voids and restore the surface to a condition approved by the Engineer.

3. Remove observation wells inside the excavation area to the subgrade and seal the hole with grout.

3.03 RECORDS

A. Observe and record the average flow rate and time of operation of each pump used in the dewatering system.

Where necessary provide appropriate devices, such as flow meters, for observing the flow rates. Submit the data, on a form furnished by the Engineer, during the period that the dewatering system is in operation.

B. Observe and record the elevation of groundwater in piezometers and previously installed observation wells on a form furnished by the Engineer, during the period that the dewatering system is in operation. Sound the depth to the bottom of each piezometer and observation well on a monthly basis to assure that fine soil particles are not penetrating the screen to build up in the standpipe. Submit observation records within 24 hours of reading, on a regular basis as required by the Engineer.

C. During initial period of the dewatering, make required observations on a daily basis. If, after a period, dewatering operations have stabilized, reduce observations to longer intervals as approved by the Engineer.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work to be performed under this section includes, but is not limited to, the furnishing of all materials, labor, tools, and equipment necessary to complete excavation, including blasting, and backfilling for structures, site backfilling, select backfill, installation of geotextile fabric, stripping, shoring, benching, and placing topsoil necessary for the complete and satisfactory completion of this item of work.

B. Related Work Specified Elsewhere

1. Section 02230 - Clearing and Grubbing

2. Section 02240 - Dewatering

3. Section 02311 - Finish Grading and Seeding

4. Section 02315 - Trenching, Backfilling & Compacting

C. Classification of Excavation

All excavation work under this Contract shall be unclassified, and includes excavation and removal of all soil, rock, fill, and all other materials encountered of whatever nature.

D. Controlled blasting is a method used to remove rock in which the various elements of the blast, hole size, depth spacing, burden, charge size, explosive charge weight per delay, distribution, and delay sequence, are carefully balanced and controlled to provide a distribution of the charge that will fracture the rock so it may be excavated to the required contours and minimize over-break and fracturing of the rock beyond the contour line. Smooth wall blasting, pre-splitting, cushion blasting and line drill are examples of operations included in the term “controlled blasting”.

1.02 QUALITY ASSURANCE

A. Testing Agency: In-situ density testing will be performed by an independent soils testing laboratory engaged and paid for by the Contractor and approved by the Engineer.

B. Referenced Standards

1. American Society for Testing and Materials (ASTM)

a. D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

b. D2487 Standard Practice for Classification of Soils for Engineering Purposes (USCS)

c. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

d. D1556 Test Method for density and Unit Weight of Soil in Place by the Sand Cone Method

e. D2922 Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods

2. OSHA Standards for Trench Safety Standards

C. Density Testing

1. Conduct density test at locations as directed by the Engineer during backfilling operations.

2. Determine density by ASTM D1556 or ASTM D2922

1.03 JOB CONDITIONS

A. The locations shown for utilities are approximate. Proceed with caution in the areas of existing utilities and expose them by hand or other excavation methods acceptable to the utility owner.

B. Erect sheeting, shoring, and bracing as necessary for protection of persons, improvements, and excavations.

C. Furnish and maintain barricades, signs and markings for excavated areas.

D. Select and install a system of dewatering to accomplish groundwater control in excavations.

E. Preserve, protect and maintain operable existing drainage ways, drains and utilities.

F. Determine safe slopes of excavations for the earth materials encountered.

G. Maintain bench marks, monuments, and other reference points. Replace any disturbed or destroyed bench marks.

H. Storage and Transport of Explosives

Proper building or magazines, with separate compartments for detonators in suitable positions for the storage of explosives in the manner and quantities to be approved, shall be provided by the Contractor. Separate vehicles or vessels for detonators shall also be used for the transportation of explosives. All explosives shall be delivered to the site in vehicles that are in compliance with state and local codes and regulations. The prevention of any unauthorized use or improper use of any explosives brought onto the site shall be the responsibility of the Contractor and only experienced licensed shot firers shall be employed to handle the explosives for the purposes of the Work.

The relevant security regulations dealing with the storage, handling, and transport of explosives shall comply with all applicable federal, state, and local codes.

The quantity of explosives on the job site shall at all time be limited to that required to complete one day's work. All explosives on the job site shall be stored in locked, heavy, shockproof containers. Detonators and explosives shall be inventoried at the end of each work day. Any missing items shall be immediately reported to the proper authorities and to the Engineer.

1.04 SUBMITTALS

A. General

B. Certificates

1. Submit a Certificate of Compliance, together with supporting data, from the materials supplier attesting that the composition analysis of backfill materials meets specification requirements.

2. Compaction Equipment List: Submit a list of all equipment to be utilized for compacting, including the equipment manufacturer's lift thickness limitations.

3. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

a. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.

b. Laboratory compaction curve according to ASTM D 1157 for each on-site and borrow soil material proposed for fill and backfill.

C. Submit signed and sealed Shop Drawing and Calculations for Sheeting and Shoring for review and approval of the Engineer. The sheeting and shoring shall be designed by a structural engineer licensed in the State of North Carolina who has a minimum of 5-years of experience with the design of similar support of excavation structures. This submittal should also include the Contractor's sequence of construction.

D. The Contractor shall appoint qualified and competent licensed shot firers for the planning and design of a Master Blasting Plan, geotechnical matters, and use of explosives. The staff shall be appointed to specified positions to be responsible for the duties necessary to carry out excavation by the method of blasting. Blasting Contractor Documentation shall be submitted to the Engineer for approval documenting that the Blasting Contractor has at least 5-years of experience and evidence of the satisfactory completion of at least five blasting programs or operations comparable in scope to this work. The Blasting Contractor shall submit documentation of licensing required by County, State, Federal or other regulatory authorities having jurisdiction. The Blasting Contractor shall apply for and obtain all required blasting permits, and shall submit documentation to the Engineer.

The staff shall be full time on site and each appointed personnel shall work exclusively on duties relating to their position.

The appointed staff shall be responsible for taking possession of explosives on

site, having pre-blast surveys performed as required, compiling of the Master Blasting Plan, preparation of the design for the blast holes drilling pattern, supervision of the drilling, establishing the explosive design, preparation of the wiring and firing sequence plan and supervision of the loading, wiring, and firing of all blasts.

The appointed staff shall also undertake accurate recording of all information regarding the drilling and blasting o a "Drilling and Blasting Record Sheet" and the explosive type, weight, and delay on a "Load Record Report." The format of said record sheets and reporting shall be to the approval of the Engineer.

The appointed staff shall attend each month or at more frequent intervals as required by the Engineer, a meeting on safety and other relevant aspects of the excavation works by blasting which will also be attended by the Engineer's Representative. The first meeting shall be held prior to and within 1-week of the first blasting, minutes of each meeting shall be maintained and submitted to the Engineer's representative within 24-hours.

The Contractor shall submit in writing his blasting proposals to the Engineer's Representative for approval at least 1-week before an initial blast and at least 48-hours before any subsequent blasts.

E. Blasting Data and Reports

Before using explosives obtain written permission form the Engineer and submit a rock removal plan including working drawings and data ten working days in advance of proposed blasting, for information only, showing blasting design and monitoring thereof, prepared and certified by a Professional Engineer registered in the State of North Carolina experienced in blasting operations.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. On site or imported natural soils as approved by Engineer.

B Suitable fill material is defined as earth fill or rock fill required materials necessary to raise the grade from an existing elevation or prepared foundation elevation to the finished elevation indicated in the Contract documents. Suitable fill materials shall meet the following:

Site FILL:

- USCS Classification of: CL, ML, CL-ML, SM, SC, SP, SW, GM, GC, GP, or GW
- Free from topsoil, organic matter, debris, cinders, or frozen material
- Total content of gravel or rock fragments larger than ½" shall not exceed 30-percent by weight of the mass

Select FILL:

- USCS Classification of: SM, SC, SP, SW, GC, GP, or GW
- Liquid Limit less than or equal to 40

- Plastic Index less than or equal to 10
- Free from topsoil, organic matter, debris, cinders, or frozen material
- Total content of gravel or rock fragments larger than ½-inch shall not exceed 30-percent by weight of the mass

2.02 PERVIOUS MATERIAL/ SELECT STONE FILL

A. Compacted stone at locations indicated in the Contract Documents.

B. Stone shall be granular material and shall comply with AASHTO #57.

2.03 GEOTEXTILE FABRIC

Geotextile fabric, also referred to as filter cloth, is to be installed under and around pervious material, or as directed by the Engineer. The filter cloth shall be placed over the newly exposed subgrade, prior to placement of pervious material, and shall conform to the following requirements:

Fabric Property	Test Method	Minimum Value
Grab tensile strength	ASTM D4632	300 lb
Grab tensile elongation	ASTM D4632	15%
Trapezoidal tear strength	ASTM D4533	110 lb.
Puncture strength	ASTM D4833	110 lb.
Permittivity	ASTM D4491	0.05 sec^{-1}
Apparent Opening Size	ASTM D4751	0.15 mm

2.04 SOURCE OF MATERIALS

A. Use materials for fill which were excavated for the construction of structures or utilities on the project site if they meet the material requirements specified in Section 2.01. If sufficient material meeting these requirements is not available from required excavation, obtain requisite material from other sources.

B. Use only material which has been approved as to quality, location of source and zone of placement in the fill.

C. The Engineer has the right to reject material at the job site by visual inspection, pending sampling and testing.

2.05 SHORING MATERIALS

Props, shores, jacks, needles, braces, sheeting, cribbing, tie backs, and similar items of proper size, and in good serviceable condition. Do not use materials that are unsuitable for indicated purposes, or which are severely damaged.

PART 3 - EXECUTION

3.01 PREPARATION AND LAYOUT

A. Establish and identify required lines, levels, contours and datum.

B. Maintain bench marks, monuments and other reference points.

C. Protect trees, shrubs, lawns and other features remaining as portion of final landscaping.

D. Construct and implement sediment and erosion control procedures including upstream diversions.

E. Stripped topsoil from the project site should be stockpiled for reuse and temporarily seeded and mulched if not used within seven days and immediately install sediment and erosion protection as required.

3.02 ROUGH GRADING

A. Rough grade to uniform contours; form foundations for embankments and load bearing fills.

B. Construct the finished subgrade to vary not more than 1-inch above or below the elevation shown.

C. Rough grade to prevent ponding of water in any area; install temporary swales if necessary to improve surface drainage.

D. Complete embankment slopes to vary not more than 6-inches from the slope line shown.

E. In situ areas indicating sponginess and instability during earth moving operations shall be excavated and prepared to receive acceptable fill materials as specified; material excavated due to unsuitability shall be removed from site.

F. Excavated subsoil materials to be used for fill materials shall be approved by Engineer; materials rejected by Engineer shall be removed from the site.

3.03 FOUNDATION PREPARATION OF LOAD BEARING AREAS

A. A load bearing area is defined as an area supporting loads of a structure or pavement area subject to motor traffic.

B. The entire exposed natural soil of the load bearing area shall be proof-rolled with no less than 5 complete coverages of vibratory compaction equipment (minimum of (1) 10,000-lb. smooth drum roller capable of a combined active and passive pressure of 30,000-lbs); all soft spots or irregularities within the natural soil, disclosed as the proof-rolling progresses, shall be excavated to sound material and then backfilled or leveled to grade as hereinafter specified; Project Engineer shall be so advised by Contractor that additional excavation is necessary to achieve satisfactory proof-rolling; additional excavation required will be paid for by a Change Order.

C. All backfill shall be compacted to 95% of maximum dry density at ±2% optimum moisture as determined by ASTM D1557 in areas to support floor slabs and footings and within 2(H):1(V) of the building foundation. All other areas should be backfilled to 92% of maximum density at ±2% optimum moisture as determined by ASTM D1557.

3.04 SHORING, SHEETING AND BRACING

A. The design of sheeting and shoring shall be the responsibility of the Contractor. Responsibility for the performance of shoring methods and devices, including slopes, if any, shall lie entirely with the Contractor. Correction of settlement and damage to persons and property due to settlement shall be the responsibility of the Contractor.

Any damage to persons, property, roads, and utilities, due to settlement, movement, or other conditions caused by inadequate support work, shall be made good by the Contractor as directed by the Engineer at no additional cost to the owner.

B. Install shoring, sheeting and bracing to comply with Federal, State and local code requirements. Responsibility for the safety of the work, personnel and structures rests solely with the Contractor.

C. Place bottom of excavation support system deep enough to allow for subsequent excavations of footings, structural elements, and pits, without affecting stability of support system or causing detrimental effect to subgrade of above.

D. Follow the excavation closely with sheeting and shoring placement.

E. Perform excavation for the installation of sheeting carefully to minimize the foundation of voids.

F. If unstable material is encountered during excavation, take measures to contain it in place and prevent ground displacement.

G. Have sufficient quantity of material on hand at all times for sheeting, shoring, bracing and other operations for the protection of the work and for use in case of accident or emergency.

H. Leave sheeting and shoring in place as long as possible, compatible with the placing and compacting of backfill.

I. Optional Methods

1. Change methods of support, if approved by the Engineer, to accommodate unforeseen conditions.

2. Any suggestions that the Contractor may have to expedite work of this Section to promote greater safety, or insure more practical or efficient installation, will be considered for approval.

3. The Contractor shall be responsible for entire work, regardless of methods specified or used. Take practical precautions to insure complete safety and sufficiency of work under this section and of related or adjacent work.

3.05 EXCAVATION - GENERAL

A. Excavate to the neat lines or setback lines for mixed face conditions and grades indicated on the Contract Drawings. Material excavated will be unclassified.

B. Excavate in sequence and stages which will not subject permanent or temporary structures, installations, or surfaces to unstable conditions.

C. Excavate as required to provide sufficient working space to permit placing, inspection, and completion of the structures.

D. Shape excavations accurately to the cross-sections and grades indicated.

E. Support the sides of excavations as specified or required.

F. Keep excavations free from water.

G. Where excess excavation is required to remove unsuitable material at bottom of foundation or structure excavations, fill to foundation/structure bearing or bottom of pervious material elevation with select stone fill material; properly compact select stone fill by methods acceptable to the Engineer to 95% of the maximum dry density at ±2% of the optimum moisture as determined by modified Proctor test (ASTM D1557).

H. If rock is exposed at design footing grades, the rock shall be over-cut one foot and replaced with select stone fill.

I. Fill all openings and fractures in the excavation bottom and sides with cement grout. Obtain Engineer's written approval of the foundation excavation before placing any foundation stone bedding or concrete.

J. The Contractor's failure to maintain dewatering operations for structure excavations shall not be a basis for payment for removal and replacement of unsuitable materials.

3.06 ROCK EXCAVATION

A. Use of Explosives

1. The use of explosives will be permitted for rock excavation only under conditions herein. Rock outcrops may be blasted only with the written approval of the Engineer.

2. The Contractor shall notify the Engineer 72-hours prior to starting blasting operations. Any public or private companies must be notified sufficiently in advance to enable the companies to take such steps, as they may deem necessary to protect their property from damage.

3. When the use of explosives is necessary for the prosecution of the work, the Contractor shall use extraordinary care so as not to endanger life or property.

B. Rock Excavation Requirements

1. Rock excavation employing methods other than the use of explosives shall be submitted to the Engineer for approval. A detailed description of the means, methods, equipment, and materials used, and methods for limiting ground motion and airblast shall be submitted to the Engineer.

Regardless of the methods for rock excavation, the Contractor shall conform to the requirements for the use of explosives or blasting, as described herein.

2. Prior to drilling and blasting, the Contractor shall meet the requirements of all submittals. Submittals to the Engineer of the Blasting Schedule, of the Blasting Plans, of all blasting operations, and of blasting products,

   and compliance by the Contractor with provisions for protection of life and property shall not relieve the Contractor of the responsibility or liability for the safety of persons and property.

   The Contractor is responsible for blasting in a safe manner, for producing smooth and sound rock surfaces at the lines of excavation; and for controlling damage and vibration. The Contractor's submittals to the Engineer shall not constitute nor shall they be construed to be a guarantee by the Engineer that the desired results will be achieved. Submittals to the Engineer shall not relieve the Contractor from the responsibility complying with the requirements of these specifications.

3. Where rock removal is necessary, the Contractor shall engage the services of a Vibration Consultant, who shall be approved by the Engineer, to advise on explosive charge weights per delay and to analyze results from seismographic recordings. The Vibration Consultant representative should be a licensed professional engineer or geologist with a minimum of 5 years of experience and have managed similar types of blasting activities for a minimum of 5 projects. The Contractor shall submit the credentials of the qualified Vibration Consultant 30-days prior to any blasting activities to the Engineer for approval. The Contractor shall employ only personnel qualified by training and experience to perform vertical wall trenching by blasting in high damage potential areas, close to, above and below ground structures, including pipelines and utilities. All individual blasts shall be kept to a practical minimum as determined by seismograph recordings analyzed by the Vibration Consultant. The Contractor shall maintain close supervision of the blasting personnel and ensure that all Federal, State and local blasting regulations, explosive manufacturer's instructions and requirements of the Vibration Consultant are complied with.

C. Blasting Plan

In each distinct individual blasting area where pertinent factors affecting blasting vibrations and their effects in the area remain the same, the Contractor shall submit a blasting plan of the initial blasts to the Engineer for approval. The plan must consist of hole size, depth, spacing, burden, type of explosive, type of delays, delay sequence, maximum amount of explosive on any one delay period, depth of rock, and depth of overburden if any. Maximum hole diameter on any blast shall not exceed 2 ½-inches; no more than one hole can be fired on the same delay period; explosives with minimum propagating characteristics shall be used; and all blasts shall be initiated at the hole having the most relief.

The Contractor shall monitor the existing vibrations in the area of blasting during normal business hours when blasting will be used for a minimum of 2-hours per day for 1-week prior to blasting to determine the existing noise within the area to be monitored.

The blasting plan shall contain complete details on the drilling blasting patterns and controls to be used, including the following information as a minimum:

1. Station limits a plan location of proposed shot

2. Plan and section views of proposed drill pattern, including blasthole spacing, blasthole diameters, blasthole angles, lift height, and subdrill depth

3. Loading diagram showing type and amount of explosives, primers, initiators, and location depth of stemming

4. Initiation sequence of blastholes, including delay times and delay system

5. Manufacturer's data sheets for all explosives, primers, and initiators to be employed

6. Location of all blasting zones signs

7. Type of monitoring used to ensure no one enters the blasting area

8. Public alert and warning system

9. Proposed location of seismic instruments and sound level meters

10. Anticipated blasting schedule, indicating days of week and time of day

11. Planned use of blasting mats and other protective measures

12. Additional information, as needed and appropriate

D. Blasting Schedule

The Blasting Contractor shall develop a Blasting Schedule detailing the date, time and location or proposed blasts. The Blasting Schedule shall be published in a local newspaper and submitted to the Engineer for information and record purposes at least 10-days, but not more than 20-days, before the start of the blasting program.

Should a change occur to the schedule, it shall be re-published and re-distributed. The Blasting Contractor shall also provide a Blasting Schedule to any public utilities, private residence, or others possibly affected. Blasting operations shall be restricted to between the hours of 8:00 AM. and 5:00 PM., Monday through Friday. The Engineer must approve any variation to this restriction in writing.

E. Pre-Construction Meeting

The Engineer will review the required submittals for conformance with the Contractor Drawings and Specifications. Within 30-days after receipt of the submittals, the Engineer will notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. Any parts of the submittals that are unacceptable will be rejected and the Contractor shall resubmit changes for re-evaluation. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of

the responsibility to satisfactorily complete the work in this specification. Prior to construction, the Contractor shall arrange a pre-construction meeting with the Engineer to discuss rock excavation procedures for this project.

F. Test Blasts

Design and conduct a test blasting program with the objective of establishing the type and weight of charge, spacing and delays, etc., which will avoid overbreak of the excavation face and which are commensurate with the peak allowable particle velocity and sound level. Conduct a test blasting program at the beginning of the operation, and when material of different characteristics is encountered. Become familiar with the stratigraphic sequence of rocks that will be exposed in each cut. Match the sonic velocity of rock with the velocity of detonation of the explosive used to create the desired rock fragmentation.

Upon completion of test blasting, expose the test area for the Engineer to examine and evaluate the results and for the blasting Contractor to determine the spacing and cartridge strength to be used for the full-scale blasting operation.

The Engineer's acceptance or approval of the test blasting program and techniques and procedures associated with the test blasting program or production blasting will not relieve the Contractor of his responsibilities to employ appropriate safety measures, and exercise proper supervision of the blasting operations. The contractor is solely responsible for damage or injury to persons, property, or utilities as a result of the use of explosives. Perform all necessary repairs in a satisfactory manner, to roadway, dwellings, utilities, or any property damage as a result of blasting at no cost to the Owner.

For existing utilities, monitor particle velocities at the edge of the right-of-way nearest the blast.

After each test blast, review the particle velocities and sound levels documented and evaluate rock breakage. Make adjustments to the blasting procedures, and conduct subsequent test blasts until the desired rock breakage occurs within allowable values of peak particle velocity. Establish the relationship of the scale distance concept with respect to peak particle velocity to control ground vibration. If any test blast results in damage or injury to property, person or utility, immediately cease all blasting activity until written permission to resume is received from the owner.

G. Prevention of ‘Flyrock’

All blasts shall be designed to prevent ‘flyrock’. The Contractor shall use adequate, good quality stemming materials. Wherever necessary, as determined by the Engineer, the covering of blasts, with blasting mats or adequate dirt cover will be required.

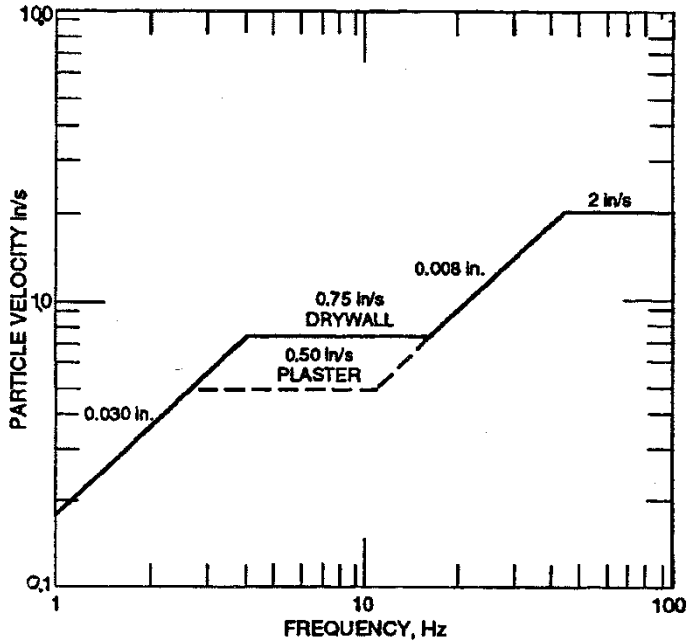
The Engineer reserves the right at any time to reduce explosive amounts, change blasting patterns on any blasting, or eliminate blasting in certain areas should conditions warrant. Nothing presented herein in any way relieves the Contractor of any responsibility of any damage to the existing pipelines or other structures or utilities in the area of blasting.

H. Seismograph, Blasting Records, and Pre-blast Surveys

The Contractor shall provide a minimum of one seismograph to measure and record ground motion caused by each subsequent blast detonated under the Contract. The seismograph shall be attached or located immediately adjacent to the nearest structure or dwelling, or on top of the nearest pipeline, as approved by the Engineer. The seismograph equipment shall be an Instantel Blastmate DS 677, or equivalent, capable of producing a permanent record of the three components of the ground motion in terms of particle velocity and the air blast in decibels. The instrument shall be capable of internal dynamic calibration. The record of each blast shall consist of the seismograph records identified by instrument number, location of the instrument positively identified, date, time and location of the blast, amount of explosive used, maximum explosive charge weight per delay period and all other data necessary to control the blasting operations. These records, as a formal report, shall be made available to the Engineer as required. Preliminary records of blasting and vibrations shall be submitted within 24-hours of blasting. Pre-blasting surveys will be provided as required by applicable law at no additional cost to the Owner.

I. Rock Excavation Vibration Limits

All blasting operations should be monitored in accordance with the Office of Surface Mining (OSM) Method 3 and the following figure.



Modification of the blasting method and reduction of the explosive weight per delay shall be used to ensure that the above limits are met.

Even though there might be buildings, pipelines or other structures closer to the blast than the monitoring location (for example, a dwelling foundation), the Contractor will not be relieved of responsibility for any damage sustained to the buildings, pipelines or structures.

J. Crossing under Existing Pipelines

If rock removal is required when crossing under existing pipelines, a rigid steel or wood beam shall be provided to support the pipeline and the bearing points of this beam should be outside the 45° influence line from the nearest point of the blast. A wood buffer shall be placed below the existing pipeline (in addition to conventional blasting mats) in order to prevent damage to the pipeline by flyrock.

K. Blasting Adjacent to Utilities

Blasting shall not be performed closer than 10-feet to existing water, gas, sewer or conduit utilities unless such facilities have been completely exposed, definitely located, and then backfilled prior to the blast. In any case, blasting shall be no closer than 2-feet from accurately located existing utilities, 10-inch or smaller diameter and no closer than 5-feet from utilities larger than 10-inch diameter.

L. Pre- and Post-Construction Surveys

1. Prior to starting and subsequent to completing any work, the Contractor shall retain the services of a qualified Professional Engineer licensed in the state of North Carolina to make a detailed inspection of all buildings, structures, roadways, landscaping and related surface improvements within 150-feet of all blasting.

2. The inspection shall include notes, measurements, photographs, and a DVD (with audio sound track) of all facilities prior to the start of construction. The audio description of the inspection shall include the date, time, weather conditions, address/stationing/location, brief description of the facility and description of physical conditions encountered. The inspection should also include documentation of existing damage and other factors (both inside and outside) which could be affected by blasting.

3. With the owner's permission, install crack monitors such as Avongard or approved equal in areas of existing cracks in structures as directed by the Engineer. Upon installation of crack monitors, obtain three baseline readings. The Contractor should monitor all crack monitors installed for a minimum of 1 week prior to all blasting operations and daily during blasting operations.

4. The Contractor shall notify and obtain written permission from the property owner(s) to enter upon said properties for the purpose of making these survey inspections. In the event that access for the purpose of determining the condition of the property is refused by the owner, the Contractor shall notify the Engineer in writing and may be relieved of the responsibility for making said survey inspections with respect to the property to which access is denied.

5. A copy of all notes, measurements, photographs, DVD, reports and data relative to existing conditions of each respective property as found by the pre-construction survey, shall be forwarded to each property owner. Two identical copies shall be submitted to the Engineer.

6. The maximum allowable noise level at any inhabited building may not exceed 110-decibels peak when measured by an approved instrument having a flat frequency response over the range of 6 to 200-Hertz. The maximum allowable noise limit at any uninhabited building may not exceed 120-decibels. When blasting is of a continuous nature, 124 to 130-decibels shall be within the caution range. When the noise levels are consistently within the caution range, the rock removal procedures shall be changed to reduce the decibel level on the next rock removal procedure.

M. Safety

The Contractor shall provide an approved system of warning and preparing the general public and all site personnel of an impending blast by both audible and visual means and shall ensure that the blasting area is cleared of all personnel immediately prior to blasting. This system shall comply with all statutory requirements. The Contractor's attention is drawn to the need to devise adequate system for warning and clearing the public from specified areas during blasting operations and to prevent persons entering the blasting area.

Automotive and pedestrian traffic within at least 150-feet. is to be stopped just prior to firing. This operation is to be carried out in close cooperation with the Police Department and in such a way as to cause minimum traffic delay.

Traffic warning and signage shall be in accordance with MUTCD requirements.

All operations involving explosives shall be suspended on the approach of a thunderstorm and shall not be resumed until the storm has clearly passed.

Blasting screens shall be erected to conform with the permit conditions. Public roads, private roads and property adjacent to the site and services within the site area shall be protected by rock fall fences which will be subjected to the Engineer's approval.

In all such cases particular attention should be paid to the requirements stated above and the effects on these structures and installations shall be closely monitored and the quantities of explosives limited accordingly.

Drilling rigs for shot holes shall be of the hydraulic type fitted with efficient silencers and with means of dust suppression.

N. Slurry Explosives

The pump truck from which any explosives are dispensed into the drilled holes shall be equipped with an accurate flow meter or similar measuring/recording device in order to accuracy monitor and control the volume of explosives dispensed at each position.

Milli-second delay detonators shall be used in all blasting locations. The use of long second delay detonators shall be limited. Sequential timers may be used only on the direction of the Blasting Engineer and with the approval of the Engineer and then only by persons suitably qualified and under the control of the Contractor's Engineer.

After a charge has been wired and tested, gunny sacks shall be placed over the charged holes: blasting mats shall then be placed on top of the charge and sand bags placed on the blasting mats.

O. Scaling and Stabilization

Rock on the cut face that is loose, hanging, or creates a potentially dangerous situation during or upon completion of the excavation in each lift shall be removed or stabilized. No drilling for the next lift shall be carried out until this work is completed.

Slopes throughout the span of the contract shall be scaled at such frequency as required to remove all hazardous loose rock or overhangs. Stabilization shall be performed at Contractor's own expense if caused by the Contractor' blasting operations.

3.07 EXCAVATION WITHIN LOAD BEARING FILL AREAS

A. After completion of the fill placement and compaction specified under this Specification and as approved by the Project Engineer, footing excavation can begin.

B. Footing Inspections: The Engineer shall inspect the footing excavations for the building foundations; and shall verify that the design bearing pressures are available and that no loose pockets exist beneath the bearing surfaces of the footing excavations.

C. Backfilling:

1. Any excavation (such as for utilities, walls, footings, etc.) done within the select fill area shall be backfilled with select fill material with placement and compaction as described in this Section.

2. Where select backfill is placed against walls, either (1) the difference in elevation of the top of the controlled fill on either side of the wall shall not be allowed to exceed 1-foot or (2) the wall shall be adequately braced.

3.08 BACKFILL STRUCTURES

A. Do not commence backfilling around any structure until such structure has been examined and approved by the Engineer.

B. Do not place backfill until the requirements for concrete curing and waterproofing have been complied with and, if required, until the test cylinders for the particular structure indicate that the concrete has attained the compressive strength specified.

C. When backfilling against structures and where applicable, place backfill material in equal lifts and to similar elevations on opposite sides of structures in order to equalize opposing horizontal pressures. Place material in uniform increments over fill area.

D. Protect structures from damage by construction activity, equipment, and vehicles. Repair or replace damaged structures to the satisfaction of the Owner.

E. See Section 3.03.D for compaction.

3.09 BENCHING

When fill is to be placed against the sides of the excavation the slopes on which the fill is to be placed shall be continuously benched at right angles to the ground surface. The benching operation shall be done as the embankment is brought up in layers. Benching shall be a minimum width of 5 feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous excavation. Material conforming to backfill requirements cut from the benches shall be compacted along with the new fill material.

3.10 DISPOSAL OF EXCAVATED MATERIAL

Surplus excavated materials shall become the property of the Contractor and be removed from the project site. Surplus excavated materials is defined as: 1. Excess excavated unsuitable materials, and/or 2. Excess excavated suitable materials.

3.11 MOISTURE CONTROL

A. Control moisture content of fill materials to $\pm$2% of the optimum moisture content as determined by ASTM D1577; material that is too wet may be spread and scarified on the fill surface and permitted to dry, until the moisture content is within specified limits; when fill material is too dry, sprinkle each layer of the fill and work moisture into the material until a uniform distribution within the specified limits is obtained; if, in the opinion of the Project Engineer, the top surface of a partial fill section becomes too dry to permit a suitable bond, scarify loosen the dried surface, dampen the loosened material and compact the moistened material.

B. Keep the top plane of load bearing fill areas under construction sloped for drainage; when rain or inclement weather is expected, flat roll the top of embankment to seal it.

3.12 SURFACE DRAINAGE

A. Intercept and divert surface drainage away from the excavation by the use of dikes, curb walls, ditches, pipes, sumps or other means.

B. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.

C. Remove the surface drainage system when no longer required.

D. Remove debris and restore the site or sites or original condition.

3.13 DRAINAGE AND DEWATERING OF EXCAVATED AREAS

A. Dewatering of excavations shall be done in accordance with Section 02240

B. Provide and maintain ditches to collect surface water and seepage which may enter the excavations and divert.

C. Dispose of precipitation and subsurface water clear of the work. Comply with provisions of the Sediment and Erosion Control Plan.

E. Backfill drainage ditches and sumps when no longer required with granular material or other material as approved by the Project Engineer.

3.14 FINISHING

A. On completion of the work, clean ditches and channels and finish the site in a neat and presentable condition. Slope areas to provide positive drainage.

B. Place topsoil and seed all areas disturbed by construction as specified in Section 02485, Finish Grading and Seeding, unless otherwise indicated.

3.15 PLACEMENT OF PERVIOUS MATERIAL

A. Grade pervious material smooth and even, free of voids, compacted, and to required thickness and elevation; provide final grades within a tolerance of ½-inch when tested with a 10-foot straightedge.

B. Compaction shall continue until all compaction marks are eliminated and the course is thoroughly and properly compacted.

C. The Geo-textile Fabric shall be placed in accordance with manufacturers specifications.

3.16 TESTING AND INSPECTION

A. Inspect and test construction of embankments, fills, backfill, and subgrades and certify to the Owner conformance in all particulars relating to specification requirements.

B. Scheduling

1. Inspection Agency shall be on site at all times when operations are scheduled and no Earthwork will be permitted in their absence.

2. Contractor to provide at least 48-hours notice of scheduled work.

C. Responsibility of Inspection Agency

1. Certification of subgrade preparation and suitability.

2. Moisture content and field density test on all layers of material placed.

3. Certification of degree of compaction attained in material placed.

4. Verification of subgrade capacity.

5. Approval of all materials used.

D. Make results available to the Owner and the Engineer within 24-hours upon completion of testing.

E. Prior to final payment to the Contractor, the Inspection Agency shall certify that all Work has been performed in accordance with the Specifications.

END OF SECTION

SECTION 02310

SITE GRADING

PART 1 - GENERAL

1.01 RELATED WORK

A. Roadway Excavation, Backfill and Compaction

B. Finish Grading

C. Definitions:

1. Subgrade: Prepared earth surfaces on or over which additional materials will be placed or work is to be performed.

1.02 JOB CONDITIONS

A. Classification of Excavated Materials: No consideration will be given to the nature of materials encountered in site grading operations. Therefore, as unclassified excavation, no additional payment will be made for difficulties occurring in excavating and handling of materials.

B. Environmental Requirements:

1. Do not perform grading when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present on the soil or occurring during the Work.

2. Exercise the necessary means and methods to control dust on the site as well as in the off site work areas where excavation and grading are required.

3. Do not leave the site in a dusty condition following the work of this Section. If necessary, employ a watering schedule to control the dust.

4. Do not use-frozen material in performing the work or place materials on frozen surfaces.

5. When it is necessary to haul soft or wet soil material over roadways, use suitable tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling at no expense to the Owner. Dewatering of such material prior to hauling over roadways may be necessary.

6. Plan work so as to provide adequate protection during storms with provisions available at all times for preventing flood damage.

C. Protection: Assume all risks attending the presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support work for same, also existing structures and property of whatever nature, in or over excavations or adjacent to such excavations. Complete responsibility for replacement and restitution work of whatever nature to the above, as damaged

or destroyed by work of this Contract, rests solely with the Contractor and at no expense to the Owner.

1. Outside Limit of Work: Take necessary precautions to protect trees, shrubs, lawns and such other landscaping from damage. Restitution work for damages rests solely with the Contractor and at no expense to the Owner.

2. Temporary Protective Construction: Erect and maintain at Contractor's expense substantial barricades to exclude pedestrians or vehicles, as necessary to protect the public.

D. Accommodation of Traffic: Do not obstruct streets, roads and highways, unless the Engineer authorizes in writing the complete closing of the street, road or highway. Employ such measures, at no expense to the Owner, as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions.

E. Explosives and Blasting are not permitted in performance of site grading work.

F. Excess Materials: No right of property in materials is granted the Contractor of excess on site materials prior to completion of Site Work. This provision does not relieve the Contractor of his responsibility to remove surplus excavated materials. Unsuitable material such as sod, trash, rubbish, stumps and spongy soil as well as excess rock shall become the property of the Contractor and shall be disposed of legally off-site. Excess suitable materials shall be stockpiled on site where directed by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Backfill: On-site excavated soil or soil-rock mixed materials free of topsoil, plant life, lumber, metal, refuse and rock or similar hard objects larger than six inches in any dimension.

PART 3 - EXECUTION

3.01 PREPARATION

A. Salvaged Topsoil: Within the areas indicated for grading strip turf and topsoil to the depth of suitable topsoil material and stock pile for subsequent topsoiling operations.

1. Topsoiling: Performed as work of Finish Grading as specified in this Division.

B. Stockpiling: Place topsoil storage piles within the limits of the project, on well-drained land and at locations not interfering with the prosecution of Work. Storage piles of topsoil shall be temporarily seeded and mulched if stored for longer than seven days.

3.02 PERFORMANCE

A. Erosion Control: Implement erosion control measures during performance of work of this Section as specified and required by the Contract Documents and the State of North Carolina whether explicitly shown on plans or not.

B. Overlot Grading: Perform rough grading over the site within the areas to be graded as indicated on the Drawings.

1. Topsoiled areas: Not more than 0.15 feet above or below indicated grade less specified topsoil depths.

C. Vehicle Traffic Area Grading: As specified in Roadway Excavation, Backfill and Compaction.

3.03 FIELD QUALITY CONTROL

A. Surface Tolerance: Check finished subgrade for smoothness and elevation in accordance with the following:

1. Use an approved template shaped to conform to the design requirement indicated on the Drawings for checking crown and contour of roadways.

2. Use an approved ten-foot straightedge to check for longitudinal irregularities in the subgrade.

3. Use string lines for controlling the finished elevation of roadway subgrade. Maintain such lines until surface irregularities have been satisfactorily corrected.

END OF SECTION

SECTION 02311

FINISH GRADING AND SEEDING

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To

1. Placing topsoil
2. Soil conditioning
3. Finish grading
4. Seeding
5. Maintenance
6. Termite Control

B. The “Seeding Restoration Table” shown on the Contract Drawings lists specified seeding restoration requirements.

C. Related Work Specified Elsewhere

1. Section 02230 - Clearing and Grubbing
2. Section 02300 - Earthwork
3. Section 02315 - Trenching, Backfilling & Compacting

1.01 QUALITY ASSURANCE

A. Source Quality Control:

1. Packaged Products shall indicate the manufacturer's guaranteed analysis on each package and arrive on site as originally packaged and unopened.

1.03 REFERENCES

A. American Society for Testing and Materials, ASTM C 602, Specification for Agricultural Liming Materials.

B. American Association of State Highways and Transportation Officials, AASHTO M 140, Emulsified Asphalt.

1.04 SUBMITTALS

A. Test Reports: Submit laboratory test reports of the soil analysis and supplement recommendations to the Engineer for approval prior to adding any soil supplements to the topsoil.

1. Laboratory reports shall recommend both grade and application rates of fertilizer and such other soil supplements as required.

2. Take sufficient quantity of topsoil samples to give a representative analysis of on-site topsoil and topsoil from outside sources, if any.

B. Soil Supplement Product Certification: Submit certificates certifying such products to have a guaranteed analysis in conformity with the Engineer approved laboratory soil supplement recommendations report.

C. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage and weed seed content percentage to certify conformity with the Specifications.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver packaged products to the site in unopened containers with labels intact and legible.

B. Store packaged products in such a manner to prevent moisture damage and other forms of contamination.

1.06 SITE CONDITIONS

A. Environmental Requirements: Do not perform Work of this Section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation present or occurring during the Work.

B. Seeding Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the seeding dates.

1. Spring: March first to June first.

2. Fall: August first to October first.

C. Existing Conditions: Following performance of related construction and prior to Finish Grading do such debris removal and site leveling as necessary in preparation for Finish Grading. Dispose of such debris in a lawful manner off site.

D. Dust Control: Exercise the necessary means and methods to control dust on the site as well as in the off-site work areas where Top-soiling and Finish Grading are required.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Topsoil: Use fertile, friable, natural, productive surface soil such as is available on site. Use topsoil free of subsoil, clay, stones or similar hard objects larger than two inches in greatest dimension and partially disintegrated debris and materials toxic or harmful to growth.

2.02 SOIL SUPPLEMENT MATERIALS

A. Agricultural Liming Materials: Products containing calcium and magnesium compounds capable of neutralizing soil acidity and containing not less than 80 percent of total carbonates. Use liming materials meeting requirements of ASTM Designation C602 and conforming to applicable state liming material regulations.

B. Fertilizer: Commercial fertilizer of uniform composition, free-flowing and in conformity with applicable state fertilizer laws.

1. Analysis: As recommended by laboratory soil supplement recommendations report.

2.03 LAWN AND SEED MATERIALS

A. Grass Seed: New crop seed, furnished in sealed packages with proof of correct mixture evidenced, age of seed indicated and compliance with applicable state regulations evidenced if required.

B. Mixture No. 1:

Species in Mix	Mix Percent by Weight	Min Percent Purity	Min Percent Germination	Max Percent Weed Seed
Red Fescue (Festuca ruba) (Illahee strain)	30	95	85	0.50
Kentucky Bluegrass (Poa pratensis)	50	85	80	0.40
Red Top (Agrostis alba)	3	90	90	0.75
Perennial Ryegrass Lolium perenne)	17	90	90	0.50

C. Lawn Mulch: Straw Stalks of any threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed material is not acceptable.

D. Mulch Binder: Emulsified asphalt conforming to the requirements of AASHTO M 140, Grade RS-1 and which does not contain solvents or other diluting agents toxic to plant life.

2.04 FERTILIZER

A. Liquid formulations may be used in lieu of dry formulations, provided the rate of application is adjusted to apply the same quantities of nitrogen, phosphorus and potassium per unit area as specified for dry formulations.

B. Contractor may submit soils samples to an approved laboratory for fertilizing recommendations.

2.05 LIME

Apply lime in accordance with manufacturer's rate table or soil sample analysis.

2.06 INOCULANT

A. Inoculate leguminous seed before seeding with nitrogen fixing bacteria culture prepared specifically for the species.

B. Do not use inoculant later than the date indicated by the manufacturer.

C. Protect inoculated seed from prolonged exposure to sunlight prior to sowing.

D. Reinoculate seed not sown within 24 hours following initial inoculation.

2.07 EROSION CONTROL FABRIC

A. Shall be a knitted construction of yarn with uniform openings interwoven with strips of biodegradable paper, furnished in rolls with 4-mil opaque polyethylene base as protection for outdoor storage.

B. Fabric 0.2 pound per square yard.

2.08 JUTE MATTING

Shall be heavy weight, minimum 0.9 pound per square yard, jute mesh with 1" opening.

2.09 FABRIC/MATTING ANCHORS

Staples for fastening fabric to ground shall be minimum 11 gauge wire, “U” shaped, with a 1" crown and 6" legs.

2.10 MULCHING MATERIALS

A. Mulches for seeded areas shall be one, or a combination, of the following:

1. Timothy hay or mixed clover and timothy hay, or wheat, or oat straw; thoroughly threshed.

   a. Cured to less than 20% moisture content by weight.

   b. Containing no stems of tobacco, soybeans, or other coarse or woody material, free of mature seed bearing stalks or roots of prohibited or noxious weeds.

2. Wood Cellulose

   a. Containing no growth or germination-inhibiting substances.

   b. Green-dyed and air-dried.

   c. Packages not exceeding 100 pounds.

   d. Moisture Content: 12% $\pm$ 3%

   e. Organic Matter (Dry oven basis) 98.6% $\pm$ 0.2%

   f. Ash Content: 1.4% $\pm$ 0.2%

   g. Minimum Water-Holding Capacity: 100%

3. Mushroom Manure:

   a. Organic origin, free of foreign material larger than 2" and substances toxic to plant growth.

   b. Organic Matter: 20% minimum

   c. Water-Holding Capacity: 120% minimum

   d. pH: 6.0

B. Mulch Binders

1. Emulsified Asphalt AASHTO M140, Grade SS-1.

2. Cut Back Asphalt AASHTO M81, RC 250.

3. Nonasphaltic Emulsion - Natural Vegetable Gum Blended with Gelling and Hardening Agents

4. Polyvinyl Acetate Emulsion Resin, Containing 60% (± 1%) total Solids by Weight.

2.11 SOIL TREATMENT MATERIALS

A. Chemicals

1. Soil treatment chemicals shall be one of the following:

   a. Dursban TC: To be used at a concentration of 1.0%, applied in water emulsion.

   b. Dragnet TC: To be used at a concentration of 0.5%, applied in water emulsion.

   c. Pryfon 6: To be used at a concentration of 0.75% applied in water emulsion.

2. Soil treatment chemicals used shall be mixed in the following proportions:

   a. Dursban TC: 1.0% water emulsion, 2 gallons of Dursban TC per 98 gallons of water.

   b. Dragnet TC: 0.5% water emulsion, 1.25 gallons of Dragnet TC per 98.75 gallons of water.

   c. Pryfon 6: 0.75% water emulsion, 1 gallon of Pryfon 6 with 96 gallons of water.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare subsoil surface for finish grading by dressing and shaping to provide for the uniform placement of topsoil.

B. Prepare subsoil surface for top-soiling by loosening to a depth of four inches and dressing and shaping to provide for the uniform placement of topsoil.

C. Remove surface rock or other foreign objects exceeding 3/4 - inches in greatest dimension. Dispose of such rock and debris in a lawful manner off site.

3.02 PERFORMANCE

A. Placement: Place topsoil over areas indicated for new grading contours. However, before topsoil placement, construction work in top-soiled areas shall have been completed. Observe precautions as follows:

1. Do not place topsoil over areas indicated to receive paving or walkways.

2. Do not work topsoil while frozen or wet. Do not work topsoil in a dusting condition but moisten same to prevent a dust nuisance.

3. Scarify subsoil to a depth of two inches for bonding topsoil with subsoil.

4. On sloped areas, work topsoil into subsoil to blend so as to eliminate slip-planing between the two soils; but leave a sufficient cover of topsoil to insure seed germination. Perform such blending of soils by ridging or serrating the subsoil on the slopes.

5. Place topsoil as needed for dressing-up minor depressions due to settling and erosion and to eliminate other minor irregularities.

B. Finished Elevations and Lines: Grade top-soiled areas of the site to within a tolerance of plus or minus one-tenth of a foot of the elevations and lines indicated and in accordance with the following:

1. Grade a uniform longitudinal fall in swales and other surface drainage areas to provide a drainage flow line that can easily be maintained and traversed with normal lawn maintenance equipment.

3. Establish finish grade of topsoil 1/2 to 3/4 inch below top of abutting walks or paving to provide positive drainage of same.

4. Do not finish grade topsoil to a depth less than six inches nor greater than 12 inches.

5. Leave finish grade surfaces free of objectionable material larger than 3/4 - inches in greatest dimension. Dispose of such objectionable material in a legal disposal area off site.

C. Compaction: Compact finish grades as the final operation using a light roller weighing not over 120 pounds per foot-width of roller.

D. Tillage: Till finish graded soil over areas indicated for lawn regardless of type of lawn work performed. Use equipment and methods common to such work, and till soil to a two inch depth minimum.

E. Soil Supplement Addition: The soil supplements for lawn areas, as required according to the Engineer approved laboratory test reports, may be incorporated into the soil during tillage operations.

F. Seeding: Sow seed mixtures when air current is low and not more than five days after soil supplements have been applied. Sow seeds in two applications using either mechanical power seeders or mechanical hand seeders. Sow one-half of the seed mixture in one direction over designated areas and the remainder at right angles to the first sowing. Seeding rates as follows:

1. Grass Seed Mixture: Five pounds per 1,000 sq. ft. area.

G. Seed Cover: Imbed seed mixtures into topsoil 1/4 inch using a light drag or rake and moving in directions parallel to the contour lines. Immediately after dragging or raking, compact seeded areas using a cultipacker or similar design lawn roller, weighing 60 to 90 pounds per linear foot of roller, and roll at right angles to existing slopes.

H. Contractor Option: Seeding and soil supplement application may be performed by the hydroseeding method. However, rates of application, methods and equipment shall receive Engineer's prior approval.

I. Lawn Mulching: Evenly apply mulch over seeded areas not more than 48 hours after seeding. Start mulching at windward side of relatively flat areas, or at the upper part of slopes. Spread mulch in a total coverage at a depth not less than 1-1/2 inches nor more than three inches.

I. Mulch Binding: Immediately following mulch spreading, apply mulch binder to anchor mulch to the soil. The number of passes over the mulch as needed to secure it firmly shall not exceed three passes with maximum applied binder not exceeding 10.0 gallons per 1,000 square feet.

3.03 MAINTENANCE

A. Maintenance operations shall begin immediately after seeding and shall continue throughout the construction time and guarantee period.

1. Seeded Areas: Keep seed moist continually for proper germination and water thereafter as necessary to prevent drying out or burning. Reseed areas not showing a prompt catch of grass, correct depressions and irregularities and reseed; repeat until a complete coverage is obtained. Cut seeded areas at required intervals to maintain grass at a maximum height of 2 1/2 inches.

B. At conclusion of maintenance period, the Engineer shall make an inspection of the lawn work to determine condition of acceptance. Make such additional repairs as required by the Engineer. Perform such work at no expense to the Owner.

END OF SECTION

SECTION 02315

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To

1. Trench excavation, backfill and compaction
2. Support of excavation
3. Pipe bedding requirements
4. Control of excavated material
5. Restoration of unpaved surfaces

B. Related Work Specified Elsewhere

1. Section 02230 - Clearing and Grubbing
2. Section 02300 - Earthwork
3. Section 02311 - Finish Grading and Seeding
4. Section 02740 – Paving and Surfacing

C. Applicable Standard Details

1. Pipe Bedding Details
2. Pipe Trench Detail
3. Concrete Cradle and Encasement Details
4. Thrust Block for Vertical Bends
5. Thrust Block for Bends, Tees, and Caps

1.02 QUALITY ASSURANCE

A. Testing Agency: Density testing shall be performed by an independent soils testing laboratory engaged and paid for by the Contractor and approved by the Engineer.

B. Referenced Standards

1. American Society for Testing and Materials (ASTM)

a. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

b. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method

c. D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

d. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods

C. Density Testing

1. Conduct one test for each 1,000 linear feet of pipeline. Conduct density tests at locations as directed by the Engineer during backfilling operations.

2. Determine density by ASTM D1556 or ASTM D2922 in areas other than State Highways and Shoulders.

1.03 SUBMITTALS

A. General: Submit in accordance with Section 01300.

B. Certificates

1. Submit, prior to delivery of the material to the job site, a Statement of Compliance from the materials supplier, together with supporting data, attesting that the composition analysis of pipe bedding and select material stone backfill materials meets specification requirements. Should a change in source of materials be made during construction, submit a new Statement of Compliance from the new source for approval before the material is delivered to the job site.

2. Submit certified density testing results from the soils testing laboratory.

C. Compaction Equipment List: Submit a list of all equipment to be utilized for compacting, including the equipment manufacturer's lift thickness limitations.

D. Agreements with Property Owners: Prior to storing or disposing of excavated materials on private property, submit a copy of the written agreement with the property owner.

1.04 JOB CONDITIONS

A. Classification of Excavation: All excavation work performed under this contract is unclassified, and includes excavation and removal of all soil, shale, rock boulders, fill, and all other materials encountered of whatever nature.

B. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures. Advise each Utility at least 3 working days in advance of intent to excavate, do demolition work and give the location of the job site. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.

2. Advise each person in physical control of powered equipment used in excavation or demolition work of the type and location of utility lines at the job site, the Utility assistance to expect and procedures to follow to prevent damage.

3. Immediately report to the Utility and the Engineer any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.

4. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

PART 2 - PRODUCTS

2.01 PIPE BEDDING MATERIAL

Bedding Material: Clean granular material meeting the requirements of AASHTO M 43 size No. 8 on detail or as approved by the Engineer.

2.02 BACKFILL MATERIAL

A. Granular material conforming to the Uniform Soil Classification Groups GW, GP, SW or SP that will completely pass a (1 1/2") sieve and that will compact readily when the usual methods of tamping are used. It shall conform to the requirements of AASHTO M 43, size number 57 and have a maximum Los Angeles Abrasion (LA) test (AASHTO T-96) of 50%.

B. Suitable Backfill Material

1. From top of pipe bedding material to 24" over top of pipe

a. Material excavated from the trench if free of stones larger than 2" in size and free of wet, frozen, or organic materials.

2. From 24" above pipe bedding to subgrade elevation

a. Material excavated from the trench if free of stones larger than 6" in size and free of wet, frozen, or organic materials.

C. Unsuitable Backfill Material: where the Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction, remove the unsuitable material and replace with select material stone backfill as specified in paragraph 2.02A or suitable foreign backfill material.

PART 3 - EXECUTION

3.01 MAINTENANCE AND PROTECTION OF TRAFFIC

A. Coordinate the work to ensure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the street is authorized.

B. Maintain access to all streets and private drives.

C. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform to construction operations and to keep traffic flowing with minimum restrictions.

D. Comply with State and local codes, permits and regulations.

3.02 CUTTING PAVED SURFACES

A. Where excavation includes breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Cut offsets at right angles to the centerline of the trench. Saw cut concrete surfaces; saw cut other hard surfaces or make straight cuts with jackhammer. No paving shall be broken except that which has been previously cut.

B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.

3.03 BLASTING

No blasting will be permitted without prior written approval of Engineer

3.04 TRENCH EXCAVATION

A. Topsoil Stripping and Stockpiling: Strip topsoil encountered during trench excavation to its full depth and stockpile for reuse.

B. Depth of Excavation

1. Gravity Pipelines: Excavate trenches to the depth and grade shown on the profile drawings for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.

2. Pressure Pipelines:

a. Excavate trenches to the minimum depth necessary to place required pipe bedding material and to provide 4' from the top of the pipe to the finish ground elevation, except where specific depths are otherwise indicated on the Contract Drawings.

b. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material or other material approved by Engineer.

c. Where the Contractor, by error or intent, excavated beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material or crusher run as directed by Engineer.

C. Width of Excavation

1. Excavate trenches to a width necessary for placing and jointing the pipe and for placing and compacting bedding and backfill around the pipe.

2. Shape trench walls completely vertical from trench bottom to at least 24" above the top of pipe.

3. For pressure pipeline fittings, excavate trenches to a width that will permit placement of concrete thrust blocks. Provide original earth

surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

4. Where rock is encountered in the sides of the trench, remove the rock to provide a minimum clearance between the pipe and rock of 6".

D. Length of Open Trench: Do not advance trenching operations more than 50' ahead of completed pipeline. No open trench shall be left overnight without approval of Engineer and adequate safety safeguards.

3.05 SUPPORT OF EXCAVATION

A. Support excavations with sheeting, shoring, and bracing or a “trench box” as required to comply with Federal and State laws and codes. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of the Contractor in any other manner shall be repaired at the Contractor’s expense.

B. Withdraw shoring, bracing, and sheeting as backfilling proceeds unless otherwise directed by the Engineer.

3.06 CONTROL OF EXCAVATED MATERIAL

A. Keep the ground surface within a minimum of 2' of both sides of the excavation free of excavated material.

B. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed, or dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.

C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural watercourses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.

D. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters, and storm drains.

3.07 DEWATERING

A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water so as to not disrupt or re-saturate the work area..

B. Maintain pipe trenches dry until pipe has been jointed, inspected, and backfilled, and concrete work has been completed. Prevent trench water from entering pipelines under construction.

C. Intercept and divert surface drainage away from excavations. Maintain storm drainage facilities, gutters, and natural surface watercourses open and in operation. Provide and install temporary facilities to maintain excavations free of water as required. Design surface drainage systems so as to not cause erosion on or off the site, or cause unwanted flow of water. When mechanical equipment is utilized to control water conditions, provide and maintain sufficient standby units onsite.

D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control. Comply with the Sediment and Erosion Control Plan whether required control and prevention methods are explicitly shown on plans or not.

3.08 PIPE BEDDING REQUIREMENTS

Refer to Drawings.

3.09 PIPE LAYING

Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

3.10 THRUST RESTRAINT

Provide pressure pipe with concrete thrust blocking or use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with the Specifications, Contract Drawings, Standard Details, and pipe manufacturer recommendations.

3.11 BACKFILLING TRENCHES

A. After pipe installation and inspection, backfill trenches from trench bottom or from the top of pipe bedding material, whichever is greater, to 12" above the crown of the pipe with specified backfill material hand placed and carefully compacted with hand-operated mechanical tampers in layers of suitable thickness to provide specified density around and under the haunches of the pipe. Backfill and compact the remainder of the trench with specified backfill material.

B. Lift thickness Limitations

1. In no case shall maximum lift thickness placed exceed the maximum limits specified by the pipe manufacturer's recommendations. However, if the Contractor' equipment manufacturer's lift thicknes recommendation is followed and the specified density is not obtained, the Contractor shall, at his own expense, remove, replace, and retest as many times as is required to obtain the specified density.

2. Compact each layer of material to 95% of the maximum density at $\pm$ two percent ($\pm$2%) of the optimum moisture content as determined by ASTM D698.

3. Notwithstanding the specified requirements for trench backfill compaction, trenches that settle below the surrounding grade prior to final completion shall be filled to surrounding grade level with appropriate materials.

3.12 UTILITY MARKING TAPE

Install detectable utility marking tape as specified in Section 15060 above all plastic pipelines, 12"-18" below final grade.

3.13 DISPOSAL OF EXCAVATED MATERIAL

Excavated material remaining after completion of backfilling shall remain the property of the Contractor, removed from the construction area and legally disposed.

3.14 RESTORATION OF UNPAVED AREAS

A. Restore unpaved surfaces disturbed by construction to match the final grade shown on the Contract Drawings.

B. Restore grassed areas in accordance with Section 02311, Finish Grading and Seeding.

END OF SECTION

SECTION 02370

EROSION CONTROL DURING CONSTRUCTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. General

Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 specification sections, apply to this section.

B. Referenced Sections

1. Section 02311 – Finish Grading and Seeding.

1.02 DESCRIPTION OF WORK

The contractor shall provide the soil erosion controls as specified herein. The cost of all erosion control measures shall be included in the appropriate Bid Items described in the Prices to Include. The Owner shall be responsible for obtaining the necessary NPDES Permit(s) for construction of the erosion and sediment control during construction. Contractor is responsible for securing and permitting off-site waste and borrow areas.

1.03 QUALITY ASSURANCE

A. Scheduling

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages. These erosion control measures shall be maintained in effective operating condition during construction until final grading and seeding occurs. Special attention must be given to dewatering activities to minimize release of silt-laden water off-site. The sediment free flows shall only be released into storm sewers, stream channels, or other stabilized drainage receptors and not onto exposed soils or any other site where flows could cause further erosion.

B. Dust Control.

Dust generation shall be minimized, including wetting down of paved and unpaved areas during the construction activities.

C. Operation Limits

The Engineer will delineate the area of excavation and backfilling operations in progress commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such temporary or permanent control measures current in accordance with the specifications. Should seasonal limitations make permanent control measures unrealistic, temporary erosion

control measures including seeding and mulching shall be taken immediately. Surplus excavated material and equipment storage is prohibited within 200 feet of any stream bank, in wooded areas, or in other environmentally sensitive areas. Surplus excavated materials shall be disposed of at site approved by the Owner.

D. Site containment

Site access will be limited and protected by the Contractor to prevent off-site tracking of soil and sediment by construction traffic. Any off-site tracking of soil and sediment will be cleaned up immediately to prevent any sedimentation escaping off-site.

E. Conflicts

1, In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

2. Notes or specific requirements listed on plans shall govern if more restrictive than these specifications.

F. Reference Standards

1. NC DEP – North Carolina Department of Environmental Quality

2. NC DOT – North Carolina Department of Transportation

3. Soil Conservation Service (Natural Resources Conservation Service)

1.04 SUBMITTALS

Not used.

1.05 JOB CONDITIONS

A. General

The contractor shall limit the surface area of erodible earth material exposed by the clearing and grubbing, excavation, and backfill operations and provide permanent or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment. Such work will involve the use of temporary and/or permanent mulches, mats, seeding or other control and contain devices or methods necessary to control erosion and sedimentation. If work is suspended for any reason, the Contractor shall maintain the soil erosion and sedimentation controls in good operating condition during the suspension of the work. Also, when the suspension of work is expected to exceed a period of 7 days, the Contractor shall temporary seed, fertilize, and mulch all disturbed areas left exposed when the work is stopped.

B. Permanent Erosion control

The Contractor shall incorporate all permanent erosion control features into the project at the earliest practicable time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent

fertilizing, seeding and mulching as soon as substantial areas can be made available. This will require the establishing of final grades and application of fertilizer, seeding and mulching. No areas where construction is completed shall be left for longer than 7 days without, as a minimum, temporary fertilizer seeding and mulching. Any disturbed area that will not be actively under construction for a period of 7 days or more shall be temporarily stabilized immediately by fertilizer, seeding and mulching.

1.06 DELIVERY, STORAGE, AND HANDLING

NOT USED

1.07 SPECIAL WARRANTY

NOT USED

PART 2 - PRODUCTS

2.01 FERTILIZER, SEED AND MULCH

A. General

All products utilized for erosion control purposes shall be provided in accordance with the requirements of specifications.

PART 3 - EXECUTION

3.01 FERTILIZER, SEED AND MULCH

A. General

All erosion control work shall be executed in accordance with specifications.

3.02 SEDIMENT BARRIERS

A. Filter Barriers (FB)

The filter barrier may be constructed using burlap or standard strength synthetic filter fabric. It is designed for low or moderate flows not exceeding 1 cfs.

1. The height of a filter barrier shall be a minimum of 15 inches and shall not exceed 18 inches.

2. Burlap or standard strength synthetic filter fabric shall be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints (and thus improve the strength and efficiency of the barrier).

3. The stakes shall be spaced a maximum of 3 feet apart at the barrier location and driven securely into the ground (minimum of 8 inches).

4. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stakes and upslope from the barrier.

5. The filter material shall be stapled to the wooden stakes, and 8 inches of the fabric shall be extended into the trench. Heavy-duty wire staples at least 1/2 inch shall be used. Filter material shall not be stapled to existing trees.

6. The trench shall be backfilled and the soil compacted over the filter material.

7. If a filter barrier is to be constructed across a ditch line or swale, the barrier shall be of sufficient length to eliminate end flow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope.

8. Filter barriers shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

B. Silt Fence (SF)

The silt fence uses a standard strength or extra strength synthetic filter fabrics. It is designed for situations in which only sheet or overland flows are expected.

1. The height of a silt fence shall not exceed 36 inches (higher fences may impound volumes of water sufficient to cause failure of the structure).

2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.

3. Posts shall be spaced a minimum of 10 feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When extra strength fabric is used without the wire support fence, post spacing shall not exceed 6 feet.

4. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of posts and upslope from the barrier.

5. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch line, tie wires or hog rings. The wire shall extend into the trench a minimum of 2 inches and shall not extend more that 36 inches above the original ground surface.

6. The standard strength filter fabric shall be stapled or wired to the fence, and 8 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.

7. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of item No. 6 applying.

8. The trench shall be backfilled and soil compacted over the filter fabric.

9. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

C. Maintenance

1. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

2. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected useable life and the barrier is still necessary, the fabric shall be replaced promptly.

3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

4. Any sediment deposit remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

3.03 MATTING

Matting shall be provided on all final slopes 3:1 or greater and bottom of drainage ditches.

3.04 TOP SOIL STOCKPILES

The Contractor may stockpile topsoil in accordance with these plans and specifications. The Contractor shall provide temporary drainage diversion of runoff around the stockpile to control soil erosion and in accordance with NCDOT's Standard Construction Drawings. Stockpiled topsoil shall be protected through the use of temporary seeding and mulching or covering such as with anchored straw mulch. Silt barriers shall be installed down gradient of these areas on contour and with their ends up slope of the contour to prevent silt-laden runoff from entering waterways or storm sewers. Within 7 days of completion of construction, any remaining soil shall either be removed or permanently stabilized.

3.05 STREAM BANKS

If construction results in the disturbance of a stream bank, it shall be restored, graded, seeded and mulched in accordance with the specifications immediately upon completion of the work crossing the stream.

END OF SECTION

SECTION 02485

FINE GRADING, TOPSOIL AND SEEDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

The Contractor shall provide all labor, material, equipment and other services necessary to place topsoil, fine grade, fertilize, lime, seed and mulch all graded, cleared, grubbed or otherwise disturbed areas, in accordance with the Contractor Drawings and Specifications.

1.02 RELATED WORK

A. Section 02310 – Site Grading
B. Section 02370 – Erosion Control During Construction

1.03 QUALITY ASSURANCE

A. Seed shall conform to the formula(s) contained herein. All seed shall be certified as to content and to be free of noxious weed seeds. In the absence of certifications on each package, the suppliers shall furnish an affidavit stating that materials provided conform to the specification requirements. Certification labels and/or affidavits shall be submitted to the Engineer.

B. Copies of delivery tickets for all materials including, but not limited to; lime, fertilizer, seed and mulch used for seeding under this contract shall be submitted to this Engineer.

1.04 SUBMITTALS

Submit the items following for the approval by the Engineer in accordance with Section 01300.

A. Submit all seed mixture certifications which include % purity, % germination, and % weed seed.

B. Source of lime product including particle size and carbonate content.

C. Fertilizer formulation and source.

D. Permanent soil stabilization matting specifications.

PART 2 – PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be furnished from an approved source on-site.

B. Topsoil shall be natural, friable, agricultural soil, possessing characteristics representative of topsoil in the vicinity that sustain vigorous plant growth.

C. Topsoil shall be free from stones, roots, toxic substances and other foreign matter which might be detrimental to plant growth. Topsoil shall meet the requirements of North Carolina Department of Transportation 2018 Standard Specifications.

2.02 LIME

A. Ground agricultural limestone shall contain not less than 55% total carbonates and shall be ground to fineness such that at least 90% will pass a No. 10 mesh screen and at least 50% will pass a No. 100 mesh screen. Courser material will be accepted provided the specified application rates are increased proportionally on the basis of the quantities passing the 100 mesh screen. No additional payment will be made for increased quantities.

2.03 FERTILIZER

A. Fertilizer use shall be formulated as 10-10-10 (nitrogen, phosphorus and potassium) respectively. Fertilizers shall be free flowing, uniform in composition and suitable for application with approved standard equipment.

B. Fertilizer shall be delivered in bags or other containers labeled with composition and/or analysis plus the name, trademark and warranty of the producer.

2.04 SEED

A. All seed shall be certified and labeled, tagged or marked per accepted horticultural practice and shall comply with all current state and federal regulations. Seed shall be furnished in sealed standard containers. Seed which becomes wet, moldy or otherwise damaged in transit and/or storage will not be acceptable and will be replaced at no additional cost to the Owner.

B. Seed and seed mixes shall be furnished with a certification from the seed company stating:

Type of Seed
Percentage of Mixture
Purity
Germination
Weed Seed

C. Seed for disturbed areas in existing hay fields shall be Orchard Grass with 95% purity, 80% Germination, 0.75% weed seed. Orchard grass seed shall be applied at the rate of 10 lb. Per 1000 SF.

D. The seed mix to be applied in all areas except hayfields shall have the following requirements:

	% Purity	% Germination	% Weed Seed	LB per acre
Kentucky 31	90	80	0.75	4.5
Annual Rye	95	85	0.75	20.0
Orchard Grass	90	80	0.75	20.0
Timothy	90	80	0.75	6.0
White Clover	90	80	0.75	3.6
Red Clover	90	80	0.75	6.0
Alsike Clover	90	80	0.75	5.5

2.05 MULCH

A. Straw mulch shall be un-weathered, un-chopped small grain straw. Oat straw is not acceptable as it may contain viable seeds which may produce serious

competition for desired species. Straw shall be dry and free of mold, noxious weeds, grass seeds, or other objectionable materials.

B. Wood cellulose mulch shall be natural wood fiber without toxic substances or foreign matter, packaged in air-dry containers capable application with power spray equipment, and shall have a minimum pH of 9.0 in distilled water.

C. Permanent soil stabilization matting shall be open weave synthetic machine produced mat consisting of synthetic non degradable fibers or elements of uniform thickness and distribution of weave throughout. Netting shall be extruded plastic having a maximum mesh opening size of 2x2 inch, sufficiently bonded or sewn on 2 inch centers along the longitudinal axis of material to prevent separation of the net from parent material for the life of the product.

PART 3 – EXECUTION

3.01 PREPARATION

A. All ground surfaces to be treated shall be cleared of stones, roots, debris and other material which might hinder proper grading and tillage to a depth of not less than three inches (3") so that the loosened surface will readily bond with the topsoil.

B. Areas to be seeded shall be graded as sown on the drawings and/or as specified herein. All surfaces shall be left in an even and properly completed condition to prevent the formation of depressions where water may stand.

3.02 TOPSOIL, LIME AND FERTILIZER

A. Topsoil shall be as specified, spread to a compacted depth of four inches (4") for areas to be seeded and shall be raked to a smooth uniform surface and compacted with a lawn roller weighting not less than 90 lbs. Per foot of roller width. Any bumps or depressions which develop shall be leveled or filled, and rolled until a satisfactory surface is obtained.

B. Lime, as specified, shall be applied at the rate of 50 lbs. per 1000 ft. Fertilizer, as specified, shall be applied at the rate of 20 lbs. per 1000 ft. Lime and Fertilizer shall be raked or harrowed into the topsoil within two (2) days of application.

3.03 SEEDING

A. The seed mix, as specified, shall be applied at the specified rate and covered to an average uniform depth of 1/4 inch by means of a brush harrow, rake, multipacker or approved device.

B. Straw mulch shall be spread uniformly over seeded areas at the rate of 115 lbs, per 1000 sq. ft. It shall be anchored with the chemical tacker, Terra Tack MP as manufactured by Grass Growers of Plainfield, New Jersey or approved equal at a rate of 100 lbs. of dry chemical material per acre. Mixing shall be per the manufacturer's instruction.

C. Wood cellulose mulch, as specified, shall be applied evenly at the rate of 50 lbs, per 1000 square feet.

3.04 SEEDING SEASONS

A. The normal seasonal dates for seeding shall be in accordance with North Carolina Department of Transportation 2018 Standard Specifications.

B. Upon approval of the seeding and mulching operation, the Contractor shall be relieved of any further responsibility, except for damage which may be caused by the Contractor's forces.

END OF SECTION

SECTION 02610

SITE DRAINAGE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To

1. Storm Drainage Piping
2. Headwalls and Endwalls
3. Inlets
4. Drainage Channels and Swales
5. Riprap
6. Double Face Concrete Barrier

B. Related Work Specified Elsewhere

1. Section 02300 - Earthwork
2. Section 02315 - Trenching, Backfilling, & Compacting

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)

B. Standard Specifications for Construction and Materials, North Carolina Department of Transportation latest edition of Standard Specifications Roads and Bridges and Supplemental Specifications as of date of bid opening.

1.03 SUBMITTALS

Submit certification attesting that materials meet or exceed the specification requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. PVC Units

1. Transport the units to the job site. Protect until required for installation.
2. Handle to avoid damage to surfaces, edges and corners of units.

PART 2 - PRODUCTS

2.01 STORM DRAIN PIPE

HDPE pipe of the sizes indicated on the Contract Drawings and conforming to North Carolina Department of Transportation latest edition of Standard Specifications Roads and Bridges, and Supplemental Specifications as of date of bid opening

2.02 SUBBASE AGGREGATE

Conform to the requirements specified in Section 02315.

2.03 RIPRAP STONE

A. Field stone or rough unhewn quarry stone of approximate rectangular shape, hard and angular, and of such quality that it will not disintegrate on exposure to water, weathering or cause degradation of water quality.

B. 9" minimum thickness, measured perpendicular to face, with no face dimension less than the thickness of the stone.

C. Not less than 70% of the individual pieces weighing minimum of 150 lbs.; not more than 10% of the individual pieces weighing less than 100 lbs.

2.04 CONCRETE:

Conform to the requirements specified in Section 03300

2.05 ENDWALLS, HEADWALLS AND INLETS

A. Locations and sizes as indicated on the Contract Drawings.

B. PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile iron grates (12” and 15” frames are cast iron) for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.

C. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc., or prior approved equal.

D. The drain basins required for this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described by ASTM D3034, Standard for Sewer PVC Pipe and Fittings; ASTM F1336F, Standard for PVC Gasketed Sewer Fittings.

E. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes 8”, 10”, 12”, 15”, 18”, 24”, and 30” (12” and 15” frames are cast iron) and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting H-25 wheel loading for heavy-duty traffic or H-10 loading for pedestrian traffic. 12” and 15” grates will be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron and ASTM A-48-83 class 30B for 12” and 15” cast iron frames. Grates shall be provided painted black.

F. The drain basin body will be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grate to the final grade height.

2.06 DOUBLE FACE CONCRETE BARRIER

Provide temporary precast concrete barrier, double face, where indicated on the Contract Drawings in accordance with North Carolina Department of Transportation latest edition of Standard Specifications Roads and Bridges, and Supplemental Specifications as of date of bid opening.

PART 3 - EXECUTION

3.01 TRENCHING, BEDDING, AND BACKFILL

Conform to the requirements specified in Section 02315.

3.02 PIPE LAYING

A. Clean and inspect pipe before lowering into the trench; start pipe laying at the low end and proceed upgrade, unless otherwise approved by the Engineer; bed the pipe for its full length.

B. Fit corrugated metal pipe connecting bands to the corrugations with bolts drawn tight.

C. Replace broken or otherwise damaged pipe, and keep pipe clean of deposits and debris; piping, as laid, shall be approved by the Engineer before the trench is backfilled.

3.03 CONSTRUCTION

A. Locate inlets and endwalls as indicated on the Contract Drawings; perform excavation as specified in Section 02315.

B. Construct endwalls as indicated on Contract Drawings.

Rub-finish exposed surfaces of headwalls and endwalls to meet the approval of the Engineer.

D. Construct drainage channels and swales to the lines and grades and cross-sections indicated on the Contract Drawings.

E. Where riprap slope protection and ditch lining is indicated on the Contract Drawings, construct to the lines and grades indicated and in accordance with North Carolina Department of Transportation latest edition of Standard Specifications Roads and Bridges, and Supplemental Specifications as of date of bid opening.

3.04 BACKFILLING

A. Backfill structures only after examination by the Engineer.

B. The backfill material used around the PVC inlets shall be crushed stone or other granular material meeting the requirements of class 1 or 2 material as defined in ASTM D2321. The surface drainage inlets shall be bedded and back-filled

uniformly in accordance with ASTM D2321. For H-25 load rated installations, an 8” to 10” thick concrete ring will be poured under the grate and frame as recommended by details provided from the manufacturer.

C. Perform backfilling and compaction as specified in Section 02315.

END OF SECTION

SECTION 02820

CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

Work performed under this section shall include, but is not limited to, furnishing and installing chain link fencing, gates, and accessories necessary for the complete and satisfactory installation of chain link fence systems as shown and as specified.

1.02 REFERENCES

A. ASTM A121 Specification for Metallic-Coated Carbon Steel Barbed Wire

B. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

C. ASTM A491 Specification for Aluminum-Coated Chain-Link Fabric

D. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings

E. ASTM A817 Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric and Marcelled Tension Wire

F. ASTM A824 Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link

G. ASTM F552 Standard Terminology Relating to Chain Link Fencing

H. ASTM F567 Standard Practice for Installation of Chain Link Fence

I. ASTM F626 Specification for Fence Fittings

J. ASTM F900 Specification for Industrial and Commercial Swing Gates

M. ASTM F1043 Specification for Strength and Protective Coatings of Metal Industrial Fence Framework

N. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates

O. ASTM F1345 Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric

T. ASTM F2200 Specification for Automated Vehicular Gate Construction

U. ASTM F2611 Guide for Design and Construction of Chain Link Security Fencing

V. Chain Link Manufacturers Institute

W NFPA 70e Handbook for Electrical Safety in the Workplace

X. UL325 Automatic operators: Door, Drapery, Gate, Louver and Window

1.03 SUBMITTALS

Submit the following working drawing information:

A. Cross sectional dimensions of posts, braces, rails, fittings, accessories and gate frames; design of gates; and details of gate hardware.

B. Spacing of posts and location of gates; abrupt changes in grade; and corner, gate, anchor, end and pull post.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company headquartered in the United States, having U.S. manufacturing facility/facilities specializing in manufacturing chain link fence products experience; comply with Section 01300.

B. Fence contractor: Company with demonstrated successful experience installing similar project and products in accordance with ASTM F567.

C. Tolerances: Current published edition of ASTM specifications tolerances apply. ASTM specification tolerances supersede any conflicting tolerance.

PART 2 – PRODUCTS

2.01 STEEL CHAIN LINK FABRIC

A. Zinc-Coated Steel Fabric: ASTM A392 hot dipped galvanized before or after weaving.

1. Class 2 – 2.0 oz. /ft^2

2.02 ROUND STEEL PIPE FENCE FRAMEWORK

A. Round steel pipe and rail: Round steel pipe and rail to be cold-rolled electric-resistance welded pipe in accordance with ASTM F1043 Materials Design Group IC, minimum steel yield strength 50,000 psi. Type B external coating, hot dip galvanized zinc 1.0 oz./ft^2 with a clear polymeric overcoat, Type D interior 90% by weight zinc-rich coating having a minimum thickness of .-30 mils.

1. Line post (2-inches O.D.)

2. End, Corner, Pull post (3-inches O.D.)

3. Top rail, brace rail, bottom and intermediate rails, (1 5/8 inches O.D.)

2.03 TENSION WIRE

A. Metallic Coated Steel Marcelled Tension Wire: 7 gauge Marcelled wire complying with ASTM A824

1. Type II Zinc-Coated, ASTM A817 Class 5 – 2.0 oz. /ft^2

2.04 BARBED WIRE

A. Metallic Coated Steel Barbed Wire: Comply with ASTM A121, double 12-1/2 gauge twisted strand wire, with 4 point 14 gauge round barbs spaced 5 inches on center. Match coating type to that of the chain link fabric. **High Security barb**

spacing is 3" on center.

B. Coating:

1. Coating Type Z – Zinc-coated: Strand wire coating Type Z, Class 3, 0.80 oz./ft², barb coating 0.70 oz./ft²

2.05 FITTINGS

A. Tension and Brace Bans: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge, minimum width of ¾ in. and minimum zinc coating of 1.20 oz./ft².

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz. /ft².

C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz./ft², assembly capable of withstanding a tension of 2,000 lbs.

D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length (2 in. 50mm) less than the fabric height. Minimum zinc coating 1.2 oz. /ft². (*Bars are to be sized in accordance to the size mesh of the chain link)*

E. Barbed Wire Arms: In compliance with ASTM F626, pressed steel galvanized after fabrication, minimum zinc coating of 1.20 oz. /ft², capable of supporting a vertical 250 lb. load.

2.06 TIE WIRE and HOG RINGS

A. Tie Wire and Hog Rings:

1. Aluminum alloy ties and hog rings per ASTM F626. 9 gauge

2.07 SWING GATES

Galvanized steel welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD (48.3 mm). ASTM F1043 Group IC 40 galvanized steel pipe. Frame members spaced no greater than 8 ft. apart vertically and horizontally. Welded joints protected by applying zinc-rich pain in accordance with ASTM Practice A780. Positive locking gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Match gate fabric to that of the fence system. Gateposts, F1043 Group IC galvanized steel pipe (3 inch O.D., 15/ft). Electrically operated gates must comply with ASTM F2200 and UL325.

PART 3 – EXECUTION

3.01 FRAMEWORK INSTALLATION

A. Posts: Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 24 in. plus an additional 3 in. for each 1 ft. increase in the fence height over 4 ft. Minimum footing diameter four times the largest cross section of the post up to 4.00" and three times the largest cross section of post 4.00", and greater. **(Site soil conditions, local frost depth, fence height and wind load may require larger diameter or deeper footings).** Top of concrete footing to 6 inches below grade to allow for additional surface coating, crowned to

shed water away from the post. Line posts installed at intervals not exceeding 10 ft. on center.

B. Top rail: When specified, install 21 ft. lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 6 in. long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end. Fences 12 feet high or higher require mid rail.

C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. and higher and for fences 5 ft. in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance ASTM F567. Truss rod is not required when center rail is used. For fences without top rail an additional brace is required at the top of the chain link between the first line post and the terminal post.

D. Tension wire: Shall be installed 2 in. up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 2 in. down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire. Install the top tension wire through the barb arm loop for fences having barbed wire and no top rail.

3.02 CHAIN LINK FABRIC INSTALLATION

Chain Link Fabric: Install fabric to outside of the secured area. Attached fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. carriage bolts spaced no greater than 12 inches on center. Small mesh fabric less than 1 in., attach to terminal post by sandwiching the mesh between the post and a vertical 2 in. wide by 3/16 in. galvanized steel strap using carriage bolts, bolted thru the bar, mesh and post spaced 15 in. on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches on center and to rail spaced no greater than 18 inches on center. Secure fabric to the tension wire with hog rings spaced no greater than 18 inches apart. Aluminum or steel tie wires shall be wrapped around the post or rail and attached to the fabric wire picket on each side by twisting the tie wire around the fabric wire picket two full turns. Excess wire shall be cut off and bent over to prevent injury. The installed fabric shall have a ground clearance of no more 2 inches or as shown on drawing. Chain link should set on finished surface on tennis courts or rat walls.

3.03 BARBED WIRE INSTALLATION

Barbed Wire: Stretched taut between terminal posts and secured in the slots provided on the line post barb arms. Attach each strand of barbed wire to the terminal post using a brace band.

3.04 GATE INSTALLATION

A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F567. Direction of swing shall be inward**.** Gates shall be plumb in the closed position having a bottom clearance of 3 inches in the closed position. Double gate drop bar receivers shall be set in a concrete footing minimum 6 in. diameter 24 in. deep. Gate leaf holdbacks shall be installed for all double gates. Electrically operated gates must be manufactured and installed in compliance with ASTM F2200, UL 325 and NFPA 70e.

3.05 NUTS AND BOLTS

Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.06 CLEAN UP

Clean Up: The area of the fence line shall be left neat and free of any debris caused by installation of the fence to the satisfaction of the owner.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Work of This Section Includes, But Is Not Limited To

1. Concrete Reinforcement
2. Concrete Formwork
3. Concrete accessories.
4. Concrete material

B. Related Work Specified Elsewhere

1. Section 03600 - Grout

1.02 REFERENCED STANDARDS AND SPECIFICATIONS

A. American Concrete Institute (ACI)

1. 117 Standard Specifications for Tolerances for Concrete Construction and Materials
2. 201 Guide for Making a Condition Summary of Concrete In Service
3. 301 Specifications for Structural Concrete for Buildings
4. 304 Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
5. 305R Hot Weather Concreting
6. 306R Cold Weather Concreting
7. 309 Recommended Practice for Consolidation of Concrete
8. 315 Manual of Standard Practice for Detailing Reinforcing Concrete Structures
9. 318 Building Code Requirements for Reinforced Concrete
10. 347 Recommended Practice for Concrete Formwork
11. 350R Concrete Sanitary Engineering Structures

B. American Society for Testing and Materials (ASTM)

1. A185 Specification for Welded Steel Wire Fabric for Concrete Reinforcement
2. A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
3. C31 Making and Curing Concrete Test Specimens in the Field
4. C33 Specifications for Concrete Aggregate
5. C39 Test for Compressive Strength of Cylindrical Concrete Specimens
6. C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
7. C94 Specification for Ready-Mixed Concrete
8. C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
9. C143 Test for Slump of Portland Cement Concrete
10. C150 Specification for Portland Cement
11. C171 Specification for Sheet Materials for Curing Concrete
12. C172 Sampling Fresh Concrete
13. C173 Test for Air Content of Freshly Mixed Concrete by the Volumetric Method
14. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
15. C260 Specification for Air-Entraining Admixtures for Concrete
16. C309 Specification for Liquid Membrane-forming Compounds for Curing Concrete
17. C494 Specification for Chemical Admixtures for Concrete
18. C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
19. D1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Construction
20. D2103 Standard Specification for Polyethylene Film and Sheeting
21. E154 Standard Test Methods for Water Vapor Retarders used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

C. American Welding Society (AWS)

1. D12.1 Welding Reinforcing Steel Metal Inserts and Connections in Reinforced Concrete Construction

D. Corps of Engineers

1. CRD C572 Specification for Polyvinyl Chloride Waterstop

2. CRD C621 Specification for Nonshrink Grout

E. American Association Of State Highway and Transportation Officials (AASHTO)

1. M182 Burlap Cloth Made From Jute or Kenaf

F. North Carolina Department of Transportation

1. Standard Specifications Roads and Bridges (latest edition as of date of bid).

1.03 QUALITY ASSURANCE

A. Design Criteria

1. Design each required concrete group to meet the physical properties specified in Table I of this Section.

2. In addition to structural strength and stability requirements, design and construct concrete in structures to ensure:

a. Maximum density and impermeability - these quantities are achieved with low water cement ratios and a slow, moist cure.

b. Maximum resistance to reaction of chemicals, alternate wetting and drying, and exposure to the elements.

c. Well-formed and smooth surfaces to minimize resistance to flow.

B. Testing Agency: Concrete testing for slump, compressive strength, and air content shall be performed by a testing laboratory engaged and paid by the Contractor and approved by the Engineer. No concrete shall be poured unless the testing agency is on-site.

C. Concrete Testing:

1. Perform compressive strength, slump, and air content tests for each 50 cubic yards of concrete placed, or any portion thereof, for each structure. Cast at least 5 cylindrical strength test specimens for each batch. Test 2 cylinders at 7 days; test 2 cylinders at 28 days. Hold the remaining cylinder for testing in the event that any of the other cylinders are damaged prior to testing.

2. Determine concrete strength from standard test specimens made and cured according to ASTM C31 and ASTM C172, and tested in accordance with ASTM C39. Perform core drilling and testing in

accordance with ASTM C42. Compute and evaluate in accordance with ASTM C94.

3. Determine air content in accordance with ASTM C231 or ASTM C173, as applicable.

4. Determine slump in accordance with ASTM C143.

5. Keep a slump cone and an air meter in close proximity to all concrete placements.

1.04 SUBMITTALS

A. Shop Drawings: Submit detailed reinforcing drawings prepared in accordance with ACI 315, including bar schedule with bar marks and bends indicated.

B. Design Mix

1. Prior to start of placing concrete, submit design mix for each group of concrete, indicating that the concrete ingredients and proportions will result in a concrete mix meeting the physical requirements for each concrete group specified in Table II of this Section.

2. Do not vary proportions of the ingredients or source of material of the approved mix without submitting corresponding test result documentation to the Engineer for approval.

C. Certificates

1. Submit a certification attesting that reinforcing steel meets the requirements of ASTM A615 including Supplementary Requirement S1, and that welded steel wire fabric meets the requirements of ASTM A185.

2. Submit, with the concrete mix design, laboratory test reports and manufacturer's certificates attesting the conformance of ingredients with these specifications (ASTM C94, paragraph 5.3.2).

3. Submit a certification or delivery ticket from the concrete supplier for each batch delivered to the site (ASTM C94, Section 15). The delivery ticket shall list: name of ready-mix batch plant, serial number of ticket, date and truck number, name of contractor, specific designation of job, batch number, amount of concrete, time loaded or of first mixing of cement and aggregates, number of revolutions, water added by receiver of concrete and receivers initials, type and name of admixtures and amount of same, type and brand of cement, amount of cement, total water content by producer, maximum size of aggregate, weights of fine and coarse aggregate, and indication that ingredients are as previously certified or approved.

D. Test Reports: Submit four (4) copies of required slump tests, air content tests, and strength tests.

E. Pour Schedules: Submit concurrently with the steel reinforcing drawings six (6) copies of concrete pour schedules showing sequence of pours and all contraction, expansion and construction joints.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Reinforcing Steel

1. For reinforcing steel fabricated on-site, ship from the mill in bundles, limited to one size and length, tagged with a waterproof tag showing the name of the mill, heat number, grade and size of the bars, and identifying number.

2. For reinforcing steel fabricated off-site, deliver in bundles identified as to structure and shop drawing number. Identify each individual bar with a waterproof tag showing the grade, size and bar mark from the approved bar schedule.

B. Concrete Ingredients: Handle, control and store concrete materials in accordance with ACI 304, Chapter 2.

PART 2 – PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use plywood complying with US Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

2. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

3. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

4. Form Ties: Factory-fabricated, adjustable-length, removable or snap off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1-1/2 in. to surface.

5. Provide ties which, when removed, will leave holes not larger than 1 in. diameter in concrete surface.

B. Earth cuts shall not be used as forms for vertical surfaces unless approved by Engineer.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A- 615, Grade 60, deformed.

B. Welded Wire Fabric: ASTM A-185 welded steel wire fabric.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II or Type IIA

1. Use one brand of cement from one manufacturing source and mill throughout project, unless otherwise acceptable to Engineer.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Fine Aggregate shall be clean, sharp, natural or manufactured sand, free from loam, clay lumps, or other deleterious substance within allowable standards.

2. Coarse Aggregate shall be clean, uncoated, graded aggregate, containing no clay, mud, loam or foreign matter and free of excessively flat or elongated pieces.

a. Maximum size of course aggregate shall not exceed:

(1) 1/5 narrowest dimension between forms.

(2) ¾ minimum clear spacing between reinforcing.

(3) 1/3 thickness of slab.

C. Water: Potable

D. Admixtures

1. General: Total Chloride ions from admixtures and other measures shall be no greater than 0.1 percent by weight of cement in the concrete mix immediately prior to service exposure.

2. Admixtures containing calcium chloride or soluble chlorides shall not be used in concrete containing aluminum and or subject to alkali-aggregate reaction.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

a. “Sika Aer”; Sika Corp.

b. “MB-VR or MB-AE”; Master Builders

c. “Darex AEA” or “Daravair”; W. R. Grace

d. Or Equal

F. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. “WRDA Hycol”; W.R. Grace.

b. “Pozzolith Normal”; Master Builders.

c. “Plastocrete 160”; Sika Chemical Corp.

d. Or Equal

G. High Range Water Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. “WRDA 19” or Daracem”; W. R. Grace.

b. “Sikament”; Sika Chemical Corp.

c. “Rheobuild”; Master Builders.

d. Or Equal

H. Water Reducing, Non Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. “Accelguard 80”; Euclid Chemical Co.

b. “Pozzolith High Early”; Master Builders.

c. “Gilco Accelerator”; Gifford-Hill/ American Admixtures.

d. Or Equal

I. Water Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. “Pozzolith Retarder”; Master Builders.

b. “Eucon Retarder 75”; Euclid Chemical Co.

c. “Daratard”, W. R. Grace.

d. Or Equal

J. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

2.04 RELATED MATERIALS

A. Waterstops.

1. Provide flat, dumbbell-type or centerbulb-type waterstops at all construction, contraction and expansion joints and at other joints as indicated on the Contract Drawings or needed.

a. Material: Polyvinyl Chloride: Corps of Engineers CRD-C 572.

b. Provide 9-inch wide by 3/8 in. thick unless noted otherwise on the Contract Drawings.

c. Manufacturers:

(1) Paul Murphy Plastics Company; Wirestop®

(2) W.R. Meadows, Inc.

(3) Greenstreak

(4) Or Equal

2. Adhesive Waterstop.

a. Material: Compounded bentonite and butyl material specifically manufactured for use in cold joints, which swells upon hydration to form a self-healing compression seal.

b. Adhere to cold surface using synthetic rubber/resin based solvent adhesive and concrete cut nails.

c. Minimum section shall be 1 in. x 3/4 in., placed per manufacturer’s instructions.

d. Manufacturers:

(1) Volclay Waterstop-RX by American Colloid Company.

(2) Or Equal.

B. Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials, which are resistant to decay when tested in accordance with ASTM E 154, as follows:

1. ASTM D2103, Polyethylene sheet not less than 8 mils thick.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per square yard, complying with AASHTO M 182, Class 2.

D. Moisture Retaining Cover: One of the following, complying with ASTM C 171.

1. Polyethylene film.

E. Liquid Membrane Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. “Masterseal”; Master Builders.

b. “Ecocure”; Euclid Chemical Co.

c. “Spartan-Cote”; The Burke Co.

d. Or Equal

G. Bonding Compound: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

2. Acrylic or Styrene Butadiene:

a. “Acrylic Bondcrete”; The Burke Co.

b. “SBR Latex”; Euclid Chemical Co.

c. “Daraweld C”; W. R. Grace.

d. Or Equal

H. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material “Type”, “Grade”, and “Class” to suit project requirements.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

   a. “Thiopoxy”; W. R. Grace.

   b. “Sikadur Hi-Mod”; Sika Chemical Corp.

   c. “Patch and Bond Epoxy”; The Burke Co.

   d. Or Equal

I. Fasteners

1. Fasteners and Anchors shall be of the type and size shown on the Drawings, and are specified as follows:

   a. Anchor Bolts.

      (1) 304 Stainless Steel, unless noted otherwise on the Drawings.

      (2) Size and configuration as shown on the Drawings.

   b. Mechanically Fastened Anchors.

      (1) Expansion anchors shall be wedge type anchors capable of withstanding the tensile and shear forces shown on the drawings.

         (a) 304 Stainless Steel unless noted otherwise on the Drawings.

         (b) Acceptable manufacturers.

            -“S-7 Concrete Anchor” by Williams Form Engineering C.

            -“Kwik Bolt 3” by Hilti Fastening Systems.

            -“Rawl Bolt” by the Rawlplug Company, Inc.

            - Or Equal

2. Substitution of the anchor types shown on the Drawings shall not be permitted without approval of the Engineer.

J. Pre-molded Joint Fillers.

1. Pre-molded Joint Fillers, Joint Sealing Compounds and Bond Breakers: Unless otherwise noted on the Drawings, the materials shall conform to the following:

   a. Pre-formed Non-extruding Filler: ASTM Designation D1752, Type III, unless noted.

b. Joint sealing compound shall be a 2 part Polysulfide base, synthetic rubber sealant, non-sagging and non-staining.

c. Manufactured clear adhesive tape to break bond between sealant and joint filler.

K. Vapor Barrier: ASTM D 2103, 6 mil polyethylene sheeting.

L. Bond Breaker: Non-staining liquid product which imparts a waterproof film to prevent adhesion of concrete and will not leave a paint-impeding coating on the face of the concrete.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing. Prepare design mixes for the following minimum 28 day compressive strengths and applications:

1. 2500 psi air entrained use for all pipe encasements and reaction backings, where specified in other Sections and as indicated on the Contract Drawings.

2. 3000 psi air entrained use for Fill Concrete and Structural Foundation Backfill.

3. 4500 psi use for all structural concrete unless otherwise noted. Submit separate mixes for each condition i.e., air entrained non-air entrained, pumped.

B. Submit design mixes and proof of performances for each type and strength of concrete in accordance with ACI 301 and ACI 318.

1. When field test are available, follow the Field Experience design method per ACI 301.

a. Provide thirty (30) consecutive tests (or two groups of the same design mix totaling 30 or more), and compute the standard deviation per ACI 301, Section 3.9.1.1.

b. When only 15 to 29 test are available, compute the increased standard deviation per ACI 301, Section 3.9.1.2.

2. When field tests are not available, supplier shall supply the trial mix design following the restrictions of ACI 301, Section 3.9.3.3.

Trial mixtures shall be tested by an independent testing facility and shall not be the same at the facility used or field quality control testing.

3. Upon written approval by the Engineer, where field test records for trial data are not available, the concrete mix design may follow the Empirical Method of ACI 301, Section 3.10.

4. When permitted by Engineer, materials certificates in lieu of materials laboratory test reports can be submitted. Materials certificates shall be

signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements.

5. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

C. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and approved by Engineer.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

3. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within following limits:

a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure.

(1) 4.5 percent (moderate exposure); 5.5 percent (severe exposure) 1-1/2-in. max. aggregate.

(2) 4.5 percent (moderate exposure); 6.0 percent (severe exposure) 1 in. max. aggregate.

(3) 5.0 percent (moderate exposure); 6.0 percent (severe exposure) 3/4-in. max. aggregate.

b. Other concrete (not exposed to freezing, thawing, or hydraulic pressure) or to receive a surface hardener: 2 percent to 4 percent air.

c. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.

F. Cement Content: Provide concrete for following conditions with maximum water-cement (W/C) ratios, by weight, as follows:

1. All 4,500 psi concrete mixes shall have a max: W/C 0.42.

2. All other concrete mixes shall have a max W/C 0.45.

3. The cement factor shall not be less than:

   a. 515 lb/yd^3 of concrete with 1-1/2-in. max. aggregate.

   b. 535 lb/yd^3 of concrete with 1-in. max. aggregate.

   c. 560 lb/yd^3 of concrete with 3/4-in. max. aggregate.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Maximum slump.

   a. Reinforced concrete foundation slabs and substructure walls - 3 in.

   b. Reinforced concrete, slabs, beams, walls, columns - 4 in.

   c. Pipe encasements - 4 in.

   d. Structural foundation backfill - 6 in.

2. Minimum slump for all concrete shall be 1 in.

3. Use admixtures for water-reducing and set control in strict compliance with manufacturer's directions.

4. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

   a. Ramps, slabs, and sloping surfaces: not more that 3 in.

   b. Reinforced foundation systems: Not less than 1 in, and not more than 3 in.

   c. Concrete containing HRWR admixture (super-plasticizer): Not more than 8 in. after addition of HRWR to site-verified 2 in. – 3 in. slump concrete.

   d. Other concrete: Not less than 1 in. or more than 4 in.

5. Slump may be increased for workability by adding High Range water reducing admixture.

2.06 CONCRETE MIXING

A. Job Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cubic yard, or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cubic yard, increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cubic yard, or fraction thereof. Job site mixing is limited to small quantities with approval of the Engineer.

B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. Ready Mix Concrete: Comply with requirements of ASTM C 94, ACI 304, and as specified.

1. When air temperature is between 85 degrees F. (30 degrees C) and 90 degrees F. (32" C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

2. Plant Equipment and facilities shall conform to the "Checklist for Certification of Ready Mixed Concrete Production Facilities" of the National Ready-Mixed Concrete Association.

3. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.01 GENERAL

A. Unless otherwise specified, conform to ACI 304, 305, and 306 for concrete installation requirements, such as preparation, mixing, conveying, depositing, curing, and cold and hot weather requirements. Consolidate concrete in accordance with ACI 309.

B. Concrete not placed within 90 minutes or 300 revolutions, whichever occurs first, after the first mixing of the cement and aggregates will be rejected.

3.02 COORDINATION

Examine the drawings and specifications for work of other sections or other contractors and coordinate such work with the requirements of this Section. Make provisions for installation of such items as sleeves, pipes, conduits, inserts and hangers in a manner that will not impair or weaken concrete construction.

3.03 REINFORCEMENT

A. Cleaning and Bending

1. Reinforcing bars shall be fabricated in accordance with the standard fabricating tolerances in Fig. 8 and 9 of ACI 315.

2. Reinforcement shall be placed to the tolerances indicated in ACI 301, Section 3.3.

3. When it is necessary to move bars to avoid interference with the reinforcement, conduits, or embedded items exceeding the specified placing tolerances, the resulting arrangement of bars shall be subject to acceptance by the Engineer.

4. All reinforcement shall be bent cold. Perform all reinforcement bending and cutting operations in the shop. Do not bend or straighten bars in a manner that will damage the reinforcement.

5. All reinforcement, at the time it is placed, shall be free of mud, oil, or other materials that may adversely affect or reduce the bond. Reinforcement with rust, mill scale, or a combination of both shall be considered satisfactory provided the minimum dimensions, weight, and height of deformations of a hand-wire-brushed test specimen conforms to the requirements of ASTM A615.

B. Placement:

1. Arrange and place reinforcement in accordance with the approved shop drawings.

2. Reinforcement shall be placed to the tolerances indicated in ACI 301, Section 3.3.

3. All reinforcement shall be supported and fastened before concrete is placed and shall be secured against displacement.

4. Reinforcement supported from the ground shall rest on precast concrete blocks having a compressive strength equal to or greater than the specified compressive strength of the concrete being placed.

5. Reinforcement supported from formwork shall rest on bar supports made of concrete, metal, plastic, or other acceptable materials. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all bar supports within ½-inch of the concrete surface shall be non-corrosive or protected against corrosion.

5. Templates shall be furnished for placement of all column dowels and anchor bolts.

6. All splices shall be as indicated on the Contract Drawings.

7. Bending or straightening of bars partially embedded in concrete shall not be permitted.

8. Welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.

C. Splicing

1. Furnish reinforcing bars in full lengths as indicated on the Contract Drawings and approved shop drawings.

2. Do not splice bars unless indicated on the Contract Drawings or approved by the Engineer in writing.

3. When authorized, make splices in accordance with ACI 318 or ACI 350. Perform welding in accordance with AWS D12.1.

4. Lap mesh reinforcement not less than one mesh space plus 2", and tie.

D. Concrete Cover

1. Provide clearance and spacing indicated on the Contract Drawings.

2. Where no clearances are indicated, the thickness of concrete cover over reinforcement shall be:

a. 3" for concrete placed against ground without the use of forms.

b. 2" for concrete placed in forms that will be exposed to ground or weather.

c. 1-1/2" for formed concrete not exposed to ground or weather.

d. 1" for slabs not exposed to ground or weather

3.04 FORMWORK

A. Responsibility

1. The design and construction of formwork are the sole responsibility of the Contractor.

2. The Contractor shall remove and replace forms which no longer have smooth surfaces and/or are weak resulting in intrusions or extrusions in the concrete face.

B. Design Criteria

1. Design formwork system which is adequately braced and has strength and stability to insure finished concrete within the tolerances specified in ACI 347.

2. Provide formwork sufficiently tight to prevent leakage of mortar.

3. Chamfer external corners 3/4", unless noted otherwise in the Contract Documents.

4. Curved portions of walls shall not be formed in a segmented fashion. Curves shall be formed using flexible systems as manufactured by Symons 'Flex-Form', PERI Form Works or equal.

C. Coating Forms

1. Coat forms with bond breaker prior to the placement of reinforcing steel.

2. Do not allow excess form coating material to stand in puddles in the forms or to come in contact with concrete against which fresh concrete is to be placed.

3. Clean reinforcing steel that has become contaminated with bond breaker to the satisfaction of the Engineer prior to placing concrete.

D. Embedded Items

1. Clean items to be embedded in concrete free from oil or foreign matter that would weaken the bond of the concrete to these items.

2. Install in the formwork requisite inserts, anchors, sleeves, and other items specified under other sections of these specifications. Close ends of conduits, piping, and sleeves embedded in concrete with caps or plugs.

3. Embedded items shall be positioned accurately and supported against displacement.

E. Joints

1. Make contraction, expansion, and construction joints where indicated on the Contract Drawings. Additional construction joints are subject to prior approval of the Engineer. Locate additional construction joints to least impair the strength of the structure.

2. Continue reinforcing steel and wire fabric across construction joints.

3. Install premolded joint filler at locations indicated. Extend filler from bottom of concrete.

4. Make splices in premolded filler in manner to preclude penetration of concrete between joint faces.

5. The surface of the concrete at all joints shall be thoroughly cleaned and all latency removed prior to placing adjoining concrete.

F. Waterstops

1. Install waterstops of the sizes and shapes indicated. Support and protect that portion of the waterstop, which extends beyond the bulkhead during placing of concrete and subsequent removal of forms.

2. Waterstops shall be continuous at construction, contraction and expansion joints to form a watertight compartment.

3. Minimum Width: 9 inches.

4. Make field splices by heat-sealing, maintaining the continuity of the ribs and bulbs, and allow the splice to cool before stressing. Field splice must be watertight. Repair damaged waterstops per manufacturer's instructions.

5. Waterstop shall be installed in accordance with the manufacturer's guidelines and recommendations.

3.05 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

A. Before placement, clean equipment for mixing and transporting the concrete. Remove debris and ice from the places to be occupied by the concrete. Clean reinforcement of dirt, loose rust, and mill scale, or other coatings.

B. Remove water from place of deposit before concrete is placed. Remove laitance and unsound material from hardened concrete before additional concrete is added.

C. Thoroughly wet the stone based on which slabs are to be placed where no vapor barrier is indicated.

3.06 MIXING

A. Mix and deliver ready-mixed concrete in accordance with ASTM C94. Plant equipment and facilities shall conform to "Certification of Ready-Mixed Concrete Production Facilities (Checklist with Instructions)" of the National Ready-Mixed Concrete Association.

B. Do not over-mix. Do not use concrete which is retained in mixers so long as to require additional water in excess of design mix water to permit satisfactory placing.

C. Use preparation methods capable of producing concrete with a temperature not more than 85^{o}F, and not less than 55^{o}F, at the time of placement.

D. Do not heat concrete ingredients to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, within the specified temperatures.

E. Do not heat water in excess of 140^{o}F.

F. Control of Admixtures:

1. Air-entraining admixtures and other required and/or approved admixtures shall be charged into the mixer as solutions and shall be measured by means of an acceptable mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.

2. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

3. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first.

G. Tempering and Control of mixing water:

1. Concrete shall be mixed only in quantities for immediate use. Concrete, which has set, shall be discarded and shall not be re-tempered.

2. When concrete arrives at the project with slump below that suitable for placing, as indicated by the Specifications, water may be added only if either the maximum permissible water-cement ratio or the maximum slump is exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Discharge of the

concrete shall be completed within 1-1/2 hours, or before the truck drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. Truck batch slips must include time of batching, total drum revolutions upon arrival at site, and quantity of water (in gallons) per cubic yard available to be added to attain the maximum design water-cement ratio.

H. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

3.07 CONVEYING

Convey concrete from the mixer to the final deposit by methods that will prevent segregation or loss of materials.

A. Preparation Before Placing:

1. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.

2. Formwork shall be completed; snow, ice and water shall be removed; reinforcement shall be secured in place; expansion joint material, anchors, waterstops and other embedded items shall be positioned; and the entire preparation shall be accepted.

3. Concrete shall not be placed on frozen ground.

B. Conveying:

1. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

2. Conveying equipment shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or workday. Conveying equipment and operations shall conform to the following additional requirements:

a. Truck mixers, agitators and non-agitating units and their manner of operation shall conform to the applicable requirements of ASTM C94.

b. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An acceptable arrangement shall be used at the discharge end to prevent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

c. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

d. Pumping or pneumatic conveying equipment shall be capable of pumping the specified mix with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

3.08 CONCRETE PLACEMENT

A. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not use vibrators to move concrete horizontally with the forms.

B. Do not use tempered concrete or concrete contaminated by foreign material.

C. Plan and conduct concrete placement to insure that the concrete is kept plastic and that the concrete is free of cold joints.

D. Where there is a time delay greater than 45 minutes between adjacent concrete placement, a bulkhead construction joint, complete with waterstops where required, must be installed.

E. Remove temporary spreaders in forms when concrete has reached an elevation rendering their service unnecessary.

F. Do not commence placing when the sun, heat, wind or limitations of facilities provided prevent proper finishing or curing.

G. Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as indicated on the Contract Drawings. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the

concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior acceptance has been obtained.

H. Placing – Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least two hours.

I. Segregation – Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or flowing. Concrete shall not be subjected to any procedure, which will cause segregation.

J. Where placing operations would involve dropping the concrete more than 5 feet, it shall be deposited through a tube made of sheet metal, canvas or other approved materials. Aluminum hoppers or tubes shall not be used. Lower ends shall be kept as close as possible to the newly placed concrete and not more than 3 feet above the concrete. All tubes shall have a minimum diameter of 6 inches unless otherwise directed by the Department.

3.09 CONSOLIDATION

A. All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators used shall be the largest size and most powerful that can be properly used in the work. Competent workmen shall operate the vibrators. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

B. Consolidate concrete thoroughly as it is placed in order to secure a dense mass. Work concrete well around the reinforcement and embedded items and into the corners of the forms.

C. Use internal vibrators inserted vertically over the entire area of the placement.

D. Vibrate until voids are eliminated, coarse aggregate is suspended in mortar, and entrapped air bubbles begin to rise to the surface. Concrete should move back into the space vacated by the vibrator.

E. Space vibrator insertions such that the area visibly affected by the vibrator overlaps the adjacent just-vibrated area by a few inches.

F. Penetrate at least 6" into previously placed layers in order to bond between layers and avoid cold joints.

G. Form vibrators may not be used.

H. Take care not to over-vibrate air entrained concrete. Place vibrator to eliminate honeycombing but avoid excess vibrating that bleeds all entrapped air from the mix.

I. Do not use vibrators to transport concrete.

3.10 JOINTS AND KEYWAYS

A. Construct expansion, control, and isolation joints and keyways where indicated on the drawings and at additional locations approved by the Engineer as shown on the Standard Details.

B. Where the placing of concrete is discontinued, clean off laitance and other objectionable material to a sufficient depth to expose sound concrete as soon as concrete is firm enough to retain its form. Smooth the top surface of concrete adjacent to the forms with a trowel to minimize visible joints on exposed faces.

C. Immediately after the work of placing concrete is halted, remove accumulations splashed upon the reinforcement and the surfaces of the forms. Perform this removal before concrete takes its initial set. Clean reinforcing steel carefully to prevent damage to the concrete steel bond.

D. Do not halt work within 18" of the top of any face.

E. For bonded horizontal joint construction, roughen the surface and expose the aggregate. Clean the surface thoroughly by wet sandblasting, by cutting with high-pressure water jet or by other approved methods. Perform cleaning after the concrete has hardened to prevent raveling of the surface below the desired depth.

F. Before bonding concrete is placed, clean the surface of loose or soft particles or other objectionable materials and keep wet for a minimum period of 12 hours.

G. Cover the cleaned and saturated surface with a coating of neat cement grout and deposit new concrete before the grout has attained its initial set.

H. The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all others not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

I. The hardened concrete of horizontal construction joints in exposed work; horizontal construction joints in the middle of beams, girders, joists, and slabs; and horizontal construction joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The fresh concrete shall be placed before the grout has attained its initial set.

3.11 CONCRETE PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperature and mechanical injury. Maintain with minimum moisture loss and relatively constant temperature for the period necessary for hydrant of the cement and hardening of the concrete.

B. After the concrete has hardened, loosen forms as soon as possible without damage to the concrete, and run curing water continuously down inside the form.

C. Unless adequate protection is provided, concrete shall not be placed during rain, sleet or snow.

D. Rainwater shall not be allowed to increase the mixing water or damage the surface finish.

E. The temperature of the concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and should not exceed 90 degrees F. When the temperature of the steel is greater than 120 degrees F, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete.

F. Protection from Mechanical Injury - During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

Loads shall not be applied to the concrete structure until the Contractor has completed curing, removing forms and placed concrete has reached a minimum compressive strength of 85% of the 28-day compressive strength, f'_c.

3.12 REMOVAL OF FORMS

A. Do not remove forms until members have acquired sufficient strength to support their own weight and imposed loads safely.

B. Forms for sides of beams, walls, columns, and other vertical faces which do not sustain loads may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after the last portion of concrete in the section has been placed, if the concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs and other structural elements that supports weight of concrete in place until concrete has achieved at least 70% of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

3. Schedule form removal to maintain surface appearances that matches approved work.

4. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.

C. In cold weather, all forms must remain in place for 5 days.

D. Notify the Engineer before forms are removed in order that an examination of the newly-stripped surfaces may be made prior to patching.

3.13 REPAIR OF SURFACE DEFECTS

A. Repair immediately after form removal.

B. Repair of Defective Areas:

1. All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary the edges shall be perpendicular to the surface or slightly undercut. No featheredges will be permitted. The area to be patched and an area at least 6 inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand passing a No. 30 mesh sieve, mixed to the consistency of thick cream, and then well brushed into the surface.

2. The patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the course aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

3. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the pre-mixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least 1 hour before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall, which will be exposed.

C. Tie Holes - After being cleaned and thoroughly dampened, the tie holes shall be filled solid with patching mortar.

D. Proprietary Materials - if approved by the Engineer, proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer's recommendations.

E. Perform patching before curing compound is applied.

F. Cure patched areas in the same way as adjacent concrete.

G. Make repairs uniform in color and finish with surrounding concrete.

3.14 CURING

A. Keep concrete moist for at least 7 curing days after placement.

B. A curing day is defined as 24-hour day when the concrete surfaces are kept moist and the uniform temperature of the concrete mass is between 55°F and 75°F.

C. Curing may be achieved by water curing or application of a liquid membrane-forming curing compound. Curing compounds may not be used on surfaces that are to receive additional concrete, paint or tile.

D. Water curing is the preferred method of protection. Cover exposed surfaces with a saturated material (burlap or cotton mats) and keep wet continuously with a soil soaker hose for 7 days. Leave covering in place, without wetting, for an additional 3 days.

E. The use of curing compound (ASTM C309) is permissible. Keep surfaces moist after the forms are removed and the form tie holes repaired. After the surfaces are finished, apply the curing compound according to the manufacturer's recommendations. Do not remove too much forming at one time.

F. Slabs: Immediately following slab finishing, apply liquid membrane-forming curing compound or begin water curing before the surface becomes dry.

G. Vertical Surfaces: When the forms are removed entirely, spray the surface with water and allow to reach a uniform damp appearance with no free water on the surface. Apply curing compound or begin water curing.

3.15 CONCRETE WALL FINISHES

A. Refer to Table II for type finish at each location.

B. Smooth Form Finish (SFF)

1. Use a form facing material that will produce a smooth, hard, uniform texture on the concrete.

2. Keep seams to a practical minimum.

3. Patch tie holes and defects.

4. Remove all fins.

3.16 CONCRETE SLAB FINISHING

A. Refer to Table II for type finish at each location.

B. Complete screeding and darbying slabs before excess moisture or bleeding water is present on the surface.

C. Do not begin subsequent finishing operations until surface water has disappeared and the concrete will sustain foot pressure with only approximately 1/4" indentation.

D. Float Finish (FF)

1. Consolidate concrete with a power-drive disc-type float or a combination floating-troweling machine with metal float shoes attached.

2. Machines which have a water attachment for wetting the concrete during the finishing operation are prohibited.

3. Unless otherwise indicated in Table II, check and level surface plane to a tolerance not exceeding 1/4" in 10 feet when tested with a 10-foot straightedge. Cut down high spots and fill low spots. Immediately after re-leveling, refloat surface to a uniform, smooth, granular texture.

4. Where slab drainage is indicated, take care to maintain accurate slopes for drainage.

E. Steel Troweling: After float finishing, steel trowel surface as specified in Table II to increase compaction of fines and to provide maximum density and wear resistance.

F. Integral Finishes (IF)

1. Use for slabs where some material other than concrete will be the final wearing surface.

2. Screeded Finish - Place screed blocks at frequent intervals and strike off to surface elevations desired. Unless otherwise indicated, use on base slabs upon which grout finish, regular mortar bed ceramic tile, sand cushion terrazzo or similar type wearing surface is applied.

3. Steel Troweled Finish - Use on concrete slabs for resilient floors, ceramic tile using thin bed method, seamless flooring, epoxy or latex terrazzo, carpet and wood.

G. Non-slip Broom Finish: In addition to floating and troweling, provide walks, ramps, steps, and exposed floor areas subject to foot traffic and likely to be wet with a final non-slip broom finish. Draw broom over previously finished finish.

H. Expansion Joints

1. Edge or lightly stone the edges of expansion and contraction joints after the forms are stripped and before the adjacent slab is placed.

2. Leave joints in the completed work carefully tooled and free of mortar and concrete.

3. Leave joint filler exposed for its full length with clean and true edges.

4. Apply sealant at expansion joints where indicated.

I. Abrasive Aggregate Non-slip Finish

1. Screed and float concrete to the required finish level with no coarse aggregate visible.

2. Uniformly sprinkle abrasive aggregate over the floated surface at a rate of not less than 1/4 pound per square foot.

3. Steel trowel surface to a smooth even finish.

4. Immediately after curing, remove cement coating covering the abrasive aggregate by steel brushing, rubbing with an abrasive stone or sandblasting to expose abrasive particles.

J. Hardener Floor Treatment: Install in accordance with manufacturer's instructions.

TABLE I
PROPERTIES OF CEMENT CONCRETE

Concrete Group	Req'd. 7-Day Strength (PSI)	Req'd. 28-Day Strength (PSI)	Reinf. Steel Grade	Max. Water/ Cement Ratio	Percent Air Content	Min./ Max. Slump	Maximum C_3A Content	Cement Type	Maximum Aggre-gate Size
E	2,000	3,000	60	0.45	5% +or - 1%	2"- 4"	8%	II or IIA	1-1/2"

TABLE II
CONCRETE FINISH SCHEDULE

Location	Concrete Group	Finish	Remarks
Weir Footing	E	ST	Surface
Weir Wall	E	SFF	Vertical Wall Face
Weir Wall	E	NSBF	Top Surface

Legend: SFF= Smooth Form Finish FF= Float Finish IF= Integral Finish
ST= Steel Trowel NSBF = Non-Slip Broom Finish

For precast structures see respective specifications for concrete finish.

3.17 HOT WEATHER REQUIREMENTS

A. Hot weather conditions are deemed to exist when the temperature in the forms is 75°F or above, or a combination of high air temperature, low relative humidity and wind velocity impairs the quality of fresh or hardened concrete. Take protective measures for mixing, transporting and placing concrete in accordance with ACI 305.

B. The temperature of the concrete at the place of discharge may not exceed 85°F.

1. If ice is used to lower temperature, place crushed, shaved or chipped ice directly into the mixer as part or all of the mixing water. Mix until ice is completely melted.

2. Record the concrete temperature at the time of discharge.

C. Do not add water that will cause the proportions to exceed the maximum water-cement ratio shown in Table I.

1. Notify the resident project representative before adding any water to the concrete mix.

2. Record the amount of water added to the concrete at the jobsite.

D. Discharge concrete within 45 minutes or 100 revolutions, whichever occurs first, after the first mixing of cement and aggregates.

E. Placing and Curing

1. Place concrete promptly upon arrival.

2. Provide at least one standby vibrator for each 3 vibrators in use.

a. Protect concrete from direct sunlight. Keep forms covered and moist by means of water sprinkling or the application of continuously wetted burlap or cotton mats for a minimum of 24 hours.

3. When forms are removed, provide wet cover to the newly exposed surfaces to avoid exposure to hot sun and wind.

4. Continue specified water curing methods for 10 days. Leave covering in place 4 additional days. Do not permit alternate wetting and drying cycles.

5. For slabs on grade, beam and deck concrete, and other horizontal placements, protect the surface between finishing operations using one or more of the following methods:

a. Careful use of a fog nozzle.

b. Spreading and removing polyethylene sheeting between finishing operations.

c. Application of monomolecular film after the strike off.

3.18 COLD WEATHER REQUIREMENTS

A. Cold weather is defined any time when the daily temperature is 40^{o}F or lower during placement and the protection period.

B. Protect concrete surfaces from freezing for at least 24 hours after placement.

C. All surfaces in contact with newly-placed concrete including formwork, reinforcement and subgrade must be above 35^{o}F.

D. Place concrete at a temperature of not less than 55^{o}F. Mix concrete at a temperature between

1. 60^{o}F and 70^{o}F when outside air temperature is above 30^{o}F.

2. 65^{o}F and 75^{o}F when outside air temperature is between 0^{o}F and 30^{o}F.

3. 70^{o}F and 80^{o}F when outside air temperature is below 0^{o}F.

E. Follow concrete placement with tarpaulins or other readily movable coverings, so only a few feet of concrete is exposed to the outside air at any time.

F. Maintain the temperature and moisture conditions specified in all parts of the newly-placed concrete by covering, insulating, housing or heating. Arrange for protection methods in advance of placement.

G. Maintain concrete at a temperature of not less than 50ºF nor more than 70ºF for a period of 3 days after placement.

H. Do not remove forms during the initial protection period.

I. Protect insulation against wetting that will impair its insulating value using moisture-proof cover material. Keep insulation in close contact with concrete.

J. Construct enclosure to withstand wind and snow loads and be reasonably air-tight. Provide sufficient space between the concrete and enclosure to permit free circulation of heated air.

K. Use vented heaters. Do not permit heaters to heat or dry concrete locally.

L. Maintain relative humidity above 40% within heated enclosures before construction supports are removed.

M. Monitor temperature to insure concrete is kept within specified limits recording time and concrete temperature every 8 hours.

N. Assure concrete has developed necessary strength before removing forms. Provide additional test cylinders with the same protection as the structure they represent to verify concrete strength before construction supports are removed.

O. If water curing is used, terminate at least 12 hours before end of temperature protection period. Permit concrete to dry.

P. After the required protection period, gradually reduce the concrete temperature within an enclosure or insulation at a rate not to exceed 20º per day until the outside temperature has been reached.

Q. Apply membrane-forming curing compound to concrete surfaces during the first period of above-freezing temperatures after forms are stripped and before air temperature rises to 50º. Apply membrane-forming curing compound to slabs as soon as finishing operations are completed, except where live steam curing is used.

3.19 CURBING AND SIDEWALKS

A. Shall be installed using materials and practices set forth in these specifications.

B. Shall be as detailed on the contract documents.

3.20 TESTING

A. General - Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when either such defect is discovered nor shall it obligate the Authority for final acceptance.

B. Testing Services - The following testing services shall be performed by the designated testing agency:

1. Perform compressive strength, slump and air content tests of the concrete during construction in accordance with the following procedures:

a. Secure composite samples in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.

b. Mold and cure three specimens from each sample in accordance with ASTM C31. Any deviations from the requirements of this standard shall be recorded in the test report.

c. Test specimens in accordance with ASTM C39. Test 2 cylinders at 7 days; test 2 cylinders at 28 days. Hold the remaining cylinder for testing in the event that any of the other cylinders are damaged prior to testing. The acceptance test results shall be the average of the strengths of the two cylinders tested at 28 days. If one cylinder in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both cylinders in a test show any of the above defects, the entire test shall be discarded.

d. Make at least one strength test for each 50 cu. yd., or fraction thereof, of each mixture design of concrete placed in any 1 day. When the total quantity of concrete with a given mixture design is less than 20 cu. yd., the strength tests may be waived by the Engineer if, in the Engineer's judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.

2. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using ASTM C143.

3. Determine air content of the concrete sample for each strength test in accordance with ASTM C231, ASTM C173, or ASTM C138.

4. Determine temperature of the concrete sample for each strength test.

C. Additional Services When Required - The following services shall be performed by the testing agency when required by the Owner at the Contractor's expense:

1. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the Owner.

2. Sample concrete at point of placement and perform required tests.

3. Review the manufacturer's report for each shipment of cement and reinforcing steel and conduct laboratory tests or spot checks of the materials as received for compliance with specifications.

4. Mold three specimens from each sample (in addition to those required in Section 3.19.B.1.b) in accordance with ASTM C31 and field cure in or on the structure providing the same method of cure for the specimens as that which the structure receives.

D. Other Services As Needed - The following services shall be performed by the testing agency at the Contractor's expense:

1. Additional testing and inspection required because of changes in materials or proportions requested by the Contractor.

2. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements.

E. Duties and Authorities of Designated Testing Agency:

1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete as required by the Authority. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing agency shall report such deficiency to the Authority and the Contractor.

2. The agency shall report all test and inspection results to the Authority and Contractor immediately after they are performed. All test reports shall include the exact location in the work at which the batch represented by a test was deposited. Reports of strength tests shall include detailed information on storage and curing of specimens prior to testing.

3. The testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the Contract Documents, nor to approve or accept any portion of the work.

F. Responsibilities and Duties of Contractor:

1. The Contractor shall provide the necessary testing services for the following:

a. Qualification of proposed materials and the establishment of mixture designs.

b. Other testing services needed or required by the Contractor.

2. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

3. The Contractor shall submit to the Authority the concrete materials and the concrete mix designs proposed for use with a written request for acceptance. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the Contractor has received such acceptance in writing.

4. To facilitate testing and inspection, the Contractor shall:

a. Furnish any necessary labor to assist the testing agency in obtaining and handling samples at the project or other sources of materials.

b. Advise the testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.

c. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hours as required by ASTM C31.

3.21 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Evaluation of Test Results:

1. Test results for standard molded and standard cured test cylinders shall be evaluated separately for each specified concrete mixture design. Such evaluation shall be valid only if tests have been conducted in accordance with procedures specified in Section 3.19.

2. For evaluation, each specified mixture design shall be represented by at least five tests.

B. Acceptance of Concrete

1. Strength - The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'_c, and no individual strength test result falls below the specified strength f'_c by more than 500 psi.

2. Durability – The durability level of the concrete will be considered satisfactory so long as the requirements of ACI 301, Section 1.7.5 are met.

C. Testing of Concrete In Place:

1. Testing by impact hammer, sonoscope, or other nondestructive device may be permitted by the Owner to determine relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, shall not be used as a basis for acceptance or rejection.

2. Core tests

a. Where required, cores at least 2 in. in diameter shall be obtained and tested in accordance with ASTM C42. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 degrees F to 80 degrees F, relative humidity less than 60 percent) for 7 days before testing and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in accordance with ASTM C42.

b. At least three representative cores shall be taken from each member or area of concrete in place that is considered

potentially deficient. The location of cores shall be determined by the Authority to least impair the strength of the structure. If, before testing, one or more of the cores shows evidence of having been damaged subsequent to or during removal from the structure, it shall be replaced with a new core.

c. The strength level of concrete in the area represented by a core test will be considered adequate if the average strength of the cores is equal to at least 85 percent of specified strength f'_c and if no single core is less than 75 percent of the specified strength f'_c.

d. Core holes shall be filled with low slump concrete or mortar. See Section 3.13, Repair of Surface Defects.

3.22 ACCEPTANCE OF STRUCTURE

A. General:

1. Completed concrete work which meets all applicable requirements will be accepted without qualification.

2. Completed concrete work, which fails to meet one or more requirements, but which has been repaired to bring it into compliance will be accepted without qualification.

3. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Specifications or in the Contract Documents. In this event, modifications may be required to assure that the work complies with the design intent.

B. Dimensional Tolerances:

1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of ACI 117 shall be considered potentially deficient in strength and subject to the provisions of Section 3.21.D.

2. Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of ACI 117 may be rejected and the excess material shall be subject to removal. If removal of the excess material is permitted, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.

3. Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely affected or misplaced items interfere with other construction.

4. Inaccurately formed concrete surfaces exceeding the limits of ACI 117, and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.

5. Finished slabs exceeding the tolerances of Section 3.16 may be repaired provided that strength or appearance is not adversely affected. High spots may be removed with terrazzo grinder, low spots filled with a

patching compound, or other remedial measures performed as permitted.

C. Appearance:

1. Other concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired only by acceptable methods.

2. Concrete not exposed to view is not subject to rejection for defective appearance.

D. Strength of Structure:

1. The strength of the structure in place will be considered potentially deficient if it fails to comply with any requirements, which control the strength of the structure, including but not necessarily limited to the following conditions:

   a. Low concrete strength as designated in Section 3.20

   b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the requirements of Section 3.03, Reinforcement, or the Contact Drawings.

   c. Concrete, which differs from the required dimensions or location in such a manner as to reduce the strength.

   d. Curing less than that specified.

   e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.

   f. Mechanical injury (as defined in Section 3.11.F), construction fires, accidents or premature removal of formwork likely to result in deficient strength.

   g. Poor workmanship likely to result in deficient strength.

2. Structural analysis and/or additional testing may be required when the strength of the structure is considered potentially deficient.

3. Core tests in accordance with Section 3.20.C.2 may be required when the strength of the concrete in place is considered potentially deficient.

4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and there results evaluated in accordance with ACI 318.

5. Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction if so directed by the Authority, or shall be replaced, at the Contractor's expense.

6. The Contractor shall pay all costs incurred in providing the additional testing, analysis and/or engineering services required by this section.

E. Durability of Structure

The durability level of the structure will be considered satisfactory so long as the requirements of ACI 301, Section 1.7 are met.

END OF SECTION

SECTION 03400

PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Valve Vaults
2. Meter Vaults
3. Pump Stations

B. Related work specified elsewhere:

1. Section 02300 – Earthwork
2. Section 15950–Adjusting, Balancing Gravity Pipe Flow–Pressure Testing

1.02 QUALITY ASSURANCE

A. Design Criteria

1. Watertight precast reinforced air-entrained concrete structures designed to ASTM C890, A-16 live loading and installation conditions, and manufactured to conform to ASTM C913.
2. Minimum 28-day Compressive Strength: 5,000 psi.
3. Honeycombed or retempered concrete will not be acceptable.

B. Reference Standards

1. American Society for Testing and Materials (ASTM)

a. ASTM C858 - Underground Precast Concrete Utility Structures.

b. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.

c. ASTM C891 - Practice for Installation of Underground Precast Concrete Utility Structures.

d. ASTM C913 - Specifications for Precast Concrete Water and Wastewater Structures.

1.03 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit detailed shop drawings to the Engineer for approval prior to fabrication.

2. Include details of reinforcing steel, joint design, concrete mix design, and design calculations.

B. Submit certification from the precast structures manufacturer attesting that the structures meet or exceed Contract Specifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete units with equipment designed to protect the units from damage.

B. Do not place units in position which will cause overstress, warp or twist.

C. Separate stacked members with battens across the full width of each bearing point.

D. Stack so that lifting devices are accessible and undamaged, and identification marks are discernible.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, Type II.

B. Coarse Aggregates: ASTM C33; Graded 1" to No. 4 Sieve.

C. Sand: ASTM C33; 2.35 fineness modulus.

D. Water: Potable; clean and free of injurious amounts of acids, alkalis, salts, organic materials, or other substances that may be incompatible with concrete or steel.

E. Air-Entraining Admixtures: ASTM C260.

F. Reinforced Steel

1. Deformed Bars: ASTM A615, Grade 60

2. Welded Wire Fabric: ASTM A185.

G. Joint Sealant: ASTM C990.

2.02 MIXES

Design concrete mix to produce the required concrete strength, air-entrainment, watertight properties, and loading requirements.

2.03 FABRICATION AND MANUFACTURE

Fabricate precast reinforced concrete structures in accordance with ASTM C913, to the dimensions indicated on the Contract Drawings, and to the specified design criteria.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Unless otherwise specified herein below, the precast units shall be installed in accordance with ASTM C891.

B. Install precast concrete units to the elevation and location indicated on the Contract Documents.

C. Install required pipe connections, valves, baffles and other appurtenances as indicated on the Contract Drawings.

3.02 BACKFILLING STRUCTURES

A. Do not backfill precast concrete structures until after examination and approval of the Engineer.

B. Backfill structures in accordance with Section 02300 - Earthwork.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to:

1. Portland Cement Grout

2. Rapid-curing Epoxy Grout

3. Non-shrink Cementitious Grout

1.02 SUBMITTALS

A. Submit a Statement of Compliance, together with supporting data, from the materials suppliers attesting the conformance of products and ingredients with these specifications.

B. Submit manufacturer's instructions for mixing, handling, surface preparation, and placing the epoxy type and the non-shrink type grouts.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT

A. ASTM C150, Type I and II.

2.02 WATER

A. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities that will cause:

1. Corrosion of steel,

2. Volume of change that will increase shrinkage cracking,

3. Efflorescence, or

4. Excess air entraining

2.03 FINE AGGREGATE

A. Washed natural sand.

B. Gradation in accordance with ASTM C33 and represented by a smooth granulometric curve within the required limits.

C. Free from injurious amounts of organic impurities as determined by ASTM C40.

2.04 RAPID-CURING EPOXY GROUT

A. High strength, three component epoxy grout formulated with thermosetting resins and inert fillers.

B. Grout shall be rapid-curing, have high adhesion, and be resistant to ordinance chemicals, acids and alkalies.

C. Physical Properties

		Reference Spec.
Compressive Strength	12,000 psi (7-day)	ASTM C579
Tensile Strength	2,000 psi minimum	ASTM C307
Coefficient of Expansion	30x10-6 in/in/^{o}F	ASTM C531
Shrinkage	None	ASTM C827

2.05 NON-SHRINK CEMENTITIOUS GROUT

A. Pre-mixed ready for use formulation requiring only the addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.

B. Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with Corps of Engineers Specification CRD-C621, or Type D non-shrink grout:

Setting Time:	Initial	2 hours (Approx.)
ASTM C191	Final	3 hours (Approx.)
Expansion:		0.10% - 0.4% Maximum
Compressive Strength:	1 day	4,000 psi
CRD-C621	7 days	7,000 psi
	28 days	10,000 psi - 10,800 psi.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until a sound, clean concrete surface is achieved.

B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Task special precautions during period of extreme weather conditions in accordance with the manufacturer's written instructions.

F. Saturate concrete surfaces with clean water; remove excess water, level none standing.

3.02 FORMWORK

A. Construct leakproof forms anchored and shored to withstand grout pressures.

B. Provide clearance between the formwork and the area to be grouted to permit proper placement of grout.

3.03 MIXING

A. Portland Cement Grout

1. Prepare grout composed of Portland cement, sand and water; do not use ferrous aggregate or staining ingredients in grout mix.

2. Use proportions of 2 parts sand and 1 part cement, measured by volume.

3. Prepare grout with sufficient water to obtain consistency to permit placing and packing.

4. Mix water and grout in two steps; pre-mix using approximately 2/3 of the water; after partial mixing, add the remaining amount of water to bring mix to the desired placement consistency and continue mixing 2-3 minutes.

5. Mix only that quantity of grout that can be placed within 30 minutes after mixing.

6. After the grout has been mixed, do not add more water for any reason.

B. Epoxy Grout & Non-Shrink Cementitious Grout: Mix and prepare epoxy grout and non-shrink cementitious grout in strict accordance with the manufacturer's instructions.

C. Mix grout components as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.

3.04 PLACING

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate the placed grout mixture or permit it to be placed if the area is being vibrated by nearby equipment.

E. The final installation shall be thoroughly compacted and free of air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.05 CURING

A. After grout has attained its initial set, keep damp for a minimum of 3 days.

B. Prevent rapid loss of water from the grout during the first 48 hours by the use of an approved membrane curing compound or with the use of the wet burlap method.

END OF SECTION

SECTION 07100

WATERPROOFING AND DAMPPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide materials, labor and equipment required to perform all waterproofing and dampproofing Work indicated on the drawings, as specified herein, and as needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Waterproofing membrane shall be compatible with waterproofing material and installed by methods approved by the membrane manufacturer.

1.03 PRODUCT HANDLING

A. Deliver the materials to the job site and store, in a safe are, out of the way of traffic and shored up off the ground surface, complying in all respects with product manufacturers recommendations.

B. Pallets of material shall be stored at job site on a level surface and protected from the weather. Membrane shall be left on pallets as received and not stacked more than one pallet high.

1.04 SUBMITTALS

A. Product data: Within 21 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided for all work under this Section;

2. Manufacturers' specifications and other data needed to prove compliance with the manufacturer’s recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.05 CAUTIONS AND WARNINGS

A. Primers and mastics are solvent-based liquids. Prior to the use of any product, consult the manufacturer's product label for handling, use and storage instructions.

B. Adhere strictly to all manufacturer's cautions, warnings and product safety and handling instructions.

PART 2 - PRODUCTS

2.01 MEMBRANE WATERPROOFING

At foundation walls below grade, use Premoulded Membrane with Plasmatic Core as manufactured by W. R. Meadows, Inc., 2100 Monroe Street, York, PA 17405. Phone: (717) 792-2627, Fax: (717) 792-0151, or acceptable equivalent. Provide joint sealing strips, bonding agents and other materials required for a complete system as recommended by manufacturer.

2.02 COATING FOR MEMBRANE WATERPROOFING

The coating for membrane waterproofing shall consist of a prime coat, three mop coats, and two layers of fabric. Membrane waterproofing shall be applied to the face of construction joints as shown on the Contract Drawings for a width of 16-inches minimum centered on the joint.

2.03 WATERPROOFING MEMBRANE

The adhesive side of the membrane shall be protected with a special release paper that can be easily removed for installation. The membrane shall conform to the following requirements:

Test Property	Test Method	Specification Limit
Grab Tensile Strength	ASTM D 5034	70
Pliability, 180-degree bend	ASTM D 146	Unaffected
Resistance to Puncture	ASTM E 154	40
Permeance, Permeabiltiy	ASTM E 96 –B	0.1
Weight, Oz/SY, Min.	ASTM D 3776	40

2.04 DAMPPROOFING

Dampproofing material shall be asphaltic coatings and shall consist of two prime coats and one seal coat. Dampproofing shall be applied to concrete surfaces that will be below ground. Dampproofing asphalt shall be hot applied and shall conform to ASTM D449. The primer shall conform to ASTM D41.

2.05 OTHER MATERIALS

Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Engineer.

PART 3 - EXECUTION

3.01 DELIVERIES

Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for this Work. Make as many trips to the job site as are needed to deliver materials of this Section in a timely manner to ensure orderly progress of the work.

3.02 COMPLIANCE

Do not permit materials not complying with the provisions of this Section to be brought onto or to be stored at the job site. Promptly remove non-complying materials from the job site and replace with materials meeting the requirements of this Section.

3.03 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.04 INSTALLATION

A. Install entire waterproofing system in strict accordance with system manufacturer's written instructions.

1. The concrete surface to receive membrane must be smooth and free from all sharp projections, dirt, dust and loose materials. Repair all voids and holes.

2. At foundation walls, continue application over the footings and under perimeter drains.

a) Backfilling may be done as soon as installation is completed and should be done within 4 hour after material is applied to the wall. Backfilling can be done as installation progresses. Care shall be taken to ensure that backfilling does not disrupt the bond of the membrane to the walls.

3. At deck, install sheets in continuous bed of hot asphalt.

B. Materials shall be applied at a temperature above 40 degrees F., unless specifically listed for application below .40 degrees F. Do not apply materials when there is ice, frost or dampness visible on the surface to be waterproofed or damp proofed.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 Description

A. Work Included:

The type of material to be used and the number of coats to be applied are listed in the "Painting Schedule" in Part 3.00 of this Section of these Specifications.

B. The term "paint", as used herein, includes enamels, paints, sealer, fillers, emulsions, and other coatings whether used as prime, intermediate, or finish coat.

1.02 Quality Assurance

A. Use only qualified journeymen painters for the mixing and application of paint on exposed surfaces; in the acceptance or rejection of installed painting, no allowances will be made for lack of skill on the part of painter.

B. Complying with all pertinent codes and regulation.

1.03 Submittals

In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these Specifications, submit for the Engineer's review the current recommended method of application published by the manufacturer of the proposed material.

1.04 Product Handling

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Store only the approved materials at the job site and store only on a suitable and designated area restricted to the storage of paint materials and related equipment.

1. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

2. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

1.05 Extra Stock

Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately 10% of each color use in each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

PART 2 - PRODUCTS

2.01 Paint Materials

A. Manufacturer:

1. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer.

2. Pittsburgh Paint, Glidden, Devoe, or Sherwin Williams or equal will be accepted subject to painting systems approval.

B. Compatibility:

1. All paint materials and equipment shall be compatible in use: finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; all tools and equipment shall be compatible with the coating to be applied.

2. Any paint used over metal primer shall be compatible with that primer.

3. Thinners, when used, shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

4. The use of lead base paint is prohibited.

PART 3 - EXECUTION

3.01 Surface Condition

A. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to a point where this installation may properly commence.

Verify that paint finishes may be applied in strict accordance with all pertinent codes and regulations and the requirements of these Specifications.

B. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 Preparation of Surfaces

A. General: Prior to all surface preparation and painting operations, completely mask, remove, or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures, cabinets, and similar items in contact with painted surfaces but not scheduled to receive paint.

B. Spot prime all exposed nails and other metals which are to be painted with emulsion paints, using a primer recommended by the manufacturer of the coating system.

C. Before applying paint or other surface treatment, thoroughly clean all surfaces involved. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet newly painted surfaces.

3.03 Preparation of Wood Surfaces

A. Clean all wood surfaces until they are free from dirt, oil, and all other foreign substance.

B. Unless specifically noted to be left rough, smooth all finished wood surfaces exposed to view, using the proper sandpaper.

3.04 Preparation of Metal Surfaces

Thoroughly clean all surfaces until they are completely free from dirt, oil and grease. Allow to dry thoroughly before application of paint.

3.05 Preparation of Concrete Block Surfaces

Thoroughly clean all surfaces until they are completely free from dirt, dust, oil, grease, and all other foreign substances.

3.06 Paint Application

A. Paint all surfaces except glass, flat concrete and similar items pre-finished and not called out as unfinished.

1. Paint all grills and other pre-finished items where the factory pre-finished is not in accordance with the Painting Schedule and color selection.

2. Allow sufficient drying time between coats.

3. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.

B. Environmental Conditions:

1. Comply with the manufacturer's recommendations as to environmental conditions under which the coating systems may be applied.

2. Do not apply paint in areas where dust is being generated.

C. Moisture Content:

1. Use a moisture-meter approved by the Engineer to test surfaces.

2. Do not apply the initial coating until moisture- meter reading is within limits recommended by the paint materials manufacturer.

D. Defects:

Sand and dust between coats to remove all defects visible to the unaided eye from a distance of five feet.

E. Color of Undercoats:

Slightly vary the color of succeeding coats.

3.07 Inspection

A. Do not apply additional coats until completed coat has been inspected and approved by the Engineer.

B. Only inspected and approved coats of paint will be considered in determining the number of coats applied.

3.08 Dry Mil Thickness

A. Apply all coatings to the dry mil thickness indicated in the "Painting Schedule".

B. Provide and use a "Tooke Dry Film Thickness Gauge", or other gage approved by the Engineer, to prove the dry mil thickness of paint applied.

3.09 Reinstallation of Removed Items

Following completion of painting in each space, promptly reinstall all items removed for painting using only workmen skilled in the particular trade.

3.10 Cleaning Up

A. During progress of the Work, do not allow the accumulation of empty containers or other excess items except in areas specifically set aside for that purpose.

Prevent accidental spilling of paint materials and, in event of such spill, immediately remove all spilled materials and the waste or other equipment used to clean up the spill, and wash the surfaces clean to their original undamaged condition, all at no cost to the Owner.

B. Upon completion of this portion of the Work, visually inspect all surfaces and remove all paint and traces of paint from surfaces not scheduled to be painted.

3.11 Painting Schedule

Apply the following finished to the areas designated:

A. Satin finish on gypsum wallboard

1. Intermediate coat: Flat Latex Enamel

2. Finish coat: Flat Latex Enamel

B. Semi Gloss Finish on metal

1. Intermediate coat: Oil Base Enamel

2. Finish coat: Oil Base Enamel

C. Satin finish on masonry block

1. Intermediate coat: Flat Latex Enamel

2. Finish coat: Flat Latex Enamel

END OF SECTION

SECTION 11101

GENERAL PROCESS MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The provisions of this entire section of the specifications are intended to govern the quality of design, fabrication, workmanship, operation, etc., of all materials, equipment and appurtenances to be furnished and installed under the various sections of the process mechanical specifications and all other sections that include process mechanical equipment as part of the specified items.

1.02 SUBMITTALS

A. Shop Drawings and Product Data

1. Shop drawings, including dimensioned drawings, descriptive literature, performance data, electrical characteristics, and in general all information necessary to provide compliance with the specifications, shall be submitted.

B. Maintenance Data and Operating Instructions

1. Submit an Operation and Maintenance Manual for the equipment furnished including a detailed description of the function of each principal component, procedures for operation, instructions for overhaul and maintenance. Include lubrication schedule, safety precautions, test procedures, electrical schematics, and parts lists.

1.03 “OR EQUAL”

Attention is directed to paragraph entitled “Specified Equipment and Materials” in Section 01600.

1.04 GUARANTEE

All materials, equipment, workmanship and performance shall be guaranteed for the period and in accordance with the provisions of Contract Documents.

1.05 MANUFACTURER’S OPERATION AND MAINTENANCE MANUALS

The Contractor shall provide manufacturer’s operation and maintenance manuals as required by Owner.

1.06 STANDARDS

Where standards, codes or specifications are referred to, the reference is to particular standards, codes or specifications together with all the latest amendments and errata applicable at the time the bids are taken. These are listed on the following page:

I.E.E.E.	Institute of Electrical & Electronics Engineers
A.S.T.M.	American Society for Testing Materials

A.S.M.E.	American Society of Mechanical Engineers
A.N.S.I.	American National Standards Institute
A.W.S.	American Welding Society
A.W.W.A.	American Water Works Association
N.F.P.A.	National Fire Protection Association
N.E.M.A.	National Electrical Manufacturer's Association
Federal	Federal Government Specifications
O.S.H.A.	Occupational Safety and Health Act
U.L.	Underwriters Laboratories
A.A.B.C.	Associated Air Balance Council
A.D.C.	Air Diffusion Council
A.G.A.	American Gas Association
A.R.I.	Air Conditioning and Refrigeration Institute
C.S.	Commercial Standard
I.B.R.	Institute of Boiler and Radiator Manufacturers
M.S.S.P.	Manufacturers Standards Society of the Valve and Fitting Industry
S.M.A.C.N.A.	Sheet Metal and Air Conditioning Contractors National Association
N.E.C.	National Electrical Code

1.07 GENERAL DESIGN OF EQUIPMENT AND MACHINERY

A. All equipment and machinery furnished under this contract shall be of the latest and most improved design suitable for the service of which it is to be used. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of labor, power, maintenance, renewals and repairs. The design and construction of all equipment and machinery shall be such as to permit operation with minimum noise, wear and vibration (maximum amplitude of 3.0 mils unless otherwise specified) when properly installed.

B. Ample room for erecting, repairs, inspecting and adjusting all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.

C. The design and construction of the several units shall be such that they shall present a uniform appearance and the arrangement shall be such that their operation shall be in harmony in every respect. Whenever possible, fittings and fixtures of the same make and model shall be used for the several units and their connections. All equipment of identical type and service shall be the product of the same manufacturer.

D. All equipment selected shall be of such size and general arrangement to suit the space in which it is to be installed.

E. The various parts of the equipment and machinery shall be of plain shape and good lines, especially designed and constructed for strength and durability. Casting shall be designed and constructed to cool uniformly without shrinking strains and shall have good sized fillets at all re-entrant corners. Sudden change of section shall be avoided.

F. Whenever possible, parts of each unit shall be made to gauge and be a duplicate of and interchangeable with the same parts of other machines of the same size and kind.

G. The workmanship shall be of the highest class throughout.

H. All assembles shall be completely shop fabricated and structural steel parts shall be shop erected. Assemblies and structural steel parts shall be match-marked before being disassembled for shipment. Parts shall be shipped assembled in as large unit as possible to minimize field reassembly. All parts shall be amply proportioned for all stresses which may occur during operation, and for any additional stresses which may occur during fabrication and erection.

I. Unless otherwise specified, welding shall be in accordance with the latest standard specifications for “Gas Tight Welding” of the American Welding Society.

J. Unless otherwise specified, galvanizing shall be hot-dipped in accordance with the latest standard specifications for “Zinc Coating” of the ASTM, Serial Designation A-123.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Unless otherwise specified, materials shall be in accordance with the following latest Standard Specifications of the ASTM:

Structural Steel	A-36
Welding Steel Pipe	A-53
Iron Castings	A-48
Babbitt	B-23
Bronze Castings	B-30
Bronze (Manganese)	B-138
Bronze (Silicone)	B-98
Steel Bolts	A-307
Hot Dip Zinc Coating	A-123
Stainless Steel Bolts	A-193, Grade B, Type 2

B. All materials shall, if required, be tested and shall fulfill all requirements specified. Physical tests may be made by the Owner or their representative. The Contractor at his own expense shall furnish test pieces and samples in the number, shape, size and finish required by the Engineer. All broken material shall become the property of the Owner. The failure of test specimens to fully conform to the requirements of the specifications shall be sufficient cause for rejection of the whole melt or stock from which samples were obtained.

C. Iron castings shall be smooth, clean and free from scale, lumps, blisters and other defects. No plugging, welding or filling will be allowed.

D. The alloy grade number of all Babbitt shall be that bearing alloy of a composition recommended by the manufacturer of the equipment or machinery for the service required, subject to the approval of the Engineer.

E. All bronze shall be made of new material and shall be free from objectionable imperfections. If the materials show signs of improper mixing when being machined, the castings will be rejected.

2.02 JOURNALS, BEARINGS AND KEYS

A. Journals and bearing surfaces shall be of sufficient size and properly proportioned for the least wear and to avoid heating under all conditions, and where necessary, provisions shall be made for each removal and for proper adjustments. Journals shall be suitable boxes which, where necessary, shall be lined with Babbitt metal hammered into grooves and bored in place. If bearings are of the ball bearing type, both inner and outer races as well as the balls shall be heat treated steel to resist wear. The balls shall be of ample size to carry the maximum loads with a large factor of safety to prevent flaking, spalling, or crushing. The balls shall be properly spaced and held in position by rugged continuous spacing or retainer rings.

B. Pins and keys shall be properly proportioned. Keys, nuts and all other parts which might otherwise work loose shall be secured with approved locking devices.

2.03 LUBRICATION

A. All bearings, except those specifically requiring oil or water lubrication, shall be pressure grease lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen. Pressure grease lubrication fittings shall be the “Alemite” type as made by the Stewart Warner Corporation, or equal. The pattern of the fitting shall be selected for accessibility in lubricating and shall meet the approval of the Engineer. Housings of grease lubricated bearings shall be automatically exhausted to atmosphere to prevent excessive greasing. The Contractor shall furnish three Alemite Hydraulic guns, or equal.

B. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication, the type of lubricant to be applied and the frequency of lubrication. Charts and schedules shall be submitted to the Engineer in quadruplicate, bound in folios, with each chart or schedule protected by a transparent plastic envelope.

C. The Contractor shall furnish one (1) year supply of each type of lubricant. A typewritten list shall be furnished with the lubricants, designating the specific lubricant to be used for each piece of equipment. This is in addition to the required operating and maintenance manuals which will also contain lubrication requirements.

2.04 MOTORS AND CONTROLS - GENERAL

A. Motors and controls shall conform to the latest requirements of IEEE and NEMA, and where applicable, shall be UL listed. Minimum sizes are specified with the driven equipment. Motor starting and control equipment is specified either with the

motor which is controlled or in an electrical specification section. The Contractor is advised to consult all specification sections to determine responsibility for motors and controls.

B. Motors shall be designed, built and tested in accordance with the latest revision of NEMA Standard MG 1.

C. Motors shall be suitable for use under the conditions and with the equipment to which applied, and designed for operation on the electrical systems specified or indicated.

1. Motor capacities shall be such that the horsepower rating and the rated full-load current will not be exceeded while operating under the specified operating conditions. Under no condition shall the motor current exceed that indicated on the nameplate.

2. Motor sizes noted in the individual equipment specifications are minimum requirements only. It is the responsibility of the equipment manufacturers and of the Contractor to furnish motors, electrical circuits and equipment of ample capacity to operate the equipment without overload, without exceeding the rated full-load current, or overheating at full-load capacity under the most severe operating service of this equipment. Motors shall have sufficient torque to accelerate the total WR^2 of the driven equipment to operating speed.

3. Motors shall be continuous duty type and shall operate quietly at all speeds and loads.

4. Motors shall be designed for operation on 60 hertz power service. Unless otherwise specified or shown, motors less than 1/2 horsepower shall be single phase, and motors 1/2 horsepower and larger shall be 3 phase.

5. Motors shall be mounted so that the motor can be removed without removing the entire driven unit.

D. Single phase motors smaller than 1/20 horsepower shall be ball or sleeve bearing, drip-proof, totally enclosed or explosion proof, as specified, 115 volts, permanent split capacitor or shaded pole type. These motors shall not be used for general power purposes and shall only be provided as built-in components of such mechanical equipment as fans, unit heaters, humidifiers and damper controllers.

E. Single phase motors 1/20 horsepower and larger shall be ball bearing, drip-proof, totally enclosed or explosion proof, as specified, with Class A or B insulation, as standard with the motor manufacturer; 115, 115/230, 200 or 230 volts as required; capacitor start-induction run, permanent split capacitor, or repulsion start-induction run type.

F. Except as otherwise specified in the various specification sections, 3 phase motors shall meet the requirements of this paragraph. Motors shall be NEMA design B squirrel cage induction type. Insulation shall be Class F and motor shall be rated at no greater than 50 degrees C rise for open motors and 65 degrees C rise for closed motors both above an ambient temperature of 45 degrees C. At 40 degrees C ambient temperature explosion proof and totally enclosed motors shall have a 1.00 service factor and drip-proof motors shall have a service factor of 1.15 or higher. Motors specified for operation at 480 volts shall be name-plated 460 volts.

G. Minimum three phase motor efficiencies at full load for motors having nominal rated speeds of 1200 RPM and higher shall be as follows:

Horsepower	Minimum Efficiency
1	80.0
1-1/2	81.5
2	82.5
3	84.0
4	85.5
5	87.5
7-1/2	87.5
10	87.5
15	88.5
20	90.2
25	91.0
30	91.0
40	91.7
50	92.4
60	93.0
75	93.0
100	93.6
125	93.6
150	94.1
200	94.5
250	95.0

Three phase motors shall be E-plus Energy Efficient Standard Duty Motor of the Electric Motor Division of Goulds, Inc., the MAC II High Efficiency motor of Westinghouse Electric Corporation, the equivalent product of Baldor Company, or equal.

H. Motors seventy-five (75) horsepower and larger shall be as specified with the driven equipment in these specifications.

I. Belt-connected motors shall have adjustable bases and set screws to maintain proper belt tension. All fan motors shall have adjustable sheaves for speed adjustment.

2.05 FLANGES AND BOLTS

A. Flanges, except as otherwise specified, shall be cast solid, and bolt holes shall be drilled and spot-faced on the back. Stud holes shall not be drilled through. Flanges shall be uniform in thickness and shall come fair and, if required, shall be turned or chipped in a neat and workmanlike manner.

B. Jacking screws shall be provided for covers, etc. where required, and also suitable eye bolts for lifting. Bolts and nuts shall be of the best quality of open hearth, free machining steel. Bolts shall have good, sound, well-fitting threads; nuts shall be cold pressed. All heads, nuts and threads shall be of the American Standard regular sizes. All ferrous bolts and nuts shall be galvanized by the hot dipped process.

C. Bolts and nuts connecting pumps, valves and meters (as in flange connections) shall be Stainless Steel - Grade 416.

2.06 COUPLINGS

A. Except where otherwise specified for a particular item of equipment, all equipment where flexible couplings are specified or are required for the purpose, a standard self-aligning forged steel coupling with sealed lubrication, as manufactured by Thomas, Koppers, Falk, Sier-Bath, or equal shall be provided between each motor and its driven equipment. One hub of the coupling shall be firmly fixed and keyed to the equipment shaft with the other hub similarly secured to the abutting drive shaft. Couplings shall be placed as close as possible to the driven equipment and the motor bearings to make compactly arranged units. Couplings shall be of all metal construction and shall be moisture-proof and dustproof. Arrangement of couplings shall be such that there is sufficient room to place a dial indicator for alignment checking of shafts of the motor driven equipment. Each coupling shall be provided with an easily removable guard meeting all OSHA requirements.

B. All equipment and motors/drives shall be field aligned using a dial indicator in accordance with the procedures established by the latest revision of the Hydraulic Institute Standards. Parallel and angular misalignment shall not exceed the limits recommended by both the equipment and the coupling manufacturer.

2.07 EQUIPMENT BEDPLATES

A. The various items of motor driven equipment, such as pumps, shall be mounted on structural steel bedplates. The bedplates shall be adequate size to accommodate the equipment and its motor, to form an integral rigid mounting platform. Steel or brass shims shall be used to level equipment bedplates mounted in contact with concrete pads or floors. Jacking bolts or jacking (leveling) nuts on mounting studs shall not be used in lieu of shims. Bedplates shall be grouted to the concrete base and shall be filed with grout in all instances where the manufacturer has made provision for introducing grouting mixture into bedplate cavities. It shall be the contractor's complete responsibility to determine the proper method, to provide all materials and components required, and to coordinate the work, to set, couple, align and install all equipment in a satisfactory manner.

PART 3 - EXECUTION

3.01 MANNER OF INSTALLATION

A. The general arrangement of pipe and equipment shall be as shown on the drawings. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted to the Engineer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment as indicated, without substantial alteration. Because of the small scale of the drawings, it is not possible to indicate the exact location of piping, all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the space requirements for proper clearances and the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such offsets, fittings, valves and accessories as may be required to meet such conditions.

B. Each trade shall determine the location, size, etc. of all chases and openings required for the proper installation of its work, and shall see that such are provided. Where it is necessary to run pipes or ductwork through walls or fittings, the trade performing the work shall notify the Contractor so that proper provisions can be made for same. Each trade shall furnish and set all inserts, sleeves, hanger

supports, etc. required for its work and shall be responsible for their proper and permanent location.

C. All piping and ductwork exposed to view shall be run generally parallel with the lines of the building and as close to walls and column as may be practical and consistent with proper grade and the maintenance of proper clearances for access to all parts requiring servicing.

D. The Contractor, in the prosecution of the work, shall do no cutting of woodwork, masonry, concrete or other materials after same have been installed, without the written permission of the Engineer. No waterproofing shall be cut for any purpose except on written approval of the Engineer.

3.02 TESTING

A. After erection, the Contractor shall adjust and balance all equipment and systems, and shall demonstrate that all equipment is operating in a satisfactory manner. All rotating equipment shall be lubricated according to recommendations of the manufacturer and all adjustments shall be made to suit anticipated station operating conditions. Each piece of machinery shall be tested to show that it operates quietly, without vibration, overheating, or sign of distress at full specified capacity. Adjustments shall be made as necessary. All defective parts on machinery shall be replaced.

B. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction.

3.03 MISCELLANEOUS

A. Finished parts shall be well protected in the shop, during transportation and before and after erection to prevent injury of any kind. Injured parts which in the opinion of the Engineer are damaged or which cannot be refitted, shall be promptly replaced by the Contractor without expense to the Owner. All exposed finished parts of machinery shall be greased or oiled before shipment.

B. The Contractor shall furnish all tools of special nature which are required for making adjustments (by the Owner after the work has been turned over to him) to equipment, but will not be required to furnish standard tools.

C. All exposed belts, gears, and drives shall be protected with guards. Guards may be of the equipment manufacturer’s standard design, but must meet all the OSHA Standards.

3.04 PAINTING AND LABELING

A. All fabricated or assembled surfaces normally painted shall be thoroughly dry and free from all rust, grease, dirt or scale. The Contractor is reminded to correlate the selection of shop prime coats to be compatible with subsequent field applied coats of paint. The Contractor shall touch up paint any item damaged during shipping or installation.

B. Each piece of equipment (including mechanical operators, and electrical switches for the equipment) shall be identified by hand painting or stenciled, two inch letters and numbers, to indicate the service or function. Unless specified otherwise in the mechanical and electrical sections of these specifications, each motor and motor

controller shall be similarly numbered (or lettered) to correspond to the number (or letter) of the driven unit.

3.05 ADJUSTMENTS TO RELATED WORK

The final work shall include any adjustment that may be required by the approved equipment furnished, with modifications made to concrete shapes and to dimensions shown on the contract drawings as may be required to suit the details of the approved equipment furnished, all at no additional cost to the County.

END OF SECTION

SECTION 11320

WET PIT SUBMERSIBLE NON-CLOG SEWAGE PUMPS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submersible Non-Clog Pumps

1.02 DESCRIPTION

A. Under this section, the contractor shall provide all labor, equipment, and materials necessary to furnish, install, test and place in operation submersible pumping units as shown in the plans and as specified herein.

B. Intended Purpose: The purpose of the pumps is to convey raw, un-screened, un-treated sewage under the conditions and installation described in this specification and shown in the project plans.

1.03 RELATED SECTIONS

A. Section 13100 - P.S. Precast Wet Wells, Valve Vaults, Meter Vaults, & Related Components

B. Section 15010 - General Building Mechanical Requirements

C. DIVISION 16 - Electrical

1.04 SUBMITTALS

A. Submit for approval complete characteristic curves of pumps prior to fabrication.

B. Submit completely assembled pump weight for each pump model to be provided.

C. Submit the following pump electric motor data:

1. Horsepower Rating
2. Voltage
3. Number of Phases
4. Service Factor
5. RPM @ Full Load
6. Locked-Rotor kVA Code (letter)
7. LRA (Locked Rotor Amps)
8. Design Letter (A, B, C, or D)
9. FLA (Full Load Amps)
10. Efficiency (%)
11. Power Factor

D. Prior to pump delivery submit for approval, certified copies of factory-run pump performance tests. Characteristics of pumps may have a tolerance of plus 10 percent of rated capacity at rated head or plus 5 percent of rated head at rated capacity. No minus tolerance will be acceptable. Give the Engineer seven days advance notice of performance test date.

E. Dimension drawings suitable for installation purposes, showing in particular distance from centerline of the pump to the face of the suction and discharge flanges, location and size of pump base anchor bolts, motor dimensions and the location and number of motor lifting lugs.

F. Complete material specifications for the pump.

G. Complete material specifications and drawings for the pump rail system.

H. Complete "Manufacturer's Equipment Warranty & Certification" form included at the back of this section.

1.05 QUALITY ASSURANCE

A. Design and construct the pumps in accordance with standards of the Hydraulic Institute. The efficiency of the pumps, when operating under conditions of the specified capacities and heads, shall be as near peak efficiency as practicable.

B. Obtain pumping equipment, motors, pump controls and appurtenances from the pump supplier whose responsibility is to ensure that the pumping equipment is properly coordinated and operated in accordance with these Specifications.

PART 2 – PRODUCTS

2.01 NON-CLOG WASTE WATER PUMPS

A. PUMP MODEL - Each pumping unit, including motor and guide rails, shall be under the unified responsibility of pump manufacturer. The pumps shall be Flygt Model NT 3153 HT or approved equal.

B. REQUIREMENTS - Furnish and install two (2) submersible non-clog wastewater pump(s). Each pump shall be equipped with a 12 hp submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.

C. PUMP DESIGN CONFIGURATION (Wet pit installation) - The pump shall be supplied with a mating cast iron __4___ inch discharge connection and be capable of delivering _200___ GPM at __70__ FT. TDH. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with _30__ feet of stainless steel lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

D. PUMP CONSTRUCTION – Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

E. COOLING SYSTEM (Cooling Jacket Equipped) – Each unit shall be provided with an integral motor cooling system. A stainless steel motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

F. CABLE ENTRY SEAL – The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.

G. MOTOR – The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. Motors shall be FM or UL listed in accordance with UL674 and 1207 for Class 1 Division 1 Group C&D hazardous environments. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 30 evenly spaced starts per hour. The rotor

bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

H. BEARINGS – The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

I. MECHANICAL SEALS – Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

Seal lubricant shall be non-hazardous.

J. PUMP SHAFT – The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

K. IMPELLER – The impeller shall be of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

L. VOLUTE / SUCTION COVER - The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-IronTM (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

M. PROTECTION – Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

N. The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

PART 3 - EXECUTION

3.01 TESTING

A. Each completed and assembled motor shall receive a routine factory test.

B. The pumps shall be performance tested at the manufacturer's plant prior to shipment. The performance shall be within the limits set forth by the Hydraulic Institute. Certified curves shall be submitted to the design engineer upon request.

C. As a minimum, each finished pump shall be performance tested for total dynamic head, capacity, efficiency and power requirements at six (6) operating points plus shut-off head for the selected impeller diameter, of which, the design capacity operating point shall be included.

D. After installation, a Field Test shall be performed by the installing contractor on each completed Submersible Pump and easy lift assembly under the supervision of the manufacturer's authorized representative. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor or excessive motor heating.

3.02 WARRANTY

A. The Pump Manufacturer shall Warrant to the Owner the Submersible Pump Units against defects in material and workmanship for a period of 1 year from date of acceptance or 15 months from date of shipment, whichever is sooner. This warranty shall cover the cost of labor and materials, excluding removal and reinstallation costs, required to correct any warrantable defect, FOB, Manufacturer's authorized Warranty Service Center.

B. Additionally, the Pump Manufacturer shall provide and administer a 5-year, prorated materials warranty on the Submersible Pump against defects in materials and workmanship. The warranty shall provide for the replacement of any part of the pump found to be defective in accordance with the following schedule:

19 to 31 Months	Payment of 75% of the Current Replacement Parts Cost.
32 to 45 Months	Payment of 50% of the Current Replacement Parts Cost.
46 to 60 Months	Payment of 25% of the Current Replacement Parts Cost.

3.03 FIELD SERVICE

A. One (1) day of Field Service shall be provided by an authorized, factory trained representative of the Pump Manufacturer. Services shall include, but not necessarily be limited to, inspection of the completed installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Manufacturer's Prescribed Warranty.

B. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

3.04 PUMP ACCESSORIES

A. Provide the following accessories with each pumping unit:

1. One (1) discharge gauge, glycerin filled, 3½ inch diameter.
2. One (1) thermal overload protection on pump.
3. One (1) mechanical seal (packaged and labeled for storage).

3.04 SPARE PARTS

A. One (1) spare pump and motor assembly shall be provided to the owner.

B. Include the following spare parts:

1. One (1) Shaft Mechanical Seal Set
2. One (1) Impeller
3. One (1) Set of Wear Rings
4. One (1) Bearing Set
5. O-rings
6. Gaskets
7. Seal leak wires and grommets

END OF SECTION

EQUIPMENT GUARANTEE CERTIFICATION FORM

Reference: Southeast Brunswick Sanitary District
Sewer Pump Station 4 Relocation

THE UNDERSIGNED HEREBY ATTESTS THAT HE/SHE HAS EXAMINED THE REFERENCED PROJECT DRAWINGS **UC-P4 THRU UC-P11** AND SPECIFICATIONS SECTION **11320** AND CERTIFIES THAT THE "**WET PIT SUBMERSIBLE NON-CLOG PUMPS"** THAT HE/SHE PROPOSES TO FURNISH AND DELIVER MEETS OR EXCEEDS CONTRACT SPECIFICATIONS, IS SUITABLE FOR THE INTENDED PURPOSE STATED IN SPECIFICATIONS SECTION **1.02.B**, IS SUITABLE FOR INSTALLATION AS PRESENTED IN THE ABOVE PROJECT DRAWINGS AND SPECIFICATIONS, AND WILL PROVIDE SATISFACTORY PERFORMANCE AT THE DESIGN CRITERIA SPECIFIED. THIS GUARANTEE OF SUITABILITY FOR INTENDED PURPOSE IS IN ADDITION TO AND SHALL NOT BE IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED.

EQUIPMENT: **"Wet Pit Submersible Non-Clog Pumps"**

MANUFACTURER: _____

Address: _____

_____

By: _____
(Typed Name and Title)

_____/s/_____ (SEAL)
(Signature) (Date)

Equipment Guarantee Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier then a Principal Person of the Supplier must also sign this form.

SUPPLIER: _____

Address: _____

By: _____
(Typed Name and Title)

(SEAL)

_____/s/_____

SECTION 13100

PUMP STATION PRECAST WET WELLS, VALVE VAULTS, METER VAULTS, & RELATED COMPONENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Precast Wet Wells

B. Precast Valve Vaults

C. Precast Meter Vaults

D. Access Hatches

1.02 RELATED SECTIONS

A. Earthwork: Section 02300

B. Precast Concrete: Section 03400

C. Grout: Section 03600

D. Waterproofing and Damp Proofing: Section 07100

1.03 SUBMITTALS

A. Submit detailed shop drawings to the Engineer for approval prior to fabrication.

B. Included details of reinforcing steel, joint design, concrete mix design, and design calculations.

C. Submit certification from the precast structures manufacturer attesting that the structures meet or exceed Contract Specifications.

1.04 QUALITY ASSURANCE

A. Design Criteria

1. Watertight precast reinforced air-entrained concrete structures designed to ASTM C890, A-16 live loading and installation conditions, and manufactured to conform to ASTM C913.

2. Minimum 28-day Compressive Strength: 5,000 psi.

3. Honeycombed or re-tempered concrete will not be acceptable.

B. Reference Standards

1. American Society for Testing and Materials (ASTM)

a. ASTM C858 - Underground Precast Concrete Utility Structures.

b. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.

c. ASTM C891 - Practice for Installation of Underground Precast Concrete Utility Structures.

d. ASTM C913 - Specifications for Precast Concrete Water and Wastewater Structures.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete units with equipment designed to protect the units from damage.

B. Do not place units in position which will cause overstress, warp or twist.

C. Separate stacked members with battens across the full width of each bearing point.

D. Stack so that lifting devices are accessible and undamaged, and identification marks are discernible.

PART 2 - PRODUCTS

2.01 CONCRETE WET WELLS, VALVE VAULTS, & METER VAULTS

A. Structure shall be constructed from precast concrete base section and precast concrete riser sections, of sizes shown on the Drawings.

B. Manhole Components

1. Component design shall conform to ASTM C-478. Reinforcing shall conform to ASTM A-185.

2. Section joints shall be rubber gasket type and preformed plastic sealing compound.

a. Rubber Compression Gasket: Composition conforming to ASTM C 361 or ASTM C 443.

b. Preformed Plastic Sealing Compound: Preformed butyl rubber sealant type meeting the requirements of Fed. Spec. SS-5-210-A. Conseal as manufactured by Concrete Sealants, or equal.

3. Concrete compressive strength shall be a minimum of 5,000 psi.

4. Pipe penetrations through wall of manhole sections shall be made with prefabricated rubber gaskets, cast integrally in concrete wall and located as shown on the Drawings. Gaskets shall conform to ASTM C-923.

5. Concrete wet well shall be Americast or Atlantic Concrete Products, Inc. Precast Concrete Manhole with D-Lok joints and A-Lok pipe seals, or equal.

C. Coatings: Wet well manhole shall be coated inside with Raven 400 Coating System or approved equal and outside with a minimum of 20 mils of coal tar epoxy, Koppers 300-M, or equal, applied in two coats.

2.02 ACCESS HATCHES

A. Rectangular Hatches

1. Access hatch shall be manufactured by Halliday or approved equal and must meet the dimensional requirements and specifications as called out on the project plans.

2. Hatch shall have a ¼" thick one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor with bituminous coating where in contact with concrete.

3. Door panels shall be ¼" aluminum diamond plate, reinforced to withstand a live load of 300 lbs. psf.

4. Uniform live load with maximum allowable deflection of 1/150 of the span.

5. Doors shall open to 90º and automatically lock with T-316 stainless steel hold open arms with aluminum release handles. Doors shall close flush with frame and have a 316 stainless steel slam lock with removable key and non-corrosive locking bar used in conjunction with an owner supplied padlock.

6. Hinges and all fastening hardware shall be T-316 stainless steel.

7. Unit shall have a neoprene cushion/gasket.

8. Cover shall be equipped with stainless steel spring assist.

9. Unit shall carry a lifetime guarantee against defects in material and/or workmanship.

B. Circular Hatches

1. Not used.

PART 3- EXECUTION

3.01 INSTALLATION

A. Unless otherwise specified herein below, the precast units shall be installed in accordance with ASTM C891.

B. Install precast concrete units to the elevation and location indicated on the Contract Documents.

C. Install required pipe connections, valves, baffles and other appurtenances as indicated on the Contract Drawings.

3.02 BACKFILLING STRUCTURES

A. Do not backfill precast concrete structures until after examination and approval of the Engineer.

B. Backfill structures in accordance with Section 02300 - Earthwork.

END OF SECTION

SECTION 14200

PORTABLE HOIST

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Portable Hoist

1.02 RELATED SECTIONS

A. P.S. Precast Wet Wells, Valve Vaults, Meter Vaults, & Related Components: Section 13100

B. General Building Mechanical Requirements: Section 15010

1.03 SUBMITTALS

A. Complete material specifications and drawings for the portable hoist.

PART 2 - PRODUCTS

2.01 PORTABLE HOIST

A. The portable hoist shall be series DB as manufactured by Halliday Products, Inc. of Orlando, Florida or approved equal.

B. The portable hoist shall be sized to facilitate equipment (pump) placement and removal. The minimum maximum load rating shall be 1,330 pounds.

C. The portable hoist shall be all T-304 stainless steel construction with marine grade brake winch and 30 feet of ¼" T-304 stainless steel cable with galvanized safety hook rated for 1 Ton.

D. The davit arm shall adjust in 1" increments from 24" to 36" and the overall unit height shall be 60".

PART 3- TESTING & WARRANTY

3.01 Warranty – The portable hoist shall be guaranteed against defects in material and or workmanship for a period of 3 years.

END OF SECTION

SECTION 15010

GENERAL BUILDING MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The provisions of this entire section of the specifications are intended to govern the quality of design, fabrication, workmanship, operation, etc., of all materials, equipment and appurtenances to be furnished and installed under the various sections of the mechanical equipment as part of the specified items.

1.02 SHOP DRAWINGS

A. Shop drawings, including dimensioned drawings, descriptive literature, performance data, electrical characteristics, and in general all information necessary to prove compliance with the specifications.

1.03 "OR EQUAL"

NOT USED

1.04 GUARANTEE

A. All materials, equipment, workmanship and performance shall be guaranteed for the period stipulated by the Owner.

1.05 MANUFACTURER'S OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall provide manufacturer's operation and maintenance manuals as required.

1.06 STANDARDS

A. Where standards, codes or specifications are referred to, the reference is to particular standards, codes or specifications together with all the latest amendments and errata applicable at the time the bids are taken. These are listed below:

B.

IEEE -	Institute of Electrical and Electronics Engineers
AMCA -	Air Moving and Conditioning Association, Inc.
ASTM -	American Society for Testing Materials
ASME -	American Society of Mechanical Engineers
ANSI -	American National Standards Institute
ASHRAE -	American Society of Heating, Refrigerating & Air Conditioning Engineers
AWS -	American Welding Society
AWWA -	American Water Works Association
NFPA -	National Fire Protection Association
NEMA -	National Electrical Manufacturer's Association
Federal -	Federal Government Specifications
OSHA -	Occupational Safety and Health Act

1.07 GENERAL DESIGN OF EQUIPMENT AND MACHINERY

A. All equipment and machinery furnished under this contract shall be of the latest and most improved design suitable for the service of which it is to be used. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of labor, power, maintenance, renewals and repairs. The design and construction of all equipment and machinery shall be such as to permit operation with minimum noise, wear and vibration (maximum amplitude of 3.0 mils unless otherwise specified) when properly installed.

B. Ample room for erecting, repairs, inspecting and adjusting all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.

C. The design and construction of the several units shall be such that they shall present a uniform appearance and the arrangement shall be such that their operation shall be in harmony in every respect. Whenever possible, fittings and fixtures of the same make and model shall be used for the several units and their connections. All equipment of identical type and service shall be the product of the same manufacturer.

D. All equipment sleeted shall be of such size and general arrangement to suit the space in which it is to be installed.

E. The various parts of the equipment and machinery shall be of plain shape and good lines, especially designed and constructed for strength and durability. Casting shall be designed and constructed to cool uniformly without shrinking strains and shall have good-sized fillets at all re-entrant corners. Sudden change of section shall be avoided.

F. Whenever possible, parts of each unit shall be made to gauge and be a duplicate of and interchangeable with the same parts of other machines of the same size and kind.

G. The workmanship shall be of the highest class throughout.

H. All assemblies shall be completely shop fabricated and structural steel parts shall be shop erected. Assemblies and structural steel parts shall be match-marked before being disassembled for shipment. Parts shall be shipped assembled in as large unit as possible to minimize field reassembly. All parts shall be amply proportioned for all stresses which may occur during operation, and for any additional stresses which may occur during fabrication and erection.

I. Unless otherwise specified, welding shall be in accordance with the latest standard specifications for “Gas Tight Welding” of the American Welding Society.

J. Unless otherwise specified, galvanizing shall be hot-dipped, in accordance with the latest standard specifications for “Zinc Coating” of the ASTM, Serial Designation A-123.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Unless otherwise specified, materials shall be in accordance with the following latest Standard Specifications of the ASTM:

1.

Structural Steel	A-36
Welding Steel Pipe	A-53
Iron Castings	A-48
Babbitt	B-23
Bronze Castings	B-30
Bronze (Manganese)	B-138
Steel Bolts	A-307
Hot Dip Zinc Coating	A-123

B. All materials shall, if required, be tested and shall fulfill all requirements specified. Southeast Brunswick Sanitary District (S.B.S.D.) may make physical tests. The Contractor at his own expense shall furnish test pieces and samples in the number, shape, size and finish required by the Engineer. All broken material shall become the property of S.B.S.D. The failure of test specimens to fully conform to the requirements of the specifications shall be sufficient cause for rejection of the whole melt or stock from which samples were obtained.

C. Iron castings shall be smooth, clean and free from scale, lumps, blisters and other defects. No plugging, welding or filling will be allowed.

D. The alloy grade number of all babbitt shall be that bearing alloy of a composition recommended by the manufacturer of the equipment or machinery for the service required, subject to the approval of the Engineer.

E. All bronze shall be made of new material and shall be free from objectionable imperfections. If the materials show signs of improper mixing when being machined, the castings will be rejected.

2.02 JOURNALS, BEARINGS AND KEYS

A. Journals and bearing surfaces shall be of sufficient size and properly proportioned for the least wear and to avoid heating under all conditions, and where necessary, provisions shall be made for easy removal and for proper adjustments. Journals shall be suitable boxes which, where necessary, shall be lined with babbitt metal hammered into grooves and bored in place. If bearings are of the ball bearing type, both inner and outer races as well as the balls shall be heat treated steel to resist wear. The balls shall be of sample size to carry the maximum loads with a large factor of safety flaking, spilling, or crushing. The balls shall be properly spaced and held in position by rugged continuous spacing or retainer rings.

B. Pins and keys shall be properly proportioned. Keys, nuts and all other parts which might otherwise work loose shall be secured with approved locking devices.

2.03 LUBRICATION

A. All bearings, except those specifically requiring oil or water lubrication shall be pressure grease lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen. Pressure grease lubrication fittings shall

be the “Alemite” type as made by the Stewart Warner Corporation, or equal. The pattern of the fitting shall be selected for accessibility in lubricating and shall meet the approval of the Engineer. Housings of grease lubricated bearings shall be automatically exhausted to atmosphere to prevent excessive greasing. The Contractor shall furnish three Alemite Hydraulic guns, or equal.

B. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication, the type of lubricant to be applied and the frequency of lubrication. Charts and schedules shall be submitted to the Engineer in quadruplicate, bound in folios, with each chart or schedule protected by a transparent plastic envelope.

C. The Contractor shall furnish one (1) year supply of each type of lubricant. Ten copies of a typewritten list shall be furnished with the lubricants, designating the specific lubricant to be used for each piece of equipment. This is in addition to the required operating and maintenance manuals which will also contain lubrication requirements.

2.04 MOTORS AND CONTROLS - GENERAL

A. Motors and controls shall conform to the latest requirements of IEEE and NEMA, and where applicable, shall be UL listed. Minimum sizes are specified with the driven equipment. Motor starting and control equipment is specified either with the motor which is controlled or in an electrical specification section. The Contractor is advised to consult all specification sections to determine responsibility for motors and controls.

B. Motors shall be designed, built and tested in accordance with the latest revision of NEMA Standard MG 1.

C. Motors shall be suitable for use under the conditions and with the equipment to which applied and designed for operation on the electrical systems specified or indicated.

1. Motor capacities shall be such that the horsepower rating and the rated full-load current will not be exceeded while operating under the specified operating conditions. Under no condition shall the motor current exceed that indicated on the nameplate.

2. Motor sizes noted in the individual equipment specifications are minimum requirements only. It is the responsibility of the equipment manufacturers and of the Contractor to furnish motors, electrical circuits and equipment of ample capacity to operate the equipment without overloading, without exceeding the rated full-load current, or overheating at full-load capacity under the most severe operating service of this equipment. Motors shall have sufficient torque to accelerate the total WR^2 of the driven equipment to operating speed.

3. Motors shall be continuous duty type and shall operate quietly at all speeds and loads.

4. Motors shall be designed for operation on 60-hertz power service. Unless otherwise specified or shown, motors less than 1/2 horsepower shall be single phase, and motors 1/2 horsepower and larger shall be 3 phase.

5. Motors shall be mounted so that the motor can be removed without removing the entire driven unit.

D. Single-phase motors smaller than 1/20 horsepower shall be ball or sleeve bearing, drip-proof, totally enclosed or explosion proof, as specified, 115 volts, permanent split capacitor or shaded pole type. These motors shall not be used for general power purposes and shall only be provided as built-in components of such mechanical equipment as fans, unit heaters, humidifiers and damper controllers.

E. Single phase motors 1/20 horsepower and larger shall be ball bearing, drip-proof, totally enclosed or explosion proof, as specified, with Class A or B insulation, as standard with the motor manufacturer; 115, 115/230, 200 or 230 volts as required; capacitor start-induction run, permanent split capacitor, or repulsion start-induction run type.

F. Except as otherwise specified in the various specification sections, 3 phase motors shall meet the requirements of this paragraph. Motors shall be NEMA design B squirrel cage induction type. Insulation shall be Class F and motor shall be rated at no greater than 50 deg. C ambient temperature explosion proof and totally enclosed motors shall have a 1.00 service factor and drip proof motors shall have a service factor of 1.15 or higher. Motors specified for operation at 480 volts shall be nameplated 460 volts.

G. Minimum three phase motor efficiencies at full load for motor-shaving nominal rated speeds of 1200 RPM and higher shall be as follows:

Horsepower	Minimum Efficiency
½	71
3/4	74
1	75
1-1/2	78
2	80
3	82
5	85
7-1/2	86
10	86
15	88
20	89
25	90
30	91
40	91
50	91
60	91
75	92

Three phase motors shall be E-plus Energy Efficient Standard Duty Motor of the Electric Motor Division of Goulds, Inc., the MAC II High Efficiency motor of Westinghouse Electric Corporation, the equivalent project of Baldor Company, or equal.

H. Motors seventy-five (75) horsepower and larger shall be as specified with the driven equipment in these specifications.

I. Belt-connected motors shall have adjustable bases and set screws to maintain proper belt tension. All fan motors shall have adjustable sheaves for speed adjustment.

2.05 FLANGES AND BOLTS

A. Flanges, except as otherwise specified, shall be cast solid, and bolt holes shall be drilled and spot-faced on the back. Stud holes shall not be drilled through. Flanges shall be uniform in thickness and shall come fair and, if required, shall be turned or chipped in a neat and workmanlike manner.

B. All equipment and motors/drives shall be field aligned using a dial indicator in accordance with the procedures established by the latest revision of the Hydraulic Institute Standards. Parallel and angular misalignment shall not exceed the limits recommended by both the equipment and the coupling manufacturer.

2.06 COUPLINGS

A. Except where otherwise specified for a particular item of equipment, all equipment where flexible couplings are specified or required, a standard self-aligning forged steel coupling with sealed lubrication, as manufactured by Thomas, Koppers, Falk, Sier-Bath, or equal, shall be provided between each motor and its driven equipment. One hub of the coupling shall be firmly fixed and keyed to the equipment shaft with the other hub similarly secured to the abutting drive shaft. Couplings shall be placed as close as possible to the driven equipment and the motor bearings to make compactly arranged units. Couplings shall be of all metal construction and shall be moisture proof and dust proof. Arrangement of couplings shall be such that there is sufficient room to place a dial indicator for alignment checking of shafts of the motor driven equipment. Each coupling shall be provided with an easily removable guard meeting all OSHA requirements.

B. All equipment and motors/drives shall be field aligned using a dial indicator in accordance with the procedures established by the latest revision of the Hydraulic Institute Standards. Parallel and angular misalignment shall not exceed the limits recommended by both the equipment and the coupling manufacturer.

2.07 EQUIPMENT BEDPLATES

A. The various items of motor driven equipment, such as pumps, shall be mounted on structural steel bedplates. The bedplates shall be adequate size to accommodate the equipment and its motor, to form an integral rigid mounting platform. Steel or brass shims shall be used to level equipment bedplates mounted in contact with concrete pads or floors. Jacking bolts or jacking (leveling) nuts on mounting studs shall not be used in lieu of shims. Bedplates shall be grouted to the concrete base and shall be filled with grout in all instances where the manufacturer has made provision for introducing grouting mixture into bedplate cavities. It shall be the Contractor's complete responsibility to determine the proper method, to provide all materials and components required, and to coordinate the work, to set, couple, align and install all equipment in a satisfactory manner.

B. All centrifugal fans shall be mounted on steel springs or rubber-in-shear vibration isolation units. These may be either shop provided with the equipment or separately field mounted.

PART 3 - EXECUTION

3.01 MANNER OF INSTALLATION

A. The general arrangement of pipe and equipment shall be as shown on the Drawings. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted to the Engineer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment as indicated, without substantial alteration. Because of the small scale of the drawings, it is not possible to indicate the exact location of piping, all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the space requirements for proper clearances and the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such offsets, fittings, valves and accessories as may be required to meet such conditions.

B. Each trade shall determine the location, size, etc. of all chases and openings required for the proper installation of its work and shall see that such are provided. Where it is necessary to run pipes or ductwork through walls or fittings, the trade performing the work shall notify the Contractor so that proper provisions can be made for same. Each trade shall furnish and set all inserts, sleeves, hanger supports, etc. required for its work and shall be responsible for their proper and permanent location.

C. All piping and ductwork exposed to view shall be run generally parallel with the lines of the building and as close to walls and column as may be practical and consistent with proper grade and the maintenance of proper clearances for access to all parts requiring servicing.

D. The Contractor, in the prosecution of the work, shall do no cutting of woodwork, masonry, concrete or other materials after same have been installed, without the written permission of the Engineer. No waterproofing shall be cut for any purpose except on written approval of the Engineer.

3.02 TESTING

A. After erection, the Contractor shall adjust and balance all equipment and systems, and shall demonstrate that all equipment is operating in a satisfactory manner. All rotating equipment shall be lubricated according to recommendations of the manufacturer and all adjustments shall be made to suit anticipated station operating conditions. Each piece of machinery shall be tested to show that it operates quietly, without vibration, overheating, or sign of distress at full specified capacity. Adjustments shall be made as necessary. All defective parts on machinery shall be replaced.

B. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction.

3.03 MISCELLANEOUS

A. Finished parts shall be well protected in the shop, during transportation and before and after erection to prevent injury of any kind. Injured parts which in the opinion of the Engineer are damaged or which cannot be refitted, shall be promptly replaced by the Contractor without expense to S.B.S.D. All exposed finished parts of machinery shall be greased or oiled before shipment.

B. The Contractor shall furnish all tools of special nature which are required for making adjustments (by S.B.S.D.) after the work has been turned over by the Contractor) to equipment, but will not be required to furnish standard tools.

C. All exposed belts, gears and drives shall be protected with guards. Guards may be of the equipment manufacturer's standard design, but must meet all the OSHA Standards.

3.04 PAINTING AND LABELING

A. All fabricated or assembled surfaces normally painted shall be thoroughly dry and free from all rust, grease, dirt or scale. The Contractor is reminded to correlate the section of ship prime coats to be compatible with subsequent field applied coats of paint. The Contractor shall touch up paint any time damaged during shipping or installation.

B. Each piece of equipment (including mechanical operators and electrical switches for the equipment) shall be identified by hand painting or stenciled two-inch letters and numbers, to indicate the service or function. Unless specified otherwise in the mechanical and electrical sections of these specifications, each motor and motor controller shall be similarly numbered (or lettered) to correspond to the number (or letter) of the drive unit.

3.05 ADJUSTMENTS TO RELATED WORK

The final work shall include any adjustment that may be required by the approved equipment furnished, with modifications made to concrete shapes and to dimensions shown on the contract drawings as may be required to suit the details of the approved equipment furnished, all at no additional cost to S.B.S.D.

END OF SECTION

SECTION 15080

VALVES AND PIPING SPECIALTIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Control valves, check valves, hydrants, gauges, and all other special piping appurtenances

1.02 DESCRIPTION

A. Under this section, the contractor is to provide and install all valves, hose connections, hydrants, valve boxes, and other piping specialties as specified, as indicated on the contract drawings, and as necessary to provide complete piping systems as intended that are not expressly specified in other sections of these specifications.

B. All valves listed within these specifications may or may not be used on each specific project. Refer to project plans for types and locations of valves for each individual project.

1.03 RELATED SECTIONS

A. General Building Mechanical Requirements: Section 15010

1.04 QUALITY ASSURANCE

A. Products shall be new, the latest standard product of reputable manufacturers, and shall have replacement parts available.

B. Potable water system materials shall bear the seal of approval of the National Sanitation Foundation (NSF).

C. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuels will be rejected.

1.05 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit manufacturer's catalog data, literature, illustrations and specifications.

2. Submit shop drawings of valves and valve operators including dimensions, net assembled weight of each size valve furnished, construction details, and materials of components.

3. Submit manufacturer's installation instructions.

4. Submit manufacturer's maintenance instructions and complete parts lists.

B. Certificates

Submit a Certificate of Compliance, together with supporting data, from the materials supplier(s) attesting that valves, accessories, and specialties meet or

exceed specification requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver valves and accessories to the job site in the manufacturer's boxes or crates. Mark each valve as to size, type and installation location.

B. Seal valve ends to prevent entry of foreign matter into valve body.

C. Store valves and accessories in areas protected from weather, moisture and possible damage.

D. Do not store materials directly on the ground.

E. Handle valves and accessories to prevent damage to interior and exterior surfaces.

1.07 JOB CONDITIONS

A. Investigate conditions affecting this work and coordinate with other contractors to prevent interference between architectural, structural, mechanical and electrical features.

B. The contract drawings for small diameter pipe are generally diagrammatic and it is not possible to indicate all fittings, valves, and other items required for a complete operating system. Provide all such valves, fittings and specialties to complete the systems as intended.

C. Provide necessary valve wheels, keys, wrenches, levers and stem extensions. Locate to assure accessibility and operability throughout the operating range without interference. Install valve stem supports, guides and operators. For buried valves, provide valve boxes and stem extensions to grade. Provide valve accessories of the same manufacturer as the valve, unless specified elsewhere.

D. Provide chain operators for valves 4" size and larger that are located 6'-0" or more above finished floor level.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide valves and piping specialties of the size and type indicated on the contract drawings.

B. Cast iron valve material shall meet or exceed the requirements of ASTM A126, Class B.

C. Valve flanges shall conform to ANSI B16.10, (125# and 250# class) as applicable.

D. Mechanical joint valve ends shall conform to ANSI/AWWA C111/A21.11.

E. Screwed valve ends shall conform to ANSI B2.1; American Standard Taper pipe threads.

F. Valves shall be of a design that requires no more than 50 lbs. pull on the hand wheel or standard valve wrench to provide positive shutoff against rated working pressure.

2.02 GATE VALVES

A. Flanged, Mechanical Joint, or Push-On Joint Gate Valves

1. Iron body, bronze mounted, solid wedge, tapered seat, non-rising stem, O-ring packing. ANSI/AWWA C500, 200 psi working pressure. Open counterclockwise.

2. Service other than potable water:

   a. Valves 2" to 12": 200 psi working pressure

   b. Valves 14" and Larger: 150 psi working pressure

   c. Stems may be copper-silicon alloy.

   d. Provide bevel gear operators on pump discharge lines.

3. Potable water service:

   a. Valves 2" and Larger: 200 psi working pressure. Provide with double disc wedge.

   b. Valves Smaller than 2": 200 psi working pressure
Wedge disc
Threaded or soldered joint.

B. Threaded and Soldered Gate Valves

1. Threaded or soldered joint.

2. Bronze body, Class B; non-rising bronze stem, ASTM B584

2.03 CHECK VALVES

A. Flange Joint Swing Disc Check Valves

1. The valve shall have a heavy duty body constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, flat faced and drilled per ANSI B16.1 Class 125 or Class 250 and be suitable for horizontal or vertical installation.

2. The valve body shall be of the full waterway type, designed to provide a net flow area of not less than the nominal inlet pipe size when swung open no more than 25 degrees. The valve shall have a replaceable bronze or stainless steel body seat. The body shall have a bolted steel cover allowing complete access to and removal of all internal components while the valve is in the line.

3. Valve disc shall be cast iron and faced with a renewable resilient seat ring of rubber or other suitable material, held in place by a follower ring and stainless steel screws.
4. The disc arm shall be ductile iron or steel, suspended from and keyed to an austenitic stainless steel shaft which is completely above the waterway and supported at each end by heavy bronze bushings. The shaft shall rotate freely without the need for external lubrication. The shaft shall be sealed where it passes through the body by means of a stuffing box and adjustable

packing. Simple O-ring shaft seals are not acceptable.

5. The valve shall be supplied with an outside lever and adjustable counterweight to initiate valve closure. Final closure shall be dampened by means of a single, side-mounted bronze air-cushion assembly directly mounted to the valve body on machined pads. The amount of cushioning shall be easily adjustable without the need for pre-charged air chambers. Commercial air cylinders which pivot and/or are attached with fabricated brackets are not acceptable.

6. The valve shall swing open smoothly at pump start and close quickly and quietly upon pump shutdown to prevent flow reversal. When closed, the valve shall seat drop tight.

7. The valve shall be GA Industries, Inc. Figure 250-DS, or approved equal.

B. Threaded and Solder Joint Check Valves for use with copper or steel water piping:

1. Horizontal swing check type

2. Bronze body

3. Renewable bronze disc

4. 200 PSI working pressure

C. Threaded and Solder Joint Check Valves for use with copper or steel compressed air piping:

1. Lift check type

2. Bronze body

3. Renewable disc

4. Union cap

5. 200 PSI working pressure

D. Globe Style Silent Check Valves

1. Semi-steel body with bronze seat, bronze valve plug, and stainless steel spring.

2. Valve plug shall be center-guided at both ends with a through integral shaft; helical or conical spring loaded.

3. Replaceable seat and valve plug.

4. Flow area through body shall be equal to or greater than the cross-sectional area of equivalent pipe size.

5. 200 PSI working pressure

E. PVC Check Valves

1. Use on all plastic piping
2. Double union ball type

3. Viton seals

4. 150 PSI working pressure

F. All check valve shall be designed so that all parts may be removed for inspection or replacement through the top of the valve with the valve in position.

2.04 PLUG VALVES

A. Eccentric plug valves shall be Milliken model 601, Cl 125 flanged, with handwheel operator (as shown on the project plans) or approved equal.

B. Plug valves shall be of the non-lubricated eccentric type with resilient faced plugs. All buried force main valves shall be furnished with mechanical joint connections, AWWA C111. All non-buried force main valves shall be furnished with flange joint connections. Port areas of all plug valves shall be at least 100% of full pipe area.

C. Valve bodies shall be of ASTM A126, Class B cast iron in compliance with AWWA Standard C504, Section 5.4. All exposed nuts, bolts, springs, washers, etc. shall be stainless steel. Resilient plug facings shall be of neoprene, suitable for use with sewage.

D. Valves shall be furnished with corrosion resistant seats which comply with AWWA Standard C507, Section 7, paragraph 7.2 and with AWWA Standard C504-74, Section 8, paragraphs 8.4, 8.5, 8.6, 8.6.2, 8.6.3., 8.6.4, 8.6.5, 8.6.6.

E. Valves shall be furnished with replaceable sleeve type bearings in the upper and lower journals. These bearings shall comply with AWWA Standard C507, Section 8, paragraphs 8.1, 8.3, and 8.5 and with AWWA Standard C504, Section 9.

F. Valve shaft seals shall comply with AWWA Standard C507-73, Section 10, and with AWWA C504, Section 10.

G. Valve pressure ratings shall be as follows and shall be established by hydrostatic tests as specified by ANSI Standard B16-1. Pressure rating shall be 175 psi. Valves shall be capable of providing drip-tight shutoff up to the full rating with pressure in each direction.

H. All 4” and smaller non-buried valves shall be furnished with lever actuators. All 6” and larger non-buried valves shall be furnished with gear reduction hand wheel actuators.

I. Valve operators shall be completely enclosed in an air, water, and oil-tight housing mounted directly on the valve and providing access to the valve stem packing. The housing shall comply with AWWA Standard C504, Sections 11.2.3 and 11.3. Both worm gear shafts and gear quadrants shall be furnished with replaceable sleeve type bearings the same as the valve bearings. Shaft seals shall be provided to seal all external shafting. All valves shall be completely sealed including the valve stem packing box. Open and closed stops shall be provided to comply with AWWA C504, Section 11.3.

J. Valves to be direct buried shall be provided with roadway valve boxes. Roadway valve boxes shall be cast iron and inside riser diameter of 5-1/4" and to be of the two-piece sliding adjustable type with drop cover marked for sewer service. Both the inside and outside of the valve box and cover shall be thoroughly cleaned and coated with asphaltum varnish, applied hot, before leaving the foundry. Extension stems with standard 2" square operating nuts shall be provided where depth from finished grade to valve operating nuts exceeds 5 feet. Extension stems shall be securely attached to the valve operating nut and shall be provided with means for centering the operating nut within the roadway valve box.

2.05 GLOBE VALVES

A. For use on air piping or for throttling service on water lines.

B. Bronze body

C. Rising stem

D. Union bonnet

E. Stainless steel plug type seat and disc

F. 200 PSI working pressure

2.06 BALL VALVES

A. Top entry, bronze body, chrome-plated brass ball, double seal TFE seat, TFE stem seal and bonnet O-ring. 200 psi working pressure. Flanged, threaded, or solder joint as applicable.

B. Iron body, (6" through 48" for water) 300 psi pressure, AWWA C507.

C. PVC ball valves: True union, double entry; Viton O-ring seals, self-lubricating Teflon seats. 150 psi working pressure.

2.07 BUTTERFLY VALVES (METAL BODY)

A. Rubber seated, tight-closing type designed, manufactured and tested in accordance with AWWA C504, latest revision.

B. Valve Body: Cast iron, ASTM A126, Class B.

C. Body Seat: 18-8 stainless steel.

D. Valve Vane: Ductile iron, A536, Grade 65-45-12, with rubber seat secured with a serrated 18-8 stainless steel clamp ring. Rubber seat shall be full 360^{o} capable of replacement or adjustment without special tools.

E. Valve Shafts: 18-8 type 304 stainless steel with diameter equal or greater than as shown in AWWA C504.

F. 200 psi working pressure.

G. Furnish with valve position indicator.

H. Notch-plate lever throttling handles for valves 6" size and smaller.

I. Heavy-duty manual actuators for valves larger than 6" size.

1. Sealed and permanently lubricated. Fully supported, exert no thrust or load on valve shaft.
2. Vertical, right-angle or buried type as applicable. Crank handle, handwheel, or square nut operator as indicated on the drawings.

2.08 AIR RELEASE VALVE

A. Combination Air Valves: Consisting of an air release valve and an air and vacuum valve factory piped into a compact assembly. The combination assembly shall automatically release air, gas or vapor under system operating pressure and shall also allow air to re-enter the system during draining or when a vacuum occurs. Combination valve designs shall feature long bodies and float stem components so that the operating mechanisms are kept free from contact with the sewage during operation. Valve construction as follows:

B. Valve Bodies and Covers: Cast iron, ASTEM A 126, Class B.

C. Inlet Size: 2-inches.

D. Outlet Size: 1-inch, NPT.

E. Maximum Working Pressure: 150 psi.

F. Valve Discharge Orifice Seat, Mechanism and Valve Stem: Stainless Steel.

G. Valve Mechanism Lever Pins and Float: High strength stainless steel, ASTM A 240.

H. Valve Float Stem and Guide: Type 304 Stainless Steel.

I. Valve Float: Stainless Steel, ASTM A 240.

J. Valve Orifice Seat: Buna-N, Nitrile Rubber, ASTM SB 800.

K. Back flushing and Cleaning Accessories: Factory assembled to the combination valve and consisting of an inlet shut-off valve, a blow-off valve, a clear water inlet valve, section of rubber hose and quick disconnect couplings.

L. Acceptable Manufacturers:

1. Val-Matic Valve and Manufacturing Corp.; Model No. 802 BW.

2. Or approved equal.

2.09 FLOW CONTROL ORIFICES

A. Threaded end inline orifices that maintain a fixed flow rate regardless of varying inlet pressure by means of a flexible orifice that varies its area inversely with pressure.

B. 100 psi minimum working pressure.

2.10 CORPORATION STOPS

A. Brass or red-brass alloy body, ASTM B62.

B. AWWA C800 threaded inlet end for tapping.

C. Outlet end suitable for service pipe intended.

2.11 CURB STOP ASSEMBLY

A. Curb Stops

1. Brass or Red Brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.

B. Curb Boxes and Covers

1. Cast iron body, extension type or Buffalo type.
2. Minneapolis or arch pattern base.
3. Lid with inscription “Water”, with pentagon plug.

2.12 SURGE RELIEF VALVE

A. External pilot operated

B. Cast iron globe body

C. Bronze trim

D. Leather packed

E. Pilot adjustment range: N/A

F. Flow range: N/A

2.13 AIR LINE SHUTOFF VALVES

A. For isolating small air supply branch and signal lines as shown in the contract drawings.

B. Toggle operated

C. Forged brass body

D. Stainless steel trim

E. O-ring stem seal

F. Minimum 200 PSI working pressure rated

2.14 FLOOR TYPE TANK AND FOUNDATION PRESSURE RELIEF VALVES

A. Floor type hydrostatic pressure relief valve shall be designed for installing in the bottom of concrete tanks.

B. The assembly shall consist of three parts: cover, body and strainer; all of cast iron conforming to ASTM A126, Class B, designed so that neither the cover or strainer can become separated from the body of the valve, due to groundwater pressure around the tank; however, when necessary, both may be easily removed by turning them to the right or left to free them from locking lugs cast integrally on the inside of the body.

C. The seats shall be installed into grooves on underside of cover and top of body; seats shall be machined to form a non-corroding lead to lead contact when cover is in closed position.

2.15 WALL TYPE TANK PRESSURE RELIEF VALVES

A. The wall type hydrostatic pressure relief valve shall be suitable for sidewall installation in tanks.

B. The valve shall be of the vertical seat design with offset single pivoted hinge.

C. The assembly shall consist of five parts: flap gate, body, gate seat plate, hinge pin and body seat.

D. The slap gate and body shall be of cast iron conforming to ASTM A126, Class B.

E. The body seat and gate seat shall be Buna N; the hinge pin shall be Type 304 stainless steel or bronze.

F. The valve shall have a 4" flange end faced and drilled to ANSI 125 pond template for connection to a 4" wall pipe; provide a cast iron strainer retained on the valve body, but removable by turning.

2.16 SOLENOID VALVES

A. Two-way type

B. Forged brass body

C. Buna N seat

D. 150 PSI working pressure rate

E. 0 PSI operating differential

F. NEMA IV enclosure

G. 120 Volt

H. Continuous duty coil

I. Normally closed, energize-to-open

2.17 PRESSURE REDUCING/REGULATOR VALVES (AIR AND LIQUID)

A. Maintain constant downstream pressure regardless of varying upstream pressures.

B. Bronze body, renewable nickel-alloy seat, removable stainless steel strainer, replaceable bronze diaphragm, stainless steel adjustment spring.

C. Pressure adjustment range: 25-75 PSI

D. 250 PSI working pressure rated

2.18 LIQUID RELIEF VALVES

A. Bronze body

B. Stainless steel spring and trim

C. Threaded female inlet and outlet

D. Adjustable pressure range

2.19 INLINE Y-STRAINERS (AIR AND LIQUID)

A. Bronze cast (ASTM B-584) body

B. 40 mesh stainless steel WYE pattern strainer

C. Female threaded connections

D. Clean-out plug

2.20 SELF-CLEANING STRAINER ASSEMBLY

A. ASTM A126, Class B, cast iron body

B. ANSI 135# drilled and flat faced flanges

C. Stainless steel cylindrical strainer screens with 3/32” perforations

D. Handwheel operated

E. Plug-type drain valve

2.21 EMERGENCY SHOWER AND EYE WASH

A. Emergency showers located indoors shall be a combination shower and eye/face wash. Eye wash shall include a stainless steel 11-inch round bowl, an eye/face wash head featuring inverted directional laminar flow which achieves zero vertical velocity supplied by an integral flow control. Unit shall include an ABS plastic showerhead with flow control, chrome-plated brass stay-open ball valve equipped with stainless steel ball and stem, and chrome-plated brass in-line 50 x 50 mesh water strainer. Unit shall also include Schedule 40 hot-dipped galvanized steel pipe and fittings, powder-coated cast-iron 9" diameter floor flange, self-adhesive high visibility safety green and bright yellow stripes, universal sign, and 1-1/4" IPS supply. Emergency showers located indoors shall be Guardian Equipment G1902, Haws model 8300-8309, or approved equal.

B. Emergency showers located outdoors shall be frostproof. Shower and eyewash valves shall have push handles for operation. The outdoors showers shall be Guardian Equipment GFR1902, Bradley model S19-310NN3, or equal.

C. Thermostatic mixing valve shall mix hot and cold water to provide controlled outlet tempered water to eyewash fixture. Thermostatic mixing valve shall employ a thermostatic mixing element to safely temper water supply, reduce all

incoming hot water to a maximum of 0.2 GPM in the event the cold water supply is lost, and shall allow a minimum of 10 GPM cold water bypass in the event the water supply becomes interrupted or the thermostatic element fails. Thermostatic mixing valve shall be set to 85 degrees F, and shall be Guardian G3700, Haws No. 9201EFE, or approved equal.

D. Emergency shower and mixing valve shall comply with ANSI Z358.1.

2.22 FIRE HYDRANTS

A. Dry-barrel break-away type conforming to AWWA C502.

1. Bury Depth: 4'-6", or as indicated on the contract drawings.
2. Inlet connection: 6".
3. Valve opening: 5-1/4".
4. Mechanical joint or bell end.
5. Corrosion resistant bolts and nuts.

B. One pumper, two hose nozzles

1. Obtain thread type and size from local fire department.
2. Attach nozzle caps by separate chains.

2.23 YARD HYDRANTS

A. Self-draining, frost-proof

B. Cast brass, post type

C. Aluminum protective shield

D. ¾" NPTF inlet connection

E. ¾" NPT outlet connection

F. 3' bury depth

G. T-handle or handwheel operator as indicated

2.24 WALL HYDRANT (EXTERIOR)

A. Cast brass, non-freeze box type

B. Brass wall casting, polished face hinged locking cover

C. Renewable nylon valve seat

D. ¾" NPTF inlet connection

E. ¾" NPT outlet connection

F. T-handle or handwheel operator as indicated

2.25 HOSE BIBBS (INTERIOR)

A. Cast brass with integral wall plate

B. Replaceable valve seat

C. Stainless steel shaft
D. Nylon washer

E. ¾" NPT outlet

F. Fixed operating wheel

2.26 VALVE BOXES

A. Three-piece, cast iron, adjustable

B. 5-1/4" diameter

C. Heights as indicated

D. Valve boxes shall be either East Jordan Iron Works, Bingham & Taylor, or approved equal.

2.27 PRESSURE GAUGES (LIQUID SERVICE)

A. Bronze bourdon tube type, brass socket. Stainless steel case. Acrylic window. Liquid filled.

B. 4-1/2" dial size. Stainless steel dial, black lines and numbers.

C. Pressure range as indicated. Graduations and figure intervals proportioned to range.

D. Polypropylene bushed, stainless steel rotary movement, micro-adjustable pointer. Minimum pressure stop, over-pressure protection. Adjustable zero set point adjustment screw which does not require removal of gauge case.

E. Accuracy to 1% of full-scale range.

F. 1/8" NPT bottom connection. Shutoff cock.

G. When indicated on the contract drawings, provide cadmium-plated diaphragm gauge seal; 316 ELC diaphragm, flushing connection, stopcock.

H. Gauges shall be manufactured by either Ashcroft, US Gauge, or approved equal.

2.28 PRESSURE GAUGES (AIR SERVICE)

A. Bronze bourdon tube type, brass socket. Stainless steel case with blowout grommet.

B. 4-1/2" dial, white background, black lines and numbers.

C. Bronze brushed, rotary movement. Micro-adjustable pointer. Accuracy to 1% of full-scale range.

D. 1/8" bottom connection. Shutoff cock.

E. Pressure range as indicated shall cover 150% of operating range. Graduations and figure intervals proportioned to range.

F. Gauges shall be manufactured by either Ashcroft, US Gauge, or approved equal.

2.29 HOSE COUPLINGS

A. Cam-locking quick-coupler

B. MPT coupler socket

C. FPT adapter plug

D. Side levers

E. Stainless steel construction

F. Buna N gaskets

G. Shall meet MIL-C-27487 specifications

2.30 BACKFLOW PREVENTER

A. A reduced pressure zone assembly shall be installed to prevent backsiphonage and backpressure of hazardous materials into the potable water supply.

B. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves.

C. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent.

D. The assembly shall include two tightly closing shutoff valves before and after the assembly, test cocks and a protective strainer upstream of the No. 1 shutoff valve.

E. Backflow preventer shall be enclosed in a heated enclosure that meets the following specifications:

1. Enclosure shall have a minimum inside dimensions of 27”L x 13”W x 23”H.

2. Enclosure shall be heated by a 60W, 120V, single phase heat trace cable.

3. Enclosure shall be a Hot-Box®, model HF013027023 (old model HB-1) as manufactured by Hubbell Power Systems, Inc.

F. The assembly shall be a Watts Regulator Company Series 909QTS, ¾”, or approved equal.

2.31 WATER METERS

A. Displacement type meeting the requirements of AWWA C700, size of meters as specified on drawings, as manufactured by Neptune systems, or approved equal.

B. Compound type meeting the requirements of AWWA C702, size as specified on drawings, as manufactured by Neptune systems, or approved equal.

2.31 TAPPING ACCESSORIES

A. Tapping Sleeves

1. Mechanical joint, or as indicated on the contract drawings.
2. 200 psi working pressure.

3. Outlet flange: ANSI B16.1, Class 125.

B. Tapping Valves

1. Iron body, bronze mounted, double disc with seat rings of larger diameter to permit entry of tapping machine cutters AWWA C500.

2. Inlet Flange, Class 125.

2.32 FLEXIBLE COUPLINGS AND REDUCERS

A. Flexible couplings and reducers are to be provided where shown on the drawings to compensate for misalignment, reduce noise and vibration, and alleviate stresses imparted to mating equipment.

B. Unless otherwise noted, couplings shall be of the double arch type capable of allowing up to 30º angular movement, 7/16" elongation, 7/8" compression, and 7/8" transverse movement. The couplings shall have a 26" Hg vacuum and a 150 psi pressure rating and shall have a maximum temperature rating of 212ºF. The couplings shall be constructed of neoprene with multiple plies of nylon cord. Couplings shall have 150 lb. ANSI steel flanges that do not require the use of backup rings and shall be suitable for mating with Schedule 80 PVC flanges. Provide control units for each coupling to prevent damage due to excessive movement.

C. For flexible couplings used on chemical piping applications, submit manufacturer's certification that the materials of construction of the coupling are suitable for continuous exposure to the chemical being transported.

2.33 FLOOR BOX

A. Bushing type floor box, fitted with bronze bushings to pressure stem alignment.

B. Non-rising type stem with cover.

C. Location and size as indicated on the contract drawings.

2.34 STEM GUIDES

A. Stem guides shall be ASTM A126, Class B, cast iron & bronze bushed.

B. Center of stem to face of wall shall be as shown on the contract drawings.

C. Stem guides shall be utilized for the support of extension stems greater than 6' long and shall be spaced 5'. Fasten stem guides

2.35 EXTENSION STEMS

A. Extension stems shall be provided for operation of valves where required. Stems shall be made from extra heavy galvanized steel pipe. Extension stems shall be complete with coupling for attachment to valve stem for non-rising stem valves and stem coupling for OS&Y gate valves. Where extension stems will be used in conjunction with floor stands, stems will be provided with a coupling for connection to the floor stand. Where required, universal joints shall be provided for deflection. Extension stems shall be sized so as to transmit full torque from the operating mechanism to the valve stem without binding, twisting, or bending.

2.36 CHAIN WHEELS

A. Where required, for overhead installation, chain wheels will be provided of a babbitt type which will bolt to existing handwheel. Rust proof chain to ASTM A153-71. Chain wheels shall be of the adjustable sprocket type which allow free fall of the chain with no binding.

2.37 SAMPLE VALVES

A. Sample valves shall consist of stainless steel ball valve connected to process pipe line with a stainless steel pipe nipple of the size indicated on the drawings. End of pipe nipple that protrudes in pipe shall be ground smooth.

B. Ball valve shall have a 316 stainless steel body, body cap, ball, stem and stem nut with TFE seat and seals, a 150 psi working pressure rating and threaded ends. Outlet end of ball valve shall terminate with a 2" long stainless steel nipple and 90^{o} elbow.

2.38 ELECTRIC MOTOR OPERATED PINCH VALVES

A. Valves shall be 4", of the full cast metal body, mechanical pinch type with flange joint ends. The valve length shall be as given in ISA S75.08. The flanges shall be drilled and tapped to mate with ANSI B16.1, Class 125/ANSI B16.5, Class 150 flanges.

B. The sleeve trim shall be one piece construction with integral flanges drilled to be retained by the flange bolts. The sleeve trim shall be reinforced with calendared nylon or calendared polyester fabric to match service conditions. The sleeve trim shall be connected to the pitch bar by tabs imbedded in the sleeve trim reinforcing ply. All internal valve metal parts are to be completely isolated form the process fluid by the sleeve trim. For full port and reduced port sleeves the port areas shall be 100% of the full pipe area at the valve ends. For Cone and Variable Orifice sleeves the port area at the inlet shall be 100% of the full pipe area, reducing to a smaller port size at the outlet.

C. The solid steel pitch mechanism shall be single acting, closing the sleeve from the top only. The mechanism shall be supported in the valve body. There shall be no cast parts in the operating mechanism. The mechanism shall be connected to the electrically actuated actuator through an ACME threaded stem. The electric motor shall be as specified. The pinch mechanism shall be adjustable for stroke without removing the valve from the line. Valve shall be manufactured in the USA.

D. An electric motor rotates a threaded nut, pushing a threaded stem into the valve body, pinching the sleeve closed. Reversing the direction of the electric motor pulls the stem out of the valve body, opening the sleeve.

2.39 FLAP GATES (FLAP VALVES)

A. Gates shall be as sized in plans or specifications. Gate Assembly shall be material combination #4, as follows:

1. Seat and Cover shall be cast iron.

2. Sealing faces (seal) shall be neoprene.

3. Side wedge blocks (cover) shall be stainless steel.

4. Pivot lugs and links shall be cast iron.
5. Bushings shall be stainless steel.

6. Fasteners shall be stainless steel.

2.40 VENTED BALL VALVES (BLEACH BALL VALVES)

A. Vented Ball Valves shall be PVC.

B. Bleach ball valves must be on the True Union type with an energized seat that will concurrently provide automatic adjustment for wear and leak-free service at the lower pressure port. The ball must contain an adequate vent to the pressure port opposite of the downstream sealing port.

C. The manufacturer must complete all components prior to the factory assembly, test, and packaging of those valves. Modifications of assembled valves by any manufacturer or vendor is unacceptable. Also, the valves must be individually packaged with each carton label stating: Bleach ball valve, size, material and manufacturer.

D. Bleach ball valves must be permanently marked externally with: the word Bleach; two opposing directional arrows, one inscribed with Flow and the other with Vent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install valves and accessories in accordance with the manufacturer’s instructions.

B. Inspect joint surfaces for structural soundness and thoroughly clean before installation.

C. Flap Gates shall be attached to pipe flanges mounted in the concrete wall. They are **NOT** to be attached directly to the concrete wall.

3.02 FIRE HYDRANTS

A. Install fire hydrants as shown on Standard Detail; provide support blocking and drainage gravel as shown; do not block drain hole.

B. Set hydrants plumb with pumper nozzle facing the roadway; set hydrants with centerline of pumper nozzle at least 18" above finished grade and the safety flange not more than 6" nor less than 2" above grade.

C. Paint hydrants in accordance with local color scheme.

D. After hydrostatic testing, flush hydrants and check for proper drainage.

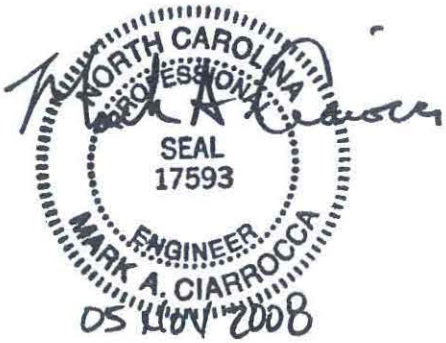
3.03 ADJUSTMENT

A. Check and adjust valves and accessories for smooth operation.

END OF SECTION

TABLE OF CONTENTS
FOR
ELECTRICAL SPECIFICATIONS

DUPLEX SUBMERSIBLE WASTEWATER PUMP STATIONS
SOUTHEAST BRUNSWICK SANITARY DISTRICT



Prepared by:

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SECTION 16000 – ELECTRICAL, BASICS

1.1 GENERAL

A. The electrical work shall be performed by a licensed EC, as a subcontract to the General Contractor (GC). The GC shall be responsible for all work included in this section.

B. The EC shall assume total responsibility for any portion of the work provided by his subcontractors.

1.2 CODES AND STANDARDS

A. Building Codes:

1. National Fire Protection Association No. 70, National Electrical Code
2. North Carolina State Building Code, Latest Edition and Revisions (NCSBC)
3. National Electrical Safety Code (NESC)
4. National Bureau of Standards (NBS)
5. Local Codes where applicable

B. Industry Standards:

1. Underwriter's Laboratories, Inc. Standards and approved listings (UL)
2. Electrical Testing Laboratories Standards (ETL)
3. National Electrical Manufacturers Association Standards (NEMA)
4. Insulated Power Cable Engineers Association Standards (IPCEA)
5. American National Standards Institute (ANSI)
6. American Society for Testing Materials Standards (ASTM)
7. Canadian Standards Association (CSA)

1.3 SCOPE OF WORK

A. It is the intent and meaning of the drawings and specifications to call for finished work that has been tested and is ready for operation. The EC shall take this into consideration and include in his bid allowance for contingencies as will allow him to provide minor pieces of materials and labor not specifically indicated but required for the job to operate properly. This paragraph is intended to insure a complete job will be provided without requests for minor extras.

1.4 ELECTRICAL SERVICE

A. The EC shall be totally responsible for coordination with the Utility Company and assistance in obtaining a permanent electrical service for the structure. He shall acquire all service agreements, etc., deliver them to the pump station Owner for signature, and return the documents to the Utility after execution. He shall act as coordinator between the Utility Company and the pump station Owner and shall supply the Utility Company with equipment

characteristics, load data, etc. Any installation, connection, underground service or special fees charged by the Utility Company for the new service shall be paid by the pump station Owner.

B. Electrical service to the structure shall be coordinated with equipment requirements and as coordinated with the utility company. Electrical service shall be 480Y277 volts, 3 phase, 4 wire.

C. The electrical service entrance raceways shall be installed by the EC and sized as shown on the contract drawings, or as required by the NEC and/or Utility Company. Service entrance conductors will be provided and installed by the Utility Company to the line side of the metering equipment. Service entrance conductors from the metering equipment to the service equipment shall be provided by the EC.

D. The EC shall coordinate the electrical service, metering and metering equipment with the local utility company for arrangements, locations, connections, etc.

E. Utility transformer pads shall be installed by the EC. Coordinate equipment pad requirements with the local utility company.

F. Current transformer cabinets and self-contained meter cabinets shall be furnished installed by the EC unless directed otherwise by the Utility Company. Load side connections shall be made by the EC. Coordinate metering requirements with the Utility Company before rough-in of service raceways.

1.5 RECORD DRAWINGS

A. One set of drawings covering the electrical contract shall be obtained by the EC to mark all changes, modifications, or revisions effected during construction such that record drawings may be prepared from the information contained thereon upon completion of the work.

1.6 APPROVAL OF MATERIALS

A. Certain makes and manufacture of materials and equipment are specified. The Contractor shall submit his proposal on the specified materials and equipment, or their equivalent, provided the words "or equal" or "or approved equal" follow the named manufacturers. If the above phrases do not appear, the specified manufacturers shall be furnished without substitution. Equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, the Engineer of Record being the judge of equality.

B. Where no specific material or equipment type is mentioned, any first class product of a reputable manufacturer may be used provided it conforms to the requirements of the specifications. These materials shall be third party listed or labeled in accordance with the General Statutes of the State (example: UL, ETL, CSA, etc).

C. The Contractor shall submit to the Engineer of Record, within 10 days following award of the contract, a list of materials and equipment for approval that he proposes to use on the project. Such list shall include the manufacturer and the trade name, type, series or model of equipment

proposed. When this list is approved by the Engineer of Record, no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted within the specified time, the Contractor shall supply materials and equipment as specified.

1.7 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. Unless directed otherwise in Architectural Specifications, Civil Specifications, or General Provisions and/or Conditions of the Contract, the Contractor shall submit six (6) sets of shop drawings, certified prints, literature, and cut sheets to the Engineer of Record for all major items of equipment and materials for review and approval. Data required to be as stipulated herein and must be submitted reasonably promptly after material list above has been approved. It is preferred that all electrical submittals for the project shall be submitted at one and the same time.

B. The Contractor shall analyze all shop drawings before submittal and certify that they meet requirements of Contract Drawings and Specifications. Contractor Certification shall be in the form of suitable approval stamp placed on each shop drawing submitted for approval with the Contractor's signature.

C. If the Engineer of Record deems submittal data is either incomplete or incorrect, one copy will be returned for correction and a new submittal will be required.

D. At least one set of all "approved" shop drawings, certified prints, etc., shall be maintained at the job site and available to representative of the Engineer of Record.

E. Approval by the Engineer of Record of shop drawings for any materials, apparatus, devices and layouts shall not relieve the Contractor from the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Such approval shall not relieve the Contractor from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the Contract Documents, the Contractor shall advise the Engineer of Record of the deviations in writing, accompanying the shop drawings, including the reason for the deviations.

F. Physical sizes of equipment used in the design layout are those of reputable equipment manufacturers. The Contractor is responsible for providing equipment that will fit the space provided. If the Contractor elects to use other manufacturer's equipment, any resulting conflicts with space clearance or codes shall be the responsibility of the Contractor to correct at his expense. The Contractor assumes all responsibility for providing code clearances.

1.8 OPERATIONS AND MAINTENANCE MANUALS, GENERAL

A. The Contractor shall provide two compilations of Operations and Maintenance Manuals. These shall be presented to the Engineer of Record before the final inspection is made. Generally, shop drawings alone are not adequate for catalog data

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

C. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Engineer.
7. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.9 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Precautions against improper use.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Manufacturer catalog data.
5. Equipment function.
6. Operating characteristics.
7. Limiting conditions.
8. Performance curves.
9. Engineering data and tests.
10. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Required sequences for electric or electronic systems.
8. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

1.10 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

1.11 DRAWINGS AND SPECIFICATIONS

A. The Electrical drawings and specifications are complementary each to the other, and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment wiring, etc and show the general arrangement of raceways, fixtures, and equipment. Drawings shall be followed as closely as actual building construction and the work of other trades will permit; however, all work shall suit the finished surroundings and/or trim.

B. It shall be understood that where the words "furnish," "provide," and/or "install" are used, it is intended that this Contractor shall purchase and install completely all material necessary and required for this particular item, system, equipment, etc.

C. Any omission from either the drawings or the specifications are unintentional, and it shall be the responsibility of the Contractor to call to the attention of the Engineer of Record any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

D. The electrical work shall conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not practical to indicate offsets, fittings and accessories that may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the Owner and as directed by the Engineer of Record.

1.12 COORDINATION OF WORK

A. It is understood and agreed that by submitting a bid, the Contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The Contractor shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in the other divisions of these specifications. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

B. The Contractor shall compare the electrical drawings and specifications with the drawings and specifications for other trades, and shall report any discrepancies between them to the Engineer of Record and obtain from him written instructions for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provisions to avoid interferences in a manner approved by the Engineer of Record. All changes required in the work of the Contractor caused by his neglect to do so shall be made by him at his expense.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each electrical raceway prior to make up and assembly.

D. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, sewer, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

E. Offsets and changes in direction of electrical raceways shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The Contractor shall furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions. Conflicts between electrical raceways, fixtures, etc., and ductwork which cannot be resolved otherwise, will be resolved by the Engineer of Record.

F. The Contractor shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The Contractor shall arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

G. Electrical Work Coordinated with Other Disciplines

1. Civil / Site Equipment
   a. The EC shall provide a source of power for all civil / site equipment. "Source" shall include conductors, raceways, circuit breakers, junction boxes, safety switches, panelboards and/or wiring troughs as required by conditions and codes and/or as shown on the contract drawings. See Civil / Control Specifications for controls, controller, control panel responsibility.
   b. The EC shall provide final power connections to equipment. Provide pigtails, flexible connections, receptacles, etc. as required and coordinate exact locations with the GC.

H. EQUIPMENT AND MATERIALS (GENERAL)

1. Equipment and materials shall be new and shall bear the manufacturer's name, trade name, and UL label in every case where a standard has been established for the particular material. The equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design.
2. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer of Record until installed. All items subject to moisture damage shall be stored in dry, heated spaces. Rusty and/or corroded materials and equipment shall be replaced at the direction of the Engineer of Record.
3. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
4. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work; fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Engineer of Record. Damage or defects, developing before acceptance of the work shall be corrected at the Contractor's expense.
5. It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the drawings and specifications.
6. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The Contractor shall promptly notify the Engineer of Record, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain written instructions from the Engineer of Record before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's instructions,

recommendations, or requirements; it shall be corrected at the direction of the Engineer of Record at no additional cost to the Owner.

I. SLEEVES, INSERTS, OPENINGS, ETC

1. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located, and installed by the EC. The EC shall give sufficient information (marked and located) to the GC in time for proper placement in the construction schedule. Should the EC delay or fail to provide sufficient information in time, the EC shall cut and patch construction as necessary and required to install electrical work. Such cutting and patching will be done by the GC but paid for by the EC.

J. CUTTING AND PATCHING

1. The EC shall do all rough cutting and patching as required for the proper installation of work under this contract. Cutting shall be kept to a minimum. The GC will finish patch and paint all such cutting.

K. LOCATIONS AND MEASUREMENTS

1. Outlets, equipment, and appliances are shown and located on the drawings. All measurements shall be verified on the project and coordinated with the drawings of other disciplines. In all cases, the work shall suit the surrounding trim and/or decoration and construction. Heights of all outlets shown on the drawings are approximate only. Slight relocations of outlets, devices, and equipment shall be made by the EC as required or as directed by the Engineer of Record at no additional cost to the Owner.

L. WORKMANSHIP

1. Work shall be executed as required by the specifications and the accompanying drawings and shall be done in a workmanlike manner by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

M. FINAL INSPECTIONS AND EQUIPMENT DEMONSTRATIONS

1. The Contractor shall furnish ladders, required tools, and men to open fixtures, boxes, panels, or any other equipment to enable the Engineer of Record to see into any parts of the installation he may request.
2. The Contractor shall furnish meters for observation of readings as directed by the Engineer of Record. Meters to be furnished include: clamp-on type ammeter, voltmeter, megger, and clamp-on type ground resistance tester.

N. OPERATING INSTRUCTIONS

1. At the completion of the entire installation, the Contractor shall arrange to operate each component of the system and then the system as a whole. When all the requirements of the plans and specifications have been met, the Contractor shall then arrange to instruct

the Owner's operating and maintenance personnel in the correct and proper procedures for the operation and maintenance of the systems

END OF SECTION 16000

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete equipment bases.
4. Cutting and patching for electrical construction.
5. Touchup painting.

1.2 SUBMITTALS

A. Product Data: For supporting devices for electrical components.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Metal Items for Use Outdoors or in Damp Locations: Stainless steel.

B. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers. Support hardware shall be stainless steel.

D. Expansion Anchors: Stainless-steel wedge or sleeve type.

2.2 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

1. Housing: NEMA 250, Type 3R enclosure.

2.3 CONCRETE BASES

A. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section for Concrete.

2.4 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

B. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

C. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.

C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Stainless steel materials.

B. Selection of Supports: Comply with manufacturer's written instructions.

C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for securing conduits.

C. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

D. Install sleeves for cable and raceway penetrations of concrete slabs, walls, and structures unless core-drilled holes are used. Install sleeves during erection of concrete forms.

E. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
2. New Concrete: Concrete inserts with machine screws and bolts.

3. Existing Concrete: Expansion bolts.
4. Steel: Spring-tension clamps on steel.
5. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section for Concrete.

3.7 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.9 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete bases.
4. Cutting and patching for electrical construction.
5. Touchup painting.

3.10 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.11 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Ground rods.
2. Ground test wells.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Chance/Hubbell.
b. Copperweld Corp.

c. Erico Inc.; Electrical Products Group.
d. Framatome Connectors/Burndy Electrical.
e. Galvan Industries, Inc.
f. Harger Lightning Protection, Inc.
g. Heary Brothers Lightning Protection Co.
h. Ideal Industries, Inc.
i. ILSCO.
j. Kearney/Cooper Power Systems.
k. O-Z/Gedney Co.; a business of the EGS Electrical Group.
l. Quazite / Strongwell.
m. Raco, Inc.; Division of Hubbell.
n. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Grounding Electrode Conductors: Stranded, insulated with green-colored insulation.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions

C. Compression Connectors: Irreversible, compression type.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: ¾" in diameter by 120 inches.

B. Test Wells: Minimum cylinder dimensions of 10" diameter x 19" deep or cube dimensions of 12" x 12" x 12" deep with grate cover, green PVC or polyethylene.

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Connections: Use welded connection or irreversible hydraulic compression connector for connections to ground rods, structural steel, and underground connections.

C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Signal and Communication Systems: For SCADA communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location.

3.3 INSTALLATION

A. Ground Rods: For service entrance, install at least two rods spaced a minimum twenty feet from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Install test wells for each ground rod. Set top of wells flush with finished grade.

D. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-52 (A)(3), using a minimum of 20 feet of bare copper conductor, sized as indicated on the drawings. Bond grounding conductor to reinforcing steel.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: Use pressure-type grounding lugs.

D. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

E. Irreversible Hydraulic Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

F. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at service disconnect enclosure grounding terminal and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by either:
   a. The fall-of-potential method according to IEEE 81, or
   b. Clamp on ground meter.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
   a. Equipment Rated 500 kVA and Less: 10 ohms.
   b. Equipment Rated 500 to 1000 kVA: 5 ohms.
   c. Equipment Rated More Than 1000 kVA: 3 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

2.2 NAMEPLATES AND SIGNS

A. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, weather and UV resistant, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

B. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or stainless steel rivets.

2.3 OUTLET AND DEVICE LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, black letters on white background, by thermal transfer. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
2. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

F. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground line warning tape located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

G. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder, and branch-circuit phase conductors:

1. 120/208-V & 120/240-V Conductors:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral : White.

2. 277/480-V Conductors:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral : Gray.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-

3.6 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 16060

wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

4. At each panelboard, a color code legend shall be permanently posted corresponding to the conductors and voltage in that panelboard

H. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

I. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Standby power system boxes and enclosures.
3. Disconnect switches.
4. Enclosed circuit breakers.
5. Motor starters.
6. Push-button stations.
7. Control devices.
8. Transformers.
9. Power-generating units.
10. Surge protection device.

END OF SECTION 16075

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600V and less.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 POWER CONDUCTORS AND CABLES

A. Manufacturers:

1. American Insulated Wire.
2. Encore.
3. General Cable.
4. Houston Wire and Cable.
5. Kerite.

6. Okonite.
7. Pirelli.
8. Senator Wire & Cable.
9. Southwire.
10. Tamaqua.

B. Conductor Material: Copper, stranded conductor for all sizes.

C. Conductor Insulation Types: Type THHN-THWN.

2.3 CONTROL CONDUCTORS AND CABLE

A. Discrete control conductors: Copper, stranded, type THHN-THWN.

1. Manufacturers:
   a. American Insulated Wire Corp.
   b. Encore Wire.
   c. General Cable Corporation.
   d. Houston Wire and Cable.
   e. Kerite Cable.
   f. Okonite.
   g. Pirelli.
   h. Senator Wire & Cable.
   i. Southwire.
   j. Tamaqua.

B. Analog cables (4-20mA): #18 AWG twisted shielded pair.

1. Manufacturers:
   a. Alpha.
   b. Belden.
   c. West Penn.

2.4 CONNECTORS AND SPLICES

A. Manufacturers:

1. Wirenuts:
   a. AMP Incorporated/Tyco International.
   b. Cooper.
   c. GB.
   d. Ideal.
   e. Thomas & Betts.
   f. 3M Company; Electrical Products Division.
2. Pre-insulated connectors:
   a. FCI.

b. Greaves.
c. Ilsco.
d. NSI.
e. Penn Union.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Pre-insulated connectors shall feature one spare port for future use.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Type THHN-THWN, single conductors in raceway for:

1. Service Entrance.
2. Feeders Concealed in Concrete and below Slabs-on-Grade.
3. Exposed Branch Circuits.
4. Branch Circuits Concealed in Concrete and below Slabs-on-Grade.
5. Discrete Control Circuits.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

C. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Inspect for physical damage; test conductors and cable for continuity and shorts.
3. Megger testing for building wire and cable:
   a. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. Minimum readings between conductors and between conductor and the grounded metal raceway shall be: 25 mega-ohms for #6 wire and smaller; 50 mega-ohms for #4 wire or larger.
   b. The Contractor shall correct malfunctioning conductors and cables, including replacement if necessary, and retest to demonstrate compliance.
   c. Certify compliance with test parameters.
4. Control / Signal Transmission Media Tests:
   a. Test cable segments for faulty connectors, splices, terminations, and the integrity of the cable and its component parts.
   b. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
5. Neutral – ground bond testing:
   a. After all fixtures, devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and grounded enclosure. If this reading is less than 25 mega-ohms, the Contractor shall disconnect the branch circuit neutral wires from the neutral bar. The Contractor shall then test each one separately to the panel until the low reading ones are found. The Contractor shall correct troubles, re-connect, and re-test until at least 25 mega-ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. Provide tabulated megger readings for each panel circuit.

C. Witness Tests:

1. The Contractor shall furnish a megger and show Engineer of Record that the conductors and panels comply with the above requirements.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
2. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.2 DEFINITIONS

A. IMC: Intermediate metal conduit.

1.3 SUBMITTALS

A. Product Data: For wireways and fittings, hinged-cover enclosures, and cabinets.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. Anamet Electrical, Inc.; Anaconda Metal Hose.
2. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
3. LTV Steel Tubular Products Company.
4. Manhattan/CDT/Cole-Flex.
5. O-Z Gedney; Unit of General Signal.
6. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 METAL WIREWAYS

A. Manufacturers:

1. Hammond.
2. Hoffman.
3. Rittal.
4. Square D.

B. Material and Construction: Stainless steel, sized and shaped as indicated, NEMA 4X.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Flanged-and-gasketed type.

F. Finish: Corrosion resistant.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.

3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Rose+Bopla.
10. Scott Fetzer Co.; Adalet-PLM Division.
11. Thomas & Betts Corporation.
12. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

C. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: IMC, rigid steel, or aluminum rigid.
2. Underground: IMC, rigid steel, or aluminum rigid.
3. Boxes and Enclosures: NEMA 250, Type 4X.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

D. Where embedded in or in contact with concrete, aluminum conduits shall be coated with an asphaltum- or bitumastic-type coating prior to concrete pour.

3.2 INSTALLATION

A. Complete raceway installation before starting conductor installation.

B. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

C. Install temporary closures to prevent foreign matter from entering raceways.

D. Protect stub-ups from damage where conduits rise above grade. Arrange so curved portions of bends are not visible above the finished grade.

E. Make bends and offsets so inside diameter is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

F. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

G. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

H. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

I. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

K. Telephone and Signal System Raceways: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings at the following points:

1. Where exiting grade level for raceways that run to wet wells, valve vaults, or meter vaults.
2. Where otherwise required by NFPA 70.

M. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Duplex receptacles & ground-fault circuit interrupters.
2. Single- and double-pole snap switches.
3. Device plates.

1.2 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc./Hubbell Subsidiary.
b. Eagle Electric Manufacturing Co., Inc.

c. Hubbell Incorporated; Wiring Device-Kellems.
d. Leviton Mfg. Company Inc.
e. Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch deep outlet box without an adapter.

2.3 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

2.4 DEVICE PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Stainless steel.
2. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FINISHES

1. Color for Wiring Devices Connected to Normal Power System: Brown, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

SECTION 16231 - PACKAGED ENGINE GENERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged engine generator sets with the following features and accessories:

1. Battery charger.
2. Engine-generator set.
3. Muffler/silencer.
4. Outdoor enclosure.
5. Starting battery.

B. Related Sections include the following:

1. Division 16 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.3 SUBMITTALS

A. Product Data: Include the following:

1. Data on features, components, accessories ratings, and performance.
2. Thermal damage curve for generator.
3. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.

2. Wiring Diagrams: Power, signal, and control wiring schematic wiring diagrams and interconnection diagrams. Identify by terminal number each required interconnection between the generator set, automatic transfer switch, & other external interconnections.

C. Service Guarantee: Provide a letter detailing local service capability and service response time guarantee.

D. Provide one mark-up copy of this specification with notations clearly showing all deviations and / or exceptions to these Specifications.

E. Voltage drop calculations for step loading as indicated:

1. Step 1: 5 kW miscellaneous load & one ____ HP, code ___ submersible pump motor with [across the line] [reduced voltage autotransformer] starter.
2. Step 2: One ____ HP, code ___ submersible pump motor with [across the line] [reduced voltage autotransformer] starter.

Note: The specifications writer shall provide the specific pump motor information indicated above in order for the generator supplier to provide voltage drop calculations. For typical submersible pump stations, limiting voltage drop to 25% will be the determining factor in selection of the standby generator unit.

F. Fuel capacity:

1. Calculations of sub-base, diesel fuel tank capacity requirement based on 48 hours runtime at full load; or
2. Calculations of LP gas capacity requirement based on 48 hours runtime at full load

G. Certified summary of prototype-unit test report.

H. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

I. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

J. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
2. Report of sound generation.
3. Report of exhaust emissions showing compliance with applicable regulations.
4. Field quality-control test reports.

K. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

L. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Contract Closeout", include the following:

1. Four sets of operating and maintenance instruction manuals shall be supplied for the engine, generator, governor, voltage regulator, and auxiliary system components as specified herein. Operation and maintenance manuals shall be prefaced with a complete bill of material that clearly identifies component descriptions and part numbers that are applicable to the specific unit supplied.
2. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

M. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications:

1. A national firm that manufactures generator sets and controls and assembles them as a complete and coordinated unit.
2. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
3. Service response shall be guaranteed to be eight hours or less upon receipt of service call notification.
4. Provide one source responsibility for warranty, parts, and service through a local representative with factory trained service technicians.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 37.

F. Comply with NFPA 70.

G. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

H. Comply with UL 2200 unless requirements of these specifications are stricter. Listed in accordance with UL 2200.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which at no cost to the Owner the manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion. Optional five year warranty shall be available upon request.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 24 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Certification shall be made in the Owner's maintenance log of repairs made and proper functioning of all engine and auxiliary systems Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

B. Service Contract: At the Owner's option, the service agreement shall be renewable on a year-to-year basis, thereafter, with costs being paid by the Owner.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but not less than one of each.
2. Indicator Lamps: Two for every six of each type used, but not less than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Paint: Two spray cans of each color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Caterpillar / Olympian.
2. Cummins / Onan.
3. Detroit Diesel.

2.2 ENGINE-GENERATOR SET

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Standby power output ratings shall be determined in accordance with the following limitations:

1. Standby ratings as calculated, with capacity as required to operate as a unit for the duration of a power outage.
2. Running kW of loads indicated shall not exceed 80% of the unit's kW rating.
3. Peak starting kVA shall not exceed the alternator's starting kVA rating at 20% voltage dip.

C. Output Connections: 480Y277 volts, 3 phase, 4 wire.

D. Safety Standard: Comply with ASME B15.1.

E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of component.

F. Fabricate engine-generator-set mounting frame and attachment of components to resist generator-set movement during a seismic event when generator-set mounting frame is anchored to building structure.

G. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

2.3 GENERATOR-SET PERFORMANCE

A. Steady-State Voltage Operational Bandwidth: 4 percent of rated output voltage from no load to full load.

B. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

C. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.

D. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.

E. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

F. Transient Frequency Performance: Less than 5 percent variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.

G. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

H. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.

I. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 SERVICE CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet.

2.5 ENGINE

A. Fuel:

NOTE TO DESIGNER: Fuel type selection shall be based on site specific requirements and in coordination with the Southeast Brunswick Sanitary District.

1. Fuel oil, Grade DF-2; or
2. LP gas.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:

1. Positive displacement, full pressure lubrication oil pump.
2. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
3. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
4. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Diesel:
   a. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions. Pump shall be capable of lifting fuel 5 feet.
   b. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
   c. Fuel Filters: Provide filter & water separator.
2. LP Gas:
   a. Carburetor.
   b. Secondary Gas Regulator.
   c. Fuel-Shutoff Solenoid Valves.
   d. Flexible Fuel Connector.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

2.6 ENGINE COOLING SYSTEM

A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

B. Radiator: Rated for specified coolant.

C. Coolant: Furnish solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

D. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

E. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

F. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

1. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.7 FUEL SUPPLY SYSTEM

A. Diesel:

1. Comply with NFPA 30 and NFPA 54.
2. Piping Connections: Field-installed fuel supply and return lines from tank to engine. Provide two flexible fuel lines with single wire braid sheath, rated 300 degrees F & 100 psi, ending in pipe threads. Install fuel lines from sub-base fuel tank.
3. Containment Provisions: Comply with requirements of authorities having jurisdiction.
4. Fuel Tank: Comply with UL & EPA requirements for sub-base fuel tanks for generators. Fuel storage capacity shall be for 48 hours at 100% full load.

B. LP Gas:

1. Piping Connections: Field-installed fuel line from utility service point to engine.

2.8 ENGINE EXHAUST SYSTEM

A. Muffler / Silencer:

1. Critical type, sized as recommended by engine manufacturer.
2. Sound level measured at a distance of 23 feet from exhaust discharge shall be 75 dBA or less when operating at full load.
3. Coated to be temperature & rust resistant.
4. Mounted internal to the enclosure and thermally insulated.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connection from Engine to Exhaust System: Flexible section of gas-proof, corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.

E. Exhaust Piping External to Engine: ASTM A 53/A 53M, Schedule 40, welded, black steel, with welded joints and fittings, and screened openings to prevent rodent entry.

2.9 COMBUSTION-AIR INTAKE

A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

2.10 STARTING SYSTEM

A. Description: 12-V electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" Article.
2. Cranking Motor: Heavy-duty, positive engagement, solenoid shift-starting motor that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates with 5% accuracy.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.11 CONTROL AND MONITORING

A. Standards: The controller shall meet the following industry standards:

1. NFPA-110 Level 1 requirements with an integral alarm horn as required by NFPA.
2. NFPA-70 (NEC).
3. Set control shall be listed under UL 508.

B. Applicability

1. The controller must operate between -40°C to +70°C and 5-95% humidity, non condensing.
2. It shall be possible to mount the control on the generator set or remotely within 40 feet of the generator set. If mounted on the generator, the control must be able to be mounted in any of 4 orientations for ease of viewing.

C. Hardware Requirements:

1. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
2. A controller mounted latch type emergency stop push button shall be supplied.
3. It shall be possible to adjust alternator output voltage at the controller.
4. The controller must provide five indicating lights:
   a. System ready - green.
   b. Not in auto – yellow.
   c. Programming mode – yellow.
   d. System warning – yellow.
   e. System shutdown - red
5. An operating guide shall be placed on the controller faceplate.
6. The controller shall include an audible alarm.

D. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

E. Functional Requirements

1. Field programmable time delay for engine start. Adjustment range, 0 to 5 minutes in 1 second increments.
2. Field programmable time delay engine cool down. Adjustment range, 0 to 10 minutes in 1 second increments.
3. It shall be possible to start the generator and run it at an idle speed during warm-up. The idle time must be user adjustable. Engine cool down at idle must also be available.
4. Real time clock and calendar for time stamping of events.
5. Output with adjustable timer for an ether injection starting system. Adjustment range, 0-10 seconds.

6. Programmable cyclic cranking that allows up to six crank cycles and up to 45 seconds of crank time per crank cycle.
7. The capability to reduce controller current battery draw, for applications where no continuous battery charging is available, must be provided. The controller vacuum fluorescent display should automatically be turned off after 5 minutes of no controller activity.
8. The controller firmware must provide alternator protection for overload and short circuit matched to each individual alternator and duty cycle.
9. A ± 0.25% digital voltage regulator must be incorporated into the controller software. No separate voltage regulator is acceptable.
10. It shall be possible to exercise the generator by programming a running time into the controller.

F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. Total instantaneous kilowatt loading and kilowatts per phase.
5. kVARS, total and per phase.
6. kVA, total and per phase.
7. DC voltmeter (alternator battery charging).
8. Engine-coolant temperature gage.
9. Engine lubricating-oil pressure gage.
10. Running-time meter.
11. Ammeter-voltmeter, phase-selector switch(es).
12. Generator-voltage adjusting rheostat.
13. Generator overload.
14. Start-stop switch.
15. Overspeed shutdown device.
16. Coolant high-temperature shutdown device.
17. Coolant low-level shutdown device.
18. Oil low-pressure shutdown device.
19. Battery voltage.
20. RPM.
21. Lube oil temperature.
22. Lube oil level.
23. Fuel pressure.
24. Fuel temperature (diesel only).
25. Fuel rate.
26. Ambient temperature.

G. The following operational records since system start up shall be stored in the controller:

a. Run time hours.
b. Run time loaded.
c. Run time unloaded.

d. Number of starts.
e. Factory test date.
f. Last run data including date, duration, and whether loaded or unloaded.
g. kW hours.

H. The following operational records shall be stored in a resettable form for maintenance use:

1. Run time hours.
2. Run time loaded.
3. Run time unloaded.
4. Number of starts.
5. Days of operation.
6. Start date after reset.
7. kW hours.

I. The controller shall store the last one hundred generator system events with date and time of the event.

J. The following information shall be stored in the controller and be displayed on demand:

1. Manufacturer's model and serial number.
2. Battery voltage.
3. Generator set kilowatt rating.
4. Rated current.
5. System voltage.
6. System frequency.

K. Inputs

1. There shall be 5 dry contact inputs that can be user configured to shutdown the generator or provide a warning.
2. Additional standard inputs:
   a. Reset of system faults.
   b. Remote two wire start from automatic transfer switch.
   c. Remote two wire start from SCADA RTU.
   d. Remote emergency stop.
   e. Idle mode enable.

L. Outputs

1. NFPA 110 Level 1 outputs shall be available.
2. There shall be twelve dry-contact outputs available for interfacing to other equipment.
3. Any of these outputs shall be able to be user configured from a list of over 25 functions and faults.
4. A programmable user defined common fault output with over 40 selections shall be available.
5. Specific outputs via dry contacts for connection to SCADA RTU:

a. Engine running.
b. Summary alarm or failure.

M. System Programming

1. Programming access is to be enabled only at the controller and shall be password protected.
2. It shall be possible to disable programming so the system can only be monitored.
3. The following shall be programmable from the controller keypad.
   a. Time delay settings:
      1) Generator run time (0 to 72 hours) – exercise.
      2) Engine start.
      3) Engine cool down.
      4) Over voltage and under voltage delays.
      5) Starting aid.
      6) Crank on and crank pause time.
      7) Iidle time.
   b. Trip point settings:
      1) High battery voltage.
      2) Low battery voltage.
      3) Over speed.
      4) Uunder frequency.
      5) Over frequency.
      6) Under voltage.
      7) Over voltage.

2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Matched to generator thermal damage curve as closely as possible.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: One of two options:

1. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being performed. Field current-sensing breaker will not be acceptable.

2. Microprocessor-based unit that continuously monitors current level in each phase of generator output, integrates generator heating effect over time, and predicts when thermal damage of the alternator will occur. When signaled by the protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from the load circuits. Protector shall perform the following functions:
   a. Initiates a generator overload alarm when the generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
   b. Under single or three-phase fault conditions, regulates the generator to 300 percent of rated full-load current for up to 10 seconds.
   c. As the overcurrent heating effect on the generator approaches the thermal damage point of the unit, the protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
   d. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.13 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1 and specified performance requirements.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H, synthetic, non-hygroscopic. Temperature rise of the rotor and stator shall be limited to 105°C at the specified kW rating.

D. Stator-Winding Leads: four bars brought out to terminal.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
2. The voltage regulator must be capable of maintaining voltage within +/- 1% at any constant load from 0 to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range,

stability, and volts-per-hertz operation, and be protected from the environment by conformal coating.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: The alternator shall be salient-pole, brushless, of 2/3 pitch to eliminate the third harmonic, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed for smooth voltage waveform.

L. Subtransient Reactance: 12 percent, maximum.

M. Performance:

1. The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short by inherent design or by the addition of an optional current boost system.
2. Upon 1-step application of any load up to 100% of the rated load at 0.8 power factor, the voltage dip shall not exceed 20% and shall recover to +/- 2% of rated voltage within 1 second.
3. The generator shall be capable of starting motor loads indicated in the submittals section, with a maximum voltage dip of 25%.

2.14 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof prepainted 14-gauge Aluminum alloy housing, wind resistant up to 110 mph. Enclosure shall feature a peaked roof to direct water run-off. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be hinged and removable by one person without tools. Door locks shall be stainless steel and keyed alike. Hardware and fasteners shall be stainless steel. Instruments and control shall be mounted within enclosure.

B. Engine Cooling Airflow through Enclosure: The generator set shall be capable of operating at full load in an ambient of 40°C with no derating of the electrical output.

1. Automatic Louvers:
   a. Engine cooling-air inlet and discharge.
   b. Louvers openings shall be screened to prevent rodent entry.
   c. Storm-proof and drainable louvers shall prevent entry of rain and snow.
   d. Inlet louvers shall be spring open and power close.
   e. Discharge louvers shall be gravity open.
   f. When the genset is not operating, all louvers shall be closed to reduce enclosure heat loss in cold weather.

C. Sound attenuation of the packaged unit shall match or exceed that of the exhaust silencer.

2.15 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.16 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
2. Generator Tests: Comply with IEEE 115.
3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Full load run.
2. Maximum power.
3. Voltage regulation.
4. Transient and steady-state governing.
5. Single-step load pickup.
6. Safety shutdown device testing.
7. Observation of Factory Tests: Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

C. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete materials and installation requirements are specified in Division 3.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generators level on concrete base.

1. Vibration Isolation: Mount packaged engine generators on isolators as recommended by the manufacturer.

C. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

E. Furnish lubricating oil to fill the crank case as recommended by the manufacturer.

F. Provide sufficient fuel to perform start-up and field testing.

3.4 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 IDENTIFICATION

A. Identify system components according to Division 16 Section "Electrical Identification".

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection as required by the manufacturer's installation criteria. Certify compliance with test parameters.
2. Perform tests recommended by manufacturer.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:
   a. Single-step full-load pickup test with an external load bank.
   b. Engine coolant temperature, oil pressure, and battery charge level along with generator voltage, amperes, and frequency shall be monitored & recorded throughout the test.
4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.
5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
6. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Remove and replace malfunctioning units and retest as specified above.

G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

H. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

1. Coordinate this training with that for transfer switches.

END OF SECTION 16231

SECTION 16289 - TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes transient voltage surge suppressors for low-voltage power, control, and communication equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Product Certificates: Signed by manufacturers of transient voltage suppression devices, certifying that products furnished comply with the following testing and labeling requirements:

1. UL 1283 certification.
2. UL 1449 listing and classification.

C. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 1.

D. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. IEEE Compliance: Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide for Surge Suppressor Testing."

D. NEMA Compliance: Comply with NEMA LS 1, "Low Voltage Surge Protective Devices."

E. UL Compliance: Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.4 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in

addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Current Technology, Inc.
2. Liebert Inc.
3. Total Protection Solutions.

2.2 SUPPRESSORS

A. Surge Protection Device (SPD):

1. 480Y277V, 3 phase, 4 wire service:
   a. Current Technology #TG150-277/480-3GY-L2-SS.
   b. Liebert #SI032277YANCX.
   c. Total Protection Solutions #TK-ST300-3Y480-B-L-XX.

B. Features to be included:

1. Surge event counter.
2. Integral fusible disconnect / safety switch.

2.3 ENCLOSURES

A. NEMA 250, type 4X.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices with conductors to suppressor as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

END OF SECTION 16289

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Enclosures.

1.2 DEFINITIONS

A. HD: Heavy duty.

B. RMS: Root mean square.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 16 Section "Electrical, Basics," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. ABB.
2. Eaton Corporation; Cutler-Hammer Products.
3. General Electric Co.; Electrical Distribution & Control Division.
4. Siemens Energy & Automation, Inc.
5. Square D/Group Schneider.

B. Fusible Switch, 1200A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

E. Double throw switches: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position. Intended for use as a manual transfer switch; to be used for switching between two power sources when not loaded.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Molded-Case Circuit Breakers: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 4X.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical tests, visual inspection, and mechanical inspection as recommended by the equipment manufacturer. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 16410

SECTION 16415 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Wiring Diagrams: Single-line diagram. Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 16 Section "Electrical, Basics," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA ICS 1.

D. Comply with NFPA 70.

E. Comply with NFPA 99.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter. Listed in accordance with UL 1008.

1.4 WARRANTY

A. Each ATS shall be warranted by the manufacturer for two years from the date of the site start-up to be free from defects in material and workmanship in accordance with the manufacturers published warranty. Where manufacturer's standard guarantees or warranties are written for a period of more than two years, at no additional cost to the OWNER, such longer terms shall apply.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASCO Power Technologies, LP.
2. GE Zenith Controls.
3. Russelectric, Inc.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels have communication capability matched with remote device.

D. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Neutral Terminal: Switched and fully rated, unless otherwise indicated.

G. Conductor Terminals: Mechanical lugs.

H. Enclosures: General-purpose NEMA 250, Type 4X, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

I. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.

1. Designated Terminals: Pressure type suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

K. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

2.4 AUTOMATIC TRANSFER-SWITCH FEATURES

A. Undervoltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from zero to thirty seconds, and factory set for five seconds.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source Availability: The transfer switch shall transfer to an available utility source immediately upon failure of the generator source.

H. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

I. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

J. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

K. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

L. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

M. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
2. Push-button programming control with digital display of settings.
3. Integral battery operation of time switch when normal control power is not available.

N. Status Indication: Alphanumeric display shall indicate status of the following:

1. Transfer Switch Position Sensing Fault.
2. Transfer Switch Fail to Transfer.
3. Internal Control Module Fault.
4. Manual Transfer Operation.
5. External Fault Condition (two inputs).
6. Not In Automatic.
7. Programming Switch Not In Off.

O. Outputs via dry contact indication:

1. Normal power available.
2. Generator power available.
3. High voltage alarm.
4. Low voltage alarm.
5. ATS in Normal position.
6. ATS in Emergency position.

2.5 FINISHES

A. Enclosures: NEMA 4X, stainless steel.

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's criteria.

B. Identify components according to Division 16 Section "Electrical Identification".

3.2 WIRING TO REMOTE COMPONENTS

A. Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform electrical tests and visual and mechanical inspection in accordance with the manufacturer's installation and start-up criteria. Certify compliance with the manufacturer's test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.
b. Observe reaction of circuit-interrupting devices when simulated fault current is applied at sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

1. Coordinate this training with that for generator equipment.

END OF SECTION 16415

SECTION 16442 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Panelboard Schedules: For installation in panelboards.

E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 16 Section "Electrical, Basics," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on Square D products.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Four spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.
   a. Outdoor Locations: NEMA 250, Type 4X or 3R (with painted stainless steel).
2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Compression type.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1 and manufacturer's requirements.

B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical tests, and visual inspection, and mechanical inspection as recommended by the equipment manufacturer. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

SECTION 16461 - DRY-TYPE TRANSFORMERS (600 V AND LESS)

PART 1 - GENERAL

1.1 SUMMARY

1. This Section includes the following types of dry-type transformers rated 600 V and less.

1.2 SUBMITTALS

A. Product Data Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Wiring and connection diagrams.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C 57.12.91.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Electric Corporation.
2. Cutler-Hammer.
3. G.E.
4. Siemens Energy & Automation, Inc.

5. Square D.

2.2 MATERIALS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices, except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Aluminum or copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Totally enclosed, nonventilated, with lifting eyes, NEMA 250, Type 3R, stainless steel or 4X, stainless steel.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Outdoor Transformer Enclosure Finish: Comply with NEMA 250 for "Outdoor Corrosion Protection."

1. Finish Color: Gray.

E. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

F. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity].

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

2.4 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls and floors for suitable mounting conditions where transformers will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install rack-mounted transformers level and plumb with equipment rack.

3.3 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.

END OF SECTION 16461

SECTION 16490 – PUMP CONTROL PANELS

PART 1 - GENERAL

1.1 SUMMARY

This section gives the requirements for installation of a pump control panel and components for control & monitoring operating status of the pump station.

1.2 CERTIFICATIONS

A. The instrumentation panel and individual components shall be 3rd part listed; UL, ETL, CSA, etc.

B. The control panel shall be listed to UL 698A, Industrial Control Panels Relating to Hazardous (Classified) Locations.

1.3 DESCRIPTION OF OPERATION

A. The control panel shall control the operation of two pumps, unless indicated otherwise.

B. Manual mode, selector switches in "HAND" position:

1. Selected motor operates. Pump shuts down upon pumping down to the Off level.
2. "Pump Down" pushbutton will allow operation of motors below the low level shutoff level.

C. Automatic mode, selector switches in "AUTO" position:

1. Float switches shall be used for level sensing.
2. One pump operates upon reaching the Lead level; two pumps operate upon reaching the Lag level. Upon pumping down to the Off level, both pumps will shut down.
3. The lead pump shall alternate for each pumping cycle. An alternation selector switch shall establish the sequence of alternation.
4. A time delay shall be introduced for the lag pump to prevent simultaneous starting after power failure or similar incidents.

D. Relays and circuitry for monitoring and indication of the following shall be provided:

1. Motor RUN status.
2. Pump seal failure. A seal failure condition shall not stop motors from operating.
3. Motor overtemperature. A motor over-temperature condition shall prevent the motor from operating until the condition is cleared.
4. Motor overload. A motor overload condition shall prevent the motor from operating until the condition is cleared by manual reset.
5. High wet well level.
6. Low wet well level. A low wet well level condition shall prevent motors from operating, unless manually bypassed by the momentary position "Pump Down" pushbutton.

E. Alarm horn and light:

1. Activated by:
    a) High wet well level.
    b) Pump seal fail.
    c) Motor overtemperature.
    d) Motor overload.
    e) Loss of utility power.
2. The alarm horn shall be silenced by an alarm silence pushbutton.
3. A reset pushbutton shall be provided to clear the high wet well level alarm condition.

F. Auxiliary signal, dry contacts shall be provided with circuitry wired to terminal blocks for connection to an external SCADA unit for the following:

1. Pump #1 RUN indication.
2. Pump #1 FAIL indication (seal failure, overtemperature, or overload).
3. Pump #2 RUN indication.
4. Pump #2 FAIL indication (seal failure, overtemperature, or overload).
5. High wet well level.
6. Loss of power, phase failure, undervoltage, overvoltage.

G. See pump control panel details on drawings for additional information.

1.4 SUBMITTALS

A. Submit shop drawings, certified prints, literature, and cuts sheets for all control panels and accessory materials.

B. Shop drawings adequate for control panel fabrication, installation and maintenance shall be submitted and approved prior to manufacture. The adequacy of shop drawings shall be determined solely by the Engineer of Record. Drawings shall include:

1. Elementary control (ladder) diagram.
2. Interconnection wiring (schematic) diagram.
3. Interior and exterior panel component layout drawings.
4. Dimensioned outline drawing of the enclosure with mounting supports.
5. Component catalog cuts and Contractor's installation drawings.

B. Post fabrication submittals shall include:

1. Device nameplate list.
2. Written certification of the UL serialized label for the pump control panel.

C. Post installation submittals shall include four copies of operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 CONTROL PANEL

A. General: Control panel shall consist of a main circuit breaker, phase monitor, surge protector, control power transformer, selector switches, pushbutton operators, auxiliary

relays, timers, alternator, indicator lights, elapsed time meters, circuit breakers, motor starters with overloads, strip heater with thermostat, duplex GFCI receptacle, alarm strobe and horn, circuitry, and terminal blocks with all components mounted in one common enclosure. The controls assembly shall provide means to operate each motor manually or automatically. Power supply shall be as indicated on the drawings. Control power shall be 120 volts.

B. Enclosure:

1. The electrical control equipment shall be mounted within a NEMA type 4X, stainless steel, gasketed, dead front enclosure of welded and seamless construction.
2. External hardware, hinges, etc., shall be 300 series stainless steel.
3. Weatherdoor: Gasketed, continuously hinged with doorstop, three point latch, quick release latches and a hasp assembly for padlocking.
4. Deadfront / interior swing panel for mounting selector switches, pushbutton operators, and LED indicators: Continuously hinged deadfront held closed with two slotted nickel plated brass captive panel screws with knurled edges to allow for finger or screwdriver tightening.
5. Control compartment shall incorporate a fixed, rigid back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. The back panel shall be 12 gauge galvanized steel, painted with heavy-duty epoxy enamel after fabrication. Back panel shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.
6. Mounting provisions: Mounting lugs shall be provided for rack mounted panels. Mounting feet shall be provided for self-supported panels.

C. Components:

1. A control panel main disconnect switch shall be heavy-duty circuit breaker type. The switch shall be lockable in either the ON or OFF position.
2. A phase monitor shall be connected to the main power input terminals to prevent motor operation upon phase loss, phase reversal, under-voltage, and phase imbalance conditions. Upon restoration of satisfactory input voltage, the unit shall automatically reset after a user programmable time delay. Phase monitor leads shall be fused in accordance with the manufacturer's requirements.
3. A surge protection device for the control panel shall be connected to the main power input terminals.
4. A 120V control power transformer shall be provided, sized in accordance with the loads to be supplied, plus 20% additional capacity.
5. Float switch circuitry from wastewater wet wells shall be connected to intrinsically safe relays / barriers.
6. Selector switches shall be heavy-duty, oil tight, manual return with standard knob. Switches shall be clearly labeled according to function
7. Motor operator selector switches shall be three position Hand-Off-Automatic type, shall permit over-ride of automatic control, and allow manual operation or shutdown of each motor.
8. Pushbutton operators shall be heavy-duty, oil tight, watertight, NEMA 4, momentary position, fully guarded type.
9. Auxiliary and control relays shall be enclosed, general purpose relays with plug-in bases and transparent polycarbonate dust cover.

a. Continuous rated coils with AC pickup voltages of 85% of nominal. Coil voltage as required.
b. Contacts rated at 120 VAC, 80 percent P.F., 10 amperes continuous, 30 amps make, 3 amps break.
c. Relays shall feature an LED indicator that is lit when the coil is energized.

10. Timer delay relays shall be enclosed, general purpose, adjustable time delay relays with plug-in bases.
    a. Operating voltage as required.
    b. Contacts rated at 120 VAC, 80 percent P.F., 10 amperes continuous, 30 amps make, 3 amps break.
    c. Timing range and ON or OFF operate delay type relays as required for the application.
    d. Transparent polycarbonate dust cover with adjustable timing dial.
11. Alternator relays shall be enclosed, general purpose duplex alternating relays with plug-in bases and transparent polycarbonate dust cover.
    a. Continuous rated coils with AC pickup voltages of 85% of nominal. Coil voltage as required.
    b. Contacts rated at 120 VAC, 80 percent P.F., 10 amperes continuous, 30 amps make, 3 amps break.
    c. Solid-state alternating circuit driving electro-mechanical relay coil.
    d. Relays shall feature state indicating LEDs in the cover.
    e. Provided for alternation of the lead pump for each run cycle.
12. Panel indicators shall be heavy-duty, oil tight, push-to-test with 120V LEDs.
13. Running time meters for each motor shall be provided.
    a. Non-resettable, hour indicating, with 6 digit registers.
    b. ¼" high numbers, white on black background. Last digit for tenths of an hour shall be of contrasting color.
14. Individual magnetic, instantaneous trip circuit breakers shall be provided for each motor. Breakers shall be lockable in the OFF position. Breakers shall be sized in accordance with the nameplate rating of the motor provided.
15. Individual full voltage across the line or reduced voltage autotransformer type starters shall be provided for each motor.
    a. Provide full voltage across the line starters for motors less than 30 HP. For motors 30 HP or greater, provide reduced voltage autotransformer type starters.
    b. Size starters in accordance with the nameplate rating of the motor provided.
    c. Starters shall meet NEMA IC1, NEMA IC2, UL 508, & NEC requirements.
    d. Replacement of coil and contacts shall not require removal of the starter or power wiring from the control panel.
    e. Manual reset, temperature compensated, melting alloy thermal overload relay; sized in accordance with the NEC, with through-door pushbutton reset.
    f. Starters shall feature auxiliary contacts for run indication and overload shutdown.
16. A strip heater with thermostat shall be provided to prevent the formation of condensation within the control panel interior.
17. A fluorescent light, switched when the panel door is opened shall be provided for the control panel interior.
18. A ground fault circuit interrupter receptacle shall be provided as a convenience outlet.
19. Alarm strobe / beacon:

a. Red LED; 120,000 hour light source life.
b. NEMA 4X; mount to control panel enclosure exterior in a waterproof matter with closed cell neoprene gasket.
c. The strobe shall flash at approximately 65 flashes per minute.
d. Design basis: Edwards 109R-N5, or equivalent by Federal Signal or Maxi-Signal.

20. Alarm horn shall be provided on the control panel exterior, with waterproof connections to the control panel. Design basis: Edwards 876-N5, or equivalent by Federal Signal or Maxi-Signal.
21. Terminal blocks shall be provided for connection of both internal connections and connections for external circuitry.
    a. Channel mounted, sectional type.
    b. Rated 600 volts, 20 amps minimum.
22. Labeling:
    a. All switches, pilot lights, control devices, major components, etc., shall be clearly labeled according to function with engraved plastic plates, black with white core. Minimum letter size shall be 1/8 inch.
    b. All conductors and terminal strips shall be labeled, matching schematic and wiring diagrams.
    c. Identification labeling shall match the bill of materials, schematic diagram, and wiring diagram.
    d. Schematic and wiring diagrams shall be displayed via a placard mounted to the inside surface of the panel door.
23. All other components necessary for a completely operable system performing the functions required shall be supplied.

D. Operating Controls and Instruments: All operating controls and instruments shall be securely mounted in such a manner that any or all standard options specified may be added without rearrangement of existing controls and instruments. All controls and instruments shall be clearly labeled to indicate function.

E. Wiring:

1. All wiring workmanship and schematic wiring diagrams shall be in compliance with applicable standards and specifications for industrial controls set forth by the Joint Industrial Council (JIC), National Machine Tool Builders Association (NMTBA), National Electrical Code (NEC), Division 16 of these specifications and other pertinent electrical codes and standards.
2. All control circuit wiring shall be, stranded copper, color coded and clearly marked at each end to match schematic wiring diagrams, and of adequate size to safely carry required electrical loads. All control wires shall be marked using T&B Shur-code sleeve markers. All wires on the back panel shall be contained in wire troughs with removable covers to facilitate field repairs and addition of optional/additional components. Splices shall not be used.

2.3 OPERATIONS AND MAINTENANCE MANUALS

A. Prepare an operation and maintenance manual for the duplex pump panel and control equipment. Manuals shall be made up with hard cover post type binders. Include index, tabbed section dividers, all approved shop drawings, installation, and maintenance

instructions packed with equipment, and parts lists.

B. Provide a written description of equipment operation, special features and maintenance requirements.

C. Provide instructions for setting all adjustable components. Record the final field settings of all adjustable components in a comprehensive table.

D. Large sheets shall be neatly folded and installed with post hole reinforcements such that sheets will unfold without need to open binder posts.

2.4 SPARE PARTS

A. One complete set of fuses.

B. One complete starter for each size provided.

C. One set of overload relays for each type and rating provided.

D. One pilot light with lens for each type provided.

PART 3 - EXECUTION

3.1 SHIPMENT AND STORAGE

A. Wrap pump panel enclosure surfaces in a protective plastic wrap before crating and shipment. Crate the pump control panel to protect it from damage during shipment and storage.

B. Store all electrical materials and equipment at the site in trailers or temporary buildings that provide protection from the effects of weather.

3.2 COORDINATION

A. Make changes to the electrical design at no additional cost if the motors supplied have electrical ratings and characteristics different from the motor specified or shown. Provide calculations used to make revised component selections. Revised selections shall comply with the specifications. Verify that final field adjustments comply with factory recommendations.

3.3 INSTALLATION

A. General: The Contractor shall receive, handle and store all equipment and materials to be installed, being careful to prevent any damage during transport and storage. All equipment stored shall be protected from weather in a manner recommended by the manufacturer.

1. All equipment shall be handled and installed in accordance with written instructions and approved shop drawing details of the manufacturer and as required by the drawings.

2. If the Contractor determines that existing conditions do not permit proper installation, he shall immediately notify the Engineer of Record.

B. Instrumentation panel and accessory equipment shall be installed in strict accordance with the manufacturer's instructions and good practice in a workmanship manner.

3.3 START-UP TESTING

A. Test instrumentation system for proper function and sequencing of all motors, indication, and remote notification capabilities.

B. Conduct a test for observation by the Engineer of Record to demonstrate operation in accordance with the drawings and specifications.

END OF SECTION 16490

SECTION 16521 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with lamps and ballasts, but not mounted on exterior surfaces of buildings.
2. Luminaire-mounted photoelectric switches.

1.2 SUBMITTALS

A. Product Data: For each luminaire, arranged in the order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of fixture, including dimensions and verification of indicated parameters.
2. Luminaire dimensions, effective projected area, details of attaching luminaires, accessories, and installation and construction details.
3. Luminaire materials.
4. Photoelectric relays.
5. Fluorescent and high-intensity-discharge ballasts.
6. Fluorescent and high-intensity-discharge lamps.
7. Electrical and energy-efficiency data for ballasts.

B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

C. Wiring Diagrams: Power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For luminaires to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace luminaires or components of luminaires and lamps that fail in materials or workmanship; corrode; or fade, stain, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
   a. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
   b. Warranty Period for Color Retention: Five years from date of Substantial Completion.
2. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Products: Floodlight, Holophane #PD175MH12KW1G or equivalent by Gardco, Hubbell, or McGraw Edison.

2.2 LUMINAIRES, GENERAL

A. Complying with UL 1598 and listed for installation in wet locations.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

F. Exposed Hardware Material: Stainless steel.

G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

2.3 PHOTOELECTRIC RELAYS

A. UL 773 or UL 773A listed, factory mounted to the luminaire.

B. Contact Relays: Single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay.

1. Relay with locking-type receptacle shall comply with NEMA C136.10.
2. Adjustable window slide for adjusting on-off set points.

2.4 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated:

1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F.
4. Open-circuit operation will not reduce average life.

2.5 HIGH-INTENSITY-DISCHARGE LAMPS

A. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000.

2.6 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping.

B. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
   a. Color: Medium bronze.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in each fixture.

B. Luminaire Attachment: Fasten to rigid conduit mast that is attached to structural supports on the equipment rack.

C. Adjust luminaires that require field adjustment or aiming.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

END OF SECTION 16521

SECTION 16795 – SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section gives the requirements for the installation of SCADA system components at a wastewater pump station. Components will be required for communication with the SCADA system of the Southeast Brunswick Sanitary District (SEBSD).

B. Pump station functions monitored for the SEBSD system include:

1. Wet well high-level alarm.
2. Lag Pump On.
3. Lead Pump On.
4. Pump Number 1 Fail.
5. Pump Number 2 Fail.
6. Utility power loss.
7. Generator running.
8. Generator alarm or failure.

C. This section includes equipment referenced as telemetry panel (TP) and remote terminal unit (RTU).

D. Completeness: These specifications cover the intended function of the equipment, but do not necessarily cover all details necessary for a complete, operating and functional system. Contractor shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.

1.2 CERTIFICATIONS

A. Equipment and components shall be 3rd part listed; UL, ETL, CSA, etc.

1.3 WARRANTY / GUARANTEE

A. The Equipment Supplier shall provide a 1-year warranty for all specified equipment stating that it is free from defects in workmanship and material.

B. It is the intent of these specifications that the manufacturer shall furnish a complete, integrated, functionally operating system. Manufacturer shall warrant that the system performs the intended functions.

C. Equipment manufacturer shall guarantee the availability of repair parts for a period of not less than fifteen years. Each component shall be given a serial number, and record drawings shall be maintained by the manufacturer with permanent copies being furnished to the Owner and Engineer.

1.4 SUBMITTALS

A. Submit shop drawings, certified prints, literature, and cuts sheets for SCADA RTUs and accessory components and materials.

B. Shop drawings adequate for equipment fabrication, installation and maintenance shall be submitted and approved prior to manufacture. The adequacy of shop drawings shall be determined solely by the Engineer of Record. Drawings shall include:

1. Elementary control (ladder) diagram.
2. Interconnection wiring (schematic) diagram.
3. Interior and exterior panel component layout drawings.
4. Dimensioned outline drawing of the enclosure with mounting supports.
5. Component catalog cuts and Contractor's installation drawings.

C. Submit documentation of SCADA system supplier qualifications to include:

1. Documentation showing that the system supplier employs permanent, competent personnel experienced in design, programming and manufacture of equipment and systems required to be furnished under these specifications. The system supplier shall identify and assign an experienced person to act as project manager. This person shall have responsible project experience on similar systems of comparable complexity.
2. Documentation that the system supplier has, and will maintain, competent service personnel within a 250 mile or less travel radius to service the equipment as specified.

D. The results of a radio path analysis shall be submitted to the Engineer of Record for review in a detailed report documenting the actual radio field test procedures and results, along with confirmation of the required antenna heights. The specific antenna heights, determined as a result of the radio path analysis, shall be identified and coordinated with the Engineer and the Electrical Contractor.

E. Post installation submittals shall include four copies of operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 SCADA SYSTEM COMPONENTS

A. SEBSD Wastewater SCADA System:

1. The components of the existing SEBSD SCADA System include:

a. Remote terminal units – ForTech Model #2RTU2.
b. Radios – 900 MHz MDS Model 9810.
c. PLC – Allen Bradley Micrologic.
d. Base station – located at SEBSD wastewater treatment facility lab building.

B. The new work shall incorporate additions and modifications to the existing system to transmit data signals from one new pump station to the existing base station.

C. The vendor for the existing SEBSD SCADA system is:

ForTech Inc.
2124 Wilkinson Blvd
Charlotte, NC 28208
Phone: 704-333-0621
Fax: 704-333-2820
Contact: Jon Forrest

D. The installation shall be compatible with and interface seamlessly with the existing SEBSD Central SCADA System.

2.2 REMOTE TERMINAL UNITS (RTU)

A. One RTU shall be installed at the Pump Station.

B. RTUs shall be supplied with the number and type of I/O points to provide the functions as described elsewhere in the specifications and drawings. Future expansion may be made by simply plugging in additional I/O modules to the I/O bus on the motherboard. Each RTU must be supplied with the following minimum configuration:

1. Motherboard
2. I/O Bus
3. Enclosure with condensation heater
4. CPU Processor Module
5. Power Supply
6. Battery/UPS
7. I/O Modules as required
8. Communications Interface

C. Enclosure: Surface mounted, lockable, NEMA 4X (Stainless Steel).

D. Environmental

1. RTUs shall operate over an ambient temp. range of -30 to 60C with relative humidity < 95%.
2. All equipment shall be designed to operate on 120 VAC 60 Hz power and have the ability to "ride through" a power interruption of 8 milliseconds or less without interruption of normal operation. A battery and charging circuit shall be included to provide 4 hour standby operation.

2.3 RADIO SYSTEM ACCESSORIES

A. Directional Antennae: One (1) YAGI directional antennae (SCALA Model #TY-900) designed for radio systems shall be provided at each RTU location. The Contractor shall provide lengths of stainless steel 2-inch diameter conduit to house the antenna cable and serve as a mast for the antenna. Height and position shall be as determined by a radio path survey. The contractor shall provide all masts, lightning suppressors and other apparatus required to make a complete, operable, and reliable system. All mounting hardware shall be stainless steel.

B. Transmission Cable

1. Provide a 6-foot section of "superflexible" transmission cable at each radio antenna port. Provide standard Type N connectors for connection to a continuous piece of cable extending to the antenna.
2. Provide low loss, foam dielectric, weatherproof transmission cable, suitable for direct environmental exposure, connecting each radio antenna port with the applicable antenna. Use "O" ring seals on connections.
3. Provide a wood pole for antenna support if a rack mounted conduit mast is not high enough as determined by the radio path survey.

2.4 SURGE PROTECTION

A. Surge protection shall be provided for antenna/radio, power, analog input, and digital input circuits shall be provided.

1. Surge suppressors for connections to AC power supply circuits shall be assemblies that are constructed as multistage devices. The first stage shall be a high energy metal oxide varistor element. The second stage shall consist of fast-acting high power bipolar silicon avalanche devices. First and second stages shall be interconnected through a series air core inductor of sufficient current-carrying capacity to permit a continuous operating current of 15 amperes. Suppressor assemblies shall be the automatic recovery type.
2. Surge suppressors for analog signal circuits shall have a surge suppression circuit consisting of a 3-electrode gas tube and silicone avalanche device to clamp each line to ground. High-energy gas tube and silicone avalanche devices shall be separated by a series impedance. Surge suppressors limit line-to-ground and line-to-line voltage to 30 volts on 24 V DC circuits.

2.5 WIRING

A. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be no less than 18 AWG copper, insulated for not less than 600 volts, with a moisture and heat resistant material and flame retardant nonmetallic covering.

B. All wires are to be identified with permanent wire number markers at each termination point of the wire. Acceptable NEC and ISA wire colors for various voltage conductors are to be used.

C. Terminal blocks for field connections shall be suitable for No. 14 - 12 AWG wire and be complete with marking strip and screw connectors. Terminals shall be labeled to agree with identifications shown on supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits plus one ground for each shielded cable. All wiring shall be grouped or cabled and firmly supported to the panel. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. No less than 25% spare terminals shall be provided. Each control loop or system shall be individually fused and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.

2.6 DEVICE IDENTIFICATION

A. All devices shall be permanently identified. The device and terminal identifications shall agree with those shown on the equipment drawings.

B. Nameplates shall be provided on the face of individual devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: The Contractor shall receive, handle and store all equipment and materials to be installed, being careful to prevent any damage during transport and storage. All equipment stored shall be protected from weather in a manner recommended by the manufacturer.

1. All equipment shall be handled and installed in accordance with written instructions and approved shop drawing details of the manufacturer and as required by the drawings.
2. If the Contractor determines that existing conditions do not permit proper installation, he shall immediately notify the Engineer of Record.

B. Control system programming shall be performed on-site to provide system functions as specified.

C. HMI Programming for the SEBSD SCADA System

1. Provide programming of the existing control system. Specific functions to be incorporated include:
   a. Monitor high level alarm:
   b. Monitor running status of Pump 1. Elapsed run time shall be recorded and indicated with a running total and rolling 24 hour total.
   c. Monitor running status of Pump 2. Elapsed run time shall be recorded and indicated with a running total and rolling 24 hour total.
   d. Monitor Pump 1 failure indication
   e. Monitor Pump 2 failure indication.
   f. Monitor loss of utility power at pump station.
   g. Monitor generator run status.
   h. Monitor generator alarm or failure.

D. Radio path surveys with complete documentation verifying the location and antenna height requirements for each RTU shall be performed by the system integrator to determine the antenna pole/tower height requirements.

3.2 START-UP TESTING

A. Test system for proper function.

3.3 WITNESS TESTING

A. The Owner, Engineer of Record, regular operators, and the maintenance staff shall be notified 1 week in advance of the time and date of the site tests. Tests shall be performed that fully exhibit the control and monitoring functions as specified herein.

3.4 SUPERVISION, START-UP, SERVICE, AND TRAINING

A. System supplier's trained service engineer shall provide installation supervision to the Contractor.

B. System supplier's trained service engineer shall provide initial startup, calibration and adjustment of equipment.

C. Manufacturer shall, during the warranty period, furnish all service necessary to repair defective equipment or work, and no charges will be made for any service due to these reasons. A complete written report shall be furnished to the Owner after each service visit, giving the reason for failure and recommendations to prevent recurrence.

D. Conditional service shall also be provided, upon request of the Owner, for a period of one year after final acceptance, up to one 8-hour day, on-site.

E. Maintenance Training: At start-up, the system supplier shall provide four (4) hours of maintenance training for the owner's personnel. Subsequent to startup, one day shall be provided to demonstrate performance of routine and preventative maintenance, troubleshooting, and repair of all field and panel hardware furnished with the system.

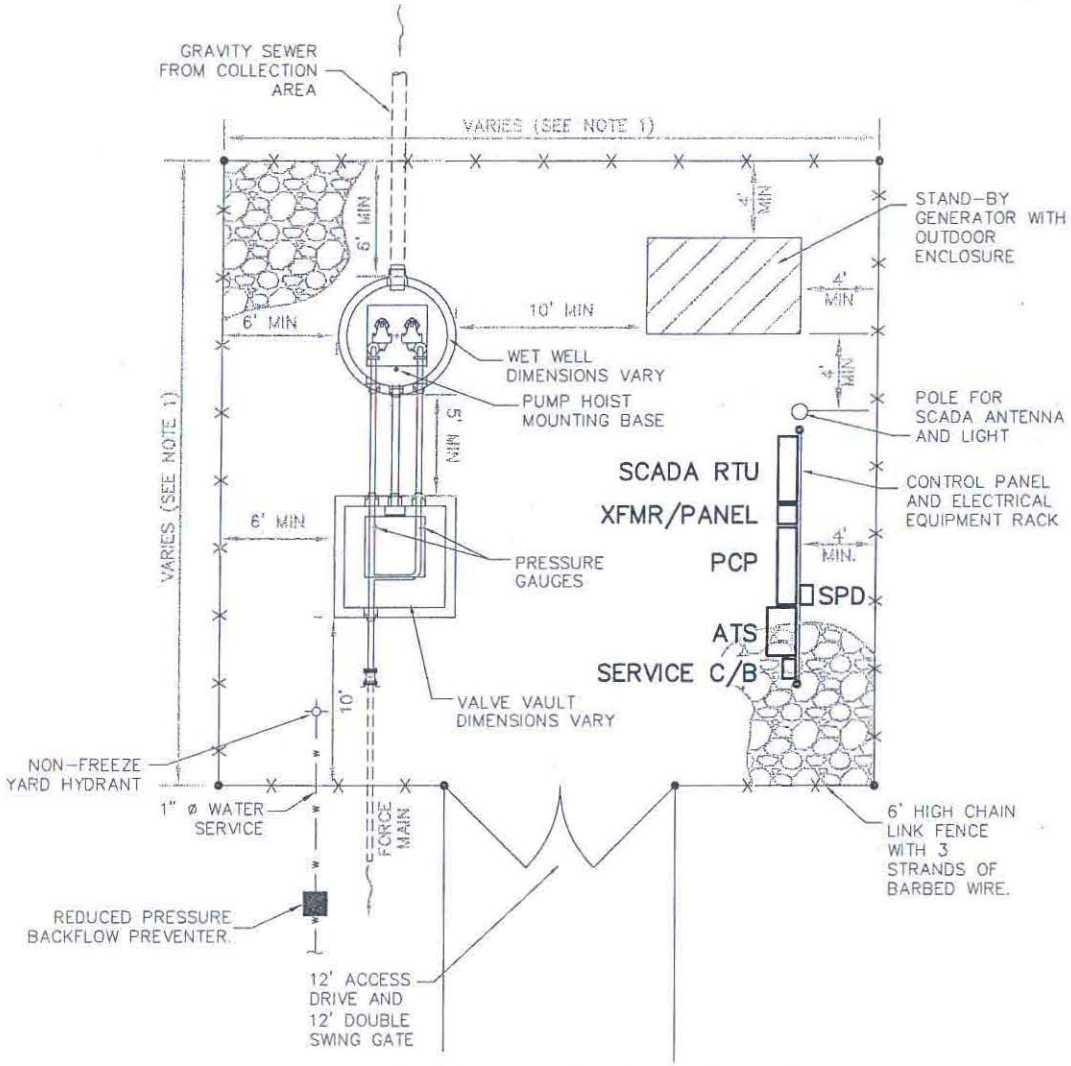
END OF SECTION

APPENDIX 16000-A

1.1 CONTENTS

A. Standard Electrical Drawings:

1. Electrical Equipment Plan Layout
2. Power Riser Diagram
3. Grounding Riser Diagram
4. Instrumentation & Control Riser Diagram
5. Pump Control Panel, Bill of Materials
6. Pump Control Panel, Bill of Materials
7. Pump Control Panel, Component Layout
8. Pump Control Panel, Component Layout
9. Pump Control Panel, Electrical Schematic
10. Pump Control Panel, Electrical Schematic
11. Pump Control Panel, Electrical Schematic
12. Pump Control Panel, Electrical Schematic
13. Pump Control Panel, Electrical Schematic
14. Pump Control Panel, Electrical Schematic
15. Pump Control Panel, Electrical Schematic



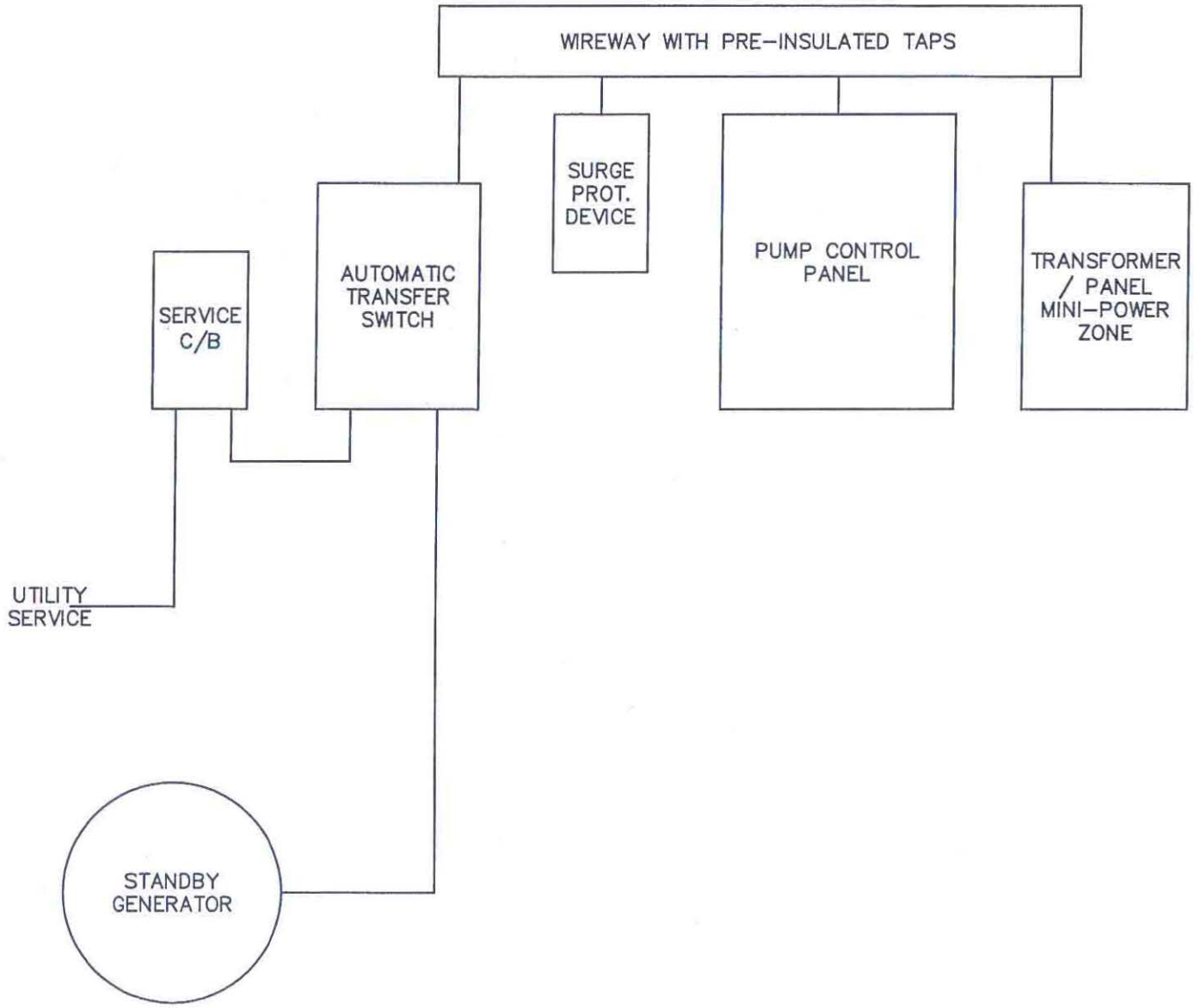
NOTES:
1. LIFT STATION SITE PLAN MAY CHANGE DUE TO THE LAND AND SPACE AVAILABLE.
2. THIS PLAN VALID FOR LIFT STATION SITE PLAN LAYOUT ONLY. FOR PUMP STATION, WET WELL AND VALVE VAULT DESIGN AND DIMENSIONS, SEE S.E.B.S.D. STANDARD DETAILS: SP005 AHC, BHC, CHC, DHC & EHC.

ELECTRICAL EQUIPMENT PLAN

NOT TO SCALE

E001

FILE NAME:	NO.	REVISION	DATE	SOUTHEAST BRUNSWICK SANITARY DISTRICT 4240 COMMITTEE DRIVE SOUTHPORT NC 28461
FILE NAME: E001 DATE: 08-06-2008 PLOT SCALE: NOT_TO_SCALE				



POWER RISER DIAGRAM

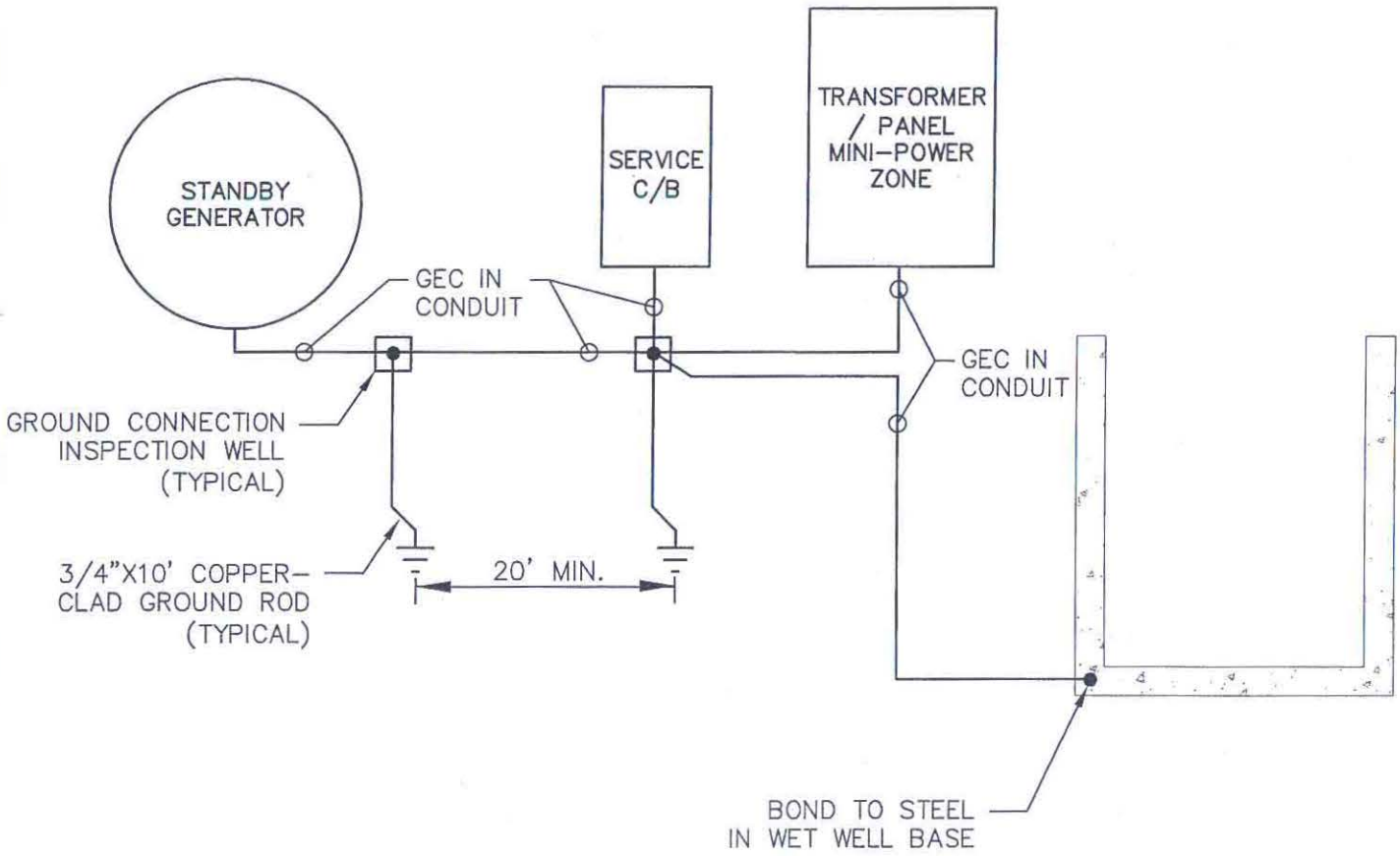
NOT TO SCALE

E002

NO.	REVISION	DATE

FILE NAME: E002
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



GEC = GROUNDING ELECTRODE CONDUCTOR. SIZE IN ACCORDANCE WITH NEC.

GROUNDING RISER DIAGRAM

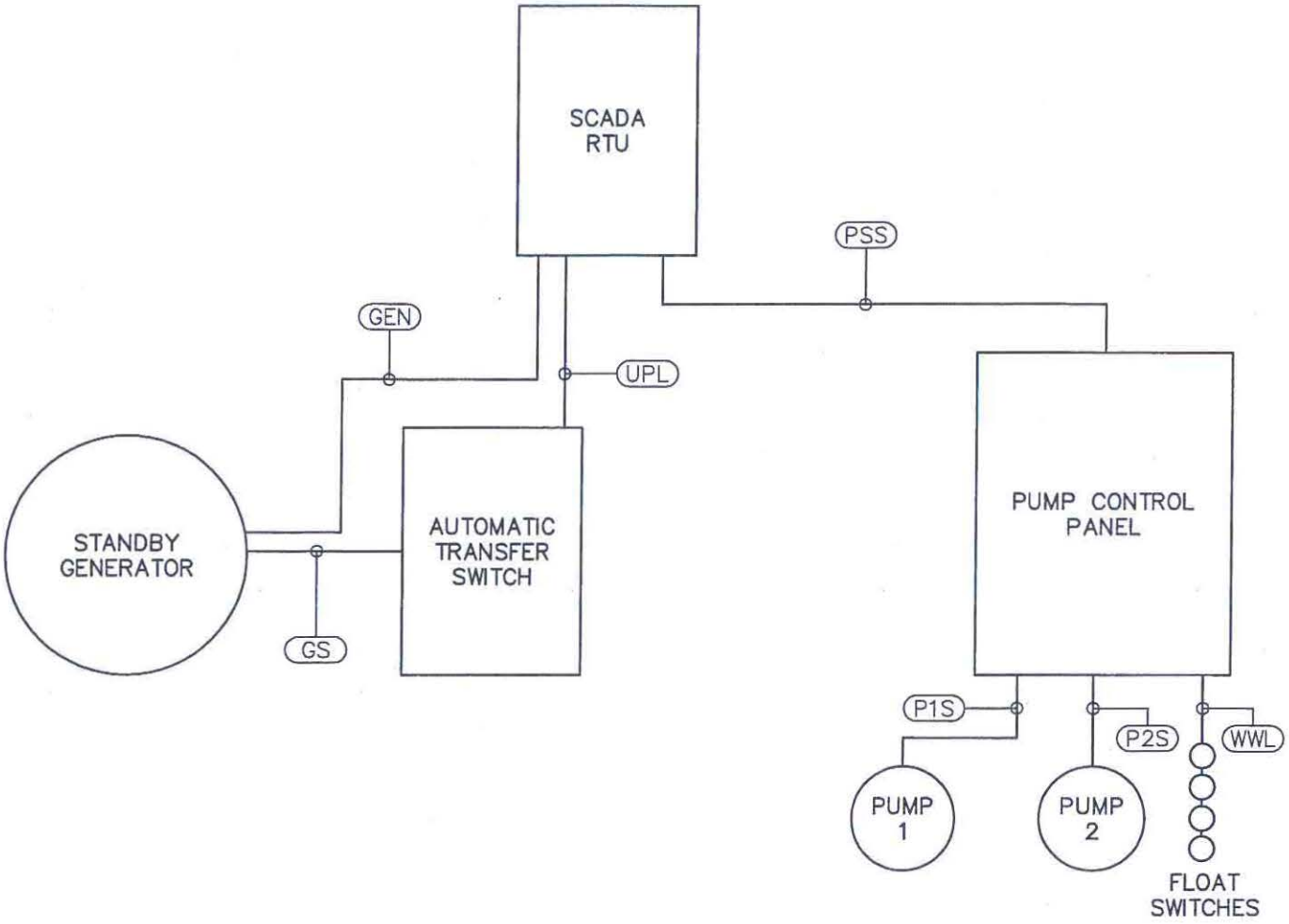
NOT TO SCALE

E003

NO.	REVISION	DATE

FILE NAME: E003
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



TAG	DESCRIPTION
GEN	GENERATOR STATUS (RUN & FAIL)
GS	GENERATOR START COMMAND
P1S	PUMP 1 STATUS (OVERTEMP & SEAL FAIL)
P2S	PUMP 2 STATUS (OVERTEMP & SEAL FAIL)
PSS	PUMP STATION STATUS (HIGH LEVEL ALARM, PUMP 1 FAIL, PUMP 2 FAIL)
UPL	UTILITY POWER LOSS
WWL	WET WELL LEVEL

INSTRUMENTATION & CONTROL RISER DIAGRAM

NOT TO SCALE

E004

NO.	REVISION	DATE

FILE NAME: E004
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461

BILL OF MATERIALS

ITEM	QUAN	DESCRIPTION	MANUFACTURER
1	1	MOUNTING PANEL CAT# A48P36	HOFFMAN
2	1	LIGHTNING ARRESTER CAT# SDSA3650	SQUARE D
3	1	100 WATT SPACE HEATER CAT# D-AH1001A	HOFFMAN
4	1	CONTROL POWER TRANSFORMER 480 - 120 CAT# 9070 Tx000D1 SERIES	SQUARE D
5	1	POWER DISTRIBUTION LUGS CAT# PDC6xxx SERIES	SQUARE D
6	1	GFI CONVENIENCE RECEPTACLE CAT# XGF15V-M	COOPER
7	1	MAIN BREAKER / PADLOCK ATTACHMENT	SQUARE D
8	2	MOTOR STARTER BREAKERS	SQUARE D
9	4	TB1 TERMINAL BLOCKS CAT# 102020	WEIDMULLER
10	30	TB1 TERMINAL BLOCKS CAT# 102010	WEIDMULLER
11	1	FU1 3 POLE, CLASS CC FUSE BLOCK / FUSES CAT# CHCC3 / FNQ-R-1	BUSSMANN
12	1	FU2 2 POLE, CLASS CC FUSE BLOCK / FUSES CAT# CHCC2 / FNQ-R--15	BUSSMANN
13	8	TB2 INTRINSICALLY SAFE TERMINAL BLOCKS CAT# 102010	WEIDMULLER
14	1	ALTERNATING RELAY / BASE CAT# LJRS110A / RUZC3M	CROUZET / SQUARE D
15	1	PHASE LOSS/UNDERVOLTAGE/REVERSAL RELAY CAT# 460-14	SYMCOM
16	2	COPPER GROUND BAR CAT# PKxxxx SERIES	SQUARE D
17	13	120 VAC 4 POLE DT RELAY / BASE CAT# RXM4AB2F7 / RXZE2S114M	SQUARE D
18			
19	1	BARRIER RELAY CAT# ISO-120-ACE	DIVERSIFIED
20	2	THREE PHASE - 480 VOLT STARTER CLASS 8536	SQUARE D
21	1	UL 4X, 304 STAINLESS ENCLOSURE	HOFFMAN
22	2	ELAPSED TIME METER CAT# 711-0160	REDDINGTON
23	2	"HAND - OFF - AUTO " SELECTOR SWITCH CAT# 9001 SKS43FBH13	SQUARE D
24	1	"AUTO - P-1-2 - P2-1 " SELECTOR SWITCH CAT# 9001 SKS46FBH13	SQUARE D

NOTE
MANUFACTURER & CATALOG # INFORMATION IS PROVIDED AS THE "BASIS OF DESIGN". ALTERNATE MANUFACTURERS MAY BE ACCEPTABLE IF EQUIVALENT IN QUALITY & FUNCTION, AND IF ACCEPTABLE TO THE OWNER & ENGINEER.

PUMP CONTROL PANEL, BILL OF MATERIAL

NOT TO SCALE

E005

NO.	REVISION	DATE

FILE NAME: E005
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461

BILL OF MATERIALS

ITEM	QUAN	DESCRIPTION	MANUFACTURER
25	2	"RUN" GREEN PILOT LIGHT CAT# 9001 SKT38LGG31	SQUARE D
26	2	"HIGH TEMP" RED PILOT LIGHT CAT# 9001 SKT38LRR31	SQUARE D
27	2	"SEAL FAIL" AMBER PILOT LIGHT CAT# 9001 SKT38LYA31	SQUARE D
28	2	"OVERLOAD" AMBER PILOT LIGHT CAT# 9001 SKT38LYA31	SQUARE D
29	1	SPARE BREAKER CAT# QO115	SQUARE D
30	1	"TEMP RESET" PUSHBUTTON CAT# 9001 SKR1BH5	SQUARE D
31	1	"SILENCE" PUSHBUTTON" CAT# 9001 SKR1BH6	SQUARE D
32	1	"HIGH LEVEL" RED PILOT LIGHT CAT# 9001 SKT38LRR31	SQUARE D
33	1	"HIGH LEVEL RESET" PUSHBUTTON CAT# 9001 SKR1BH5	SQUARE D
34	2	PUMP PROTECTION RELAYS / BASE CAT# MINCAS II / RUZC3M	FLYGT / SQUARE D
35	1	LAG DELAY TIMER / BASE CAT# 9050 JCK11V20 / RUZC2M	SQUARE D
36	1	EXTERNAL ALARM LIGHT CAT# LRX40F	INGRAM
37	1	NEMA 4X ALARM HORN CAT# 855P-B10LE22	ALLEN-BRADLEY
38	2	OVERLOAD RESET MECHANISM CAT# 9066 RA-1	SQUARE D
39	1	RECEPTACLE/BOX/COVER CAT# GF15L / 660 / 864	HUBBELL / RACO
40	1	SYSTEM CONTROL POWER BREAKER CAT# QO110	SQUARE D
41	1	OEM BREAKER INTERIOR CAT# QON816L100	SQUARE D
42	1	TRANSFORMER SECONDARY MAIN BREAKER CAT# QO120	SQUARE D
43	1	SPACE HEATER BREAKER CAT# QO110	SQUARE D
44	1	CONVENIENCE RECEPTACLE BREAKER CAT# QO115	SQUARE D
45	1		
46	1		
47			
48			
49			

NOTE
MANUFACTURER & CATALOG # INFORMATION IS PROVIDED AS THE "BASIS OF DESIGN". ALTERNATE MANUFACTURERS MAY BE ACCEPTABLE IF EQUIVALENT IN QUALITY & FUNCTION, AND IF ACCEPTABLE TO THE OWNER & ENGINEER.

PUMP CONTROL PANEL, BILL OF MATERIAL

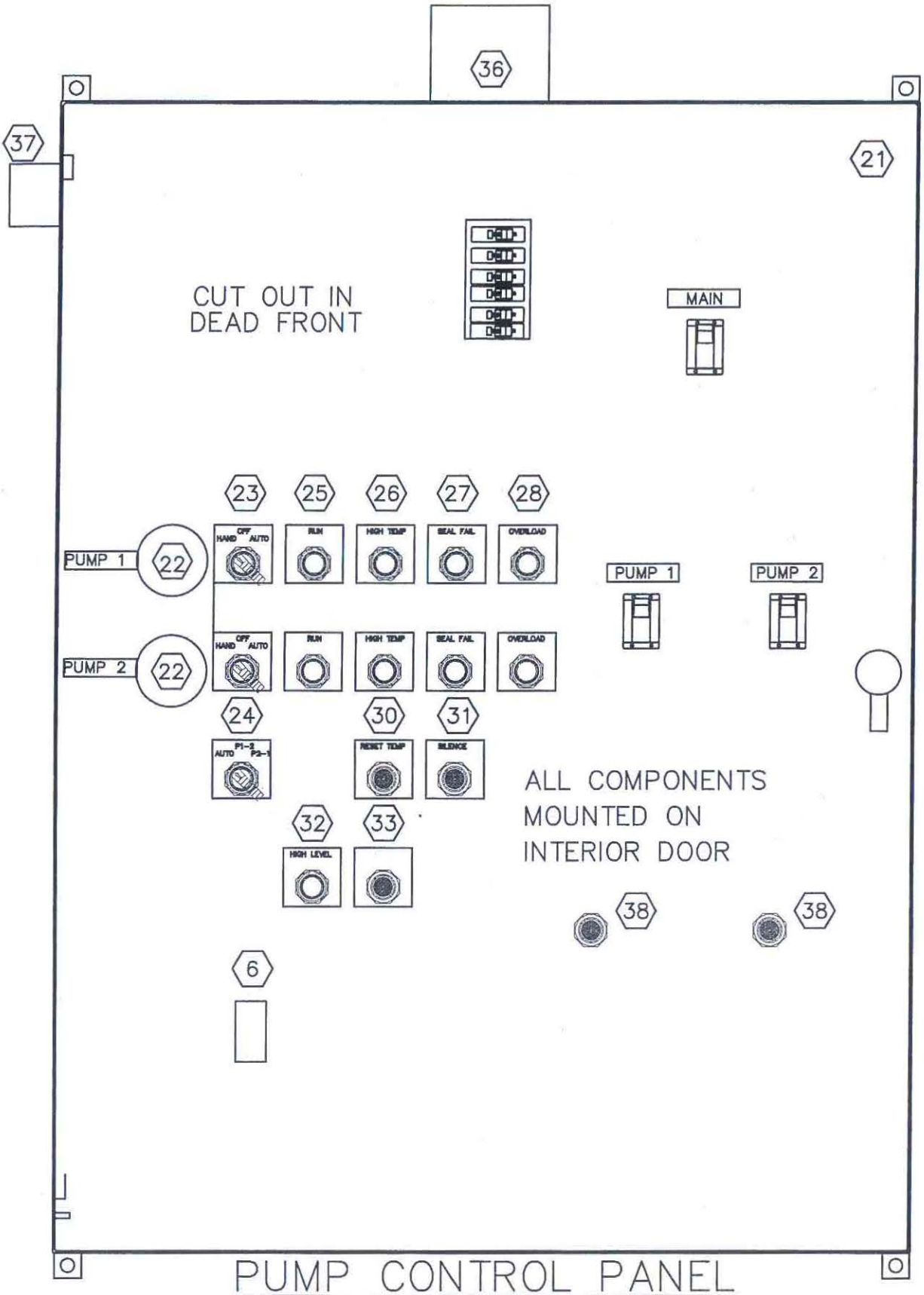
NOT TO SCALE

E006

NO.	REVISION	DATE

FILE NAME: E006
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL

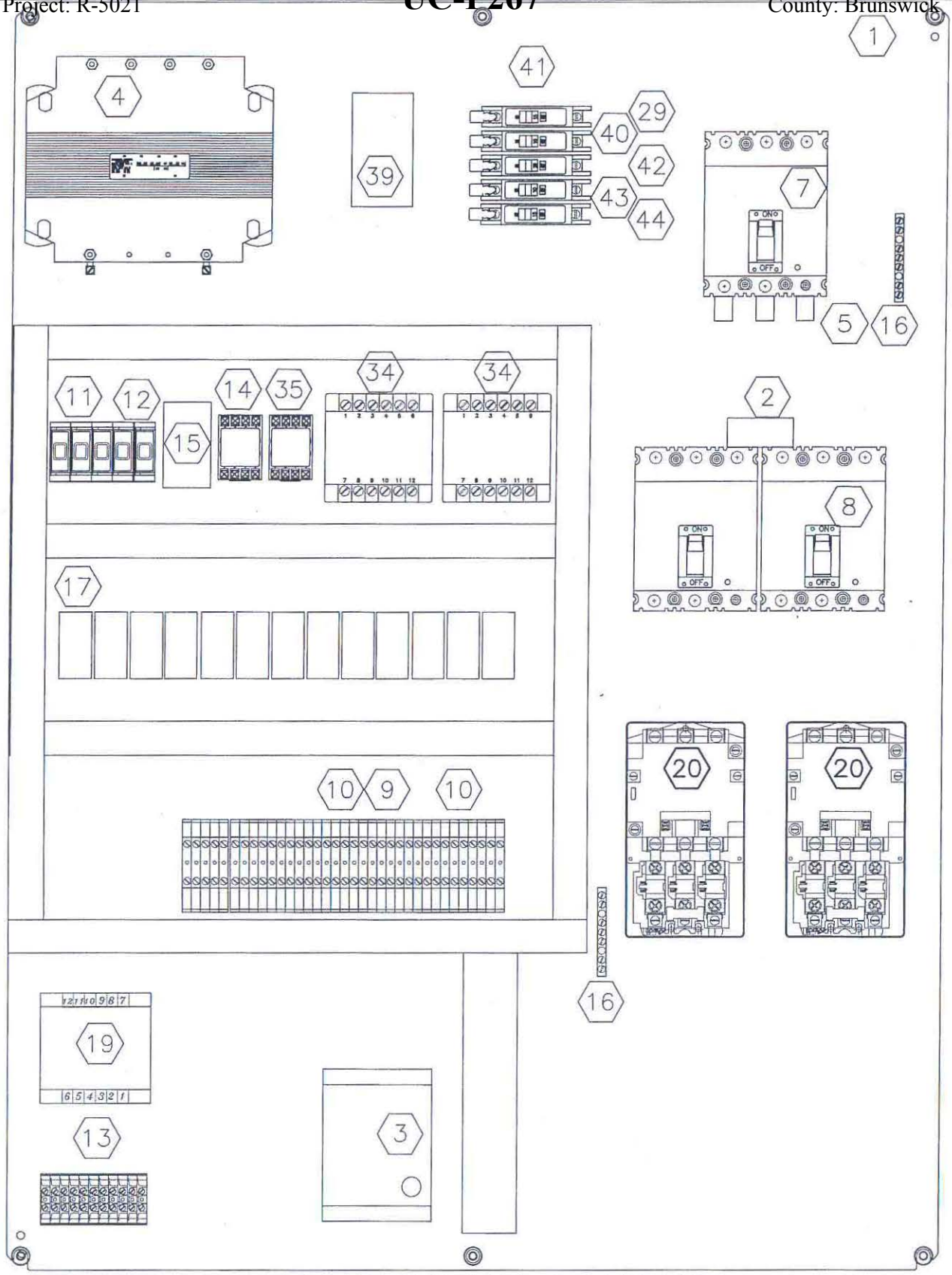
NOT TO SCALE

E007

NO.	REVISION	DATE

FILE NAME: E007
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK
SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



COMPONENT LAYOUT

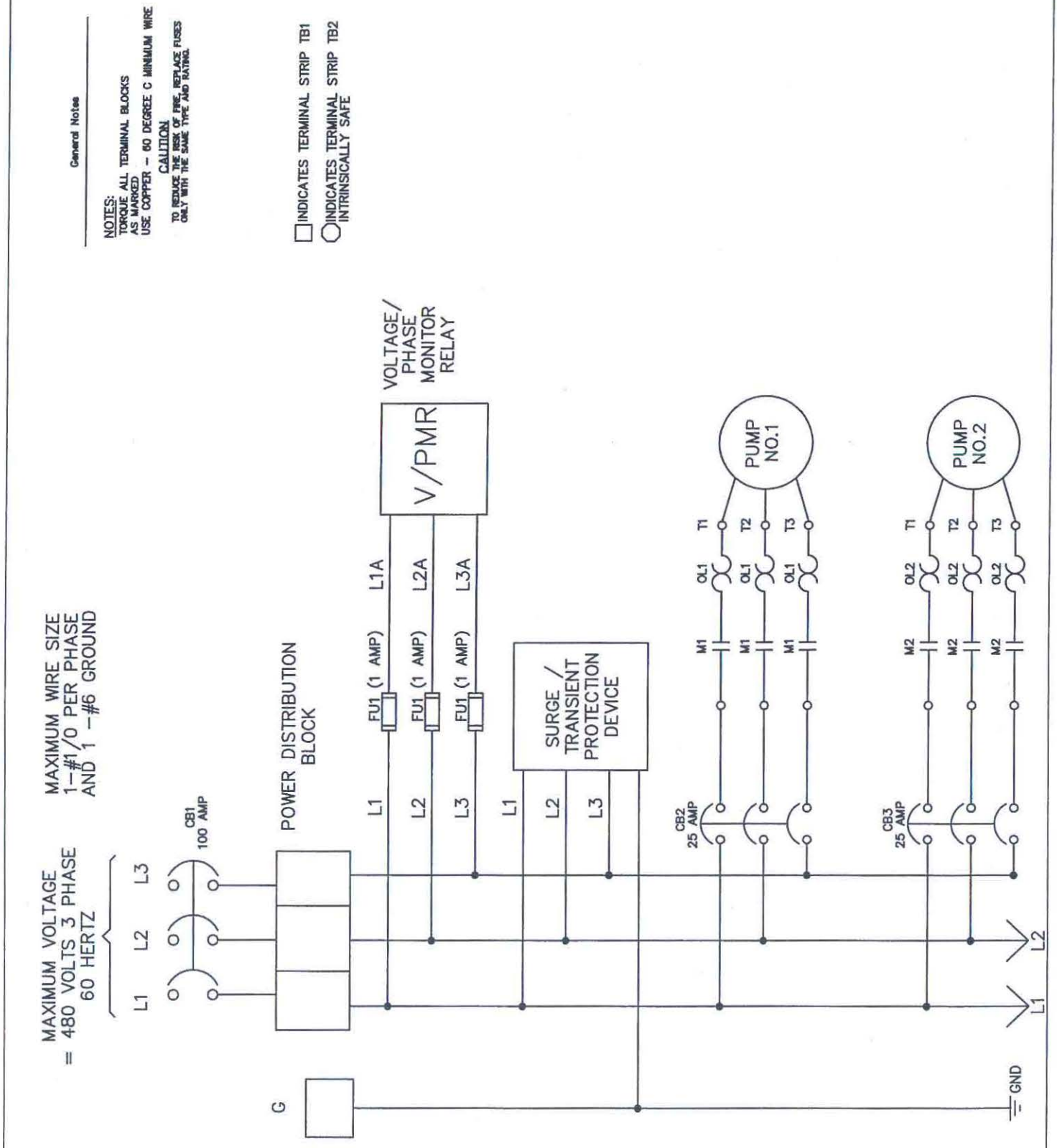
NOT TO SCALE

E008

NO.	REVISION	DATE

FILE NAME: E008
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

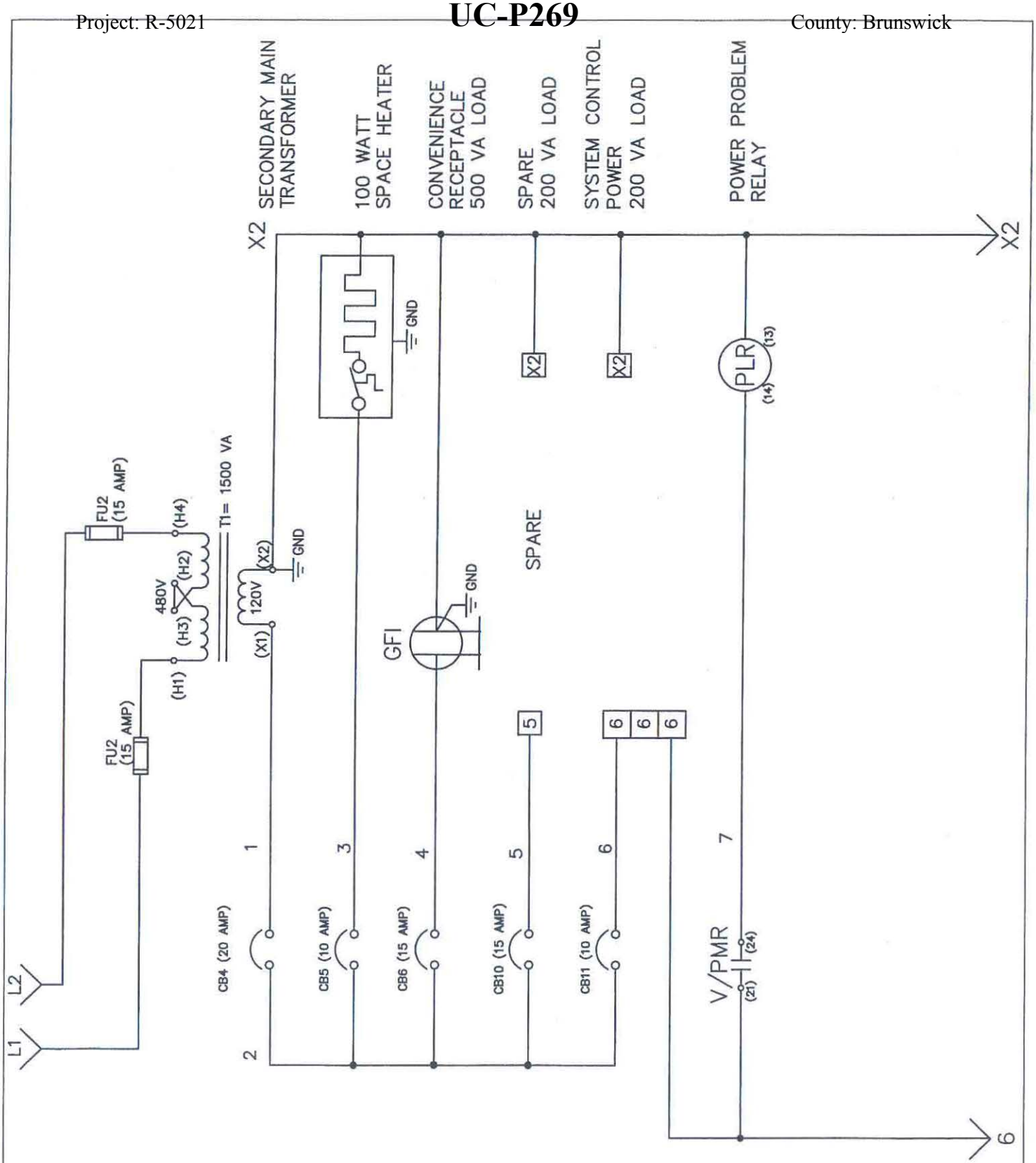
NOT TO SCALE

E009

NO.	REVISION	DATE

FILE NAME: E009
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

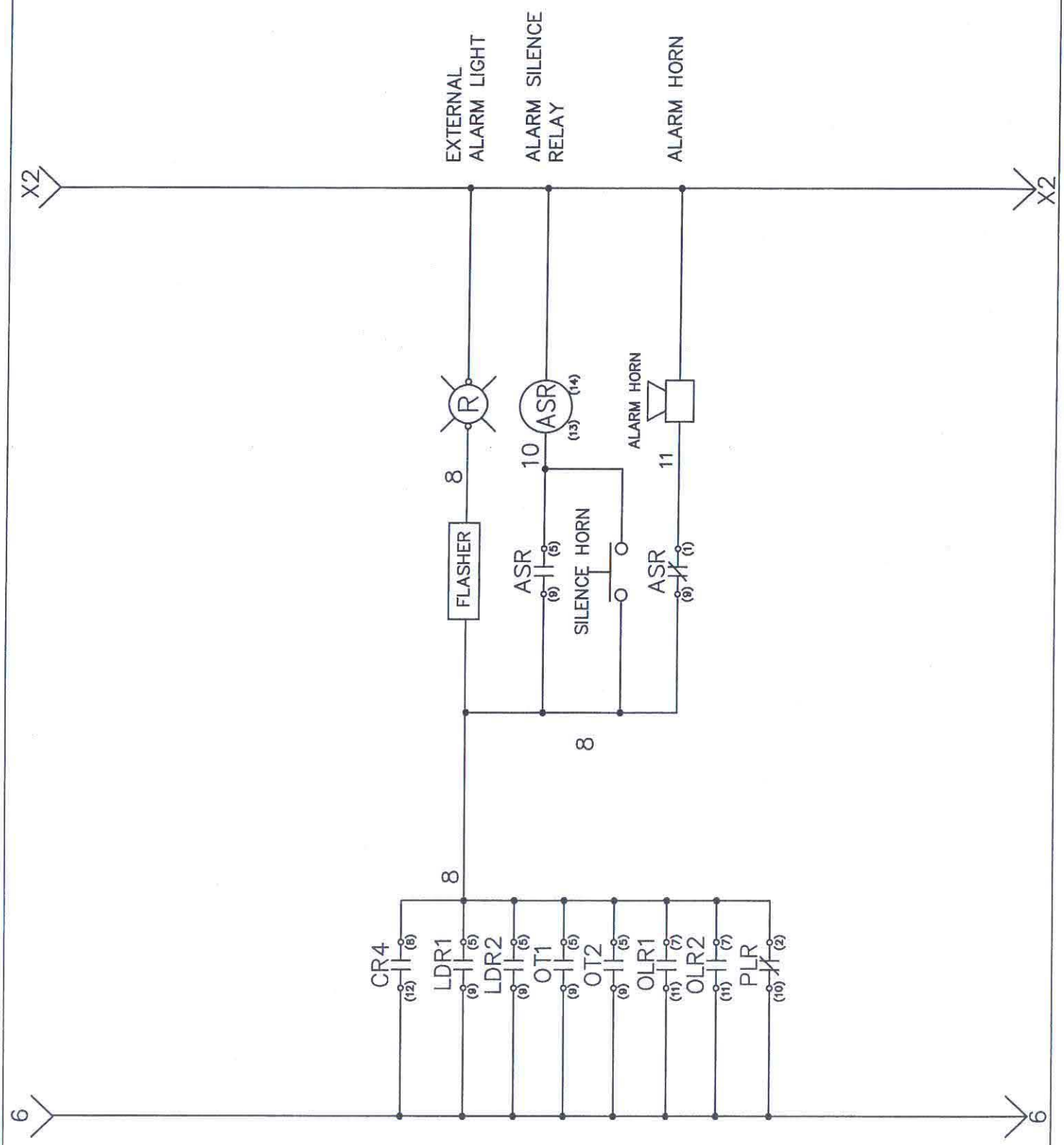
NOT TO SCALE

E010

NO.	REVISION	DATE

FILE NAME: E010
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

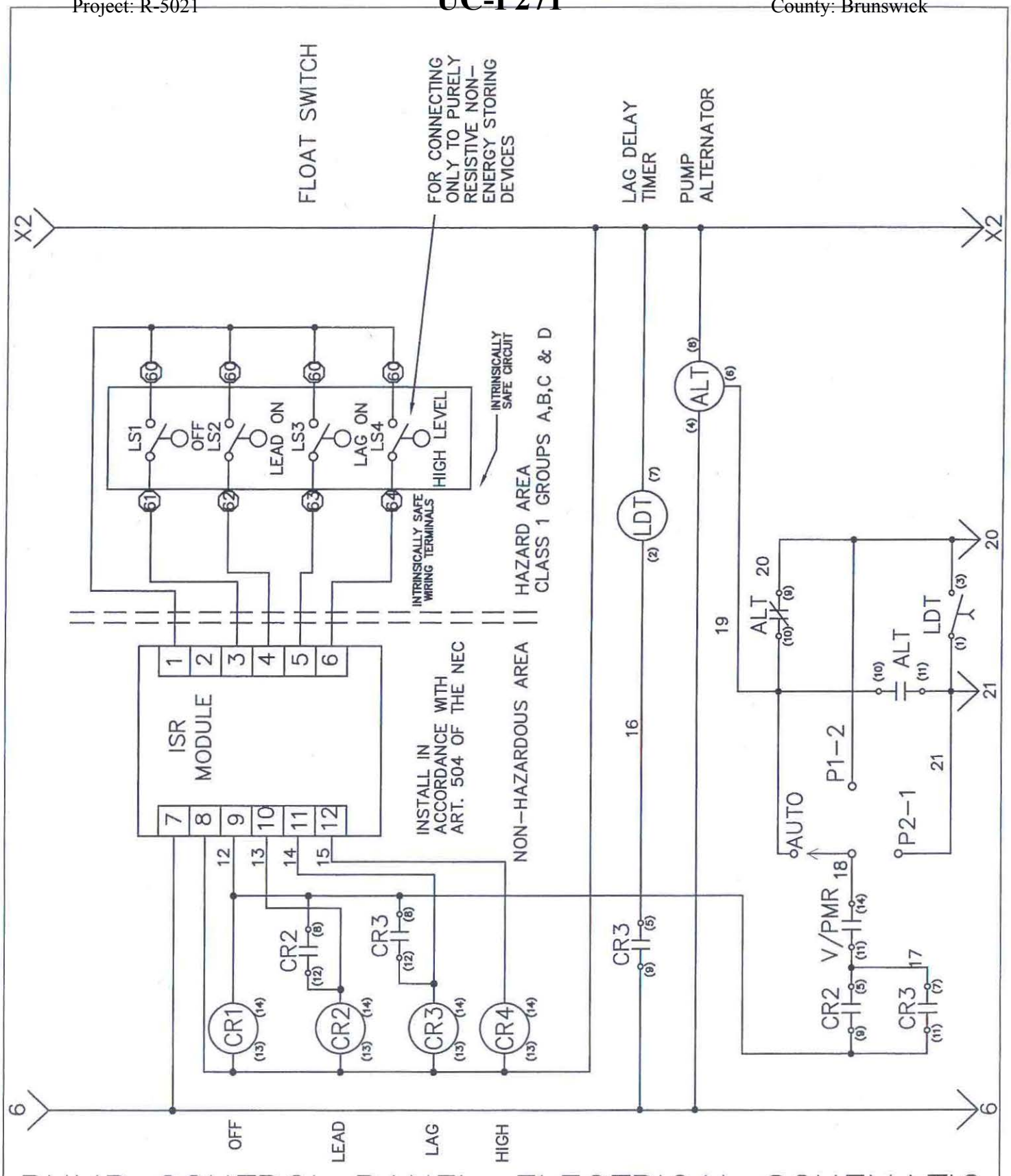
NOT TO SCALE

E011

NO.	REVISION	DATE

FILE NAME: E011
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

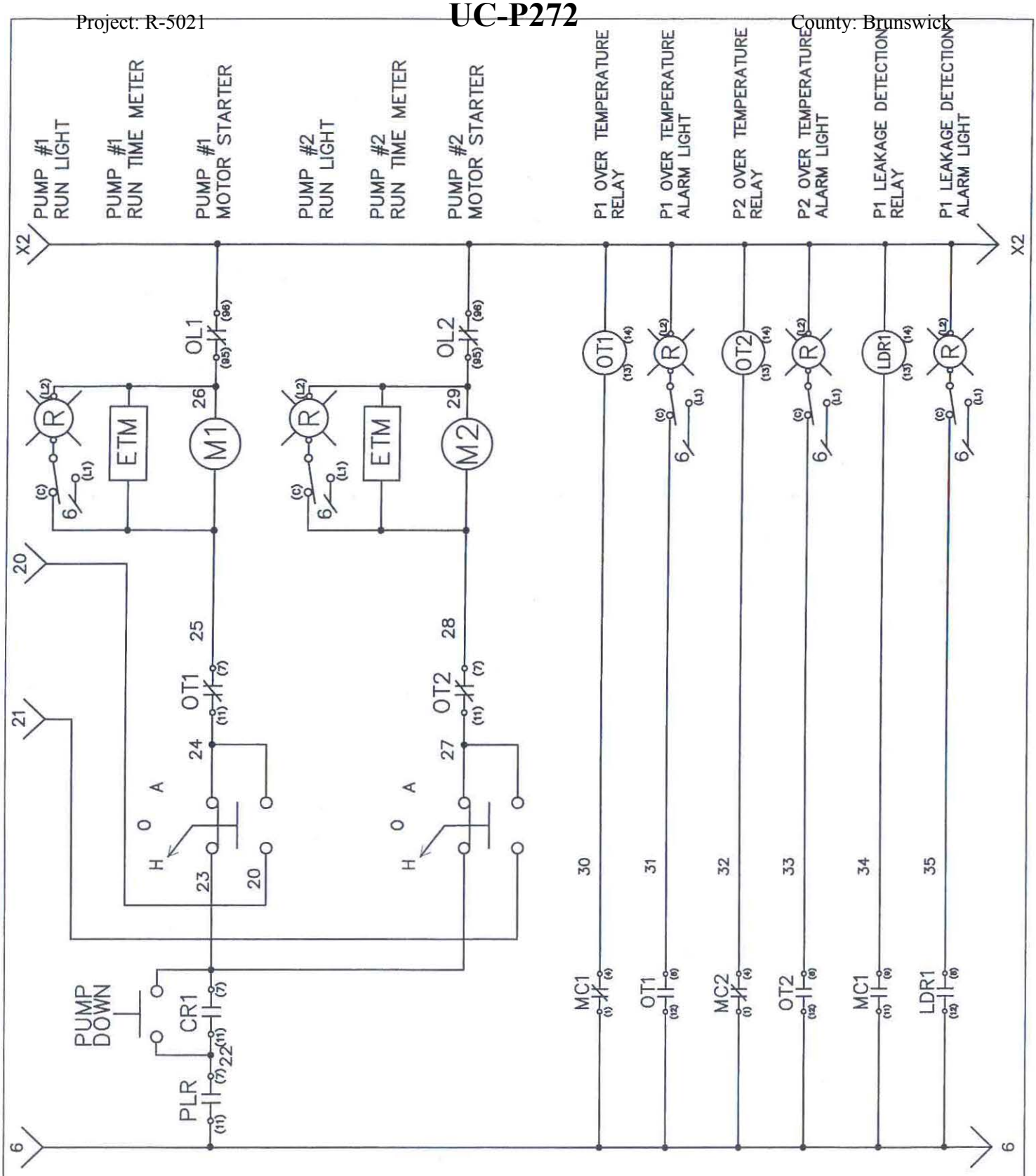
NOT TO SCALE

E012

NO.	REVISION	DATE

FILE NAME: E012
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

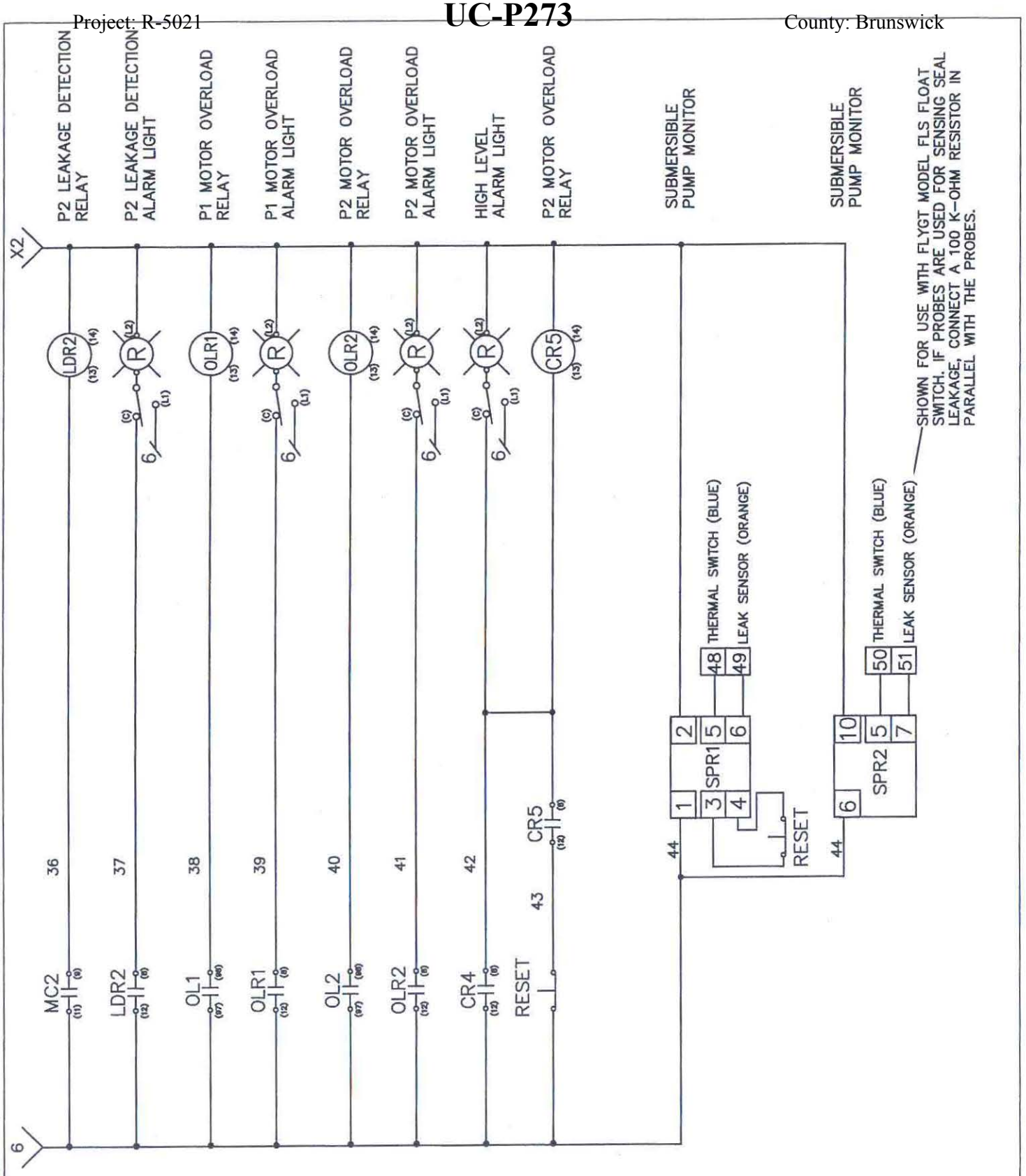
NOT TO SCALE

E013

NO.	REVISION	DATE

FILE NAME: E013
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

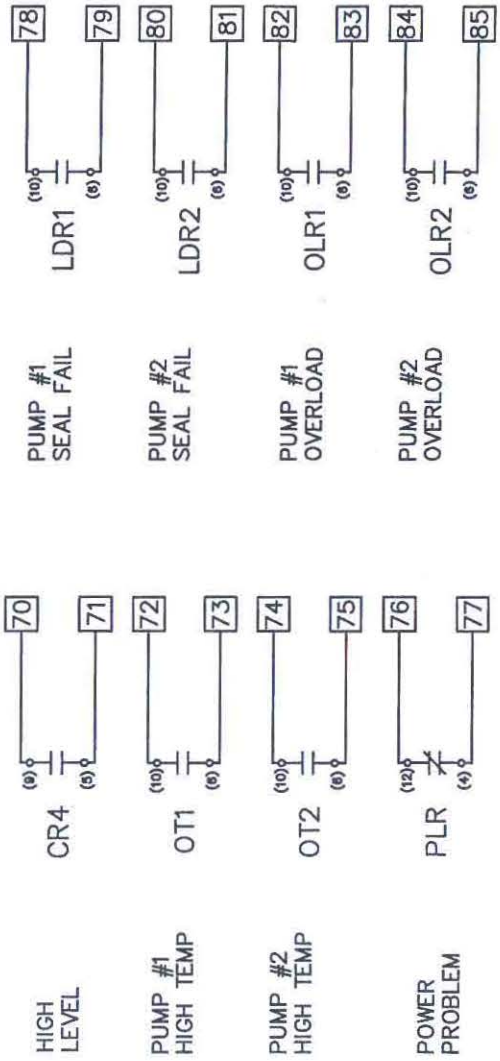
NOT TO SCALE

E014

NO.	REVISION	DATE

FILE NAME: E014
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461



PUMP CONTROL PANEL, ELECTRICAL SCHEMATIC

NOT TO SCALE

E015

NO.	REVISION	DATE

FILE NAME: E015
DATE: 08-06-2008
PLOT SCALE: NOT_TO_SCALE

SOUTHEAST BRUNSWICK SANITARY DISTRICT
4240 COMMITTEE DRIVE
SOUTHPORT NC 28461

PROJECT SPECIAL PROVISIONS
Utilities by Others

RK&K
900 Ridgefield Drive, Suite 350 | Raleigh, NC 27609 | P 919.878.9560 | T 888.521.4455 | F 919.790.8382 | www.rkk.com

General:

The following utility companies have facilities that will be in conflict with the construction of this project:

A) Brunswick EMC (Trans) – Power (Trans)
B) Brunswick EMC (Dist) – Power (Dist)
C) Duke Energy – Power (Dist)
D) City of Southport – Power (Dist)
E) Piedmont Natural Gas – Natural Gas (Dist)
F) AT&T Telecommunications – Telecommunications
G) ATMC Communications – Telecommunications
H) Spectrum – CATV/Communications

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) Brunswick EMC (Trans)

1) Brunswick EMC (Trans) completed all relocation work with the exception of the project area -L- (NC 211) STA 47+50 (+/-) to 78+00 (+/-) RT. Relocations in this area will be complete 548 days after Construction Date of Availability.
2) Contact person for Brunswick EMC (Trans) is Mr. Rodney Scruggs at (910) 755-4246

PROJECT SPECIAL PROVISIONS
Utilities by Others

B) Brunswick EMC (Dist)

1) Brunswick EMC (Dist) completed all relocation work with the exception of the project area -L- (NC 211) STA 47+50 (+/-) to 78+00 (+/-) RT. Relocations in this area will be complete 548 days after Construction Date of Availability.
2) Contact person for Brunswick EMC (Dist) is Mr. Michael Blue at (910) 540-1087

C) Duke Energy (Dist)

1) Duke Energy (Dist) has completed their relocation work and will remove remaining pole line after AT&T has transferred off. See AT&T Telecommunications for timeline.
2) Contact person for Duke Energy (Dist) is Mr. Joe Graves at (910) 619-9339

D) City of Southport Power (Dist)

1) City of Southport Power (Dist) completed all relocation work
2) Contact person for City of Southport power (Dist) is Mr. Mike Blue (Brunswick EMC (Dist)) at (910) 540-1087

E) Piedmont Natural Gas (Dist)

1) Piedmont Natural Gas (Dist) completed all relocation work with the exception of the project area -L- (NC 211) STA 305+00 (+/-) to 314+00 (+/-) LT. Relocations will be complete in line with the project area delay of 548 days after Construction Date of Availability.
2) Contact person for Piedmont Natural Gas (Dist) is Mr. DJ Medeiros at (910) 431-3233

F) AT&T Telecommunications

1) AT&T has completed the relocation their relocation work from the beginning of the project through Station -L- (NC 211) STA 227+00 (+/-) with the exception in Note #2.
2) AT&T will install facilities in the following area -L- (NC 211) STA 47+50 (+/-) to 78+00 (+/-) RT and fiber cutovers will be complete 548 days after Construction Date of Availability.
3) AT&T will install facilities from -L- (NC 211) STA 227+00+00 (+/-) to 432+50 (+/-) and fiber cutovers will be complete 548 days after Construction Date of Availability.
4) Contact person for AT&T Telecommunications is Ms. Chrissy Coston at (910) 341-7664

PROJECT SPECIAL PROVISIONS
Utilities by Others

G) ATMC Communications

1) ATMC Communications completed all relocation work with the exception of the project area -L- (NC 211) STA 47+50 (+/-) to 78+00 (+/-) RT. Relocations in this area will be complete 548 days after Construction Date of Availability.
2) Contact person for ATMC Communications is Mr. Scott Duton at (910) 232-7344

H) Spectrum CATV/Communications

1) Spectrum CATV/Communications completed all relocation work with the exception of the project area -L- (NC 211) STA 47+50 (+/-) to 78+00 (+/-) RT. Relocations in this area will be complete 548 days after Construction Date of Availability.
2) Spectrum CATV/Communications is Mr. Steve Barnette at (910) 772-5755

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

HIGH QUALITY WATERS:

Description

Beaverdam Creek and Dutchman Creek have been identified as high quality waters. This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading operations within the High Quality Water Zone and as designated by the Engineer. The High Quality Water Zones are identified on the plans as Environmentally Sensitive Areas. This also requires special procedures to be used for seeding and mulching and staged seeding.

The High Quality Water Zone/Environmentally Sensitive Area shall be defined as a 50-foot buffer zone on both sides of the stream measured from top of streambank.

Construction Methods

(A) Clearing and Grubbing

In areas identified as High Quality Water Zones/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 High Quality Water Zones/ 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 High Quality Water Zones/ 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 High Quality Water Zones/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	$\geq$80	%
Porosity (Permanent Net)	ECTC Guidelines	$\geq$85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	$\geq$8.0	lb/ft^2

Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥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

INFILTRATION BASIN WITH BAFFLES: **(East)**

Description

Provide an infiltration basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Infiltration Basin with Baffles Detail sheet provided in the erosion control plans. Work includes constructing sediment basin, installation of coir fiber baffles, providing and placing geotextile spillway liner, providing coir fiber mat stabilization for the primary spillway outlet, disposing of excess materials, removing geotextile liner and coir fiber mat, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Staples	1060-8
Coir Fiber Mat	1060-14
Coir Fiber Baffle	1640

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. Excavation into or below the water table shall not occur, and avoid compacting the bottom of the basin with equipment tires, excavation bucket, etc. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*. Construct earth berm around perimeter of infiltration basin as shown in the detail and the earth berm height shall be limited to 3 ft.

Construct the primary spillway according to the Infiltration Basin with Baffles Detail sheet in the erosion control plans. 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. 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 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 Infiltration Basin with Baffles detail.

At the primary spillway 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.

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*.

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 other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	Pay Unit
Coir Fiber Mat	Square Yard
Low Permeability Geotextile	Square Yard

EARTHEN DAM WITH SKIMMER: **(East)**

Description

Provide an earthen dam with a skimmer attached to a barrel pipe at the outlet of a proposed roadway ditch to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Earthen Dam with Skimmer Detail sheet provided in the erosion control plans. Work includes constructing earthen dam, installation of coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of ditch underneath skimmer device, providing and placing geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, removing earthen dam, coir fiber baffles, geotextile liner and skimmer device, and disposing of excess materials.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Staples	1060-8
Coir Fiber Mat	1060-14
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 proposed ditch according to the roadway plans and cross sections with ditch surface free of obstructions, debris, and pockets of low-density material. Construct earthen dam and install the primary spillway according to the Earthen Dam with Skimmer 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*. Accumulated silt behind the earthen dam and baffles shall be removed regularly 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 impounded in the ditch. 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 ditch. 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 ditch according to the Earthen Dam with Skimmer 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.

Measurement and Payment

The construction of the earthen dam will be paid for as *Borrow Excavation* as provided in Section 230 of the *Standard Specifications* or included in the lump sum price for grading.

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 ditch 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.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 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*.

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, culverts and channels. 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, culverts and channels.

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:

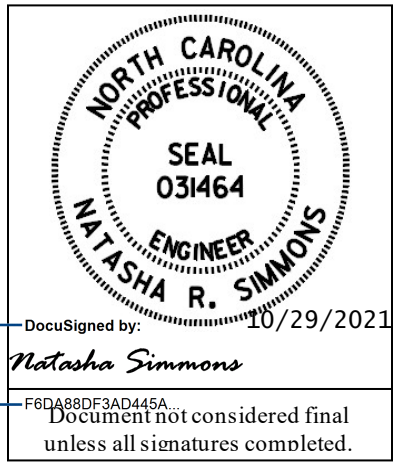
Pay Item	**Pay Unit**
Fabric Insert Inlet Protection Device	Each
Fabric Insert Inlet Protection Device Cleanout	Each

POND DRAINAGE PLAN REQUIREMENT:

The Contractor shall develop a Pond Drainage Plan for all ponds that are required to be drained for the construction of this project and submit the plan to the Engineer at the preconstruction conference for approval. The Pond Drainage Plan shall include but not be limited to procedures and rate of water drawdown, sediment control measures, water quality monitoring, fish and wildlife relocation plan, shall address procedures avoiding the inundation of a receiving body of water with deoxygenated or nutrient rich water resulting in impacts to aquatic life or algae bloom and procedures for maintaining downstream channel stability. If such ponds to be drained are on the NC DEQ Dam Safety Inventory List, all NC DEQ Dam Safety procedures must be followed.

Any erosion control devices or permanent seeding and mulching in areas where ponds have been drained will be paid for at the contract unit price for the item required. All additional erosion and sediment control practices not included in the contract documents that may be required on a pond drainage site will be done at the Contractor's expense.

No direct payment will be made for developing or implementing the Pond Drainage Plan as the cost of such shall be included in the lump sum price bid for *Clearing and Grubbing*.



R-5021
Signals and Intelligent Transportation Systems
Project Special Provisions
(Version 18.5)

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Contents

1. GENERAL REQUIREMENTS

1.1. DESCRIPTION

A. General

Conform to these Project Special Provisions, Project Plans, the *2018 Standard Specifications for Roads and Structures* (also referred to hereinafter as the "*Standard Specifications*") and the *2018 Roadway Standard Drawings* (also referred hereinafter as the "*Standard Drawings*"). The current edition of these specifications and publications in effect on the date of advertisement will apply.

In the event of a conflict between these Project Special Provisions and the *Standard Specifications*, these Project Special Provisions govern.

Conform to the NCDOT and NC Statewide IT Policies and Standards as described at http://it.nc.gov. The architecture of the IT modules must be approved by NCDOT IT and the NC Office of Information Technology architecture groups.

B. Scope

The scope of this project includes the installation of seven (7) new IP (Internet Protocol) based, closed circuit television (CCTV) cameras and four (4) new pedestal-mounted dynamic message signs (DMS). The scope also includes installing fiber optic drop cables to seven (7) CCTVs and four (4) DMS signs and terminating in field cabinets. The scope includes installing fiber optic drop cables to connect twelve (12) signals, including upgrading eight (8) existing signals and installing four (4) new signals.

Communication between the CCTVs, DMSs and the existing Traffic Operations Center at the Division 3 office in Castle Hayne, NC will be accomplished over cellular modems. The cellular modems will be furnished and installed by the Department.

Electrical service to the CCTV cameras and DMSs will consist of new electrical service installations and modifications to existing electrical service (existing traffic signal) as designated in the Project Plans. The Contractor shall coordinate with the appropriate electric utility company in the area to establish new service.

Note that the locations of each proposed device shown in the Project Plans are an approximation. Locate and mark proposed device locations in the field and receive approval from the Deputy Division Traffic Engineer before performing any construction. Do not construct any conduits or junction boxes to proposed devices until the device locations are approved by the Deputy Division Traffic Engineer. The Deputy Division Traffic Engineer can be reached at (910) 341-2200.

Integrate the new cellular modems (furnished and installed by the Department) with existing and new communications infrastructure so that the new CCTVs and DMSs are all accessible and can be controlled by computer and network hardware and software at the NCDOT Division 3 office in Castle Hayne, NC, as well as shared for access and control from the State Traffic Operations Center (STOC) in Raleigh.

Conduct device and system tests as described in these Project Special Provisions.

1.2. MATERIALS

A. Domestic Steel and Iron Products

See Section 106-1 (B) of the *Standard Specifications*.

B. Qualified Products

Furnish new equipment, materials, and hardware unless otherwise required. Inscribe manufacturer's name, model number, serial number, and any additional information needed for proper identification on each piece of equipment housed in a case or housing.

Furnish factory assembled cables without adapters, unless otherwise approved by the Engineer, for all cables required to interconnect any field or central equipment.

Certain equipment listed in these Project Special Provisions must be pre-approved on the Department's ITS & Signals Qualified Products List (QPL) by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project.

The QPL is available on the Department's website. The QPL website is:

https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals-Qualified-Products.aspx

C. Warranties

Comply with all requirements of Article 1098-1(D) of the *Standard Specifications* for providing manufacturer's warranties on Contractor-furnished equipment.

1.3. CONSTRUCTION METHODS

A. Ground Surface Restoration

Upon completion of the installation of all conduit and the backfilling of all trenches and other excavations, restore the disturbed ground to its original condition as determined and approved by the Engineer. Backfill the excavation areas with removed material, tamp the backfilled material, and rake smooth the top 1-1/2 inches. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with the same type of grass as the surrounding areas and mulch the newly seeded areas. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

B. Information Technology Compliance

Conform to the State of North Carolina Information Technology (IT) policy and standards as described at http://it.nc.gov. The architecture of the IT modules must be approved by the NC- DOT IT and NC Office of Information Technology architecture groups.

C. Plan of Record Documentation

Comply with all requirements of Article 1098-1(F) of the *Standard Specifications* for providing plan of record documentation for all work performed under this Project.

2. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

2.1. 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."

2.2. 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."

2.3. 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."

3. SIGNAL HEADS

3.1. MATERIALS

A. General

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. 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 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.

LED Circular Signal Modules

Provide 12-inch circular sections 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 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
12-inch green circular	15	15

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.

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.

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.

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. 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.

4. JUNCTION BOXES

4.1. DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems and all necessary hardware.

4.2. MATERIAL

Refer to Division 3.

Item	Section
Junction Box	1098-5
Graded Stone	545

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

A. Standard Size Junction Box

Provide standard size junction boxes and covers with minimum inside dimensions of 16"(l) x 10"(w) x 10"(d).

B. Oversized Junction Box

Provide oversized junction boxes and covers with minimum inside dimensions of 28"(l) x 15"(w) x 22"(d).

C. Special Oversized Heavy-Duty Junction Box

Provide special oversized heavy-duty junction boxes and covers with minimum inside dimensions of 36"(l) x 24"(w) x 24"(d).

4.3. CONSTRUCTION METHODS

Install standard size junction boxes as shown in the plans and where underground splicing of electrical cables is necessary. Install standard size junction boxes within 3 feet of pole or pole foundation where transitioning from below ground to a riser assembly. Install standard size junction boxes within 5 feet of each end of each lateral run of conduit for electrical cables.

When lateral runs for electrical cables are greater than 150 feet, install additional junction boxes to ensure distances between junction boxes does not exceed 150 feet.

Install oversized junction boxes for fiber-optic cables at locations shown in the plans. Install special oversized junction boxes at underground splice locations as shown in the plans.

Provide real world coordinates for all junction boxes and equipment cabinets installed or used under this project. Provide the coordinates in feet units using the North Carolina State Plane coordinate system (1983 North American Datum also known as NAD ’83). Furnish coordinates that do not deviate more than 1.7 feet in the horizontal plane and 3.3 feet in the vertical plane. Global positioning system (GPS) equipment able to obtain the coordinate data within these tolerances may be used. Submit cut sheets on the GPS unit proposed to collect the data for approval by the Engineer.

Provide both a digital copy and hard copy of all information regarding the location (including, but not limited to, manufacturer, model number, and NCDOT inventory number) in the Microsoft® spreadsheet provided by the Department, shown by example below.

Submit coordinate information in a spreadsheet provided by the Department and in accordance with the below table.

NCDOT Inv #	Name	Location	Latitude	Longitude	Manufacturer	Model #
05-0134	Equipment Cabinet	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
05-0134	Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 3 (Near Cabinet)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG118HA00(Cover)
05-0134	Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG118HA00(Cover)

4.4. MEASUREMENT AND PAYMENT

Junction Box ( ) will be measured and paid in actual number of junction boxes of each size and type furnished, installed and accepted.

No measurement will be made of covers, washed stone and grounding systems as these will be incidental to furnishing and installing junction boxes.

Payment will be made under:

Pay Item **Pay Unit**

Junction Box (Standard Size) .....Each
Junction Box (Oversized Heavy-Duty) .....Each
Junction Box (Special Oversized Heavy-Duty) .....Each

5. CONTROLLERS WITH CABINETS

5.1. DESCRIPTION

Furnish and install controllers with cabinets and all necessary hardware. Furnish all pole or foundation mounting hardware, detector sensor cards, external electrical service disconnects, one Corbin Number 2 cabinet key, one police panel key, conflict monitors or malfunction management units, surge protection, grounding systems, AC/DC isolator cards and all necessary hardware.

5.2. MATERIAL

Furnish material, equipment and hardware under this section that is pre-approved on the ITS and Signals QPL.

5.3. 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

5.4. MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 336S pole mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details. Provide 336S pole mounted cabinets that are 46" high with 40" high internal rack assemblies.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that

operate properly over a temperature range of -40º F to +185º F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A

Occurrences (8x20µs waveform)……..10 minimum @ 20,000A

Maximum Clamp Voltage…….395VAC

Operating Current……..15 amps

Response Time……..< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (6 times, 8x20µs)

(Differential Mode)…….400A

(Common Mode)……1,000A

Occurrences (8x20µs waveform)……..500 min @ 200A

Maximum Clamp Voltage

(Differential Mode @400A)……35V

(Common Mode @1,000A)…….35V

Response Time……..< 5 nanoseconds

Maximum Capacitance……..35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A

Occurrences (8x20µs waveform)……..100 min @ 2,000A

Maximum Clamp Voltage…….Rated for equipment protected

Response Time……..< 1 nanosecond

Maximum Capacitance…….1,500 pF

Maximum Series Resistance…….15Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..10,000A

Occurrences (8x20µs waveform)……..100 @ 2,000A

Maximum Clamp Voltage…….30V

Response Time……..< 1 nanosecond

Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

Peak Surge Current (Single pulse, 8x20µs)……..20,000A

Maximum Clamp Voltage……350VAC

Response Time……..< 200 nanoseconds

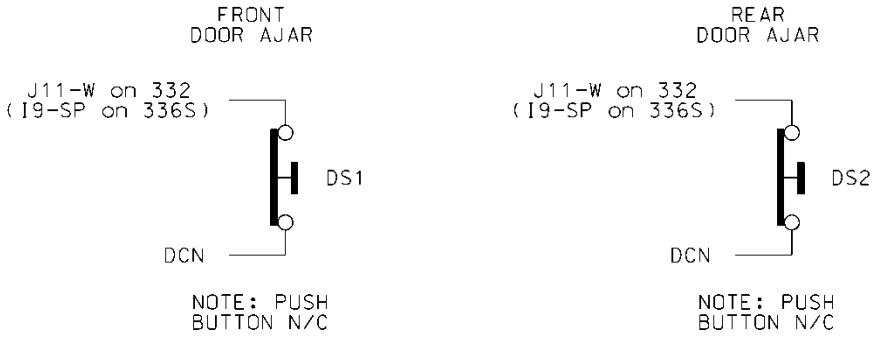
Discharge Voltage……<200 Volts @ 1,000A

Insulation Resistance……≥100 MΩ

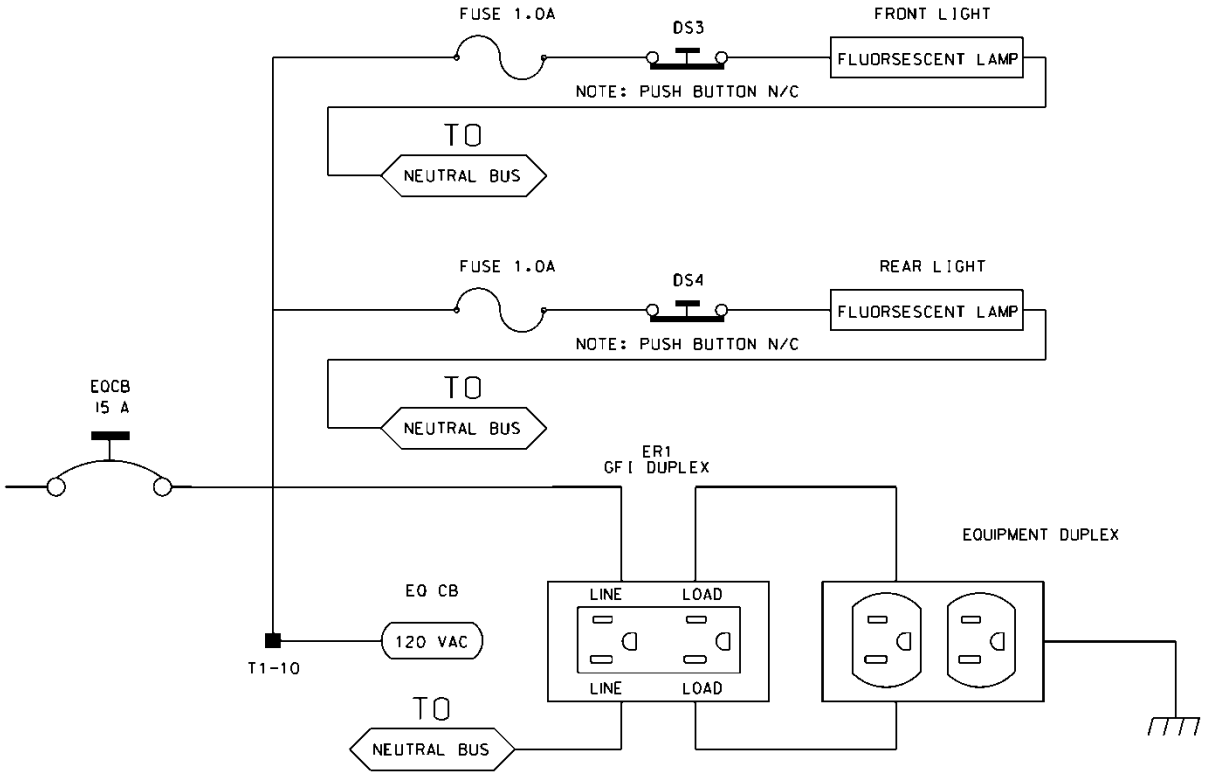
Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. For model 336S cabinets, mount the police panel on the rear door. Ensure that the police panel door permits access to the police panel when the main door is closed. Ensure that no rainwater can enter the cabinet even with the police panel door open. Provide a police panel door hinged on the right side as viewed from the front. Provide

a police panel door lock that is keyed to a standard police/fire call box key. In addition to the requirements of LA Specification No. 54-053-08, provide the police panel with a toggle switch connected to switch the intersection operation between normal stop-and-go operation (AUTO) and manual operation (MANUAL). Ensure that manual control can be implemented using inputs and software such that the controller provides full programmed clearance times for the yellow clearance and red clearance for each phase while under manual control.

Provide a 1/4-inch locking phone jack in the police panel for a hand control to manually control the intersection. Provide sufficient room in the police panel for storage of a hand control and cord.

Ensure the 336S cabinet Input File is wired as follows:

336S Cabinet **Port-Bit/C-1 Pin Assignment**														
Slot #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
C-1 (Spares)	59	60	61	62	63	64	65	66	75	76	77	78	79	80
Port	3-2	1-1	3-4	1-3	3-1	1-2	3-3	1-4	2-5	5-5	5-6	5-1	5-2	6-7
C-1	56	39	58	41	55	40	57	42	51	71	72	67	68	81
Port	2-1	1-5	2-3	1-7	2-2	1-6	2-4	1-8	2-6	5-7	5-8	5-3	5-4	6-8
C-1	47	43	49	45	48	44	50	46	52	73	74	69	70	82

For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

Connect detector test switches for cabinets as follows:

336S Cabinet		332 Cabinet	
Detector Call Switches	**Terminals**	**Detector Call Switches**	**Terminals**
Phase 1	I1-F	Phase 1	I1-W
Phase 2	I2-F	Phase 2	I4-W
Phase 3	I3-F	Phase 3	I5-W
Phase 4	I4-F	Phase 4	I8-W
Phase 5	I5-F	Phase 5	J1-W
Phase 6	I6-F	Phase 6	J4-W
Phase 7	I7-F	Phase 7	J5-W
Phase 8	I8-F	Phase 8	J8-W

Provide the PCB 28/56 connector for the conflict monitor unit (CMU) with 28 independent contacts per side, dual-sided with 0.156 inch contact centers. Provide the PCB 28/56 connector contacts with solder eyelet terminations. Ensure all connections to the PCB 28/56 connector are soldered to the solder eyelet terminations.

Ensure that all cabinets have the CMU connector wired according to the 332 cabinet connector pin assignments (include all wires for auxiliary output file connection). Wire pins 13, 16, R, and U of the CMU connector to a separate 4 pin plug, P1, as shown below. Provide a second plug, P2, which will mate with P1 and is wired to the auxiliary output file as shown below. Provide an additional plug, P3, which will mate with P1 and is wired to the pedestrian yellow circuits as shown below. When no auxiliary output file is installed in the cabinet, provide wires for the green and yellow inputs for channels 11, 12, 17, and 18, the red inputs for channels 17 and 18, and the wires for the P2 plug. Terminate the two-foot wires with ring type lugs, insulated, and bundled for optional use.

	P1		**P2**		**P3**	
PIN	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**	**FUNCTION**	**CONN TO**
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that

removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

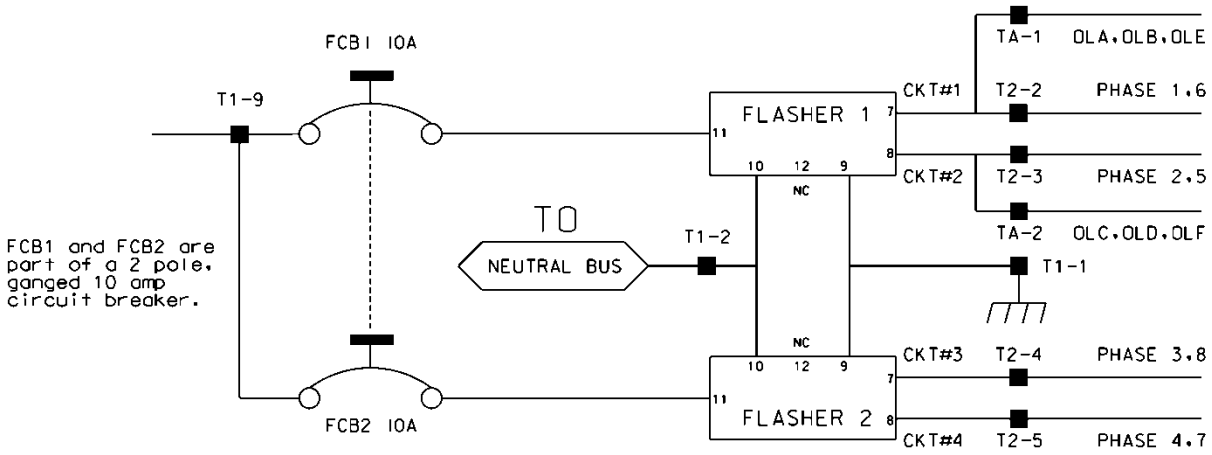
	P20 Connector				
PIN	**FUNCTION**	**CONN TO**	**PIN**	**FUNCTION**	**CONN TO**
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	**FUNCTION**
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	**WATTAGE**
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' "*Transportation Electrical Equipment Specifications*" dated March 12, 2009 with Erratum 1.

C. Type 170 E Cabinet Physical Requirements

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Furnish unpainted, natural, aluminum cabinet shells. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125 inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

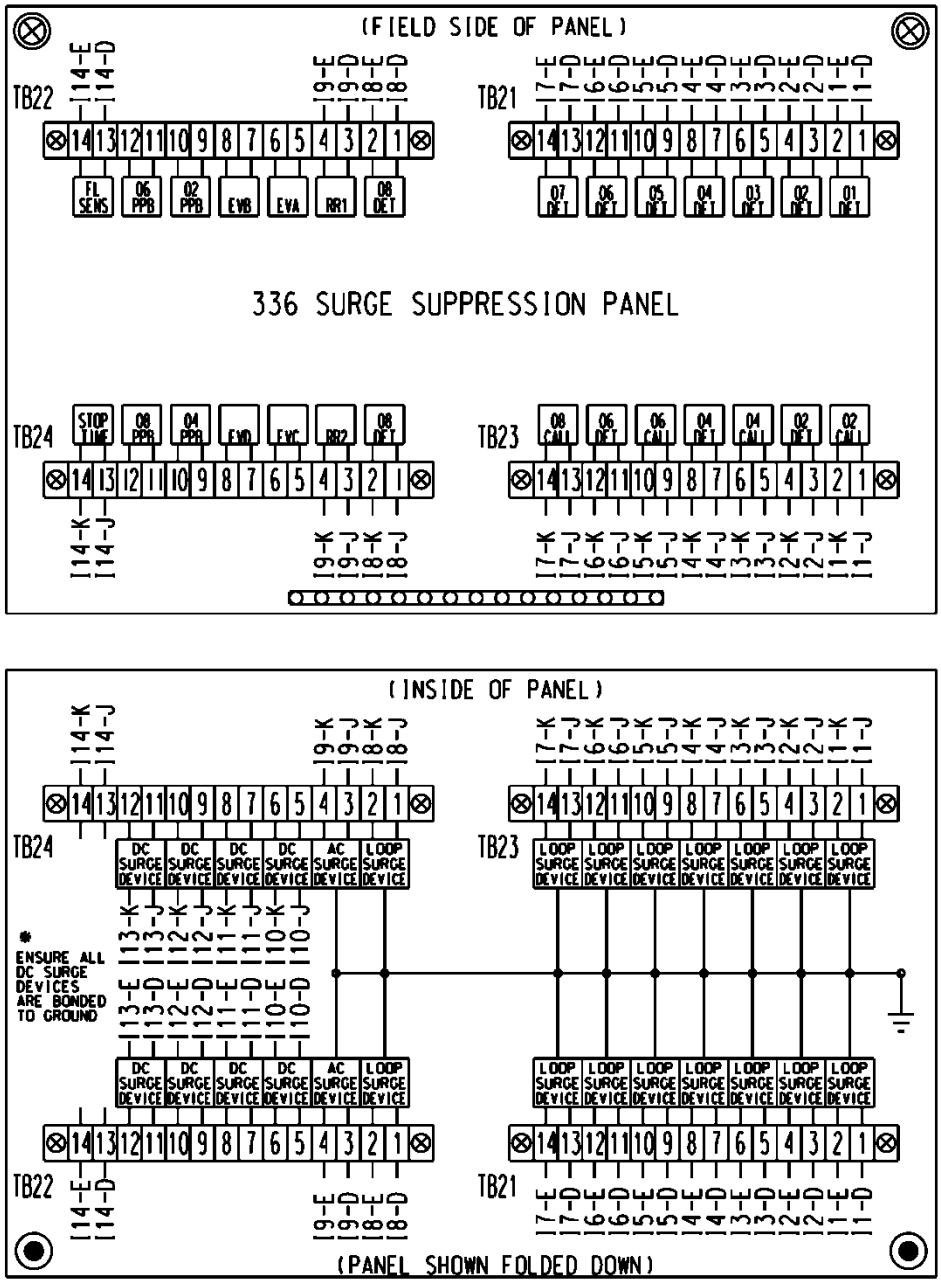
Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For pole mounted cabinets, mount surge protection devices for the AC+ interconnect inputs, inductive loop detector inputs, and low voltage DC inputs on a swing down panel assembly fabricated from sturdy aluminum. Attach the swing down panel to the bottom rear cabinet rack assembly using thumb screws. Ensure the swing down panel allows for easy removal of the input file without removing the surge protection panel assembly or its parts. Have the surge protection devices mounted horizontally on the panel and soldered to the feed through terminals of four 14 position terminal blocks with #8 screws mounted on the other side. Ensure the top row of terminals is connected to the upper slots and the bottom row of terminals is connected to the bottom slots. Provide a 15 position copper equipment ground bus attached to the field terminal side (outside) of

the swing down panel for termination of loop lead-in shield grounds. Ensure that a Number 4 AWG green wire connects the surge protection panel assembly ground bus to the main cabinet equipment ground.



For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment

ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070E 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 2070E 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).

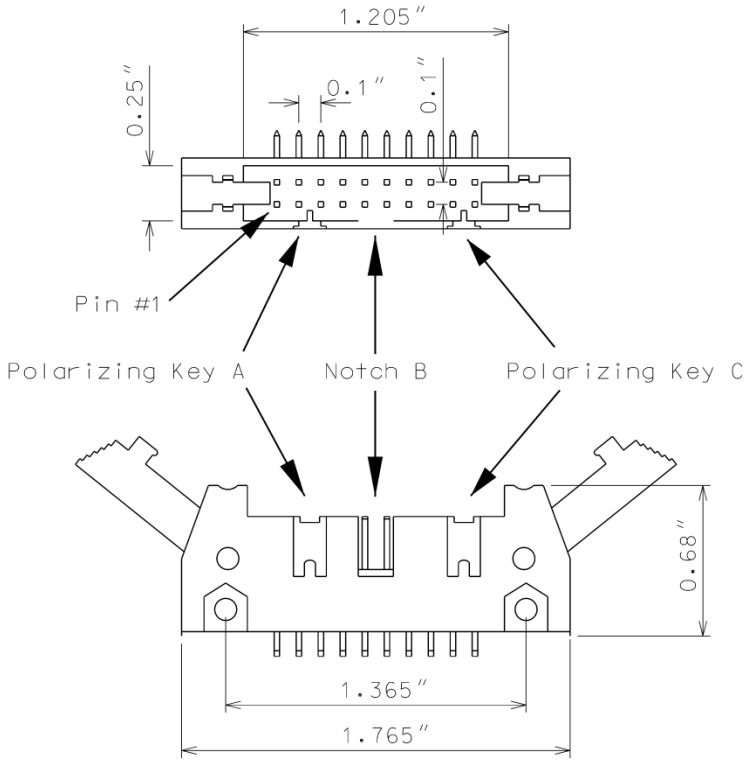
Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1 s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1 s (210 mode).

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

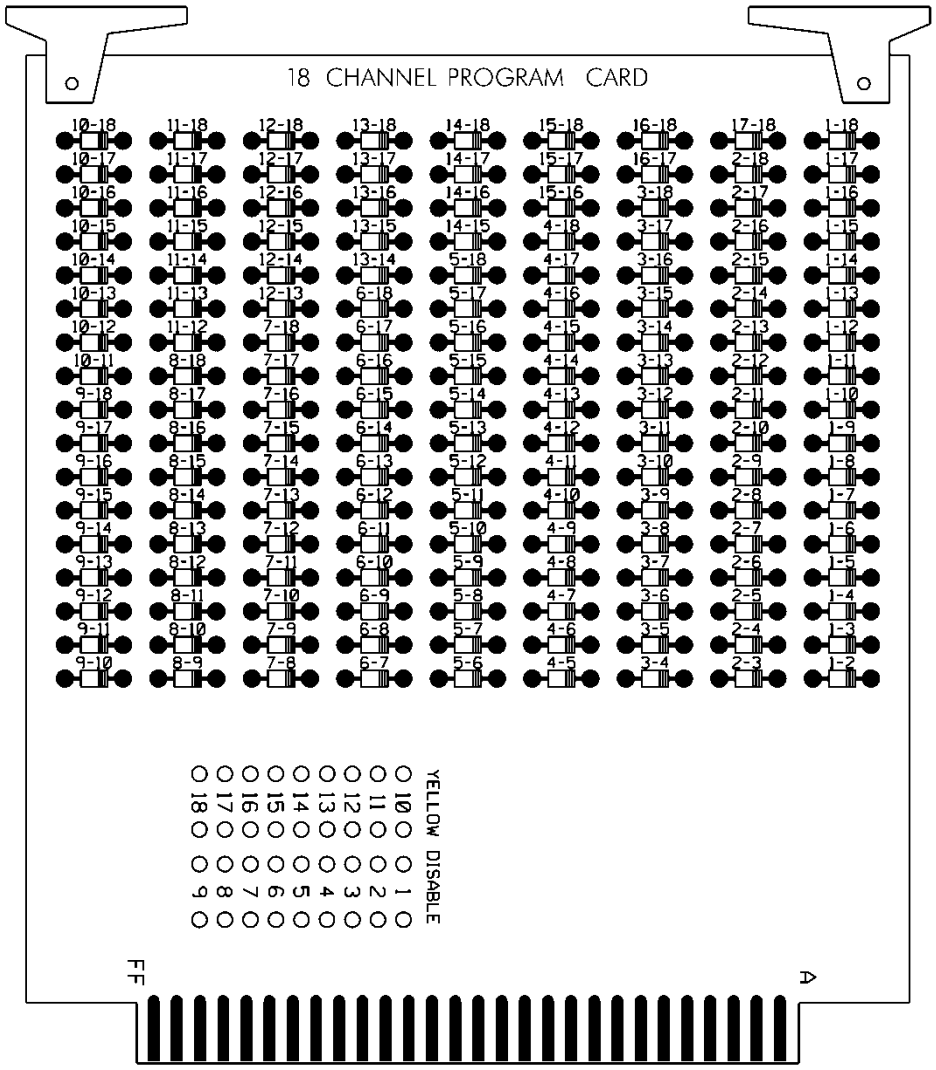
Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	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



5.5. 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.

5.6. MATERIALS – TYPE 2070E CONTROLLERS

Furnish model 2070E 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 2070E controllers with OS-9 release 1.3.1 or later with kernel edition #380 or later operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1E, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2E+, 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
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

5.7. CONSTRUCTION METHODS

A. General

Remove existing controllers and cabinets where required. Remove maintenance diary from cabinet and place in new cabinet or deliver to the Engineer. Take existing equipment out of service only at the time directed.

Locate new cabinets so as not to obstruct sight distance of vehicles turning on red.

Install controllers, cabinets, detector sensor units and hardware that provide required phasing, color sequence, flash sequence, interconnection, railroad clearance and preemption and emergency vehicle clearance and preemption.

Stencil signal inventory number on cabinet side facing roadway. Use 3-inch black characters.

Provide external electrical service disconnect at all new and existing cabinet locations unless otherwise specified.

Do not program controller for late night flashing operation at railroad preemption installations. For all other installations, do not program controller for late night flashing operation unless otherwise directed. Ensure all signal heads for same approach flash concurrently during flashing operation.

Provide serial number and cabinet model number for each new controller and controller cabinet installed.

Activate controllers with proposed phasing and timing.

B. System Interconnection

When interconnection of signals is required (via fiber optics, ethernet, wireless, etc.), install communications interface equipment and hardware for signals. Demonstrate proper operation of interconnection using manual commands and upload/download capability to each local controller from the respective master controller after interconnection is complete.

Program telemetry command sequences and enable devices necessary for testing of communication between local controllers and field master controllers and between field master controllers and Department-furnished central computer. Where master controllers are not used, demonstrate proper operation of interconnection between local intersections controllers and a central system server.

C. Workshop

Provide enclosed workshop to set up and test new controllers and cabinets before installation. Locate workshop within Division responsible for project administration. Ensure workshop provides

protection from weather and sufficient space to house 2 test observers, all necessary test equipment and material, controllers and cabinets.

Configure and test each controller and cabinet to match the proposed signal design. Ensure all equipment furnished and installed or modified by the Contractor at each location operates in full compliance with the plans and project special provisions. Test each controller and cabinet for proper color sequence, flashing operation, phase timings, preemption, coordination and conflict monitor programming or malfunction management unit programming. Ensure that simultaneous conflicting phase outputs will cause the cabinet to revert to flashing operation. For intersections with any type of preemption, submit a completed Preemption Test Procedure Checklist. The checklist is located on the Department's website.

Test the cabinet and controller for eight hours minimum. Following this test and before installation, the Engineer will inspect the equipment in operation. The Engineer may require other tests to ensure proper operation. These tests shall be at no additional cost to the Department.

5.8. MEASUREMENT AND PAYMENT

Controller with Cabinet ( ) will be measured and paid as the actual number of each type of controllers with cabinets furnished, installed and accepted.

Controller ( ) will be measured and paid as the actual number of each type of controllers without cabinets furnished, installed and accepted.

Detector Card ( ) will be measured and paid as the actual number furnished, installed and accepted.

No measurement will be made of conflict monitors, malfunction management units, external electrical service disconnect, grounding systems, modems, meter bases and workshop as these will be incidental to furnishing and installing controllers with cabinets.

Payment will be made under:

Pay Item	Pay Unit
Controller with Cabinet (Type 2070E, Base-Mounted)	Each
Controller with Cabinet (Type 2070E, Pole-Mounted)	Each
Controller (Type 2070E)	Each
Detector Card (2070E)	Each

6. MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE DETECTION ZONES

6.1. 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.

6.2. 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.

6.3. 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.

After the final signal construction is complete, remove the Microwave Vehicle Detection System – Multiple Zones shown in the Project Plans. Return the equipment to the Department between 8:00 a.m. and 12:00 p.m., Monday through Thursday.

6.4. MEASUREMENT AND PAYMENT

Microwave Vehicle Detection System – Multiple Zones will be measured and paid for as the actual number of microwave vehicle detection systems – multiple zones furnished, installed, accepted and eventually removed.

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:

Pay Item	Pay Unit
Microwave Vehicle Detection System – Multiple Zones	Each

8. GPS UNIT

8.1. DESCRIPTION

Furnish and install a GPS unit in the traffic signal cabinet for time synchronization in accordance with the plans and specifications. Comply with the provisions of Section 1700 of the *Standard Specifications*.

8.2. MATERIALS

Provide Trimble Acutime GG Smart Antenna, or an approved equivalent, for time synchronization that is compatible with Oasis 2070 controller software.

8.3. CONSTRUCTION METHODS

Mount GPS antenna on pole adjacent to cabinet at a minimum height of 10' insuring that the antenna can acquire enough satellites to be accurate. Use ¾" rigid metallic conduit with appropriate fittings for mounting the antenna and running the lead-in cable. Provide GPS antenna lead-in cable that is not more than 50' in length. Provide a drip loop in the cable before it enters the conduit. Insure the cable entry point into the conduit is waterproof. If a pole is not within 30' of the cabinet, the GPS antenna may be mounted to the top of the cabinet, while insuring that the connection point into the cabinet is waterproof.

8.4. MEASUREMENT AND PAYMENT

GPS Unit will be measured and paid for as the actual number of GPS units furnished, installed, and accepted.

No measurement will be made for interface cables and connectors, as these are considered incidental to furnishing and installing the GPS unit assemblies.

Payment will be made under:

Pay Item	**Pay Unit**
GPS Unit	Each

9. TRAFFIC SIGNAL SUPPORTS

9.1. METAL TRAFFIC SIGNAL SUPPORTS – ALL 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 *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.

Ensure that metal signal poles permit cables to be installed inside poles and any required mast arms. For holes in the poles and arms used to accommodate cables, provide full-circumference grommets. Arm flange plate wire access holes should be deburred, non grommeted, and oversized to fit around the 2" diameter grommeted shaft flange plate wire access hole.

After fabrication, have steel poles, required mast arms, and all parts used in the assembly hot-dip galvanized per Section 1076. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during the galvanization process. Provide hot-dip galvanizing on structures that meets or exceeds ASTM Standard A-123. Provide galvanizing on hardware that meets or exceeds ASTM Standard A-153. Ensure that threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing that complies with the following:

Repair of Galvanizing ..... Article 1076-7

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.

Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details. Fabricate anchor bases and mast arm connecting plates from plate steel meeting, as a minimum, the requirements of ASTM A572 Gr 50, AASHTO M270 Gr 50, ASTM A709 Gr50, or an approved equivalent. Conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

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 "Luminaire Arms" below or later in the Project Special Provisions.

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. Mast Arm Poles

Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details.

Fabricate metal arm shaft from coil or plate steel that meet the requirements of ASTM A 595 Grade A tubes. Provide arm 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, eliminating circumferential weld splices.

Use the submerged arc process, or other NCDOT previously approved process suitable for arm shafts, to continuously weld arm shafts along their entire length. The longitudinal seam weld shall be finished flush to the outside contour of the base metal. Ensure arm shaft has no circumferential welds except at the lower end joining the shaft to the arm flange plate. 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*, except no field welding on any part of the arm shaft will be permitted unless approved by a qualified Engineer.

After fabrication, hot-dip galvanize steel arm shafts and all assembly components per section 1076 of the *Standard Specifications*. Design arm shafts with weep holes large enough and properly located to drain molten zinc during the galvanization process. Provide hot-dip galvanizing on steel arm shafts that meets or exceeds ASTM Standard A-123, AASHTO M111, or an approved equivalent. Perform repair of damaged galvanizing that complies with the following *Standard Specifications* article:

Repair of Galvanizing ..... Article 1076-7

Ensure metal arm shafts permit cables to be installed inside arm shafts. For holes in arm shafts used to accommodate cables, provide full-circumference grommets. Wire access holes for arm flange plates should be deburred, non-grommeted, and oversized to fit around 4-inch diameter grommeted wire access holes for shaft flange plates.

Provide a minimum of four (4) 1-1/2" diameter high strength bolts for connection between arm plate and pole plate. Increase number of bolts to a minimum of six (6) 1-1/2" diameter high strength bolts when arm lengths are greater than 50'-0" long.

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 M4.

Provide a removable end cap with stainless steel attachment screws for the end of each mast arm. Ensure cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to arm with a sturdy chain or cable approved by the Engineer. Ensure chain or cable is long enough to permit cap to hang clear of arm end opening when cap is removed.

Provide pole flange plates and associated gussets and fittings for attachment of required mast arms. As part of each mast arm attachment, provide a cable passage hole in pole to allow passage of cables from pole to arm. Provide a grommeted 4-inch diameter cable passage hole on the shaft side of the connection to allow passage of cables from pole to arm.

Furnish all arm plates and necessary attachment hardware, including bolts and brackets.

Provide two (2) extra bolts for each arm.

Provide arms with weatherproof connections for attaching to the pole shaft.

Provide hardware that is galvanized steel, stainless steel, or corrosive-resistant aluminum.

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.

Install horizontal-type arms with a manufactured rise preventing arm from deflecting below arm attachment height.

Ensure maximum angular rotation of the top of mast arm pole does not exceed 1 degree 40 minutes (1°40'). Ensure allowable mast arm deflection does not exceed that allowed per 6th Edition AASHTO. For all group load combinations specified under Section 3 of 6th Edition AASHTO, restrict tip of fully loaded arm from going below arm attachment point with the pole.

E. Luminaire Arms

Comply with the following for Steel Luminaire Arms:

- Furnish tapered tube or standard weight black steel pipe conforming to ASTM A 53-90a, Type E or Type S, Grade B or an approved equivalent.
- Provide welding conforming to Article 1072-18 of the *Standard Specifications*, except no field welding on any part of the will be permitted unless approved by a qualified Engineer.
- Hot-dip galvanize the structure in accordance with AASHTO M 111 or an approved equivalent, once all fabricating, cutting, punching, and welding are completed.
- In accordance with National Electrical Safety Code (NESC) Article 230.2(E), provide identification of the electrical source provider for the luminaire feeder circuit with contact information on a permanent label located in the pole hand hole near the feeder circuit raceway.

Additional information can also be found in the Luminaire Arm Section of the Project Special Provisions.

9.2. DRILLED PIER FOUNDATIONS FOR METAL TRAFFIC SIGNAL 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.

Skin Friction is to be calculated 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.

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 site-specific, non-standard 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. Design the metal pole foundation to conform to the applicable provisions in the NCDOT Metal Pole Standard Drawings and Section B4 (Non-Standard Foundation Design) below. Failure to conform to this requirement will be grounds for rejection of the design.

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

9.3. METAL SIGNAL POLE REMOVALS

A. Description

Remove and dispose of existing metal support poles, and remove and dispose of existing foundations, associated anchor bolts, electrical wires and connections.

B. Construction Methods

1. Foundations

Remove and promptly dispose of the metal signal pole foundations including reinforcing steel, electrical wires, and anchor bolts to a minimum depth of two feet below the finished ground elevation. At the Contractor's option, remove the complete foundation.

2. Metal Poles

Consult Division Traffic Services regarding ownership of poles. If the Division chooses to maintain these structures in their inventory for future use, permanently mark the pole with the signal inventory number, asset inventory number or some identifying information that identifies where the pole came from

Remove the metal support poles, and promptly transport the metal support poles from the project. Use methods to remove the metal support poles and attached equipment that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no additional cost to the Department.

Transport and properly dispose of the materials.

Backfill and compact disturbed areas to match the finished ground elevation. Seed unpaved areas.

Use methods to remove the foundations that will not result in damage to other portions of the project or facility. Repair damages that are a result of the Contractor's actions at no cost to the Department.

9.4. POLE NUMBERING SYSTEM

A. New Poles

Attach an identification tag to each pole shaft and mast arm section as shown on Metal Pole Standard Drawing Sheet M2 "Typical Fabrication Details Common To All Metal Poles".

9.5. DECORATIVE METAL POLE WITH MAST ARM

Provide decorative black metal poles with mast arms at 03-0977 – NC 211 at Saint James Drive similar to the existing metal poles with mast arms. Provide a traffic signal pole system comprised of a fluted tapered pole, smooth tapered signal mast arm, and decorative base. Comply with Protective Coating for Metal Poles Section of these Project Special Provisions for applying the black powder coating.

Provide a luminaire arm and light fixture in accordance with these plans. Comply with Division 14 – Lighting of the *Standard Specifications* and sections of the Project Special Provisions.

The actual style of the traffic signal pole system, luminaire arm, and light fixture shall be approved by the Engineer prior to ordering and installation.

9.6. MEASUREMENT AND PAYMENT

Metal Pole with Single Mast Arm will be measured and paid for as the actual number of metal poles with single mast arms furnished, installed, and accepted.

Metal Pole with Dual Mast Arm will be measured and paid for as the actual number of metal poles with dual mast arms furnished, installed, and accepted.

Decorative Metal Pole with Single Mast Arm will be measured and paid for as the actual number of decorative metal poles with single mast arms furnished, installed, and accepted.

Mast Arm with Metal Pole Design will be measured and paid for as the actual number of designs for mast arms with metal poles furnished and accepted.

Metal Pole Foundation Removal will be measured and paid for as the actual number of metal signal pole foundations removed and disposed.

Metal Pole Removal will be measured and paid for as the actual number of metal signal poles removed and disposed.

Soil Test will be measured and paid for as the actual number of soil tests with SPT borings drilled furnished and accepted.

Drilled Pier Foundation will be measured and paid for as the 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 signal support structures.

Payment will be made under:

Pay Item	Pay Unit
Metal Pole with Single Mast Arm	Each
Metal Pole with Dual Mast Arm	Each
Decorative Metal Pole with Single Mast Arm	Each
Mast Arm with Metal Pole Design	Each
Metal Pole Foundation Removal	Each
Metal Pole Removal	Each
Soil Test	Each
Drilled Pier Foundation	Cubic Yard

10. PROTECTIVE COATING FOR METAL POLES

10.1. DESCRIPTION

Protective coating for metal poles is a supplemental durable color coating that is applied to galvanized steel and aluminum traffic signal structures installed in locations where maintaining an aesthetic appearance is important. Powder Coating is the preferred supplemental protective coating process for coating galvanized steel and aluminum structures. However, for the purposes of this special provision, an Acrylic Primer and top coat paint system is included as an acceptable alternative when protective color coating is required.

Provide protective coating over galvanization for all steel poles including all necessary hardware in accordance with the plans and specifications. Any aluminum components do not need to be galvanized before application of protective coating.

10.2. MATERIALS

With the exception of aluminum components, furnish all metal poles with galvanic protection along with a tough and durable application of protective coating. Aluminum components shall have a durable powder coating application. Galvanization is not required for aluminum components.

Furnish pole caps that have a low gloss powder finish applied over a hot-dipped galvanized surface. Comply with the applicable provisions of Sections 442-10 and 442-13 of the *Standard Specifications*.

Ensure the selected color for protective coating has been verified and approved by the Engineer prior to fabrication.

10.3. COATING SHOP APPROVAL

Approve the coating shop facility prior to the application of any coating process. Submit all requests, procedures and documents electronically to:

- Mr. Cabell Garbee, P.E., Manufactured Products Engineer
- cgarbee@ncdot.gov

A) Submit a quality control procedure that the company has established to ensure a quality and durable coating. The quality control procedure shall contain at a minimum the following:

- Qualified / Certified personnel to manage the QC Program and to conduct Quality Control tests
- Qualified / certified coaters
- Source and type of powder
- How the powder will be stored
- Powder application facility (heated or unheated)
- Surface pre-treatment
- Surface preparation including profile
- Application methods
- Curing conditions (conventional or infrared)
- Curing Temperature

- Adhesion & Holiday Detection
- Repair Procedure
- Storage and protection of coated items
- Shipping and handling (packing, protection, and wrapping)

B) Submit a powder certification from the manufacturer

C) Submit the following to the Chemical Testing Engineer a minimum of four weeks prior to coating application.

1. Two test panels of ASTM A36 steel, ¼ or greater in thickness measuring 8 inches by 11 inches using the proposed color of the final coat; a powder coated over galvanized test panel and a powder coated over un-galvanized test panel.
2. In addition, provide two (2) samples of the same or comparable material and thickness as production pieces. Ensure production piece replicas do not exceed twelve inches (12") in length and width nor 50 pounds in weight.
3. Submit all test panels with inspection reports and records according to *Standard Specifications*, Section 442, Section 1072, Section 1076, and Section 1080.
4. Acceptance of the panels is determined by meeting the requirements of ASTM D-4541 of 800 psi for both galvanized and un-galvanized and production piece test panels.
5. Send all panels to:

   Materials and Tests Unit
   1801 Blue Ridge Road
   Raleigh, NC 27607
   Attn: Chemical Testing Engineer

10.4. POWDER COATING

A. Galvanizing

Galvanize steel products in accordance with Section 1076 of the *Standard Specifications*. Ensure the fabricator or designated representative(s) that is supplying the components to be galvanized communicates with the galvanizer to indicate that the galvanized pieces will be powder coated to avoid water or chromate quenching.

B. Surface Preparation

Comply with manufacturer's recommended surface coating specifications, Steel Structure Painting Council (SSPC) specifications and applicable articles of Section 442 (Painting Steel Structures) of the *Standard Specifications*. Ensure that surface preparations and treatments are performed and meet the requirements of the above referenced specifications.

Some pole components, specifically steel plates ¾ inches or more in thickness, may need blast cleaning prior to structure assembly to remove impurities and non-metallic foreign materials. Mechanically remove all weld flux after structure is assembled

Degrease and prepare steel structure for zinc coating after assembly using full immersion baths and pickling processes in heat controlled caustic and acid solutions. Rinse and clean structure to remove caustic or acid solutions by immersion in a circulating fresh water bath. Immerse structure

in a heat controlled concentrated zinc ammonium chloride flux solution and air dry as a final prep before hot-dip galvanization.

Ensure that the surface preparation is no less than specified by the powder manufacturer's recommendations. Prepare all components to be coated in accordance with SSPC SP-2 (Hand Tool Cleaning) and/or SSPC SP-3 (Power Tool Cleaning). Remove all drainage spikes, high spots, protrusions or other surface defects using hand or power tools. Do not remove the galvanization below the limits set forth in AASHTO M111.

Remove grease, oils, moisture, scale, rust or any other foreign matter prior to powder coating to ensure ideal adhesion and coating performance. Prepare and coat the galvanized surface as soon as possible after the galvanization process.

C. Powder Coating Application and Curing

Prepare galvanized finish for powder coating by brush blasting in accordance with SSPC-SP7. Ensure all threaded components of the structure are protected from damage during blasting process.

Use thermosetting powder resin that meets 5A or 5B classifications of ASTM D3359. Apply powder coating electrostatically. Follow manufacturer's recommended preheating requirements. Ensure the top coat finish is applied uniformly to all surfaces with a dry film thickness of between 3.0 to 5.0 mils. Cure the top coat by heating the structure to manufacturer recommended temperatures at the duration required to ensure complete and uniform bond.

D. Quality Control

Ensure the applicator provides all test reports and documentation and inspects all coated material as outlined in the *Standard Specifications*, Section 442, Section 1072, Section 1076, and Section 1080. Ensure the quality control inspection is kept separate from the production functions.

E. Storage, Shipping, and Handling

Store all powder coated material inside or as directed by the Engineer.

Protect the product from incurring damage during all shipping, handling, and storing activities. Do not store the product directly on the ground or in areas where water may pool; the Engineer determines the effectiveness of all storage, shipping and handling methods.

F. Repair of Powder Coated Material

Repair all damage to the coating by the original method of application as outlined in the coating facility's repair procedure. Ensure all repair areas meet the original requirements for adhesion as stated in this Project Special Provision.

Photograph, document, and report all damages upon delivery to the project site prior to unloading. Provide documented damage notifications to the Engineer or to their authorized representative so the application firm can be notified. The Engineer has the authority to accept or reject the material as outlined in the Standard Specifications.

Submit to the Engineer a repair procedure for damaged coatings which occur during storage, transporting, handling and or installation. Utilize a liquid paint approved by the Department, compatible with the powder applied product. Ensure all repair areas demonstrate an adhesion rating of 400 psi in accordance with ASTM D-4541. Obtain Engineer's acceptance of the final finish.

10.5. ACRYLIC PRIMER AND TOP COAT PAINT SYSTEM 4 (MODIFIED)

A. Description

Follow NCDOT procedures for Powder Coating over Galvanizing. Provide an Acrylic Primer and top coat when a substitute for powder coating is necessary.

Provide supplemental coating for all mast arms with metal signal poles and all necessary hardware for the signalized intersection in accordance with Standard Specifications – sections 442 and 1080, as contained herein, and as shown on the plans. The Structural Steel Shop Coatings Program can be found at the following link:

https://connect.ncdot.gov/resources/Materials/MaterialsResources/Structural%20Steel%20Shop%20Coatings%20Program.pdf

Ensure all painting work for new structures, except field touch-up and bolt painting is performed in the shop.

Coatings Shop Approval

Use only NCDOT approved shop coating facilities meeting the requirements outlined in the current edition of the Structural Steel Shop Coatings Program. This program is available on the Materials and Tests website.

Provide shop certification in accordance with the Structural Steel Shop Coatings Program (Shop facilities that are currently certified and in good standing with the American Institute Steel Construction (AISC) / Sophisticated Paint Endorsement (SPE) and/or the Society of Protective Coatings (SSPC) Qualification Procedure Three (QP-3).

B. Surface Preparation

Ensure all surface preparation is not less than that specified by the paint manufacturer's recommendations.

Clean galvanized surfaces to be painted with a 2,500 psi pressure washer. Allow surfaces to dry completely before beginning surface preparation.

Ensure all components to be coated are prepared in accordance with SSPC SP2 (Hand Tool Cleaning and or SSPC SP-3 (Power Tool Cleaning). Remove all drainage spikes, high spots, protrusions or other surface defects using hand or power tools. Do not remove the galvanization below the limits set forth in AASHTO M111.

Perform abrasive sweep blasting in accordance with ASTM D6386. Refer to this section for a description of the abrasive blast material to be used. Use a material and technique capable of stripping action to remove corrosion products and to provide a rough surface profile while leaving base zinc layers intact.

Blow down all blasted surfaces with clean compressed air to provide a clean, dry surface.

Ensure all surfaces are free of visible zinc oxides or zinc hydroxides.

C. Materials

Use an approved/qualified waterborne paint meeting the requirements of NCDOT Standard specification section 1080. Do not apply paint until each batch has been tested by the Department. Provide color as specified in the contract documents.

Ensure all paint used on this contract is produced by the same manufacturer.

D. Painting

Apply paint in accordance with the requirements of Section 1080 and Section 442 of the *Standard Specifications* using System 4 as modified herein.

System 4 (Modified)
Acrylic Primer and Top Coats

Coat	Material	Mils Dry/Wet Film Thickness	Mils Dry/Wet Film Thickness
		Minimum	Maximum
Primer	1080-9 White	3.0 DFT	5.0 DFT
Stripe	1080-9*	4.0 WFT	7.0 WFT
Topcoat	1080-9*	2.0 DFT	4.0 DFT
Total		5.0 DFT	9.0 DFT

***Ensure the selected color for protective coating has been verified and approved by the Engineer prior to fabrication.**

The time between blast and coating application shall be in accordance with ASTM D6386 time requirements. In no case shall the prepared surface extend beyond 8 hours.

Mask off and do not paint all data plates and faying surfaces prior to application.

Spray apply all coatings except for the stripe coat. Brush apply the stripe coat to all plate edges, welds, bolt holes and bolts prior to applying the finish coat.

E. Curing

Store all material in a heated shop for a period no less than 24 hours once top coat has been applied. Continue storing material until requirements of ASTM D-1640 have been met.

F. Inspection

Quality Control shall conduct the required quality control tests as outlined in the Structural Steel Shop Coatings Program and report the minimum information required by the appropriate ASTM test methods. At a minimum, quality control forms shall be on company letterhead with logo that provides a daily inspection report form equivalent to the information required on the M&T-611 Form. The M&T-611 Form can be found in the Structural Steel Shop Coatings Program. Dry Film Thickness (DFT) measurements shall be obtained on all coating layers, including the galvanized layer and shall incorporate the use of a Type 2 gauge as defined in SSPC PA-2.

Ensure all material is of a uniform appearance free of runs, drips, and sags.

G. Handling

Do not handle, ship, or erect coated members until paint is thoroughly dry.

Protect all shipping and handling either from the coating facility to project site and or storage site to area(s) to construction location from incurring damage to product. Wood blocks and nylon slings are recommended for securing, loading, hoisting or storing members.

H. Repair of Damaged Coating

Repair damage occurring to the galvanized portion of the coating during shipment or installation in accordance with Articles 1076-7 and 1080-7 of the *Standard Specifications*. Repair damage occurring to the painted portion of the coating during shipment or installation by applying 4.0-7.0 wet mils of topcoat with a brush or roller and feather or taper this to be level with the surrounding areas.

10.6. MEASUREMENT AND PAYMENT

Protective Coating for Single Mast Arm Pole ( ) will be measured and paid as the actual number of single mast arm poles with powder coat applied furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Protective Coating for Single Mast Arm Pole (Black)	Each

11. LUMINAIRE MAST ARMS

11.1. DESCRIPTION

Furnish and install LED luminaire mast arms (excluding lighting assemblies) and all necessary hardware in accordance with the plans and specifications. Comply with the provisions of Sections 1400 and 1700 of the *Standard Specifications*.

Design the luminaire support arm together with the signal support structure to achieve a light assembly mounting height of 30 feet above the roadway. Conform to design dimensions and light assembly loading shown on the structure loading diagrams. Refer to the Radial Orientation Detail on loading diagrams for proper orientation of arm attachment to the signal pole. Design free end of support arm for a 2-inch slip fit socket connection for attaching light assembly.

Lighting assembly to be provided and installed by Brunswick Electric Membership Corporation. Please coordinate with:

Wesley D. Thomas
Senior Staking Engineer
Brunswick EMC
(910) 754-4391, Ext 5310 (phone)
Wesley.thomas@bemc.org

Verify lighting assembly manufacturer and specifications prior to submittal of shop drawings.

Provide a luminaire arm and light fixture in accordance with these plans. The actual style of the luminaire arm and light fixture at 03-0977 – NC 211 at Saint James Drive shall be approved by the Engineer prior to ordering and installation so it is similar to the existing luminaire arm and light fixture.

11.2. MATERIALS

Comply with the provisions of Traffic Signal Supports Section of these Project Special Provisions.

Provide a luminaire mast arm that meets the design criteria as required by the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 including all of the latest interim revisions, and the *Standard Specifications*.

Provide a luminaire mast arm designed to support an ellipsoidal shaped luminaire, which has a center of gravity not more than 18" from the end of the support, with a maximum weight of 35 pounds, a projected area of EPA 0.87 square feet, and a bracket arm length of 12 feet.

Deliver luminaire mast arm with a smooth uniform finish, free of disfiguring scratches or dents, and with suitable protection for further handling.

Wrap or package each luminaire mast arm as recommended by the manufacturer to prevent damage during shipping and handling. Repair or replace, at the option of the Engineer, any standards with abraded finishes or other damage.

Furnish steel luminaire mast arms. Galvanize steel components after fabrication. Use galvanization which conforms to the requirements of ASTM A123 for tubes, plates, and bars, and to ASTM A153 for hardware.

Furnish tapered tube or standard weight black steel pipe conforming to ASTM A 53-90a, Type E or Type S, Grade B or an approved equivalent.

Provide welding conforming to Article 1072-18 of the *Standard Specifications*, except no field welding on any part of the will be permitted unless approved by a qualified Engineer.

Hot-dip galvanize the structure in accordance with AASHTO M 111 or an approved equivalent, once all fabricating, cutting, punching, and welding are completed.

In accordance with National Electrical Safety Code (NESC) Article 230.2(E), provide identification of the electrical source provider for the luminaire feeder circuit with contact information on a permanent label located in the pole hand hole near the feeder circuit raceway.

11.3. CONSTRUCTION METHODS

Comply with the provisions of Traffic Signal Supports Section of these Project Special Provisions.

Perform work as required by the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 including all of the latest interim revisions, and the *Standard Specifications*.

Do not lay the luminaire mast arms on the ground, without proper blocking and protection to prevent warping and discoloration. Protect them from other construction work, including landscape mulching and fertilizing operations.

11.4. MEASUREMENT AND PAYMENT

Luminaire Mast Arm will be measured and paid for as the actual number of luminaire mast arms furnished, installed, and accepted. No payment will be made for bolts, washers, or nuts needed to connect the luminaire mast arm to the pole.

Payment will be made under:

Pay Item	Pay Unit
Luminaire Mast Arm	Each

12. JUNCTION BOX MARKERS

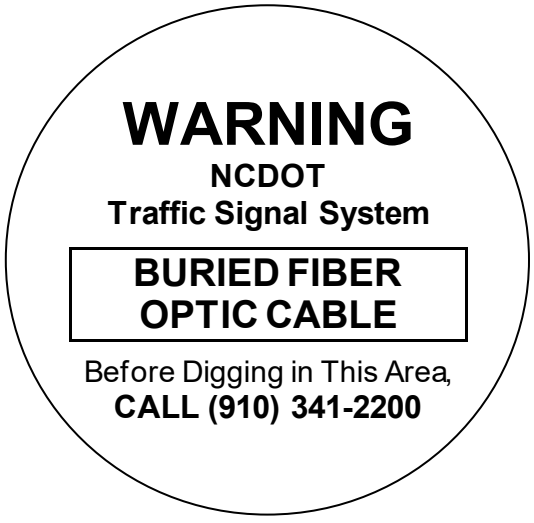
12.1. DESCRIPTION

Furnish and install junction box markers with all necessary hardware and adhesives to warn of buried fiber-optic communications cable.

12.2. MATERIALS

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.

12.3. CONSTRUCTION METHODS

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 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.

12.4. 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:

Pay Item	Pay Unit
Junction Box Marker	Each

13. BACK PULL FIBER OPTIC CABLE

13.1. DESCRIPTION

Back pull and store or back pull and reinstall existing communications cable.

13.2. CONSTRUCTION

During project construction where instructed to back pull existing aerial sections of fiber optic communications cable, de-lash the cable from the messenger cable and back pull the cable to a point where it can be stored or re-routed as shown on the plans. If instructed, remove and discard the existing messenger cable and pole mounting hardware once the cable is safely out of harm's way.

During project construction where instructed to back pull existing underground sections of fiber optic communications cable, back pull the cable to a point where it can be stored or re-routed as shown on the plans. If instructed, remove abandoned junction boxes and backfill with a suitable material to match the existing grade. Leave abandoned conduits in place unless otherwise noted.

Where instructed, re-pull the fiber optic cable back along messenger cable or through conduit systems.

13.3. MEASUREMENT AND PAYMENT

Back Pull Fiber Optic Cable will be paid for as the actual linear feet of fiber optic cable back pulled and either stored or back pulled and rerouted. Payment is for the actual linear feet of cable back pulled.

No payment will be made for removing messenger cable and pole mounting hardware or removing junction boxes and back filling to match the surrounding grade as these items of work will be considered incidental to back pulling the fiber optic cable.

Payment will be made under:

Pay Item	Pay Unit
Back Pull Fiber Optic Cable	Linear Feet

14. ETHERNET SWITCHES

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.

14.1. DESCRIPTION

A. Ethernet Edge Switch

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for traffic signal and DMS in the field equipment cabinets as shown in the Project Plans and as described in these Project Special Provisions for the successful integration of the field devices into the Division 3 TOC. 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 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 Division to program the new devices.

B. Network Management

Ensure that the edge switch is fully compatible with the Division's existing Network Management Software.

14.2. 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 and Field Ethernet Transceiver 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 and Field Ethernet Transceiver 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

14.3. 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.

14.4. 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:

Pay Item	**Pay Unit**
Ethernet Edge Switch	Each

15. COMMUNICATIONS SYSTEM SUPPORT EQUIPMENT

15.1. DESCRIPTION

Furnish communications system support equipment with all necessary hardware in accordance with the plans and specifications.

15.2. MATERIALS

A. General

Furnish equipment with test probes/leads, batteries (for battery-operated units), line cords (for AC-operated units), and carrying cases. Provide operating instructions and maintenance manuals with each item.

Before starting any system testing or training, furnish all communications system support equipment.

B. Fiber-Optic Support Equipment

1. Ethernet Edge Switch (For Emergency Restoration)

Furnish Ethernet Edge Switch identical to the type installed in the traffic signal controller cabinets to be used for emergency restoration of the system and the fiber-optic communications system.

C. Wireless Radio Support Equipment

1. Lightning Arrestor

Furnish wireless radio lightning arrestors identical to the type installed in the traffic signal controller cabinets to be used for emergency restoration of the transient voltage suppression equipment.

15.3. MEASUREMENT AND PAYMENT

Furnish Ethernet Edge Switch will be measured and paid for as the actual number of Ethernet Edge Switch furnished and accepted.

Furnish Wireless Lightning Arrestor will be measured and paid for as the actual number of wireless radio lightning arrestors furnished and accepted.

Payment will be made under:

Pay Item	Pay Unit
Furnish Ethernet Edge Switch	Each
Furnish Wireless Lightning Arrestor	Each

16. MODIFY SPREAD SPECTRUM WIRELESS RADIO

16.1. DESCRIPTION

Make modifications to existing Spread Spectrum Radio installations.

16.2. 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*.

16.3. 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

16.4. 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:

Pay Item	Pay Unit
Modify Radio Installation	Each

17. REMOVE SPREAD SPECTRUM RADIO

17.1. DESCRIPTION

Remove and replace spread spectrum radio assembly and all necessary hardware and signage as shown in the Project Plans.

17.2. CONSTRUCTION METHODS

Remove and replace the existing spread spectrum radio assemblies, including antenna, with a 900 MHz Serial/Ethernet Spread Spectrum Radio to communicate with the 2070E controllers during construction. Section 1736 of the *Standard Specifications* includes measurement and payment of replacing the existing spread spectrum radio assemblies or installing new 900MHz serial/ethernet spread spectrum radio assemblies. Remove the existing spread spectrum radio assemblies and return the equipment to Division 3 Traffic Services between 8:00 a.m. and 12:00 p.m, Monday through Thursday.

After fiber optic cable construction is complete and the closed loop system is communicating over to fiber, remove the 900 MHz Serial/Ethernet Spread Spectrum Radio assemblies shown in the Project Plans. Return the equipment to Division 3 Traffic Services between 8:00 a.m. and 12:00 p.m., Monday through Thursday.

17.3. 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:

Pay Item	**Pay Unit**
Remove 900MHz Radio	Each

18. ELECTRICAL SERVICE FOR ITS DEVICE

18.1. DESCRIPTION

Install new or modify existing electrical service equipment for ITS devices as shown in the Project Plans. 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.

18.2. MATERIALS

A. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Project Plans. Provide meter base/disconnect combination panels that have a minimum of eight (8) spaces in the disconnect. Furnish a single pole 15A circuit breaker at each CCTV location. Furnish a double pole 50A circuit breaker at each DMS 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 12 through number 2/0 AWG.

Furnish NEMA Type 3R combinational panel rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meets the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167°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 2/0 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.

At overhead service locations, furnish 1.25" 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 Varistor
- Voltage ..... 120/240 Single Phase, 3 wire
- Maximum current..... 100,000 amps
- Maximum energy ..... 3,000 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 Project Plans, modify the existing electrical service by installing an additional 15A, single pole circuit breaker in an existing service disconnect enclosure for CCTV locations. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Ensure circuit breakers are listed as meeting UL-489. Install conduit between the existing service disconnect enclosure and an adjacent junction box as shown in the Project Plans.

C. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Project 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 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 1/0 AWG.

D. 3-Wire Copper Service Entrance Conductors

Furnish 3-wire, 3 AWG 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 or B-787 standards.

E. 4-Wire Copper Feeder Conductors

Furnish 4-wire stranded copper 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 or B-787 standards.

See the Project Plans for wire sizes and quantities.

F. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper 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 or B-787 standards.

See the Project 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 mechanical crimps for grounding system installations. Comply with the NEC, *Standard Specifications*, these Project Special Provisions, and the Project Plans.

18.3. CONSTRUCTION METHODS

Permanently label cables at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation. Use component name and labeling scheme approved by the Engineer.

A. Meter Base/Disconnect Combination Panel

Install meter base/disconnect combination panels with lightning arrestors as called for in the Project Plans. At all new CCTV and DMS locations, route the feeder conductors from the meter base/disconnect to the CCTV and DMS equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and either PVC or HDPE for below ground depending on the installation method required by the Project Plans.

B. Modify Existing Electrical Service Equipment

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 conduit system between the existing service disconnect and the new cabinet or equipment cabinet disconnect as shown in the Project Plans. All above ground conduits, conduit bodies and fittings must be rigid galvanized steel. Underground conduits and fittings can be PVC or HDPE. Transition from rigid galvanized steel to PVC using rigid galvanized steel sweeping elbows or in junction boxes. Install stranded copper feeder conductors from the service disconnect to the new cabinet or equipment cabinet disconnect sized as shown in the Project Plans.

C. Equipment Cabinet Disconnect

Install equipment cabinet disconnects and circuit breakers as called for in the Project Plans. Install THWN stranded copper feeder conductors as shown in Project 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 Project Plans.

D. 3-Wire Copper Service Entrance Conductors

At locations shown in the Project Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 inch rigid galvanized risers as shown in the Project Plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as specified in the Project Plans. Comply with the *Standard Specifications*, the *Standard Drawings* and all applicable electrical codes.

E. 4-Wire Copper Feeder Conductors

At locations shown in the Project 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 Project Plans. Comply with the *Standard Specifications* and *Standard Drawings* and all applicable electrical codes.

F. 3-Wire Copper Feeder Conductors

At locations shown in the Project 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 Project Plans. Comply with the *Standard Specifications,* the *Standard Drawings* and all applicable electrical codes.

G. Grounding System

Install ground rods as indicated in the Project Plans. Connect the #4 AWG grounding conductor to ground rods using irreversible mechanical crimps. 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.

Submit to the Engineer a completed Inductive Loop & Grounding Test Form available on the Department's website at:

https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx

18.4. MEASUREMENT AND PAYMENT

Electrical Service for ITS Device will be measured and paid as the actual number of complete and functional electrical service locations furnished, installed and accepted for powering ITS Devices as called for in the Project Plans. 3-Wire copper service entrance conductors, 4-Wire copper feeder conductors, 3-Wire copper feeder conductors, 5/8" X 10' grounding electrodes, #4 solid bare grounding, breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, new electrical service disconnects, 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, equipment cabinet disconnects, and any remaining hardware, fittings, feeder conductors, conduit bodies to connect the electrical service to the cabinet will be considered incidental to the installation of electrical service for an ITS device and will not be paid for separately.

No measurement or payment will be made for new electrical equipment installed for a traffic signal as this will be incidental to the traffic signal installation.

No measurement or payment will be made for new electrical equipment shared by a traffic signal and an ITS device as this will be incidental to the traffic signal installation and or modification.

Payment will be made under:

Pay Item	Pay Unit
Electrical Service for ITS Device	Each

19. DIGITAL CCTV CAMERA ASSEMBLY

19.1. 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. Contact the Division 3 Deputy Division Traffic Engineer to confirm the CCTV locations prior to beginning construction.

19.2. MATERIALS

A. General

Furnish and install new CCTV camera assemblies at the locations shown on the Project Plans. 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. Camera

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)
- ResolutionScalable: 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 Project 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 *Standard Specifications*. 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: -40º F to + 158º 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: 14º F to 131º 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.

19.3. 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 *Standard Specifications*. 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 CCTV Camera Assembly. Ground all equipment as called for in the *Standard Specifications*, these Project Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

19.4. 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.

19.5. COMPATAIBILITY 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.

19.6. 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.

19.7. 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:

Pay Item	**Pay Unit**
Digital CCTV Camera Assembly	Each

20. CCTV FIELD EQUIPMENT CABINET

20.1. 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.

Furnish terminal blocks for power for cabinet CCTV, and communications devices as needed to accommodate the number of devices in the cabinet.

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 equipment cabinet.

Communications between the cameras and the Division office will be accomplished over cellular modems. The Department will furnish and install the cellular modem in the cabinet at the locations shown in the Project Plans.

20.2. 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 the back door is opened. The lights must be mounted so as to not 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.

D. 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 main 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.

20.3. CONSTRUCTION METHODS

For each field equipment cabinet installation, use stainless steel banding or other method approved by the Engineer to fasten cabinet to metal 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.

20.4. MEASUREMENT AND PAYMENT

Field equipment cabinet will be measured and paid as the actual number of field equipment cabinets furnished, installed and accepted.

No separate 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.

Payment will be made under:

Pay Item	**Pay Unit**
Field Equipment Cabinet	.Each

21. WOOD POLE

21.1. DESCRIPTION

Furnish and install wood poles, grounding systems and all necessary hardware for CCTV camera installations. Reference applicable Sections of Article 1720 of the *Standard Specifications*.

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*.

21.2. MATERIAL

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 *Standard Specifications*.

A. 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.

B. Wood Pedestal

Furnish 6" x 6" x 8' wood pedestal for attaching ITS electrical services as shown in the Project Plans.

21.3. CONSTRUCTION METHODS

A. CCTV Wood Pole

Mark final pole locations and receive approval from the Deputy Division Traffic 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

B. Wood Pedestal

Mount the post in a location to install the ITS Device electrical service near the service.

Drill or auger a hole for placement of pole and to allow for compacting. Set pole at manufacturer's recommended depth. Ensure the pole is within 2 degrees of vertical when fully loaded.

Backfill hole with pole installed and tamp backfill in 6 inch lifts with a mechanical tamp until compacted density is at least 95% of original density.

On new Department-owned poles, install a grounding system consisting of #6 AWG solid bare copper wire that is exothermically welded 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. Install ground wire

so as to minimize damage from vandalism and environmental exposures. Install ground wire up pole. Use hot-dipped galvanized wire staples to secure ground wire to pole.

21.4. MEASUREMENT AND PAYMENT

CCTV Wood Pole will be measured and paid for as the actual number of wood poles for CCTV camera furnished, installed, and accepted.

Wood Pedestal will be measured and paid for as the actual number of wood post furnished, installed, and accepted for ITS Device electrical service.

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:

Pay Item	Pay Unit
CCTV Wood Pole	Each
Wood Pedestal	Each

22. AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

22.1. DESCRIPTION

Furnish an air terminal and lightning protection system that is comprised of items meeting UL 96 and UL 467 product standards for lightning protection and installed to be compliant with the National Fire Protection Association 780 Standards for Lightning Protection Systems. The lightning protection system shall consist of, as a minimum, an Air Terminal, vertical Air Terminal Base (wood pole), 28-Strand bare-copper lightning conductor, 4-point grounding systems (grounding electrodes), #4 AWG copper bonding conductors, marker tape and other miscellaneous hardware.

22.2. MATERIALS

A. General

Reference the following Typical Details where applicable:

- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

B. Wood Pole

Furnish a UL Listed Class II, copper clad minimum 48" long by ½" diameter air terminal. Ensure the air terminal has a tapered tip with a rounded point on one end and is threaded on the connection end with standard Unified Coarse (UNC) 13 threads per inch.

Furnish a copper vertical air terminal base that has internal threading to accept a ½" diameter air terminal with UNC 13 threads per inch. Provide a base that allows for a minimum ¼" mounting hole to secure the base to the vertical side of a wood pole. Ensure the air terminal base includes (2) 5/16" cap screws to secure the bare copper lightning conductor. Additionally, provide (2) ½" copper tube straps (conduit clamps) to secure the air terminal and bare copper lightning conductor to the pole.

C. Copper Lightning Conductor and Ground Rods

Furnish a Class II rated copper lightning conductor which consists of 28 strands (minimum) of 15 AWG copper wires to form a rope-lay bare copper lightning conductor. Furnish 5/8" diameter, 10-foot-long copper-clad steel ground rods with a 10-mil thick copper cladding to serve as an integral part of the 4-point grounding system. Furnish irreversible mechanical clamps to secure the 28-strand lightning conductor, #4 AWG bare copper ground wires and grounding electrodes together to complete the grounding system.

22.3. CONSTRUCTION METHODS

A. Wood Pole

Install the vertical air terminal base approximately 12" below the top of the wood pole and install the air terminal to the threaded connection on the base. Install a ½" copper tube strap (conduit clamp) over the air terminal, 6" from the top of the pole. Additionally, secure the copper lightning conductor under both 5/16" diameter cap screws located on the base. Install an additional ½" copper tube strap (conduit clamp) over the bare copper lightning conductor, 6" below the air terminal base. Locate the ¼" mounting hole on the vertical air terminal base and install a ¼" by 3" (minimum) long lag bolt through the base and into the wood pole to support the air terminal assembly.

Route the bare copper lightning conductor to maintain maximum horizontal separation from any risers that traverse up the pole. Secure the bare copper lightning conductor to the pole on 24" centers using copper cable clips. From the bottom of the pole (ground level) install a 2" by 10' long PVC U-Guard over the bare copper lightning conductor to protect the cable from vandalism.

B. Copper Lightning Conductor and Ground Rods

Install the 4-point grounding system by installing a central grounding electrode that is surrounded by a minimum of three (3) additional grounding electrodes spaced approximately 20 feet away from the central grounding electrode and approximately 120 degrees apart. Interconnect each grounding electrode using a #4 AWG bare copper conductor back to the central grounding electrode using irreversible mechanical crimps. Additionally, using an irreversible mechanical crimp, connect the bare copper lightning conductor to the central grounding electrode. Install each grounding electrode and its corresponding #4 AWG bare copper grounding wire and 28 strand copper lightning conductor such that the wires are 24" below grade. Install marker tape 12" below grade and above all grounding conductors.

In instances where right-of-way does not allow for ground rod spacing as required above, reference the 2018 Roadway Standard Drawings - Section 1700.02 "Electrical Service Grounding" for "Limited Shoulder" or "Restricted Space" installation alternatives.

Prior to connecting the lightning protection system to an electrical service, perform a grounding electrode test on the lightning protection system to obtain a maximum of 20 ohms or less. Install additional grounding electrodes as need to obtain the 20 ohms or less requirement. The grounding electrode resistance test shall be verified or witnessed by the Engineer or the Engineer's designated representative.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than one ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method. Submit a completed inductive Loop & Grounding Test Form available on the Department's website.

22.4. MEASUREMENT AND PAYMENT

No measurement will be made for furnishing and installing the "Air Terminal and Lightning Protection System" as this will be considered incidental to "CCTV Metal Pole" & "CCTV Wood Pole" installations.

23. DYNAMIC MESSAGE SIGN (DMS)

23.1. 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 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 existing DMS database at the Division 3 Traffic Operations Center using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new back-to-back pedestal type DMSs at the locations shown in the Project Plans.

Furnish operating DMS systems consisting of, but not limited to, the following:

- **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.

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/

Communications between the DMSs and the Division office will be accomplished over cellular modems. The Department will furnish and install the cellular modem in the cabinet at the locations shown in the Project Plans.

23.2. 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 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.

E. 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.

F. 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.

G. 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 -40ºF to +176ºF. 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 +140ºF, when the outdoor ambient temperature is +115ºF 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 140ºF. The DMS provide an output to the controller to notify the Vanguard client when the DMS shuts down due to high temperature.

H. 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.

I. 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 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.

Furnish two (2) spare display modules per each DMS installed for emergency restoration.

J. 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 that have a single part number. 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.

K. 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.

L. 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 two 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

M. DMS Mini Controller

For Front Access DMS Types, 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.

N. 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.

O. 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.

P. 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.

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 and 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, and 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.

Q. 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.

R. 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.

S. 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.

T. 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.

U. 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.

V. 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.

W. Maintenance Procedures

Specify the recommended preventative maintenance procedures and checks at pre-operation, monthly, quarterly, semi-annual, 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.

X. 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 disassemblies, overhaul, and re-assemblies, 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.

Y. 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.

23.3. CONSTRUCTION METHODS

A. Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of Dynamic Message Sign 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 Division Traffic Engineer will establish the actual location of each Dynamic Message Sign assemblies. 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 *Standard Specification* 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 assemblies 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.

23.4. 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.

23.5. 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.

23.6. 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.

23.7. 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:

Pay Item	Pay Unit
Dynamic Message Sign (Type 1C)	Each

24. NTCIP REQUIREMENTS

This section defines the NTCIP requirements for the DMSs covered by these Project Special Provisions and Project Plans.

24.1. 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 color 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
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.

24.2. 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 (Type 1C)" and will be full compensation for all work listed above.

25. DMS PEDESTAL STRUCTURE

25.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structure and attachment of the DMS enclosures to the structures 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, back-to-back DMS assemblies as shown in the Project Plans.

Provide the back-to-back pedestal type DMS structure at the DMS-1/DMS-2 and DMS-3/DMS-4 with a minimum of 20 feet of clearance from the high point of the road to the bottom of the Front access DMS enclosure.

Design the new DMS assemblies (including footings) and DMS mounting assemblies 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.

Design the new DMS assemblies (including footings) and submit shop drawings for approval. A Professional Engineer that is required in the state of North Carolina will prepare such computations and drawings. These must bear their 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 provide DMS S-dimension elevation drawings for the DMS locations to the Engineer for approval.

25.2. MATERIAL

Use materials that meet the following requirements of the *Standard Specifications*:

- Section 906 of the *Standard Specifications*.
- Standard Provision SP09R005 *Foundations and Anchor Rod Assemblies for Metal Poles*.
- Standard Provision SP09R007 *Overhead and Dynamic Message Sign Foundations*.

25.3. 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*.

25.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure (type) will be measured and paid as the actual number of each type of dynamic message sign pedestal structure assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete dynamic message sign assemblies, supporting structure, hardware, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

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 *Standard Specifications.*

Payment will be made under:

Pay Item	**Pay Unit**
DMS Structure (Back-to-Back Pedestal)	Each

26. OBSERVATION PERIOD

26.1. 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.)

26.2. FINAL ACCPETANCE

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.

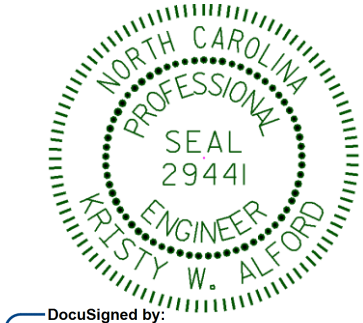
The completed System will be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including as-built plans.

26.3. MEASURMENT 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.

Project Special Provisions
Structures

The following special provisions apply only to bridges 090259 and 090024 and all culverts on the project.



8/25/2021

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"

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
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.

7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structures Management Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	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.

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-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.

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.

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.

GROUT FOR STRUCTURES (12-1-17)

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.

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.

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.

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)

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

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.

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

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

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

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.

THERMAL SPRAYED COATINGS (METALLIZATION) (12-1-2017)

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.

QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the requirements outlined in the Thermal Sprayed Coatings (Metallization) Program.

MATERIALS

Use only materials meeting the requirements of Section 7 of the Thermal Sprayed Coatings (Metallization) Program.

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.

INSPECTION AND TESTING

The TSC Contractor must conduct inspections and tests listed in the Thermal Sprayed Coatings (Metallization) Program.

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.

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.

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.

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.

OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT AT STATION 64+15.00 -L-, 83+76.00 -L-, 226+01.00 -L-, & 316+72.00 -L- (12-12-13)

GENERAL

This Special Provision covers the design, fabrication and construction of precast reinforced concrete box culverts intended for the conveyance of storm water.

If the option is indicated on the plans, the submittal for a precast reinforced box culvert in lieu of a cast-in-place culvert is permitted. Design the precast culvert sections in accordance with ASTM C1577 or the current edition of the AASHTO LRFD Bridge Design Specifications. Rate all sizes of precast reinforced concrete box culverts in accordance with the current edition of the AASHTO Manual for Bridge Evaluation. Ensure the culvert rates for the AASHTO design loads and North Carolina's legal loads (see Section 2.0 for North Carolina's legal loads). Provide the size and number of barrels as indicated on the plans. Detail the culvert with cast-in-place wings walls and footings. Precast wing walls and footings will not be allowed. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

The design and rating of the precast and cast-in-place members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans and rating sheets for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box and cast-in-place members. Have a North Carolina Registered Professional Engineer check and seal the plans, rating sheets and design calculations. After the plans, rating sheets and design calculations are reviewed and, if necessary, the corrections made, submit one set of plans and rating sheets on 22" x 34" sheets to become part of the contract plans.

If the span, rise and design earth cover for the precast reinforced concrete box culvert are identical to a previously approved submittal, the Contractor may request the previously approved design calculations and plans be considered as the submittal for review and approval. However, a set of plans and rating sheets will need to be submitted to become part of the contract plans.

PROJECT SPECIAL PROVISIONS
STRUCTURE

Bridge Nos. 093, 260, 263, 264

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HNTB NORTH CAROLINA, PC

343 E. Six Forks Road
Suite 200
Raleigh, NC 27609

NORTH CAROLINA PROFESSIONAL SEAL 12916 ENGINEER PAUL J. BARBER

DocuSigned by:
Paul J. Barber
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9/17/2021

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURE AT STATION POC 31+30.81 -YREV- AND 39+52.37 -Y14A- **(8-13-04)**

1.0 GENERAL

Maintain traffic on NC 211 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance of 15'-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.

CONSTRUCTION, MAINTENANCE AND REMOVAL OF TEMPORARY ACCESS AT STATION 390+15.00 -L- **(12-12-13)**

5.0 GENERAL

Construct, maintain, and remove the temporary access required to provide the working area necessary for construction of the new bridge, construction of the temporary detour structure, or for the removal of an existing bridge, as applicable. Temporary access may involve the use of a work bridge or other methods; however, all types of temporary access are required to meet the requirements of all permits, the Standard Specifications, and this Special Provision.

6.0 TEMPORARY WORK BRIDGE

At the contractor's option, construction of a temporary work bridge within the limits shown on the plans is permitted. The temporary work bridge shall have a minimum span length of 20 feet. Submit details of the temporary work bridge to the Engineer prior to constructing the work bridge to ensure conformance with the plans and all permits. Completely remove the temporary bridge prior to final acceptance or as otherwise required by the permits.

7.0 BASIS OF PAYMENT

The lump sum price bid for "Construction, Maintenance and Removal of Temporary Access at Station 390+15.00 -L-" will be full compensation for the above work, or other methods of access, including all material, work bridge components, equipment, tools, labor, disposal, and incidentals necessary to complete the work.

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

8.0 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.

9.0 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.

10.0 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.

11.0 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 POC 390+15.00 -L-".

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 POC 390+15.00-L- Lump Sum

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.

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.

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-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.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

   Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

   The following requirements replace those of Article 3.4.8.2.

   Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

   Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

8.0 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.

9.0 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

10.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit.

The first table below covers "Structure Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers "Geotechnical Submittals". The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structures Management Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam Joint Seals"

Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
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

Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structures Management Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	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.

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.

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:

www.epi.state.nc.us/epi/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.

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

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.

P-2

Electronically Transmitted
Reverification
U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2007-03647-010** County: **Brunswick County** U.S.G.S. Quad: **Lockwoods Folly**

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Permittee: **Mr. Mason Herndon**
NCDOT, Project Development Environmental Engineer
Address: **5501 Barbados Blvd.**
Castle Hayne, NC 28429

Size (miles) **7.263**
Nearest Waterway **River Swamp**
USGS HUC **03040208**

Nearest Town **Southport**
River Basin **Lower Pee Dee**
Coordinates Latitude: **33.9578374387385**
Longitude: **-78.0724545271761**

Location description: **The project (R-5021) is located between Midway/Middleton Ave. and Southport near the intersection of Highway 87 along Highway 211, Brunswick County.**

Description of projects area and activity: **The project (Hwy 211) involves widening the existing roadway from 2 lanes to 4 with a raised median, and adding grade separated interchanges at NC 906 (Midway/Middleton Rd.) and NC 133 (Long Beach Rd.). The project also includes replacing the bridge at Dutchman Creek as well as culverts along the project. Standard road building equipment, such as trucks, cranes, and bulldozers will be used. The 7.263 mile long project involves the permanent fill of 15.995 acres of wetlands, 0.747 acre of excavation in wetlands, 1.685 acres of mechanized land clearing, 1.905 aces of permanent surface water impacts, 0.204 acres of temporary surface water impacts, 1,149 linear feet of permanent stream impacts, and 195 linear feet of temporary stream impact.**

This verification addresses changes in the intersection at the western end of the project reflected in new permit drawing sheets 1, 5, 6, 8, 9, 82, 83, 94, and 95 of 95 dated 10/5/2021, attached.

Applicable Law: ☒ Section 404 (Clean Water Act, 33 USC 1344)
☐ Section 10 (Rivers and Harbors Act, 33 USC 403)

Authorization: Regional General Permit Number : **1982000031**
SEE ATTACHED RGP or NWP GENERAL, REGIONAL AND/OR SPECIAL CONDITIONS

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached conditions and your submitted application and referenced permit plans 1-95 of 95 dated 5/8/2018, 5/15/2018, 8/17/2018, 8/22/2018, 2/19/2021, and 10/5/2021, and Utility plans of record sheets 1-22 of 22 dated 6/27/2018 and 8/20/2018. ** As indicated above there have been changes to 9 sheets dated 10/5/2021 described above and attached. Any violation of the attached conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order, a Class I administrative penalty, and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide and/or regional general permit authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide and/or regional general permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide and/or regional general permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide and/or regional general permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide and/or regional general permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

SAW-2007-03647-010

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Resources (telephone 919-807-6300) to determine Section 401 requirements.

For activities occurring within the twenty coastal counties subject to regulation under the Coastal Area Management Act (CAMA), prior to beginning work you must contact the N.C. Division of Coastal Management in Morehead City, NC, at (252) 808-2808.

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits.

If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact **Brad Shaver at (910) 251-4611 or Brad.E.Shaver@usace.army.mil**.

Remarks: This reverification of Regional General Permit 31 replaces the expired verification first issued on October 2, 2018 and RGP 31 verification dated March 22, 2021. There is a reduction in permanent wetland impacts which is reflected on the new mitigation transfer form attached to this decision.

Corps Regulatory Official: Brad E Shaver Digitally signed by Brad Shaver Date: 2021.10.13 15:17:21 -04'00'

Date: **October 13, 2021**

Expiration Date of Verification: **May 25, 2025**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Copy furnished (electronic):

Mr. Chris Rivenbark, NCDOT, Division 3
Ms. Hannah Sprinkle, NCDEQ-DWR
Ms. Beth Harmon, DMS
Mr. Todd Tugwell, USACE

SAW-2007-03647-010

SPECIAL CONDITIONS
R-5021, Highway 211 Widening

1. **Work Limits:** All work authorized by this permit shall be performed in strict compliance with referenced permit plans 1-95 of 95 dated 5/8/2018, 5/15/2018, 8/17/2018, 8/22/2018, 2/19/2021, and 10/5/2021, which are a part of this permit. The Utility plans of record are sheets 1-22 of 22 dated 6/27/2018 and 8/20/2018. 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 US Army Corps of Engineers 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, drawings and attachments shall be available at the project site during the construction and maintenance of this project.

4. **Pre-Construction Meeting:** The Permittee shall schedule and attend a preconstruction meeting between its representatives, the contractors representatives, and the U.S. Army Corps of Engineers, Wilmington Field Office, NCDOT Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all the terms and conditions contained with this Department of Army Permit. The Permittee shall provide the Corps, Wilmington Field Office, NCDOT Project Manager, with a copy of the final permit plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. If the permit plans provided in the application have not changed a certification from the Division should be received stating that the final construction plans don't vary from the permit plans. The Permittee shall schedule the preconstruction meeting for a time frame when the Corps, NCDCM, and NCDWQ Project Managers can attend. The Permittee shall

invite the Corps, NCDCM, and NCDWR Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedule and participate in the required meeting. 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, 69 Darlington Ave, North Carolina, 28403, and by telephone at: 910-251-4611. The Permittee shall reference the following permit number, SAW-2007-03647, 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. **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.

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. **Culverts:**

A. 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. Measures to avoid destabilizing the channel, including head cutting upstream, shall be considered in the placement of the culvert.

B. 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.

C. 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.

D. Culverts placed within wetlands must be installed in a manner that does not restrict the flow and circulation patterns of waters of the United States. Culverts placed across wetland fills purely for the purposes of equalizing surface water shall not be buried, but the culverts must be of adequate size and/or number to ensure unrestricted transmission of water.

11. **Sediment Erosion Control:**

A. 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.

B. 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.

C. 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.

D. The Permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to 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. **Temporary Excavation/Fills:** 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. Temporary excavation (typically organics) associated with culvert installation should be side cast and replaced once the pipes are installed to return the stream channel and flood plain to original dimensions.

13. **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 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 this Special Condition. 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 this Special Condition. 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.

∗ 14. **Compensatory Mitigation:**

A. In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

B. ** There has been a reduction in wetland mitigation need since the last reverification in March 2021. In total, 18.387 acres of wetland loss shall be mitigated through North Carolina Division of Mitigation Services (DMS) at a 2:1 ratio for a total credit need of 36.774 acres. Take impacts associated with Site # 15 shall be mitigated via DMS at a 1:1 ratio for a need of 0.04 of an acre. **Stream mitigation has been previously satisfied in 2018

15. **Aquatic Life Movements:** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area. All discharges of dredged or fill material within waters of the United States shall be designed and constructed to maintain low flows to sustain the movement of aquatic species.

Brad E Shaver

Digitally signed by Brad Shaver
Date: 2021.10.13 15:18:02 -04'00'

P-9

Action ID Number: SAW-2007-03647-010 **County:** Brunswick County

Permittee: North Carolina Department of Transportation

Project Name: NCDOT/R-5021/NC 211/Division 3

Date Verification Issued: October 13, 2021

Project Manager: Brad Shaver

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
Attn: Brad Shaver
69 Darlington Ave
Wilmington, NC 28403

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers representative. Failure to comply with any terms or conditions of this authorization may result in the Corps suspending, modifying or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and condition of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee **Date**

P-10

DEPARTMENT OF THE ARMY
Wilmington District, Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

Regional General Permit No. SAW-198200031 (RGP 31)
Name of Permittee: North Carolina Department of Transportation
Effective Date: May 26, 2020
Expiration Date: May 25, 2025

DEPARTMENT OF THE ARMY
REGIONAL GENERAL PERMIT

A regional general permit (RGP) to perform work in or affecting navigable waters of the United States and waters of the United States, upon recommendation of the Chief of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of March 3, 1899 (33 U.S.C. 403), and Section 404 of the Clean Water Act (33 U.S.C. 1344), is hereby modified and re-issued by authority of the Secretary of the Army by the

District Commander
U.S. Army Engineer District, Wilmington
Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403-1343

TO AUTHORIZE THE DISCHARGE OF DREDGED OR FILL MATERIAL IN WATERS OF THE UNITED STATES (U.S.), INCLUDING WETLANDS, ASSOCIATED WITH BEST-FIT WIDENING PROJECTS, OR PHASES OF "PHASED" BEST-FIT WIDENING PROJECTS, THAT (1) HAVE UNDERGONE INTERAGENCY REVIEW AND COMPLETED THE INTERAGENCY MERGER PROCESS, AND (2) WOULD CAUSE ONLY MINIMAL INDIVIDUAL AND CUMULATIVE ADVERSE ENVIRONMENTAL EFFECTS. THESE PROJECTS ARE CONDUCTED BY THE VARIOUS DIVISIONS OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION (NCDOT), INCLUDING THE NCDOT DIVISION OF HIGHWAYS, RAIL, BICYCLE/PEDESTRIAN, ETC.

Detailed Description/Terms

The Merger Process merges the requirements of the National Environmental Policy Act (NEPA) with those of Section 404 of the Clean Water Act (CWA).

A best-fit widening project, or a phase of a "phased" best-fit widening project, must complete the interagency Merger Process in order to qualify for authorization under RGP 31.

Projects that require an Environmental Impact Statement (EIS) cannot be authorized by RGP 31.

Best-fit widening projects, or phases of "phased" best-fit widening projects, may include a small amount of new location roadway for components such as interchanges, intersections, road segments, etc., provided that (1) the Merger Team concurs on the new location portion, and (2) the Corps determines that the amount of new location roadway is acceptable for authorization under RGP 31. Note that "new location roadway" is not limited to the examples provided above.

If the Merger Process for a specific best-fit widening project, or a phase of a "phased" best-fit widening project, is modified to exclude Concurrence Points (CPs), or changed in any way that prevents the interagency Merger Team from concurring, non-concurring, or abstaining (for those agencies that are allowed to abstain under the Merger Memorandum of Understanding) on all CPs, RGP 31 cannot be used to authorize the best-fit widening project or phase. Note that combining CPs is acceptable in some circumstances and will not prevent a best-fit widening project or phase from being authorized under RGP 31.

The Corps will determine if RGP 31 can be used to authorize a particular best-fit widening project, as follows:

- **Best-fit widening projects that are <u>not</u> phased** - this decision will not be made by the Corps until (1) the best-fit widening project completes the full Merger Process (i.e., all CPs have been completed) for road widening projects; (2) the prospective permittee completes final design for the project; (3) the prospective permittee submits a pre-construction notification (PCN) for the project to the Corps, and; (4) the Corps completes the evaluation of the PCN. If the Corps determines that the project qualifies for use of RGP 31, and once all other requirements are satisfied, the Corps will issue a verification letter for the use of RGP 31 for impacts to waters of the U.S. for the best-fit widening project.

- **Best-fit widening projects that are phased** - this decision will not be made by the Corps until (1) the entire best-fit widening project completes the Merger Process, up to and including completion of CP 4A (Avoidance/Minimization); (2) the initial phase to be constructed (Phase 1) completes CPs 4B and 4C; (3) the prospective permittee completes final design for Phase 1; (4) the prospective permittee submits a PCN for the entire project to the Corps, and; (5) the Corps completes the evaluation of the PCN. If the Corps determines that the project qualifies for use of RGP 31, and once all other requirements are satisfied, the Corps will issue a verification letter for the use of RGP 31 for impacts to waters of the U.S. for the project, but the verification letter will authorize construction of Phase 1 <u>only</u>.

  Authorization of impacts for Phase 2 - with the exception of (1) noted above, Phase 2 will be processed as Phase 1 was, i.e., Phase 2 completes CPs 4B and 4C, the prospective permittee completes final design for Phase 2, the prospective permittee submits a PCN to the Corps for evaluation, and the Corps completes the re-evaluation of the PCN. If the

Corps determines that the project still qualifies for use of RGP 31, and once all other requirements are satisfied, the Corps will issue a re-verification letter for the use of RGP 31 authorizing Phase 2 construction. If there are additional phases of a project, the same process will apply.

Phased Projects - if, after the entire project completes CP 4A, project impacts to waters of the U.S. for a particular phase increase or change to such a degree that the Corps determines that the proposed impacts of that phase would cause more than minimal individual and cumulative adverse environmental effects, RGP 31 will no longer be available for use and an Individual Permit will be required for the remainder of the project. This will apply even if impacts to waters of the U.S. for previous phases of that specific project were authorized by RGP 31.

If the Programmatic Merger Process changes while a best-fit widening project, or phase of a "phased" best-fit widening project, is in the Merger Process (e.g., if the Merger Process is updated or revised on a programmatic scale), the Merger Process for widening projects that was in place when the project review by the interagency Merger Team began (i.e., at CP 1), will remain in effect, unless the Merger Team concurs that the new programmatic process may be used. If the Merger Teams concurs that the new programmatic process may be used for a phase of a "phased" best-fit widening project, that process will be used for the remainder of the project/all phases.

While there is no impact limit under RGP 31, the Corps will require an Individual Permit if the proposed impacts (permanent and/or temporary) of a best-fit widening project, or phases of a "phased" best-fit widening project, would have more than minimal individual and cumulative adverse environmental effects. Additionally, if the Corps determines, on a case-by-case basis, that the concerns for the aquatic environment so indicate, he/she may exercise discretionary authority to override this RGP and require an Individual Permit.

1. Special Conditions.

a. The prospective permittee must submit a pre-construction notification (PCN) and applicable supporting information to the District Engineer and receive written verification from the Corps that the proposed work complies with this RGP prior to commencing any activity authorized by this RGP.

b. If the project will not impact a designated "Area of Environmental Concern" (AEC) in the twenty* (20) counties of North Carolina covered by the North Carolina Coastal Area Management Act (CAMA) ("CAMA counties"), a consistency submission is not required. If the project will impact a designated AEC and meets the definition of "development", the prospective permittee must obtain the required CAMA permit. Development activities shall not commence until a copy of the approved CAMA permit is furnished to the appropriate Corps Regulatory Field Office (Wilmington Field Office – 69 Darlington Avenue, Wilmington, NC 28403 or Washington Field Office – 2407 West 5th Street, Washington, NC 27889).

***The 20 CAMA counties in North Carolina include Beaufort, Bertie, Brunswick, Camden,**

Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington.

c. No work shall be authorized by this RGP within the 20* CAMA counties without prior consultation with the National Oceanic and Atmospheric Administration's (NOAA) Habitat Conservation Division. For each activity reviewed by the Corps where it is determined that the activity may affect Essential Fish Habitat (EFH) for federally managed species, an EFH Assessment shall be prepared by the prospective permittee and forwarded to the Corps and NOAA Fisheries for review and comment prior to authorization of work.

d. Culverts and pipes. The following conditions [(1)-(8)] apply to the construction of culverts/pipes, and work on existing culverts/pipes.

Additionally, if the proposed work would affect an existing culvert/pipe (e.g., culvert/pipe extensions), the prospective permittee must include actions (in the PCN) to correct any existing deficiencies that are located:

- At the inlet and/or outlet of the existing culvert/pipe, IF these deficiencies are/were caused by the existing culvert/pipe, or

- Near the inlet or outlet of the existing culvert/pipe, IF these deficiencies are/were caused by the existing culvert/pipe.

These deficiencies may include, but are not limited to, stream over-widening, bank erosion, streambed scour, perched culvert/pipes, and inadequate water depth in culvert(s). Also note if the proposed work would address the existing deficiency or eliminate it – e.g., bank erosion on left bank, but the culvert extension will be placed in this eroded area. If the prospective permittee is unable to correct the deficiencies caused by the existing culvert/pipe, they must document the reasons in the PCN for Corps consideration.

(1) No activity may result in substantial, permanent disruption of the movement of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area. Measures will be included that will promote the safe passage of fish and other aquatic organisms.

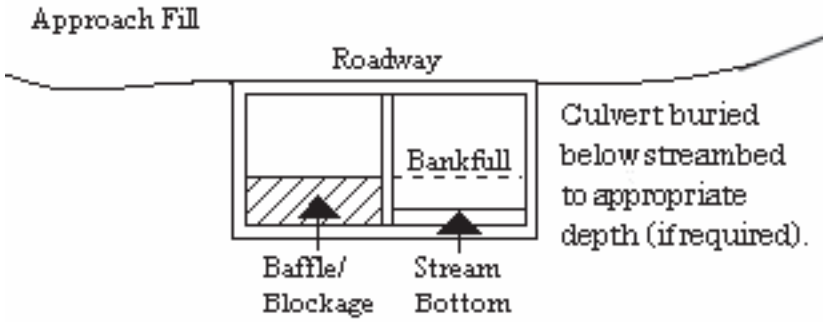
(2) The dimension, pattern, and profile of the stream above and below a culvert/pipe shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. It is acceptable to use rock vanes at culvert/pipe outlets to ensure, enhance, or maintain aquatic passage. Pre-formed scour holes are acceptable when designed for velocity reduction. 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 will be determined from gauge data, if available. In the absence of such data, bankfull flow will be used as a comparable level.

(3) Burial/depth specifications: If the project is located within any of the 20* CAMA counties, culvert/pipe inverts will be buried at least one foot below normal bed elevation when they are placed within the Public Trust AEC and/or the Estuarine Waters AEC as designated by CAMA. If the project is located outside of the 20* CAMA counties, culvert/pipe inverts will be buried at least one foot below the bed of the stream for culverts/pipes that are greater than 48 inches in diameter. Culverts/pipes that are 48 inches in diameter or less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, to include passage during drought or low flow conditions. Every effort shall be made to maintain the existing channel slope. A waiver from the burial/depth specifications in this condition may be requested in writing. The prospective permittee is encouraged to request agency input about waiver requests as early as possible, and prior to submitting the PCN for a specific project; this will allow the agencies time to conduct a site visit, if necessary, and will prevent time delays and potential project revisions for the prospective permittee. The waiver will only be issued by the Corps if it can be demonstrated that the impacts of complying with burial requirements would result in more adverse impacts to the aquatic environment.

(4) Appropriate actions to prevent destabilization of the channel and head cutting upstream shall be incorporated in the design and placement of culverts/pipes.

(5) Culverts/pipes placed within riparian and/or riverine wetlands must be installed in a manner that does not restrict the flow and circulation patterns of waters of the U.S. Culverts/pipes placed across wetland fills purely for the purposes of equalizing surface water do not have to be buried, but must be of adequate size and/or number to ensure unrestricted transmission of water.

(6) Bankfull flows (or less) shall be accommodated through maintenance of the existing bankfull channel cross sectional area in no more than one culvert/pipe or culvert/pipe barrel. Additional culverts/pipes or barrels at such crossings shall be allowed only to receive flows exceeding the bankfull flow. A waiver from this condition may be requested in writing; this request must be specific as to the reason(s) for the request. The waiver will be issued if it can be demonstrated that it is not practicable to comply with this condition.



(7) Where adjacent floodplain is available, flows exceeding bankfull will be accommodated by installing culverts/pipes at the floodplain elevation. When multiple culverts/pipes are used, baseflow must be maintained at the appropriate width and depth by the construction of floodplain benches, sills, and/or construction methods to ensure that the overflow culvert(s)/pipe(s) is elevated above the baseflow culvert(s)/pipe(s).

(8) The width of the baseflow culvert/pipe shall be comparable to the width of the bankfull width of the stream channel. If the width of the baseflow culvert/pipe is wider than the stream channel, the culvert/pipe shall include baffles, benches and/or sills to maintain the width of the stream channel. A waiver from this condition may be requested in writing; this request must be specific as to the reason(s) for the request. The waiver will be issued if it can be demonstrated that it is not practicable or necessary to include baffles, benches or sills.

See the remaining special conditions for additional information about culverts/pipes in specific areas.

e. Discharges into waters of the U.S. designated by either the North Carolina Division of Marine Fisheries (NCDMF) or the North Carolina Wildlife Resources Commission (NCWRC) as anadromous fish spawning areas are prohibited during the period between February 15th and June 30th, without prior written approval from the Corps and the appropriate wildlife agencies (NCDMF, NCWRC, and/or the National Marine Fisheries Service (NMFS)). Discharges into waters of the U.S. designated by NCWRC as primary nursery areas in inland waters are prohibited during the period between February 15th and September 30th, without prior written approval from the Corps and the appropriate wildlife agencies. Discharges into waters of the U.S. designated by NCDMF as primary nursery areas shall be coordinated with NCDMF prior to being authorized by this RGP. Coordination with NCDMF may result in a required construction moratorium during periods of significant biological productivity or critical life stages.

The prospective permittee should contact:

NC Division of Marine Fisheries
3441 Arendell Street
Morehead City, NC 28557
Telephone 252-726-7021
or 800-682-2632

North Carolina Wildlife Resources Commission
Habitat Conservation Division
1721 Mail Service Center
Raleigh, NC 27699-1721
Telephone (919) 707-0220

f. This permit does not authorize the use of culverts in areas designated as anadromous fish spawning areas by the NCDMF or the NCWRC.

g. No in-water work shall be conducted in waters of the U.S. designated as Atlantic sturgeon critical habitat during the periods between February 1st and June 30th. No in-water work shall be conducted in waters of the U.S. in the Roanoke River designated as Atlantic sturgeon critical habitat during the periods between February 1st and June 30th, and between August 1st to October 31st, without prior written approval from NMFS.

h. Before discharging dredged or fill material into waters of the U.S. in designated trout watersheds in North Carolina, the PCN will be sent to the NCWRC and the Corps concurrently. See https://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/Trout.aspx for the designated trout watersheds. The PCN shall summarize alternatives to conducting work in waters of the U.S. in trout watersheds that were considered during the planning process and detail why alternatives were or were not selected. For proposals where (1) a bridge in a trout stream will be replaced with a culvert, or (2) a culvert will be placed in a trout stream, the PCN must also include a compensatory mitigation plan for all loss of stream bed, and details of any on-site evaluations that were conducted to determine that installation of a culvert will not adversely affect passage of fish or other aquatic biota at the project site. The evaluation information must include factors such as the proposed slope of the culvert and determinations of how the slope will be expected to allow or impede passage, the necessity of baffles and/or sills to ensure passage, design considerations to ensure that expected baseflow will be maintained for passage and that post-construction velocities will not prevent passage, site conditions that will or will not allow proper burial of the culvert, existing structures (e.g., perched culverts, waterfalls, etc.) and/or stream patterns up and downstream of the culvert site that could affect passage and bank stability, and any other considerations regarding passage. The level of detail for this information shall be based on site conditions (i.e., culverts on a slope over 3% will most likely require more information than culverts on a slope that is less than 1%, etc.). Also, in order to evaluate potential impacts, the prospective permittee will describe bedforms that will be impacted by the proposed culvert – e.g., pools, glides, riffles, etc. The NCWRC will respond to both the prospective permittee and the Corps.

i. For all activities authorized by this RGP that involve the use of riprap material for bank stabilization, the following measures shall be applied:

(1) Where bank stabilization is conducted as part of an activity, natural design, bioengineering, and/or geoengineering methods that incorporate natural durable materials, native seed mixes, and native plants and shrubs are to be utilized, as appropriate to site conditions, to the maximum extent practicable.

(2) Filter cloth must be placed underneath the riprap as an additional requirement of its use in North Carolina waters; however, the prospective permittee may request a waiver from this requirement. The waiver request must be in writing. The Corps will only issue a waiver if the prospective permittee demonstrates that the impacts of complying with this requirement would result in greater adverse impacts to the aquatic environment. Note that filter fabric is not required if the riprap will be pushed or "keyed" into the bank of the waterbody.

(3) The placement of riprap shall be limited to the areas depicted on submitted work plan drawings.

(4) Riprap shall not be placed in a manner that prevents or impedes fish passage.

(5) Riprap shall be clean and free from loose dirt or any pollutant except in trace quantities that will not have an adverse environmental effect.

(6) Riprap shall be of a size sufficient to prevent its movement from the authorized alignment by natural forces under normal conditions.

(7) Riprap material shall consist of clean rock or masonry material such as, but not limited to, granite, marl, or broken concrete.

j. Discharges of dredged or fill material into waters of the U.S., including wetlands, must be minimized or avoided to the maximum extent practicable.

k. Generally, off-site detours are preferred to avoid and minimize impacts to the human and natural environment; however, if an off-site detour is considered impracticable, then an on-site detour may be considered as a necessary component of the actions authorized by this RGP. Impacts from the detour may be considered temporary and may not require compensatory mitigation if the impacted area is restored to pre-construction elevations and contours after construction is complete. The permittee shall also restore natural hydrology and stream corridors (if applicable) and reestablish native vegetation/riparian corridors. If the construction of a detour (on-site or off-site) includes standard undercutting methods, removal of all material and backfilling with suitable material is required. See special condition “s” for additional information.

l. All activities authorized by this RGP shall, to the maximum extent practicable, be conducted "in the dry", with barriers installed between work areas and aquatic habitat to protect that habitat from sediment, concrete, and other pollutants. Where concrete is utilized, measures will be taken to prevent live or fresh concrete, including bags of uncured concrete, from coming into contact with waters of the U.S. until the concrete has set and cured. All water in the work area that has been in contact with concrete shall only be returned to waters of the U.S. when it no longer poses a threat to aquatic organisms (concrete is set and cured).

m. In cases where new alignment approaches are to be constructed and the existing approach fill in waters of the U.S. is to be abandoned and no longer maintained as a roadway, the abandoned fill shall be removed and the area will be restored to pre-construction elevations and contours. The permittee shall also restore natural hydrology and stream corridors (if applicable), and reestablish native vegetation/riparian corridors, to the extent practicable. This activity may qualify as compensatory mitigation credit for the project and will be assessed on a case-by-case basis in accordance with Special Conditions “q” and “r” in this document. Any proposed on-site wetland restoration area must be void of utility conflicts and/or utility maintenance areas. A restoration plan detailing this activity will be required with the submittal of the PCN.

n. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity

must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

o. The project must be implemented and/or conducted so that all reasonable and practicable measures to ensure that equipment, structures, fill pads, and work associated with the project do not adversely affect upstream and/or downstream reaches. Adverse effects include, but are not limited to, channel instability, scour, flooding, and/or shoreline/streambank erosion. During construction, the permittee shall routinely monitor for these effects, cease all work if/when detected, take initial corrective measures to correct actively eroding areas, and notify the Corps immediately. Permanent corrective measures may require additional authorization from the Corps.

p. All PCNs will describe sedimentation and erosion control structures and measures proposed for placement in waters of the U.S. To the maximum extent practicable, structures and measures will be depicted on maps, surveys or drawings showing location and impacts to jurisdictional wetlands and streams. In addition, appropriate soil and erosion control measures must be established and maintained during construction. All fills, temporary and permanent, must be adequately stabilized at the earliest practicable date to prevent erosion of fill material into adjacent waters or wetlands.

∗ q. Compensatory mitigation will be required for permanent impacts resulting in a loss of waters of the U.S. due to culvert/pipe installation and other similar activities. Mitigation may be required for stream relocation projects (see Special Condition “r” below). When compensatory mitigation is required, the prospective permittee will attach a proposed mitigation plan to the PCN. Compensatory mitigation proposals will be written in accordance with currently approved Wilmington District guidance and Corps mitigation regulations, unless the purchase of mitigation credits from an approved mitigation bank or the North Carolina Division of Mitigation Services (NCDMS) is proposed to address all compensatory mitigation requirements. The Corps Project Manager will make the final determination concerning the appropriate amount and type of mitigation.

r. Stream Relocations (non-tidal only) - for the purposes of permitting, stream relocations are considered a loss of waters of the U.S. Depending on the condition and location of (1) the existing stream, and (2) the relocated channel, stream relocation(s) may provide a functional uplift. The Corps will determine if an uplift is possible based on the information submitted with the PCN. If the anticipated uplift(s) occurs, it may offset, either partially or fully, the loss associated with a stream relocation(s) - (i.e., due to the uplift, either no compensatory mitigation would be required for the stream relocation itself, or compensatory mitigation would be required at a reduced ratio).

Because the amount of potential uplift is dependent upon the condition (or quality) of the channel to be relocated, there is no pre-determined amount of uplift needed to satisfy the requirements for a successful relocation project. After performing the evaluation(s) noted in this

document, the prospective permittee will propose a certain amount of uplift potential and the Corps project manager will make the final determination. Baseline conditions and subsequent monitoring must show that the relocated channel is providing/will provide aquatic function at, or above, the level provided by the baseline (pre-project) condition. If the required uplift is not achieved, the work will not be in compliance with this special condition of RGP 31 and remediation will be required through repair (and continued monitoring), or by the permittee providing compensatory mitigation (e.g., mitigation credit through an approved bank, mitigation credit through NCDMS, etc.).

Compensatory mitigation, in addition to the stream relocation activity, may be required if the Corps determines that (a) no uplift in stream function is achievable, (b) the proposed uplift in stream function is not sufficient, by itself, (c) the risks associated with achieving potential uplifts in stream function are excessive, and/or (d) the time period for achieving the potential uplifts/functional success is too great.

On-site compensatory mitigation is not the same as stream relocation. While stream relocation simply moves a stream to a nearby, geographically similar area, it does not generate mitigation credits. If NCDOT proposes to generate compensatory mitigation on a project site, NCDOT must submit a mitigation plan that complies with 33 CFR 332.4.

* **The prospective permittee is required to submit the following information for any proposed project that involves stream relocation, regardless of the size/length of the stream relocation** (note that 1-5 below only apply to stream relocations and <u>not</u> to compensatory mitigation):

(1) A statement detailing why relocating the stream is unavoidable. In order to ensure that this action is separate from a compensatory mitigation project, the need for the fill must be related to road/interchange/intersection construction or improvement, and the project must meet the requirements set forth in the full description/terms on pages 1-3 of this permit.

(2) An evaluation of effects on the relocated stream and buffer from utilities, or potential for impact from utility placement in the future.

(3) An evaluation of the baseline condition of the stream to be relocated. In order to demonstrate a potential uplift, the prospective permittee must provide the baseline (pre-impact) condition of the stream that is proposed for relocation. The prospective permittee will document the baseline condition of the stream by using the Corps' (Wilmington District's) current functional assessment method - e.g., the North Carolina Stream Assessment Method (NCSAM). The functional assessment must be used to identify specific areas where an uplift would reasonably be expected to occur, and also show important baseline functions that will remain after the relocation.

(4) An evaluation of the potential uplifts to stream function for the relocated channel. The amount of detail required in the plan will be commensurate with the functional capacity of the original stream and proposed uplift(s). Low functional capacity will warrant less monitoring and less detail in the plan in order to ensure that the relocated channel provides the same, or better/increased, suite of aquatic functions as the existing channel.

(5) A proposed monitoring plan for the relocated channel (and buffer, if applicable), will be prepared in accordance with current District guidance. The level of detail needed in the plan will be directly related to the quality of baseline functions and the anticipated uplift, therefore it is recommended that a pre-application discussion occur with the Corps Project Manager as early as possible. For example, if the risk for achieving the anticipated functional uplift is moderate or low, or if there is a low amount of proposed uplift, less information and monitoring will be required in the proposed relocation plan; similar to the requirements found in the "2003 Stream Mitigation Guidelines". If the risk for uplift is higher, or if there is a high amount of proposed uplift, additional monitoring and information will be required, trending toward the prescriptions found in the most recent Wilmington District Compensatory Mitigation Guidance – e.g., the 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update. All monitoring will be for at least 5 years unless the Corps project manager determines that (a) a specific project requires less than 5 years due to site conditions or limited risk/uplift potential, and/or complexity (or simplicity) of the existing channel and/or the relocation work, or (b) the Corps project manager determines (during the monitoring period) that the 5 years of monitoring may be reduced (or that no further monitoring is required) based on monitoring information received once the stream relocation has been completed.

s. Upon completion of any work authorized by this RGP, all temporary fills (to include culverts, pipes, causeways, etc.) will be completely removed from waters of the U.S. and the areas will be restored to pre-construction elevations and contours. The permittee shall also restore natural hydrology and stream corridors (if applicable), and reestablish native vegetation/riparian corridors. This work will be completed within 60 days of completion of project construction. If this timeframe occurs while a required moratorium of this permit is in effect, the temporary fill shall be removed in its entirety within 60 days of the moratorium end date. If vegetation cannot be planted due to the time of the year, all disturbed areas will be seeded with a native mix appropriate for the impacted area, and vegetation will be planted during the next appropriate time frame. A native seed mix may contain non-invasive small grain annuals (e.g. millet and rye grain) to ensure adequate cover while native vegetation becomes established. The PCN must include a restoration plan showing how all temporary fills and structures will be removed and how the area will be restored to pre-project elevations and contours.

t. Once the authorized work in waters of the U.S. is complete, the permittee shall sign and return the compliance certificate that is attached to the RGP verification letter.

u. The District Engineer will consider any comments from Federal and/or State agencies concerning the proposed activity's compliance with the terms and conditions of this RGP.

v. The Corps may place additional special conditions, limitations, or restrictions on any verification of the use of RGP 31 on a project-by-project basis.

2. General Conditions.

a. Except as authorized by this RGP or any Corps approved modification to this RGP, no excavation, fill or mechanized land-clearing activities shall take place within waters or wetlands, at any time during construction or maintenance of the project. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with the project.

b. Authorization under this RGP does not obviate the need to obtain other federal, state, or local authorizations.

c. All work authorized by this RGP must comply with the terms and conditions of the applicable CWA Section 401 Water Quality Certification for this RGP issued by the North Carolina Division of Water Resources (NCDWR).

d. The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside of the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

e. The activities authorized by this RGP must not interfere with the public’s right to free navigation on all navigable waters of the U.S. No attempt will be made by the permittee to prevent the full and free use by the public of all navigable waters at, or adjacent to, the authorized work for a reason other than safety.

f. The permittee understands and agrees that if future operations by the U.S. require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

g. The permittee, upon receipt of a notice of revocation of this RGP for the verified individual activity, may apply for an individual permit, or will, without expense to the U.S. and in such time and manner as the Secretary of the Army or his/her authorized representative may direct, restore the affected water of the U.S. to its former conditions.

h. This RGP does not authorize any activity that would conflict with a federal project's congressionally authorized purposes, established limitations or restrictions, or limit an agency's ability to conduct necessary operation and maintenance functions. Per Section 14 of the Rivers and Harbors Act of 1899, as amended (33 U.S.C. 408), no project that has the potential to take possession of or make use of for any purpose, or build upon, alter, deface, destroy, move, injure, or obstruct a federally constructed work or project, including, but not limited to, levees, dams, jetties, navigation channels, borrow areas, dredged material disposal sites, flood control projects, etc., shall be permitted unless the project has been reviewed and approved by the appropriate Corps approval authority. Permittees shall not begin the activity authorized by this RGP until notified by the Corps that the activity may proceed.

i. The permittee shall obtain a Consent to Cross Government Easement from the appropriate Corps District's Land Use Coordinator prior to any crossing of a Corps easement and/or prior to commencing construction of any structures, authorized dredging, or other work within the right-of-way of, or in proximity to, a federally designated disposal area.

j. The permittee will allow the Wilmington District Engineer or his/her representative to inspect the authorized activity at any time deemed necessary to ensure that the activity is being performed or maintained in strict accordance with the Special and General Conditions of this permit.

k. This RGP does not grant any property rights or exclusive privileges.

l. This RGP does not authorize any injury to the property or rights of others.

m. This RGP does not authorize the interference with any existing or proposed federal project.

n. In issuing this permit, the Federal Government does not assume any liability for the following:

(1) Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

(2) Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest.

(3) Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

(4) Design or construction deficiencies associated with the permitted work.

(5) Damage claims associated with any future modification, suspension, or revocation of this permit.

o. Authorization provided by this RGP may be modified, suspended or revoked in whole, or in part, if the Wilmington District Engineer, acting for the Secretary of the Army, determines that such action would be in the best public interest. The term of this RGP shall be five (5) years unless subject to modification, suspension, or revocation. Any modification, suspension, or revocation of this authorization will not be the basis for any claim for damages against the U.S. Government.

p. No activity may occur in a component of the National Wild and Scenic Rivers System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or "study river" (e.g., National Park Service, U.S. Forest Service, etc.).

q. Endangered Species.

(1) No activity is authorized under this RGP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under this RGP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(2) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal prospective permittees (and when FHWA is the lead federal agency) must provide the District Engineer with the appropriate documentation to demonstrate compliance with those requirements. The District Engineer will review the documentation and determine whether it is sufficient to address ESA compliance for the RGP activity, or whether additional ESA consultation is necessary.

* (3) Non-federal prospective permittees - for activities that might affect federally-listed endangered or threatened species or designated critical habitat, the PCN must include the name(s) of the endangered or threatened species that might be affected by the proposed work or that utilize the designated critical habitat that might be affected by the proposed work. The District Engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat. In cases where the non-federal prospective permittee has identified listed species or critical habitat that might be affected or is

in the vicinity of the project, and has so notified the Corps, the prospective permittee shall not begin work until the Corps has provided notification that the proposed activities will have “no effect” on listed species or critical habitat, or until Section 7 consultation has been completed.

(4) As a result of formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS) or NMFS, the District Engineer may add species-specific endangered species conditions to the RGP verification letter for a project.

(5) Authorization of an activity by a RGP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the USFWS or the NMFS, the ESA prohibits any person subject to the jurisdiction of the U.S. to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(6) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the USFWS in North Carolina at the addresses provided below, or from the USFWS and NMFS via their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.noaa.gov/fisheries.html respectively.

USFWS offices in North Carolina:

The Asheville USFWS Office covers all NC counties west of, and including, Anson, Stanly, Davidson, Forsyth and Stokes Counties.

US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Telephone: (828) 258-3939

The Raleigh USFWS Office covers all NC counties east of, and including, Richmond, Montgomery, Randolph, Guilford, and Rockingham Counties.

US Fish and Wildlife Service
Raleigh Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Telephone: (919) 856-4520

r. The Wilmington District, USFWS, NCDOT, and the FHWA have conducted programmatic Section 7(a)(2) consultation for a number of federally listed species and habitat, and programmatic consultation concerning other federally listed species and/or habitat may occur in the future. The result of completed programmatic consultation is a Programmatic Biological Opinion (PBO) issued by the USFWS. These PBOs contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" of whichever species or critical habitat is covered by a specific PBO. Authorization under RGP 31 is conditional upon the permittee's compliance with all the mandatory terms and conditions associated with incidental take of the applicable PBO (or PBOs), which are incorporated by reference in RGP 31. Failure to comply with the terms and conditions associated with incidental take of an applicable PBO, where a take of the federally listed species occurs, would constitute an unauthorized take by the permittee, and would also constitute permittee non-compliance with the authorization under RGP 31. If the terms and conditions of a specific PBO (or PBOs) apply to a project, the Corps will include this/these requirements in any RGP 31 verification that may be issued for a project. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its PBO, and with the ESA.

s. Northern long-eared bat (NLEB) (*Myotis septentrionalis*). Standard Local Operating Procedures for Endangered Species (SLOPES) for the NLEB have been approved by the Corps and the U.S. Fish and Wildlife Service. See http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/ESA/ . This SLOPES details how the Corps will make determinations of effect to the NLEB when the Corps is the lead federal agency for an NCDOT project that is located in the western 41 counties of North Carolina. This SLOPES does not address NCDOT projects (either federal or state funded) in the eastern 59 counties of North Carolina. Note that if another federal agency is the lead federal agency for a project in the western 41 counties, procedures for satisfying the requirements of Section 7(a)(2) of the ESA will be dictated by that agency and will not be applicable for consideration under the SLOPES; however, information that demonstrates the lead federal agency's (if other than the Corps) compliance with Section 7(a)(2) / 4(d) Rule for the NLEB, will be required in the PCN. Note that at the time of issuance of RGP 31, the federal listing status of the NLEB as "Threatened" is being litigated at the National level. If, as a result of litigation, the NLEB is federally listed as "Endangered", this general condition ("s") will no longer be applicable because the 4(d) Rule, and this NLEB SLOPES, will no longer apply/be valid.

t. For proposed activities the sixteen (16) counties listed below, prospective permittees must provide a copy of the PCN to the USFWS, 160 Zillicoa Street, Asheville, North Carolina 28801. This PCN must be sent concurrently to the USFWS and the Corps Project Manager for that specific county.

The 16 counties with tributaries that drain to designated critical habitat that require notification to the Asheville USFWS are: Avery, Cherokee, Forsyth, Graham, Haywood, Henderson, Jackson, Macon Mecklenburg, Mitchell, Stokes, Surry, Swain, Transylvania, Union and Yancey.

u. If the permittee discovers or observes any live, damaged, injured or dead individual of an endangered or threatened species during construction, the permittee shall immediately notify the Wilmington District Engineer so that required coordination can be initiated with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service.

v. Historic Properties.

(1) In cases where the District Engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places (NRHP), the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(2) Federal prospective permittees (or when FHWA is the lead federal agency) should follow their own procedures for complying with the requirements of Section 106 of the NHPA. Federal prospective permittees must provide the District Engineer with the appropriate documentation to demonstrate compliance with those requirements; this includes copies of correspondence sent to all interested, federally recognized tribes and a summary statement about tribal consultation efforts or, if the Corps enters into a Programmatic Agreement (PA) with the FHWA/NCDOT, documentation that the FHWA/NCDOT has complied with PA requirements. The District Engineer will review the documentation and determine whether it is sufficient to address Section 106 compliance for this RGP activity, or whether additional Section 106 consultation is necessary.

* (3) Non-federal prospective permittees - the PCN must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO), as appropriate, and the NRHP (see 33 CFR 330.4(g)). When reviewing PCNs, the District Engineer will comply with the current procedures for addressing the requirements of Section 106 of the NHPA. The District Engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the District Engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties.

(4) Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)).

(5) Section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to a prospective permittee who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a

historic property to which the permit will relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the prospective permittee. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the prospective permittee, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

w. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this general 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.

x. Permittees are advised that development activities in or near a floodway may be subject to the National Flood Insurance Program that prohibits any development, including fill, within a floodway that results in any increase in base flood elevations. This general permit does not authorize any activity prohibited by the National Flood Insurance Program.

y. The permittee must install and maintain, at his/her expense, any signal lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, on authorized facilities. For further information, the permittee should contact Coast Guard Sector North Carolina at (910) 772-2191 or email Coast Guard Fifth District at cgd5waterways@uscg.mil.

z. The permittee must maintain any structure or work authorized by this general permit in good condition and in conformance with the terms and conditions of this general permit. The permittee is not relieved of this requirement if the permittee abandons the structure or work. Transfer in fee simple of the work authorized by this general permit will automatically transfer this general permit to the property's new owner, with all of the rights and responsibilities enumerated herein. The permittee must inform any subsequent owner of all activities undertaken under the authority of this general permit and provide the subsequent owner with a copy of the terms and conditions of this general permit.

aa. At his or her sole discretion, any time during the processing cycle, the Wilmington District Engineer may determine that this general permit will not be applicable to a specific proposal. In such case, the procedures for processing an individual permit in accordance with 33 CFR 325 will be available.

bb. Except as authorized by this general permit or any Corps approved modification to this general permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used.

cc. Except as authorized by this general permit or any Corps approved modification to this general permit, all excavated material will be disposed of in approved upland disposal areas.

dd. Activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon this general permit will remain authorized provided the activity is completed within twelve months of the date of the general permit's expiration, modification, or revocation. Activities completed under the authorization of this general permit that were in effect at the time the activity was completed continue to be authorized by the general permit.

ee. The permittee is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.

ff. The activity must comply with applicable FEMA approved state or local floodplain management requirements.

gg. There will be no unreasonable interference with navigation or the right of the public to riparian access by the existence or use of activities authorized by this RGP.

hh. Unless authorization to fill those specific wetlands or mudflats has been issued by the Corps, heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

ii. This RGP will not be applicable to proposed construction when the Wilmington District Engineer determines that the proposed activity will significantly affect the quality of the human environment and determines that an EIS must be prepared.

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

CLARK.ROBERT.JAMES.1018901303

Digitally signed by CLARK.ROBERT.JAMES.1018901303
Date: 2020.05.26 14:49:22 -04'00'

Robert J. Clark
Colonel, U. S. Army
District Commander

Nationwide Permit 58
Utility Line Activities for Water and Other Substances

Effective Date: March 15, 2021 / Expiration Date: March 15, 2026
Authorities: Sections 10 and 404

Activities required for the construction, maintenance, repair, and removal of utility lines for water and other substances, excluding oil, natural gas, products derived from oil or natural gas, and electricity. Oil or natural gas pipeline activities or electric utility line and telecommunications activities may be authorized by NWPs 12 or 57, respectively. This NWP also authorizes associated utility line facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.

Utility lines: This NWP authorizes discharges of dredged or fill material into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of utility lines for water and other substances, including outfall and intake structures. There must be no change in pre-construction contours of waters of the United States. A "utility line" is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. Examples of activities authorized by this NWP include utility lines that convey water, sewage, stormwater, wastewater, brine, irrigation water, and industrial products that are not petrochemicals. The term "utility line" does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area.

Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges of dredged or fill material into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for above-ground utility lines: This NWP authorizes the construction or maintenance of foundations for above-ground utility lines in all waters of the United States, provided the foundations are the minimum size necessary.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including utility line substations, in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges of dredged or fill material into non-tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (see 33 CFR part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit.

This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

* Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) a section 10 permit is required; or (2) the discharge will result in the loss of greater than 1/10-acre of waters of the United States. (See general condition 32.) (Authorities: Sections 10 and 404)

Note 1: Where the utility line is constructed, installed, or maintained in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, a copy of the NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: For utility line activities crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Utility line activities must comply with 33 CFR 330.6(d).

Note 3: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 4: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to the General Bridge Act of 1946. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Note 5: This NWP authorizes utility line maintenance and repair activities that do not qualify for the Clean Water Act section 404(f) exemption for maintenance of currently serviceable fills or fill structures.

Note 6: For activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b)(4) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, "District Engineer's Decision." The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

GENERAL CONDITIONS

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific

conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. **Navigation.** (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. **Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. **Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. **Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. **Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. **Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. **Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. **Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. **Management of Water Flows.** To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. **Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. **Equipment.** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. **Soil Erosion and Sediment Controls.** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. **Removal of Temporary Structures and Fills.** Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. **Proper Maintenance.** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. **Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. **Wild and Scenic Rivers.** (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. **Tribal Rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. **Endangered Species.** (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA

section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

* (c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where

"take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. **Migratory Birds and Bald and Golden Eagles.** The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. **Historic Properties.** (a) No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate

documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

* (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect.

(d) Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. **Discovery of Previously Unknown Remains and Artifacts.** Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. **Designated Critical Resource Waters.** Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. **Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address

documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee-responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. **Safety of Impoundment Structures.** To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. **Water Quality.** (a) Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401,

a CWA section 401 water quality certification for the proposed discharge must be obtained or waived (see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.

(b) If the NWP activity requires pre-construction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.

(c) The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. **Coastal Zone Management.** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. **Regional and Case-By-Case Conditions.** The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. **Use of Multiple Nationwide Permits.** The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

(a) If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

(b) If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2-acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. **Transfer of Nationwide Permit Verifications.** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____
(Transferee)

_____
(Date)

∗ 30. **Compliance Certification.** Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the

certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

* 31. **Activities Affecting Structures or Works Built by the United States.** If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

* 32. **Pre-Construction Notification.** (a) *Timing*. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33

CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) *Contents of Pre-Construction Notification*: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) (i) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures.

(ii) For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs.

(iii) Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided

results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the “study river” (see general condition 16); and

(10) For an NWP activity that requires permission from, or review by, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from, or review by, the Corps office having jurisdiction over that USACE project.

(c) *Form of Pre-Construction Notification*: The nationwide permit pre-construction notification form (Form ENG 6082) should be used for NWP PCNs. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) *Agency Coordination*: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iii) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or e-mail that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will

consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the single and complete crossings of waters of the United States that require PCNs to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings of waters of the United States authorized by an NWP. If an applicant requests a waiver of an applicable limit, as provided for in NWPs 13, 36, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by an NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district

engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters. The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure that the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) that the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant

submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

Further Information

1. District engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term “discharge” means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat

type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of “open waters” include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has surface water flowing continuously year-round during a typical year.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request

may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate

may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized jurisdictional stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef,

permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a "water of the United States." If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

REGIONAL CONDITIONS:

The following Regional Conditions have been approved by the Wilmington District for the Nationwide Permits (NWPs) published in the January 13, 2021, *Federal Register* (86 FR 2744) announcing the reissuance of 12 existing (NWPs) and four new NWPs, as well as the reissuance of NWP general conditions and definitions with some modifications.

A. EXCLUDED WATERS AND/OR AREAS

The Corps has identified waters that will be excluded from the use of all NWP's during certain timeframes. These waters are:

1. **Anadromous Fish Spawning Areas.** Work in waters of the U.S. designated by either the North Carolina Division of Marine Fisheries (NCDMF) or the North Carolina Wildlife Resources Commission (NCWRC) as anadromous fish spawning areas are prohibited from February 15th through June 30th, without prior written approval from the Corps and the appropriate wildlife agencies (NCDMF, NCWRC and/or the National

Marine Fisheries Service (NMFS)). Work in waters of the U.S. designated by NCWRC as primary nursery areas in inland waters are prohibited from February 15th through September 30th, without prior written approval from the Corps and the appropriate wildlife agencies. Work in waters of the U.S. designated by NCDMF as primary nursery areas shall be coordinated with NCDMF prior to being authorized by this NWP. Coordination with NCDMF may result in a required construction moratorium during periods of significant biological productivity or critical life stages.

2. **Trout Waters Moratorium.** Work in waters of the U.S. in the designated trout watersheds of North Carolina are prohibited from October 15th through April 15th without prior written approval from the NCWRC, or from the Eastern Band of Cherokee Indians (EBCI) Fisheries and Wildlife Management (FWM) office if the project is located on EBCI trust land. (See Section C.3. above for information on the designated trout watersheds).

3. **Sturgeon Spawning Areas.** No in-water work shall be conducted in waters of the U.S. designated by the National Marine Fisheries Service as Atlantic sturgeon critical habitat from February 1st through June 30th. No in-water work shall be conducted in waters of the U.S. in the Roanoke River designated as Atlantic sturgeon critical habitat from February 1st through June 30th, and August 1st through October 31st, without prior written approval from NMFS.

4. **Submerged Aquatic Vegetation.** Impacts to Submerged Aquatic Vegetation (SAV) are not authorized by any NWP, except NWP 48, NWP 55 and NWP 56, unless Essential Fish Habitat (EFH) consultation has been completed pursuant to the Magnuson-Stevens Fisheries Conservation and Management Act (Magnuson-Stevens Act). Permittees shall submit a PCN (See NWP General Condition 32) to the District Engineer prior to commencing the activity if the project would affect SAV. The permittee may not begin work until notified by the Corps that the requirements of the Magnuson-Stevens Act have been satisfied and that the activity is verified.

B. REGIONAL CONDITIONS APPLICABLE TO ALL NWP's

1. **Critical Habitat in Western NC.** For proposed activities within waters of the U.S. that require a Pre-Construction Notification (PCN) and are located in the thirteen counties listed below, permittees must provide a copy of the PCN to the U.S. Fish and Wildlife Service (USFWS), 160 Zillicoa Street, Asheville, North Carolina 28801 and the Corps Asheville Regulatory Field Office. Please see General Condition 18 for specific PCN requirements related to the Endangered Species Act and the below website for information on the location of designated critical habitat.

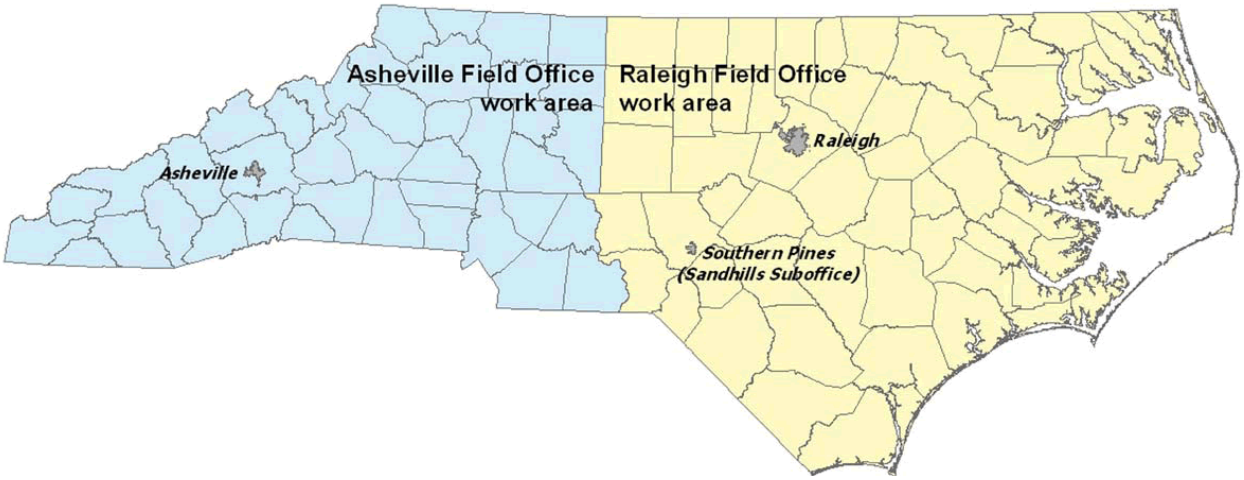
Counties with tributaries that drain to designated critical habitat that require notification to the Asheville U.S. Fish and Wildlife Service: Avery, Cherokee, Graham, Haywood, Henderson, Jackson, Macon, Mecklenburg, Mitchell, Swain, Transylvania, Union and Yancey.

Website and office addresses for Endangered Species Act Information:

The Wilmington District has developed the following website for permittees which provides guidelines on how to review linked websites and maps in order to fulfill NWP General Condition 18 (Endangered Species) requirements: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/AgencyCoordination/ESA.aspx.

Permittees who do not have internet access may contact the appropriate U.S. Fish and Wildlife Service offices listed below or Corps at (910) 251-4850.

Below is a map of the USFWS Field Office Boundaries:



Asheville U.S. Fish and Wildlife Service Office counties: All counties west of and including Anson, Stanly, Davidson, Forsythe and Stokes Counties.

U.S. Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Telephone: (828) 258-3939

Raleigh U.S. Fish and Wildlife Service Office counties: All counties east of and including Richmond, Montgomery, Randolph, Guilford, and Rockingham Counties.

U.S. Fish and Wildlife Service
Raleigh Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Telephone: (919) 856-4520

* 2. **Special Designation Waters.** Prior to the use of any NWP that involves a discharge of dredged or fill material in any of the following identified waters and/or adjacent wetlands in North Carolina, permittees shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32). The North Carolina waters and wetlands that require additional PCN requirements are:

  "Primary Nursery Areas" (PNA), including inland PNA, as designated by the North Carolina Marine Fisheries Commission and/or the North Carolina Wildlife Resources Commission. The definition of and designated PNA waters can be found in the North Carolina State Administrative Code at Title 15A, Subchapters 3R and 10C (15A NCAC 03R .0103; 15A NCAC 10C .0502; and 15A NCAC 10C .0503) and at the following web pages:

  - http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2003%20-%20marine%20fisheries/subchapter%20r/15a%20ncac%2003r%20.0103.pdf

  - http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2010%20-%20wildlife%20resources%20and%20water%20safety/subchapter%20c/15a%20ncac%2010c%20.0502.pdf

  - http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2010%20-%20wildlife%20resources%20and%20water%20safety/subchapter%20c/15a%20ncac%2010c%20.0503.pdf

* 3. **Trout Waters.** Prior to any discharge of dredge or fill material into streams, waterbodies or wetlands within the 294 designated trout watersheds of North Carolina, the permittee shall submit a PCN (see General Condition 32) to the District Engineer prior to commencing the activity. The permittee shall also provide a copy of the PCN to the appropriate NCWRC office, or to the EBCI FWM Office (if the project is located on EBCI trust land), to facilitate the determination of any potential impacts to designated Trout Waters.

NCWRC and NC Trout Watersheds:

NCWRC Contact**	**Counties that are entirely within Trout Watersheds***		**Counties that are partially within Trout Watersheds***	
Mountain Coordinator 645 Fish Hatchery Rd., Building B Marion, NC 28752 828-803-6054 For NCDOT Projects: NCDOT Coordinator 12275 Swift Rd. Oakboro, NC 28129 704-984-1070	Alleghany Ashe Avery Graham Haywood	Jackson Macon Swain Transylvania Watauga	Burke Buncombe Caldwell Cherokee Clay Henderson Madison	McDowell Mitchell Polk Rutherford Surry Wilkes Yancey
EBCI Contact**	**Counties that are within Trout Watersheds***			
Office of Natural Resources P.O. Box 1747, Cherokee, NC 28719 (828) 359-6113	Qualla Boundary and non-contiguous tracts of trust land located in portions of Swain, Jackson, Haywood, Graham and Cherokee Counties.			

*NOTE: To determine PCN requirements, contact the Corps Asheville Regulatory Field Office at (828) 271-7980 or view maps showing trout watersheds in each County at the following webpage: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/Trout/.

**If a project is located on EBCI trust land, submit the PCN in accordance with Regional Condition C.16. Contact the Corps Asheville Regulatory Field Office at (828) 271-7980 with questions.

* 4. **Western NC Waters and Corridors.** The permittee shall submit a PCN (see General Condition 32) to the District Engineer prior to commencing the activity in waters of the U.S. if the activity will occur within any of the following identified waters in western North Carolina, within 0.5 mile on either side of these waters, or within 0.75 mile of the Little Tennessee River, as measured from the top of the bank of the respective water (i.e., river, stream, or creek):

Brasstown Creek
Burningtown Creek
Cane River
Caney Fork
Cartoogechaye Creek
Chattooga River
Cheoah River
Cowee Creek
Cullasaja River
Deep Creek
Ellijay Creek
French Broad River
Garden Creek
Hiwassee River
Hominy Creek
Iotla Creek
Little Tennessee River (within the river or within 0.75 mile on either side of this river)
Nantahala River
Nolichucky River
North Fork French Broad River
North Toe River
Nottley River
Oconaluftee River (portion not located on trust/EBCI land)
Peachtree Creek
Shooting Creek
Snowbird Creek
South Toe River
Stecoah Creek
Swannanoa River
Sweetwater Creek
Tuckasegee River (also spelled Tuckaseegee or Tuckaseigee)
Valley River
Watauga Creek
Watauga River
Wayah Creek

West Fork French Broad River

To determine PCN requirements, contact the Corps Asheville Regulatory Field Office at (828) 271-7980 or view maps for all corridors at the following webpage: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/Designated-Special-Waters.aspx .

5. **Limitation of Loss of Stream Bed.** NWPs may not be used for activities that may result in the loss of more than 0.05 acres of stream bed, except for NWP 32.

6. **Pre-Construction Notification for Loss of Stream Bed Exceeding 0.02 acres.** The permittee shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32) prior to the use of any NWP for any activity that results in the loss of more than 0.02 acres of stream bed. This applies to NWPs that do not have PCN requirements as well as those NWPs that require a PCN.

7. **Mitigation for Loss of Stream Bed.** For any NWP that results in a loss of more than 0.02 acres of stream bed, the permittee shall provide a mitigation proposal to compensate for more than minimal individual and cumulative adverse impacts to the aquatic environment, unless the District Engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal. For stream bed losses of 0.02 acres or less that require a PCN, the District Engineer may determine, on a case-by-case basis, that compensatory mitigation is required to ensure that the activity results in minimal adverse effect on the aquatic environment.

8**. Riprap.** For all NWPs that allow for the use of riprap material for bank stabilization, the following conditions shall be applied:

a. Filter cloth must be placed underneath the riprap as an additional requirement of its use in North Carolina waters. The placement of filter fabric is not required if the riprap will be pushed or “keyed” into the bank of the waterbody. A waiver from the specifications in this Regional Condition must be requested in writing.

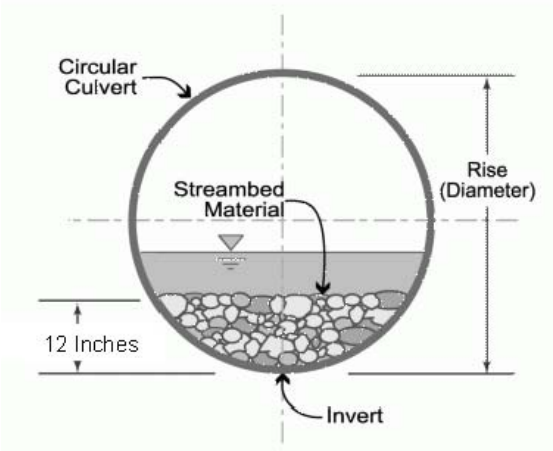
b. Riprap shall be placed only on the stream banks, or, if it is necessary to be placed in the stream bed, the finished top elevation of the riprap should not exceed that of the original stream bed.

9**. Culvert Placement.** For all NWPs that allow for culvert placement, the following conditions shall be applied:

a. For all NWPs that involve the construction/installation of culverts, measures shall be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms

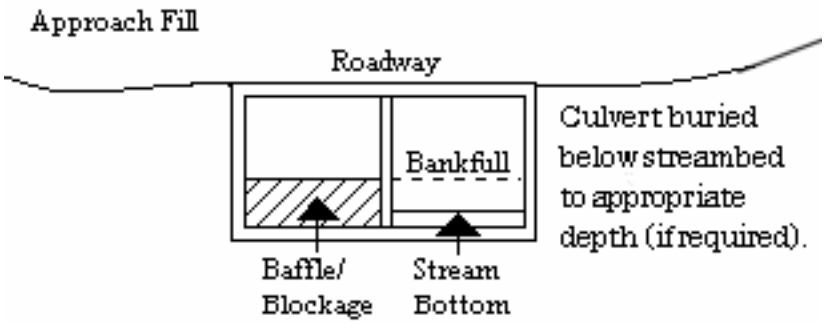
Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches. If the culvert outlet is submerged within a pool or scour hole and designed to provide for aquatic passage, then culvert burial into the streambed is not required.
Culvert burial is not required for structures less than 72 inch diameter/width, where the slope of the culvert will be greater than 2.5%, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g., rock ladders, cross vanes, sills, baffles etc.). Culvert burial is not required when bedrock is present in culvert locations.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.



A waiver from the depth specifications in this condition may be requested, in writing, by the permittee and issued by the Corp. This waiver request must be specific as to the reasons(s) for the request. The waiver will be issued if it can be demonstrated that the proposed design would result in less impacts to the aquatic environment. Culverts placed across wetland fills purely for the purposes of equalizing surface water do not have to be buried, but the culverts must be of adequate size and/or number to ensure unrestricted transmission of water.

b. Bank-full flows (or less) shall be accommodated through maintenance of the existing bank-full channel cross sectional area. Additional culverts or culvert barrels at such crossings shall be allowed only to receive bank-full flows.



c. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. 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 culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. If the width of the culvert is wider than the stream channel, the culvert shall include multiple boxes/pipes, baffles, benches and/or sills to maintain the natural width of the stream channel. If multiple culverts/pipes/barrels are used, low flows shall be accommodated in one culvert/pipe and additional culverts/pipes shall be installed such that they receive only flows above bankfull.

10. **Utility Lines.** For all NWPs that allow for the construction and installation of utility lines, the following conditions shall be applied:

a. Utility lines consisting of aerial electric power transmission lines crossing navigable waters of the U.S. (which are defined at 33 CFR part 329) must comply with the applicable minimum clearances specified in 33 CFR 322.5(i).

b. The work area authorized by this permit, including temporary and/or permanent fills, will be minimized to the greatest extent practicable. Justification for work corridors exceeding forty (40) feet in width is required and will be based on pipeline diameter and length, size of equipment required to construct the utility line, and other construction information deemed necessary to support the request. The permittee is required to provide this information to the Corps with the initial PCN package.

c. A plan to restore and re-vegetate wetland areas cleared for construction must be submitted with the required PCN. Cleared wetland areas shall be re-vegetated, as appropriate, with species of canopy, shrub, and herbaceous species. The permittee shall not use fescue grass or any other species identified as invasive or exotic species by the NC Native Plant Society (NCNPS): https://ncwildflower.org/invasive-exotic-species-list/.

d. Any permanently maintained corridor along the utility right of way within forested wetlands shall be considered a loss of aquatic function. A compensatory mitigation plan will be required for all such impacts associated with the requested activity if the activity requires a PCN and the cumulative total of permanent conversion of forested wetlands

exceeds 0.1 acres, unless the District Engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal.

Where permanently maintained corridor within forested wetlands is 0.1 acres or less, the District Engineer may determine, on a case-by-case basis, that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment.

e. When directional boring or horizontal directional drilling (HDD) under waters of the U.S., including wetlands, permittees shall closely monitor the project for hydraulic fracturing or "fracking." Any discharge from hydraulic fracturing or "fracking" into waters of the U.S., including wetlands, shall be reported to the appropriate Corps Regulatory Field Office within 48 hours. Restoration and/or compensatory mitigation may be required as a result of any unintended discharges.

11. **Temporary Access Fills.** The permittee shall submit a PCN to the District Engineer prior to commencing the activity if the activity will involve the discharge of dredged or fill material into more than 0.1 acres of wetlands or 0.02 acres of stream channel for the construction of temporary access fills and/or temporary road crossings. The PCN must include a restoration plan that thoroughly describes how all temporary fills will be removed, how pre-project conditions will be restored, and include a timetable for all restoration activities.

12. **Federal Navigation Channel Setbacks.** Authorized structures and fills located in or adjacent to Federally authorized waterways must be constructed in accordance with the latest setback criteria established by the Wilmington District Engineer. You may review the setback policy at http://www.saw.usace.army.mil/Missions/Navigation/Setbacks.aspx. This general permit does not authorize the construction of hardened or permanently fixed structures within the Federally Authorized Channel Setback, unless the activity is approved by the Corps. The permittee shall submit a PCN (see General Condition 32) to the District Engineer to obtain a written verification prior to the construction of any structures or fills within the Federally Authorized Channel Setback.

13. **Northern Long-eared Bat – Endangered Species Act Compliance**

The Wilmington District, U.S. Army Corps of Engineers has consulted with the United States Fish and Wildlife Service (USFWS) in regard to the threatened Northern long-eared bat (NLEB) (*Myotis septentrionalis*) and Standard Local Operating Procedures for Endangered Species (SLOPES) have been approved by the Corps and the USFWS. This condition concerns effects to the NLEB only and does not address effects to other federally listed species and/or federally designated critical habitat.

P-65

A. Procedures when the Corps is the lead federal* agency for a project:

The permittee must comply with (1) and (2) below when:

• the project is located in the western 41 counties of North Carolina, to include non-federal aid North Carolina Department of Transportation (NCDOT) projects, OR;
• the project is located in the 59 eastern counties of North Carolina and is a non-NCDOT project.

*Generally, if a project is located on private property or on non-federal land, and the project is not being funded by a federal entity, the Corps will be the lead federal agency due to the requirement to obtain Department of the Army authorization to impact waters of the U.S. If the project is located on federal land, contact the Corps to determine the lead federal agency.

(1) A permittee using an NWP must check to see if their project is located in the range of the NLEB by using the following website: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf. If the project is within the range of the NLEB, or if the project includes percussive activities (e.g., blasting, pile driving, etc.), the permittee is then required to check the appropriate website in the paragraph below to discover if their project:

• is located in a 12-digit Hydrologic Unit Code area ("red HUC" - shown as red areas on the map), AND/OR;
• involves percussive activities within 0.25 mile of a red HUC.

Red HUC maps - for the western 41 counties in NC (covered by the Asheville Ecological Services Field Office), check the project location against the electronic maps found at: http://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html. For the eastern 59 counties in NC (covered by the Raleigh Ecological Services Field Office), check the project location against the electronic maps found at: https://www.fws.gov/raleigh/NLEB_RFO.html.

(2) A permittee must submit a PCN to the District Engineer, and receive written verification from the District Engineer, prior to commencing the activity, if the activity will involve any of the following:

• tree clearing/removal and/or, construction/installation of wind turbines in a red HUC, AND/OR;
• bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, (applies anywhere in the range of the NLEB), AND/OR:
• percussive activities in a red HUC, or within 0.25 mile of a red HUC.

The permittee may proceed with the activity without submitting a PCN to either the Corps or the USFWS, provided the activity complies with all applicable NWP terms and

general and regional conditions, if the permittee's review under A.(1) and A.(2) above shows that the project is:

- located outside of a red HUC (and there are no percussive activities), and the activity will NOT include bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, OR;
- located outside of a red HUC and there are percussive activities, but the percussive activities will not occur within 0.25-mile of a red HUC boundary, and the activity will NOT include bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, OR;
- located in a red HUC, but the activity will NOT include tree clearing/removal; construction/installation of wind turbines; bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, and/or; any percussive activities.

B. Procedures when the USACE is not the lead federal agency:

For projects where another federal agency is the lead federal agency - if that other federal agency has completed project-specific ESA Section 7(a)(2) consultation for the NLEB, and has (1) determined that the project would not cause prohibited incidental take of the NLEB, and (2) completed coordination/consultation that is required by the USFWS (per the directions on the respective USFWS office's website), that project may proceed without PCN to either the USACE or the USFWS, provided all General and Regional Permit Conditions are met.

The NLEB SLOPES can be viewed on the USACE website at: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/ESA/. Permittees who do not have internet access may contact the USACE at (910) 251- 4633.

14. **West Indian Manatee Protection.** In order to protect the endangered West Indian manatee (*Trichechus manatus*) the Permittee shall implement the USFWS' Manatee Guidelines, and strictly adhere to all requirements therein. The guidelines can be found at https://www.fws.gov/raleigh/pdfs/ManateeGuidelines2017.pdf.

15. **ESA Programmatic Biological Opinions.** The Wilmington District, USFWS, NCDOT, and the FHWA have conducted programmatic Section 7(a)(2) consultation for a number of federally listed species and designated critical habitat (DCH), and programmatic consultation concerning other federally listed species and/or DCH may occur in the future. The result of completed programmatic consultation is a Programmatic Biological Opinion (PBO) issued by the USFWS. These PBOs contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" of whichever species or critical habitat is covered by a specific PBO. Authorization under NWPs is conditional upon the permittee's compliance with all the mandatory terms and conditions associated with incidental take of the applicable PBO (or PBOs), which are incorporated by reference in

the NWPs. Failure to comply with the terms and conditions associated with incidental take of an applicable PBO, where a take of the federally listed species occurs, would constitute an unauthorized take by the permittee, and would also constitute permittee non-compliance with the authorization under the NWPs. If the terms and conditions of a specific PBO (or PBOs) apply to a project, the Corps will include this/these requirements in any NWP verification that may be issued for a project. For an activity/project that does not require a PCN, the terms and conditions of the applicable PBO(s) also apply to that non-notifying activity/project. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its PBO and the ESA. All PBOs can be found on our website at: https://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/ESA/.

16. **Work on Eastern Band of Cherokee Land.**

Notifying NWPs - All PCNs submitted for activities in waters of the U.S. on Eastern Band of Cherokee Indians (EBCI) trust land (i.e., Qualla Boundary and non-contiguous tracts of trust land located in portions of Swain, Jackson, Haywood, Graham and Cherokee Counties), must comply with the requirements of the latest MOU between the Wilmington District and the EBCI.

Non-notifying NWPs - Prior to the use of any non-notifying NWP for activities in waters of the U.S. on EBCI trust land (i.e., Qualla Boundary and non-contiguous tracts of trust land located in portions of Swain, Jackson, Haywood, Graham and Cherokee Counties), all prospective permittees must comply with the requirements of the latest MOU between the Wilmington District and the EBCI; this includes coordinating the proposed project with the EBCI Natural Resources Program and obtaining a Tribal Approval Letter from the Tribe.

The EBCI MOU can be found at the following URL: http://saw-reg.usace.army.mil/FO/Final-MOU-EBCI-USACE.pdf

17. **Sedimentation and Erosion Control Structures and Measures**
All PCNs will identify and describe sedimentation and erosion control structures and measures proposed for placement in waters of the U.S. The structures and measures should be depicted on maps, surveys or drawings showing location and impacts to jurisdictional wetlands and streams.

C. SECTION 401 WATER QUALITY CERTIFICATION (WQC) AND/OR COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION SUMMARY AND APPLICABLE CONDITIONS

The CZMA Consistency Determination and all Water Quality Certifications for the NWPs can be found at: https://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Permits/2017-Nationwide-Permits/

ROY COOPER
Governor
DIONNE DELLI-GATTI
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

March 31, 2021

DWR #20181014 V2
Brunswick County

Mr. Phillip s. Harris III, P.E., C.P.M. Unit Head
Environmental Analysis Unit
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, NC 27600-1598

Subject: **RENEWAL APPROVAL OF 401 WATER QUALITY CERTIFICATION WITH ADDITIONAL CONDITIONS FOR NC 211 from SR 1500 (Midway Road) to NC 87 NCDOT TIP# R-5021, Brunswick County**

Dear Mr. Harris:

You have our approval for the impacts listed below for the purpose described in your application received by the Division of Water Resources (Division) March 16, 2021, with subsequent information on March 22, 2021 via e-mail. These impacts are covered by the attached Water Quality General Certification Number 4135 and the conditions listed below. This Certification is a renewal of the Certification issued on September 10, 2018. This certification is associated with the use of Regional General Permit Number 198200031 once it is issued to you by the U.S. Army Corps of Engineers. Please note that you should get any other federal, state or local permits before proceeding with your project, including those required by (but not limited to) Sediment and Erosion Control, Non-Discharge, and Water Supply Watershed regulations.

The Division has determined that the proposed project will comply with water quality requirements provided that you adhere to the conditions listed in the enclosed certification and to the additional conditions itemized below.

The following proposed impacts are hereby approved. No other impacts are approved, including incidental impacts. [15A NCAC 02H .0506(b)]

Stream Impacts in the Lumber and the Cape Fear River Basin

Site	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)
Site 5 L-83+55 – 83+84 LT			82	14	96	N/A
Site 6 L- 100+43-100+73 LT			91	9	100	N/A
Site 7 L-106+05 – 107+32 LT			133	13	146	N/A
Site 13 L-216+73 1 218+28 LT			153	19	172	N/A
Site 14 L-216+53 – 216+82 RT			16	15	31	N/A
Site 16 L-225+77 – 226+44 LT			150	10	160	N/A
Site 17 L-225+59 – 225+92 RT			59	10	69	N/A
Site 25 L-315+96 – 316+63 LT			85	24	109	N/A
Site 25A L-316+38 – 317+38 LT			107		107	N/A
Site 26 L-316+52 – 317+84 RT			116	24	140	N/A
Site 31 L-369+37 – 369+59 RT			18	29	47	N/A
Site 34 L-428+24 – 428+68 LT			73	8	81	N/A
Site 40 Y22-23+04 – 23+21 RT			26	10	36	N/A
Site 41 Y22-23+17-23+32 LT			40	10	50	N/A
Total			**1149**	**195**	**1344**	**N/A**

Total Stream Impact for Project Site: 1344 linear feet

Wetland Impacts in the Lumber* and the Cape Fear River Basin

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	**Hand Clearing (ac)	Total Take (ac)	Total Wetland Impact (ac)
*Site 1 L-55+59 – 57+85 RT			0.172				0.172
*Site 2 L-65+12 – 69+60 RT	0.045	0.122					0.167
*Site 3 YA-11+18 – 14+70 RT/LT	0.666		0.241	0.035			0.942
*Site 4 YREV 38+47 – 48+34 LT	0.906			0.068			0.974
*Site 4 L-81+78 - - 86+05 RT			0.211				0.211`
*Site 5 L-85+22 – 86+44 LT	0.076			0.015			0.091
*Site 5 YB – 16+72 – 19+00LT	0.084			0.025			0.109
*Site 6 L-100+78 – 103+67 LT	0.149			0.032			0.181
*Site 9 L- 113+86 – 126+79 LT	1.186			0.147			1.333
*Site 10 L-126+92 – 144+52 LT	0.985			0.271			1.256
Site 11 L-200+46 - - 205+16 RT	0.101			0.053			0.154
Site 13 L-216+76 – 217+92 LT	0.039		0.024				0.063
Site 14 L-215+99 – 217+82 RT	0.046		0.001	0.007			0.054
Site 15 L-222+97 – 223+54 LT	0.024		0.020			0.040	0.044
Site 16 L-225+21 – 227+48 LT	0.303		0.008	0.019			0.330
Site 17 L-222+60 - -226+73 RT	0.015		0.131	0.027			0.173
Site 18 L-237+79 - -242+95 LT	0.540			0.045			0.585

Site 19 L-245+23 - -275+27 LT	5.350			0.296			5.646
Site 20 L-275+51 - -286+64 LT	2.206			0.124			2.330
Site 21 L-271+43 – 275+91 RT			0.079	0.028			0.107
Site 22 L-278+65 – 283+16 RT			0.087	0.037			0.124
Site 23 L-289+94 – 304+98 LT	2.564			0.168			2.732
Site 42 L-324+23 – 324.26 LT			0.001				0.001
Site 28 L-353+34 – 353+73 RT	0.006			0.040			0.046
Site 29 L-366+77 – 369+06 LT	0.277			0.069	0.019		0.365
Site 30 L-370+03 – 375+93 LT	0.492			0.071			0.563
Site 32 L-370+83 – 370+94 RT	0.001			0.001			0.002
Site 36 YREV-9+47 – 9+77 RT			0.003				0.003
Site 37 Y14A-52+57 – 59+22 RT	0.2222			0.048			0.270
Site 38 Y14A-55+80 – 66+12 LT	0.058		0.009	0.029			0.096
Site 39 Y14A-64+77 – 66+24 RT	0.009			0.021			0.030
Site 42 L-324+23 – 324+26 LT			0.001				0.001
Total	**16.350**	**0.0**	**1.110**	**1.676**	**0.019**	**0.040**	**19.176**

Total Wetland Impacts for Project Site: 19.176 acres.
**** Hand Clearing does not count towards impacts**

Open Water Impacts in the Lumber and Cape Fear River Basin

Site	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
Site 2 L-57+22 – 75+36 RT	0.290		0.290
Site 12 L-211+66 – 214+04 LT	0.237	0.142	0.379
Site 24 L-313+81 – 314+96 RT	0.065		0.065
Site 35 YB-11+41 – 13+72 LT	0.068	0.008	0.076
Site 37 Y14D-19+91 – 20+15 LT	0.005	0.005	0.010
Site 37 Y14A-52+57 – 59+29 RT	0.311	0.005	0.316
Site 38 Y14A-55+80 – 66+12 LT	0.287	0.004	0.291
Total	**1.263**	**0.164**	**1.427**

Total Open Water Impact for Project Site: 1.263 acres.

This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of this Certification. If you change your project, you must notify the Division and you may be required to submit a new application package with the appropriate fee. If the property is sold, the new owner must be given a copy of this Certification and is responsible for complying with all conditions. [15A NCAC 02H .0507(d)(2)].

If you are unable to comply with any of the conditions of the attached Water Quality General Certification or with the additional conditions itemized below, you must notify the Wilmington Regional Office within 24 hours (or the next business day if a weekend or holiday) from the time the permittee becomes aware of the circumstances.

The permittee shall report to the Wilmington Regional Office any noncompliance with, and/or any violation of, stream or wetland standards [15A NCAC 02B .0200] including but not limited to sediment impacts to streams or wetlands. Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the permittee became aware of the non-compliance circumstances.

Project Specific Conditions:

1. The NCDOT Division Environmental Program Supervisor 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)
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. [15A NCAC 2H.0506(b)(3)
3. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. To meet the requirements of NCDOT's NPDES permit NCS000250, please refer to the most recent version of the *North Carolina Department of Transportation Stormwater Best Management Practices Toolbox* manual for approved measures. [15A NCAC 02H .0507(d)(2) and 15A NCAC 02H .0506(b)(5)]
4. 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)]
5. 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)
6. A turbidity curtain will be installed in the stream if driving or drilling activities occur within the stream channel, on the stream bank, or within 5 feet of the top of bank, or during the removal of bents from an old bridge. This condition can be waived with prior approval from the NCDWR. [15A NCAC 02H .0506(b)(3)
7. 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)]

8. 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)
9. For the streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species. [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. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species. [15A NCAC 02H.0506(b)(2)]
12. Tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian areas. For the establishment of permanent herbaceous cover, erosion control matting shall be used in conjunction with an appropriate native seed mix on disturbed soils within the riparian area and on disturbed steep slopes with the following exception. Erosion control matting is not necessary if the area is contained by perimeter erosion control devices such as silt fence, temporary sediment ditches, basins, etc. Matting should be secured in place with staples, stakes, or wherever possible, live stakes of native trees. Erosion control matting placed in riparian areas shall not contain a nylon mesh grid, which can impinge and entrap small animals. For the establishment of temporary groundcover within riparian areas, hydroseeding along with wood or cellulose based hydro mulch applied from a fertilizer- and limestone-free tank is allowable at the appropriate rate in conjunction with the erosion control measures. Discharging hydroseed mixtures and wood or cellulose mulch into surface waters in prohibited. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

∗ *13.* Compensatory mitigation for impacts for to 19.176 acres of wetlands is required. 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 letters dated August 27, 2018 and March 12, 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.

Additional Conditions:

14. 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)]

15. 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]

16. 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)]

17. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions. [15A NCAC 02H.0506(b)(2)]

18. 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)]

∗ 19. 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)]

20. 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)]

21. 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)]

22. 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)]

23. 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)]

24. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited. [15A NCAC 02H.0506(b)(3)]

25. 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]

26. 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.*

27. 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.

28. 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.

29. 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]

30. 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]

31. 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)]

32. 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)]

33. 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]

34. 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.

35. 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)]

* 36. 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" to notify the NCDWR when all work included in the 401 Certification has been completed. [15A NCAC 02H.0502(f)]

37. 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.0231(a)(6)]

38. 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)

39. 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.

40. Where placement of sediment and erosion control devices in wetlands and/or waters is unavoidable, they shall be removed and the natural grade restored upon completion of the project. [15A NCAC 02H.0506(b)(3) and (c)(3)

This approval and its conditions are final and binding unless contested. [G.S. 143-215.5]

This Certification can be contested as provided in Chapter 150B of the North Carolina General Statutes by filing a Petition for a Contested Case Hearing (Petition) with the North Carolina Office of Administrative Hearings (OAH) **within sixty (60) calendar days**. Requirements for filing a Petition are set forth in Chapter 150B of the North Carolina General Statutes and Title 26 of the North Carolina Administrative Code. Additional information regarding requirements for filing a Petition and Petition forms may be accessed at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000.

One (1) copy of the Petition must also be served to the North Carolina Department of Environmental Quality:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This letter completes the review of the Division under section 401 of the Clean Water Act and 15A NCAC 02H .0500. Please contact Joanne Steenhuis at (910) 796-7306 or joanne.steenhuis@ncdenr.gov if you have any questions or concerns.

Sincerely,

DocuSigned by:
Amy Chapman
9C9886312DCD474...

S. Daniel Smith, Director
Division of Water Resources

cc: Brad Shaver, USACE Wilmington Regulatory Field Office (via email)
Mason Herndon, NC DOT Division 3 Environmental Program Supervisor
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
Cathy Brittingham, NC Division of Coastal Management
Beth Harmon, Division of Mitigation Services
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P-78A

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

October 20, 2021
Brunswick County
NCDWR Project No. 20181014 v.4
TIP R-5021

MODIFICATION of APPROVAL of 401 WATER QUALITY CERTIFICATION with ADDITIONAL CONDITIONS

Mr. Philip S. Harris, III, P.E., CPM
Natural Environment Section Head
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Dear Mr. Harris:

You have our approval, in accordance with the conditions listed below, for the following impacts for the purpose of widening NC 211 between west of NC 906(Midway Rd) to east of NC 87 in Brunswick County:

Wetland Impacts in the Lumber River Basin

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)
Original approved impacts at Site 2	0.045	--	0.122	--	--	0.167
Impacts approved with this modification at Site 2	0	--	0	--	--	0
Difference	-0.045	--	-0.122	--	--	-0.167
Original approved impacts at Site 3	0.666	--	0.240	0.035	--	0.941
Impacts approved with this modification at Site 3	0.316	--	0	0.044	--	0.360
Difference	-0.350	--	-0.240	+0.009	--	-0.581

The project shall be constructed in accordance with your modified application dated received October 11, 2021. All the authorized activities and conditions associated with the original Water Quality Certification dated September 10, 2018 and subsequent modifications still apply except where superseded by this certification. After reviewing your application, we have decided that these impacts are covered by General Water Quality Certification Number 4135. This certification corresponds to the Regional General Permit 31 issued by the Corps of Engineers. In addition, you should acquire any other federal, state or local permits before you proceed with your project including (but not limited to) Sediment and Erosion Control, Non-Discharge and Water Supply Watershed regulations. This approval will expire with the accompanying 404 permit.

This approval is valid solely for the purpose and design described in your application (unless modified below). Should your project change, you must 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 total wetland fills for this project (now or in the future) exceed one acre, or of total impacts to streams (now or in the future) exceed 300 linear feet, 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.0259. For this approval to remain valid, you must adhere to the conditions listed in the attached certification(s) and any additional conditions listed below.

Condition(s) of Certification:

1. This modification is applicable only to the additional proposed activities. All of the authorized activities and conditions associated with the original Water Quality Certification dated September 10, 2018 and subsequent modifications still apply except where superseded by this certification.

2. 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)]

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

This letter completes the review of the Division of Water Resources under Section 401 of the Clean Water Act. If you have any questions, please contact Hannah Sprinkle at (910) 796-7306 or Hannah.Sprinkle@ncdenr.gov.

Sincerely,

DocuSigned by:
Amy Chapman
9C9886312DCD474...

:tor
Division of Water Resources

Electronic copy only distribution:

Brad Shaver, US Army Corps of Engineers, Wilmington Field Office
Mason Herndon, Division 3 Environmental Program Supervisor
Chris Rivenbark. NC Department of Transportation
Cathy Brittingham, NC Division of Coastal Management
Stephen Lane, NC Division of Coastal Management
Hannah Sprinkle, NC Division of Water Resources Wilmington Regional Office

P-78C

File Copy

North Carolina Department of Environmental Quality | Division of Water Resources
512 North Salisbury Street | 1617 Mail Service Center | Raleigh, North Carolina 27699-1617
919.707.9000

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER RESOURCES

WATER QUALITY GENERAL CERTIFICATION NO. 4135

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR US ARMY CORPS OF ENGINEERS

- **NATIONWIDE PERMIT NUMBER 14 (LINEAR TRANSPORTATION PROJECTS), AND**
- **REGIONAL GENERAL PERMIT 198200031 (NCDOT BRIDGES, WIDENING PROJECTS, INTERCHANGE IIMPROVEMENTS)**

Water Quality Certification Number 4135 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 Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to surface waters and wetland areas as described in 33 CFR 330 Appendix A (B) (14) of the US Army Corps of Engineers regulations and Regional General Permit 198200031.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Effective date: December 1, 2017

Signed this day: December 1, 2017

By

for Linda Culpepper
Interim Director

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Resources (DWR):

a) If any of the conditions of this Certification (listed below) cannot be met; or
b) Any temporary or permanent impacts to wetlands, open waters and/or streams, except for construction of a driveway to a single family residential lot that is determined to not be part of a larger common plan of development, as long as the driveway involves a travel lane of less than 25 feet and total stream impacts of less than 60 feet, including any topographic/slope stabilization or in-stream stabilization needed for the crossing; or
c) Any stream relocation or stream restoration; or
d) Any high-density project, as defined in 15A NCAC 02H .1003(2)(a) and by the density thresholds specified in 15A NCAC 02H .1017, which:
    i. Disturbs one acre or more of land (including a project that disturbs less than one acre of land that is part of a larger common plan of development or sale); and
    ii. Has permanent wetland, stream or open water impacts; and
    iii. Is proposing new built-upon area; and
    iv. Does not have a stormwater management plan reviewed and approved under a state stormwater program[1] or a state-approved local government stormwater program[2].

    Projects that have vested rights, exemptions, or grandfathering from state or locally-implemented stormwater programs and projects that satisfy state or locally-implemented stormwater programs through use of community in-lieu programs **require written approval**; or
e) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as: ORW (including SAV), HQW (including PNA), SA, WS-I, WS-II, or North Carolina or National Wild and Scenic River.
f) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as Trout except for driveway projects that are below threshold (b) above provided that:
    i. The impacts are not adjacent to any existing structures
    ii. All conditions of this General Certification can be met, including adherence to any moratoriums as stated in Condition #10; and
    iii. A *Notification of Work in Trout Watersheds Form* is submitted to the Division at least 60 days prior to commencement of work; or
g) Any permanent impacts to coastal wetlands [15A NCAC 07H .0205], or Unique Wetlands (UWL); or
h) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of NC Wetland Rules (15A NCAC 02H .0500), NC Isolated Wetland Rules (15A NCAC 02H .1300), NC Surface Water or Wetland Standards (15A NCAC 02B .0200), or State Regulated Riparian Buffer Rules (15A NCAC 02B .0200); or

[1] e.g. Coastal Counties, HQW, ORW, or state-implemented Phase II NPDES
[2] e.g. Delegated Phase II NPDES, Water Supply Watershed, Nutrient-Sensitive Waters, or Universal Stormwater Management Program

* i) Any impacts to subject water bodies and/or state regulated riparian buffers along subject water bodies in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman Lake, Jordan Lake or Goose Creek Watersheds (or any other basin or watershed with State Regulated Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless:*
    i. The activities are listed as "EXEMPT" from these rules; or
    ii. A Buffer Authorization Certificate is issued by the NC Division of Coastal Management (DCM); or
    iii. A Buffer Authorization Certificate or a Minor Variance is issued by a delegated or designated local government implementing a state riparian buffer program pursuant to 143-215.23

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval.

I. ACTIVITY SPECIFIC CONDITIONS:

*1. If this Water Quality Certification is used to access residential, commercial or industrial building sites, then all parcels owned by the applicant that are part of the single and complete project authorized by this Certification must be buildable without additional impacts to streams or wetlands. If required in writing by DWR, the applicant shall provide evidence that the parcels are buildable without requiring additional impacts to wetlands, waters, or state regulated riparian buffers. [15A NCAC 02H .0506(b)(4) and (c)(4)]

2. For road and driveway construction purposes, this Certification shall only be utilized from natural high ground to natural high ground. [15A NCAC 02H .0506(b)(2) and (c)(2)]

*3. Deed notifications or similar mechanisms shall be placed on all lots with retained jurisdictional wetlands, waters, and state regulated riparian buffers within the project boundaries in order to assure compliance with NC Wetland Rules (15A NCAC 02H .0500), NC Isolated Wetland Rules (15A NCAC 02H .1300), and/or State Regulated Riparian Buffer Rules (15A NCAC 02B .0200). These mechanisms shall be put in place at the time of recording of the property or individual parcels, whichever is appropriate. [15A NCAC 02H .0506(b)(4) and (c)(4)]

4. For the North Carolina Department of Transportation, compliance with the NCDOT's individual NPDES permit NCS000250 shall serve to satisfy this condition. All other high-density projects that trigger threshold item (d) above shall comply with one of the following requirements: [15A NCAC 02H .0506(b)(5) and (c)(5)]

a. Provide a completed Stormwater Management Plan (SMP) for review and approval, including all appropriate stormwater control measure (SCM) supplemental forms and associated items, that complies with the high-density development requirements of 15A NCAC 02H .1003. Stormwater management shall be provided throughout the entire project area in accordance with 15A NCAC 02H .1003. For the purposes of 15A NCAC 02H .1003(2)(a), density thresholds shall be determined in accordance with 15A NCAC 02H .1017.

b. Provide documentation (including calculations, photos, etc.) that the project will not cause degradation of downstream surface waters. Documentation shall include a detailed analysis of the hydrological impacts from stormwater runoff when considering the volume and velocity of stormwater runoff from the project built upon area and the size and existing condition of the receiving stream(s).

Exceptions to this condition require application to and written approval from DWR.

II. GENERAL CONDITIONS:

*1. When written authorization is required, the plans and specifications for the project are incorporated into the authorization by reference and are an enforceable part of the Certification. Any modifications to the project require notification to DWR and may require an application submittal to DWR with the appropriate fee. [15A NCAC 02H .0501 and .0502]

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts) as authorized in the written approval from DWR; or beyond the thresholds established for use of this Certification without written authorization. [15A NCAC 02H .0501 and .0502]

No removal of vegetation or other impacts of any kind shall occur to state regulated riparian buffers beyond the footprint of impacts approved in a Buffer Authorization or Variance or as listed as an exempt activity in the applicable riparian buffer rules. [15A NCAC 02B .0200]

*3. In accordance with 15A NCAC 02H .0506(h) and Session Law 2017-10, compensatory mitigation may be required for losses of greater than 300 linear feet of perennial streams and/or greater than one (1) acre of wetlands. Impacts associated with the removal of a dam shall not require mitigation when the removal complies with the requirements of Part 3 of Article 21 in Chapter 143 of the North Carolina General Statutes. Impacts to isolated and other non-404 jurisdictional wetlands shall not be combined with 404 jurisdictional wetlands for the purpose of determining when impact thresholds trigger a mitigation requirement. For linear publicly owned and maintained transportation projects that are not determined to be part of a larger common plan of development by the US Army Corps of Engineers, compensatory mitigation may be required for losses of greater than 300 linear feet per perennial stream.

Compensatory stream and/or wetland mitigation shall be proposed and completed in compliance with G.S. 143-214.11. For applicants proposing to conduct mitigation within a project site, a complete mitigation proposal developed in accordance with the most recent guidance issued by the US Army Corps of Engineers Wilmington District shall be submitted for review and approval with the application for impacts.

4. All activities shall be in compliance with any applicable State Regulated Riparian Buffer Rules in Chapter 2 of Title 15A.

5. 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]

   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*.

   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.

   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.

   If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, 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 Watersheds*.

6. Sediment and erosion control measures shall not be placed in wetlands or waters except within the footprint of temporary or permanent impacts authorized under this Certification. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0501 and .0502]

7. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02B .0201]

8. An NPDES Construction Stormwater Permit (NCG010000) is required for construction projects that disturb one (1) or more acres of land. The NCG010000 Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If the project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. [15A NCAC 02H .0506(b)(5) and (c)(5)]

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit. [15A NCAC 02H .0506(b)(5) and (c)(5)]

9. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the *NC Sediment and Erosion Control Manual*, or the *NC DOT Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(3) and (c)(3)]

10. If activities must occur during periods of high biological activity (e.g. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities. [15A NCAC 02H .0506 (b)(2) and 15A NCAC 04B .0125]

    All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium. A copy of the approval from the resource agency shall be forwarded to DWR.

    Work within a designated trout watershed of North Carolina (as identified by the Wilmington District of the US Army Corps of Engineers), or identified state or federal endangered or threatened species habitat, shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

11. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. 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 culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. [15A NCAC 02H .0506(b)(2) and (c)(2)]

Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

If multiple pipes or barrels are required, they shall be designed to mimic the existing stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel shall be avoided.

When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross vanes, etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 60 calendar days prior to the installation of the culvert.

When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as, a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 60 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application to and written approval from DWR.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(5)]

13. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters. [15A NCAC 02B .0200 and 15A NCAC 02B .0231]

14. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state. [15A NCAC 02B .0200]

15. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, planform pattern, and longitudinal bed profile. For projects that receive written approval, no temporary impacts are allowed beyond those included in the application and authorization. All temporarily impacted sites shall be restored and stabilized with native vegetation. [15A NCAC 02H .0506(b)(2) and (c)(2)]

16. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities* so as not to restrict stream flow or cause dis-equilibrium during use of this Certification. [15A NCAC 02H .0506(b)(2) and (c)(2)]

17. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original stream elevation and streambank contours are restored and maintained. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or in a manner that precludes aquatic life passage. [15A NCAC 02H .0506(b)(2)]

18. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures. [15A NCAC 02H .0506(b)(2)]

19. Applications for rip-rap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Rip-rap Groins in Estuarine and Public Trust Waters) shall meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

20. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils. [15A NCAC 02H .0506(b)(3) and (c)(3) and 15A NCAC 02B .0211 (12)]

21. Heavy equipment working in wetlands shall be placed on mats or other measures shall be taken to minimize soil disturbance. [15A NCAC 02H .0506(b)(3) and (c)(3)]

22. In accordance with 143-215.85(b), the applicant shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

*23. If an environmental document is required under the State Environmental Policy Act (SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse. If an environmental document is required under the National Environmental Policy Act (NEPA), then this General Certification is not valid until a Categorical Exclusion, the Final Environmental Assessment, or Final Environmental Impact Statement is published by the lead agency. [15A NCAC 01C .0107(a)]

24. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

25. The applicant and their authorized agents shall conduct all 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 DWR determines that such standards or laws are not being met, including 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, then DWR may revoke or modify a written authorization associated with this General Water Quality Certification. [15A NCAC 02H .0507(d)]

26. 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 Certification. A copy of this Certification, including all conditions shall be available at the project site during the construction and maintenance of this project. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

* 27. When written authorization is required for use of this Certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return a certificate of completion (available on the DWR website https://edocs.deq.nc.gov/Forms/Certificate-of-Completion). [15A NCAC 02H .0502(f)]

28. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards. [15A NCAC 02H .0507(c)]

29. If the property or project is sold or transferred, the new permittee shall be given a copy of this Certification (and written authorization if applicable) and is responsible for complying with all conditions. [15A NCAC 02H .0501 and .0502]

III. GENERAL CERTIFICATION ADMINISTRATION:

* 1. In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. An applicant for a CAMA permit under Article 7 of Chapter 113A of the General Statutes for which a Water Quality Certification is required shall only make one payment to satisfy both agencies; the fee shall be as established by the Secretary in accordance with 143-215.3D(e)(7).

2. This Certification neither grants nor affirms any property right, license, or privilege in any waters, or any right of use in any waters. This Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and this Certification does not create any prescriptive right or any right of priority regarding any usage of water. This Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Certification to possess any prescriptive or other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded.

3. This Certification grants permission to the Director, an authorized representative of the Director, or DWR staff, upon the presentation of proper credentials, to enter the property during normal business hours. [15A NCAC 02H .0502(e)]

4. This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide Permit and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification. This General Certification is rescinded when the US Army Corps of Engineers reauthorizes any of the corresponding Nationwide Permits and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Resources.

5. Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

* 6. The Director of the North Carolina Division of Water Resources may require submission of a formal application for Individual Certification for any project in this category of activity if it is deemed in the public's best interest or determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the water or downstream waters are precluded.

History Note: *Water Quality Certification (WQC) Number 4135 issued December 1, 2017 replaces WQC Number 4088 issued March 3, 2017; WQC 3886 issued March 12, 2012; WQC Number 3820 issued April 6, 2010; WQC Number 3627 issued March 2007; WQC Number 3404 issued March 2003; WQC Number 3375 issued March 18, 2002; WQC Number 3289 issued June 1, 2000; WQC Number 3103 issued February 11, 1997; WQC Number 2732 issued May 1, 1992; WQC Number 2666 issued January 21, 1992; WQC Number 2177 issued November 5, 1987.*

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER RESOURCES

WATER QUALITY GENERAL CERTIFICATION NO. 4276

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR US ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER 58 (UTILITY LINE ACTIVITIES FOR WATER AND OTHER SUBSTANCES)

Water Quality General Certification Number 4276 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 Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to surface waters and wetland areas as described in 33 CFR 330 Appendix A (B) (58) of the US Army Corps of Engineers regulations.

The State of North Carolina certifies that the specified category of activity will comply with water quality requirements and applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Effective date: March 15, 2021

Signed this day: December 18, 2020

By

S. Daniel Smith
Director

GC4276

GENERAL CERTIFICATION COVERAGE:

Activities that are eligible for US Army Corps of Engineers Nationwide Permit 58 qualify for coverage under this General Certification unless they meet one of the thresholds listed below. Activities meeting any one (1) of the thresholds or circumstances listed below are not eligible for coverage under this General Certification and require *an Individual* 401 Water Quality Certification from the Division of Water Resources (DWR):

a) If any of the conditions of this General Certification cannot be met; or
b) Total temporary impacts to streams greater than 500 feet within the entire utility project; or
c) Any permanent impacts to streams; or
d) Total permanent impacts to wetlands or open waters equal to or greater than one-tenth (1/10) acre within the entire utility project; or
e) Any stream restoration or stream relocation; or
f) Any high-density project, as defined in 15A NCAC 02H .1003(3) and by the density thresholds specified in 15A NCAC 02H .1017, which:
    i. Disturbs one acre or more of land (including a project that disturbs less than one acre of land that is part of a larger common plan of development or sale); and
    ii. Has permanent wetland, stream or open water impacts; and
    iii. Is proposing new built-upon area; and
    iv. Does not have a stormwater management plan reviewed and approved under a state stormwater program[1] or a state-approved local government stormwater program[2].

    Projects that have vested rights, exemptions, or other legacy rights or exemptions from state or locally-implemented stormwater programs and projects that satisfy state or locally-implemented stormwater programs through use of community in-lieu fee programs **require an Individual 401 Certification**; or
g) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as: ORW (including SAV), HQW (including PNA), SA, WS-I, WS-II, Trout, or North Carolina or National Wild and Scenic River; or
h) Any permanent impacts to coastal wetlands [15A NCAC 07H .0205], or Unique Wetlands (UWL) [15A NCAC 02B .0231]; or
i) Any impacts to subject water bodies and/or state regulated riparian buffers along subject water bodies in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman Lake, Jordan Lake or Goose Creek Watersheds (or any other basin or watershed with State Regulated Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless*:
    i. The activities are listed as "EXEMPT" or "DEEMED ALLOWABLE" from these rules; or

[1] e.g. Coastal Counties, HQW, ORW, or state-implemented Phase II NPDES
[2] e.g. Delegated Phase II NPDES, Water Supply Watershed, Nutrient-Sensitive Waters, or Universal Stormwater Management Program

ii. A Buffer Authorization Certificate is issued by the NC Division of Coastal Management (DCM); or
iii. A Buffer Authorization Certificate, Certificate with Exception, or Minor Variance is issued by a delegated or designated local government implementing a state riparian buffer program pursuant to 143-215.23.

In accordance with 15A NCAC 02H .0503(f), the Director of the North Carolina Division of Water Resources may require submission of a formal application for Individual Certification for any project if it is deemed in the public's best interest or determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or will degrade the waters so that existing uses of the waters or downstream waters are precluded.

This General Certification does not relieve the permittee of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

This General Certification neither grants nor affirms any property right, license, or privilege in any waters, or any right of use in any waters. This General Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and does not create any prescriptive right or any right of priority regarding any usage of water. This General Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this General Certification to possess any prescriptive or other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded.

Upon the presentation of proper credentials, DWR may inspect the property.

This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this General Certification. This General Certification is rescinded when the US Army Corps of Engineers reauthorizes the corresponding Nationwide Permit or when deemed appropriate by the Director of the Division of Water Resources.

Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

I. ACTIVITY SPECIFIC CONDITIONS:

1. All sewer lines shall be designed, constructed and maintained in accordance with Title 15A NCAC Chapter 02T, applicable Minimum Design Criteria (MDC), and/or Alternative Design Criteria.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: The referenced Minimum Design criteria and 02T rules were adopted to ensure that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity; wildlife: secondary contact recreation: agriculture); and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

2. Any utility construction corridor that is parallel to a stream or open water shall not be closer than 10 feet to the top of bank or ordinary high-water mark.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

3. Where there are temporary or permanent impacts from stream crossings, utility lines shall cross the stream channel at a near-perpendicular direction (i.e., between 75 degrees and 105 degrees to the stream bank).

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

4. Construction corridors in wetlands and/or across stream channels shall be minimized to the maximum extent practicable and shall not exceed 40 feet wide.

   For construction corridors in wetlands and across stream channels, stumps shall be grubbed only as needed to install the utility, and remaining stumps shall be cut off at grade level. The general stripping of topsoil within wetlands along the construction corridor is prohibited.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses, and

the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

5. Permanent maintained access corridors in wetlands and across stream channels shall be restricted to the minimum width practicable and shall not exceed 30 feet wide.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

6. For all utility lines constructed within wetlands, an anti-seep collar shall be placed at the downstream (utility line gradient) wetland boundary and every 150 feet up the gradient until the utility exits the wetland. Anti-seep collars may be constructed with class B concrete, compacted clay, PVC pipe, or metal collars. Wetland crossings that are directionally drilled, and perpendicular wetland crossings that are open cut and less than 150 feet long do not require anti-seep collars. The compacted clay shall have a specific infiltration of 1 X 10^{-5} cm/sec or less. A section and plan view diagram is attached for the anti-seep collars.

   The following specifications shall apply to class B concrete:
   i. Minimum cement content, sacks per cubic yard with rounded coarse aggregate 5.0
   ii. Minimum cement content, sacks per cubic yard with angular coarse aggregate 5.5
   iii. Maximum water-cement ratio gallons per sack 6.8
   iv. Slump range 2" to 4"
   v. Minimum strength - 28-day psi 2,500

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

7. The permittee shall restore wetland contours to pre-construction conditions. Any excess material will be removed to a high ground disposal area.

   The mixing of topsoil and subsoils within the wetlands along utility corridors shall be minimized to the greatest extent practical. During excavation, the soils shall be placed on

fabric to minimize impacts whenever possible. Topsoil excavated from utility trenches will be piled separately from subsoils and will be backfilled into the trench only after the subsoils have been placed and compacted.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. In determining that the proposed activity will comply with state water quality standards (including designated uses, numeric criteria, narrative criteria and the state's antidegradation policy), the Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards or would result in secondary or cumulative impacts.

II. GENERAL CONDITIONS:

1. The permittee shall report to the DWR Regional Office any noncompliance with, and/or any violation of, stream or wetland standards [15A NCAC 02B .0200], including but not limited to sediment impacts to streams or wetlands. Information shall be provided orally within 24 hours (or the next business day if a weekend or holiday) from the time the permittee became aware of the non-compliance circumstances.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: Timely reporting of non-compliance is important in identifying and minimizing detrimental impacts to water quality and avoiding impacts due to water pollution that precludes any best use on a short-term or long-term basis.

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts); or beyond the thresholds established for use of this General Certification and Nationwide Permit.

   Citation: 15A NCAC 02H .0506; 15A NCAC 02H .0507(c)
   Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity; wildlife; secondary contact recreation; agriculture); and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

3. All activities shall be in compliance with any applicable State Regulated Riparian Buffer Rules in Chapter 2B of Title 15A in the North Carolina Administrative Code.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: The referenced Riparian Buffer rules were adopted to address water quality impairments and further protect existing uses.

4. 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.

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 *North Caroline Department of Transportation Sediment and Erosion Control Manual*.

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.

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.

If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, 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 Watersheds*.

Citation: 15A NCAC 02H .0506(b)(2); 15A NCAC 02H .0507(c); 15A NCAC02B .0200; 15A NCAC 02B .0231
Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (12) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

5. Sediment and erosion control measures shall not be installed in wetland or waters except within the footprint of temporary or permanent impacts otherwise authorized by this

Certification. If placed within authorized impact areas, then placement of such measures shall not be conducted in a manner that results in dis-equilibrium of any wetlands, streambeds, or streambanks. Any silt fence installed within wetlands shall be removed from wetlands and the natural grade restored within two (2) months of the date that DEMLR or locally delegated program has released the specific area within the project to ensure wetland standards are maintained upon completion of the project.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC02B .0200; 15A NCAC 02B .0231
Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (12) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

6. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
   Justification: A project that affects waters shall not be permitted unless the existing uses (including aquatic life propagation and biological integrity), and the water quality to protect such uses, are protected. Protections are necessary to ensure any remaining surface waters or wetlands, and any surface waters or wetlands downstream, continue to support existing uses during and after project completion. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

7. If the project is covered by NPDES Construction Stormwater Permit Number NCG010000 or NPDES Construction Stormwater Permit Number NCG250000, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required.

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their Individual NPDES Stormwater Permit Number NCS000250.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200; 15A NCAC 02B .0231
Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (12) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. As cited in Wetland Standards: (1) Liquids, fill or other solids, or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses; and (3) Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.

8. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the *NC Sediment and Erosion Control Manual*, or the *NC Department of Transportation Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water.

   Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200
   Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses; and (12) turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes, or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

9. If activities must occur during periods of high biological activity (e.g. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities.

   All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries

(DMF), or National Marine Fisheries Service (NMFS) shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium.

Work within a designated trout watershed of North Carolina (as identified by the Wilmington District of the US Army Corps of Engineers), or identified state or federal endangered or threatened species habitat, shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 04B .0125
Justification: In order to protect against impairment of water quality standards and best usage of receiving and downstream waters, water quality based management practices must be employed to protect against direct or indirect discharge of waste or other sources of water pollution. Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity, wildlife, secondary contact recreation, agriculture), and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

10. In-stream structures installed to mimic natural channel geomorphology such as cross-vanes, sills, step-pool structures, etc. shall be designed and installed in such a manner that allow for continued aquatic life movement.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
    Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. Ensuring that in-stream structures are installed properly will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

11. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. 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 culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. If the width of the culvert is wider than the stream channel, the culvert shall include multiple boxes/pipes, baffles, benches and/or sills to maintain the natural width of the stream channel. If multiple culverts/pipes/barrels are used, low flows shall be accommodated in one culvert/pipe and additional culverts/pipes shall be installed such that they receive only flows above bankfull.

    Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life. If the culvert outlet is submerged within a pool

or scour hole and designed to provide for aquatic passage, then culvert burial into the streambed is not required.

For structures less than 72" in diameter/width, and topographic constraints indicate culvert slopes of greater than 2.5% culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross-vanes, sills, baffles etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 30 calendar days prior to the installation of the culvert.

When bedrock is present in culvert locations, culvert burial is not required, provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 30 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. Ensuring that in-stream structures are installed properly will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
    Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. Ensuring that in-stream

structures are installed properly will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

13. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters.

    Citation: 15A 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0231
    Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.

14. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state.

    Citation: 15A 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200
    Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.

15. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross-sectional dimensions, planform pattern, and longitudinal bed profile. All temporarily impacted sites shall be restored and stabilized with native vegetation.

    Citation: 15A NCAC 02H.0506(b); 15A NCAC 02H .0507(c)
    Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Protections are necessary to ensure any remaining surface waters or wetlands, and any surface waters or wetlands downstream, continue to support existing uses after project completion.

16. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the

North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities so as not to restrict stream flow or cause dis-equilibrium during use of this General Certification.

Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. Ensuring that in-stream structures are installed properly will ensure that surface water quality standards are met and conditions of waters are suitable for all best uses.

17. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original streambed elevation and streambank contours are restored and maintained and shall consist of clean rock or masonry material free of debris or toxic pollutants. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or be installed in a manner that precludes aquatic life passage.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
    Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

18. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows, and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0201
    Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

19. Rip-rap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Rip-rap Groins in Estuarine and Public Trust Waters) shall meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

    Citation: 15A NCAC 02H .0507(c); 15A NCAC 07H .1400 et seq.

Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

20. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication, and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0200
    Justification: A project that affects waters shall not be permitted unless the existing uses, and the water quality to protect such uses, are protected. Activities must not cause water pollution that precludes any best use on a short-term or long-term basis. As cited in Stream Standards: (2) Oils, deleterious substances, or colored or other wastes: only such amounts as shall not render the waters injurious to public health, secondary recreation, or to aquatic life and wildlife, or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated uses.

21. Heavy equipment working in wetlands shall be placed on mats or other measures shall be taken to minimize soil disturbance and compaction.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c); 15A NCAC 02B .0231
    Justification: Wetland standards require maintenance or enhancement of existing uses of wetlands such that hydrologic conditions necessary to support natural biological and physical characteristics are protected; populations of wetland flora and fauna are maintained to protect biological integrity of the wetland; and materials or substances are not present in amounts that may cause adverse impact on existing wetland uses.

22. In accordance with 143-215.85(b), the permittee shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

    Citation: 15A NCAC 02H .0507(c); N.C.G.S 143-215.85(b)
    Justification: Person(s) owning or having control over oil or other substances upon notice of discharge must immediately notify the Department, or any of its agents or employees, of the nature, location, and time of the discharge and of the measures which are being taken or are proposed to be taken to contain and remove the discharge. This action is required in order to contain or divert the substances to prevent entry into the surface waters. Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule (including, at minimum: aquatic life propagation, survival, and maintenance of biological integrity; wildlife; secondary contact recreation; agriculture); and

that activities must not cause water pollution that precludes any best use on a short-term or long-term basis.

23. The permittee and their authorized agents shall conduct all 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.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
    Justification: Surface water quality standards require that conditions of waters be suitable for all best uses provided for in state rule, and that activities must not cause water pollution that precludes any best use on a short-term or long-term basis. The Division must evaluate if the activity has avoided and minimized impacts to waters, would cause or contribute to a violation of standards, or would result in secondary or cumulative impacts.

24. 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 General Certification. A copy of this General Certification shall be available at the project site during the construction and maintenance of this project.

    Citation: 15A NCAC 02H .0506(b); 15A NCAC 02H .0507(c)
    Justification: Those actually performing the work should be aware of the requirements of this 401 Water Quality General Certification to minimize water quality impacts.

History Note: Water Quality Certification (WQC) Number 4276 issued December 18, 2020 replaces WQC 4133 issued December 1, 2017 for activities eligible for USACE NWP 58; WQC 4086 issued March 3, 2017; WQC 3884 issued March 19, 2012; WQC 3819 issued March 19, 2010; WQC 3699 issued November 1, 2007; WQC 3625 issued March 19, 2007; WQC 3374 issued March 18, 2002; WQC 3288 issued June 1, 2000; WQC 3101 issued February 11, 1997; WQC 3022 issued September 6, 1995, WQC 2664 issued January 21, 1992.

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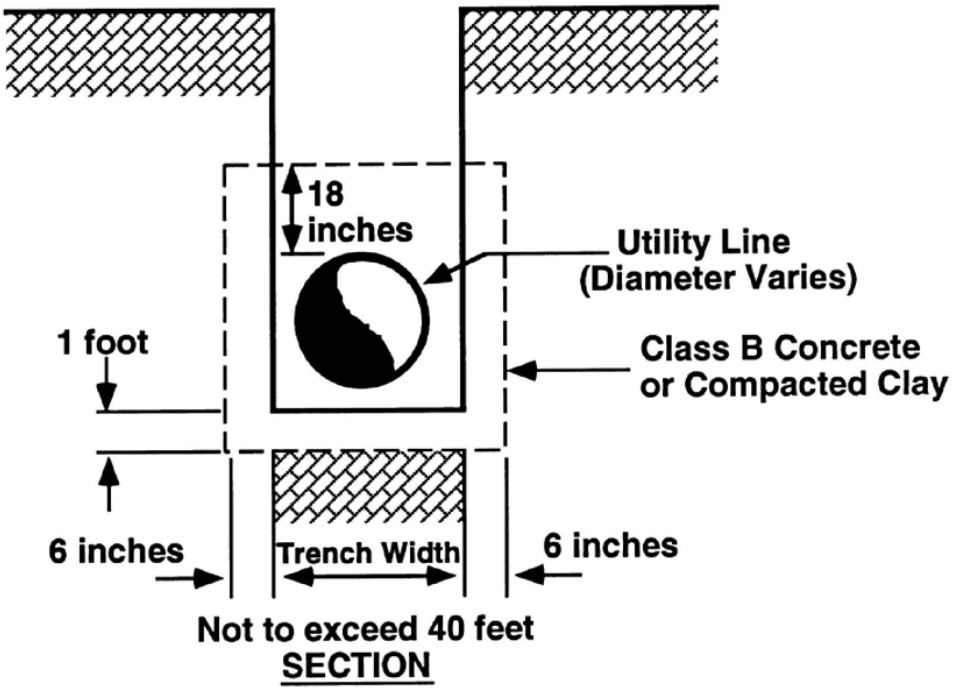
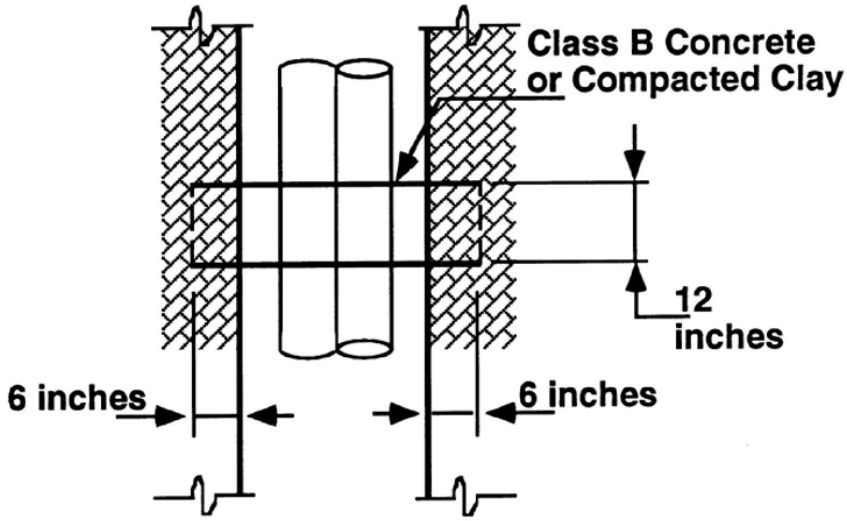
GC4276

ANTI -SEEP COLLAR



SECTION



PLAN

09/08/99

CONTRACT: C204123

TIP PROJECT: R-5021

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

BRUNSWICK COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5021	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
41582.1.1	STP-0211(021)	PE
41582.2.2	STP-0211(021)	UTILITIES
41582.2.3	STP-0211(021)	R/W
41582.3.1	STP-0211(021)	CONSTRUCTION

PERMIT DRAWING
SHEET 1 OF 95

REVISED 10-5-2021

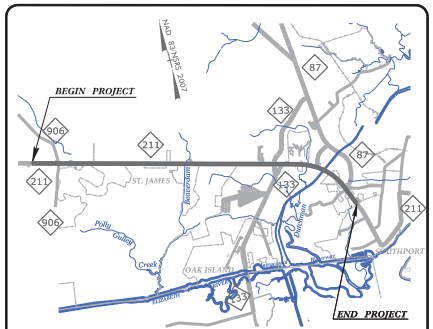
LOCATION: NC 211 FROM WEST OF NC 906 (MIDWAY ROAD) TO EAST OF NC 87

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, CULVERTS & SIGNALS CULVERTS, SIGNALS, AND RETAINING WALLS

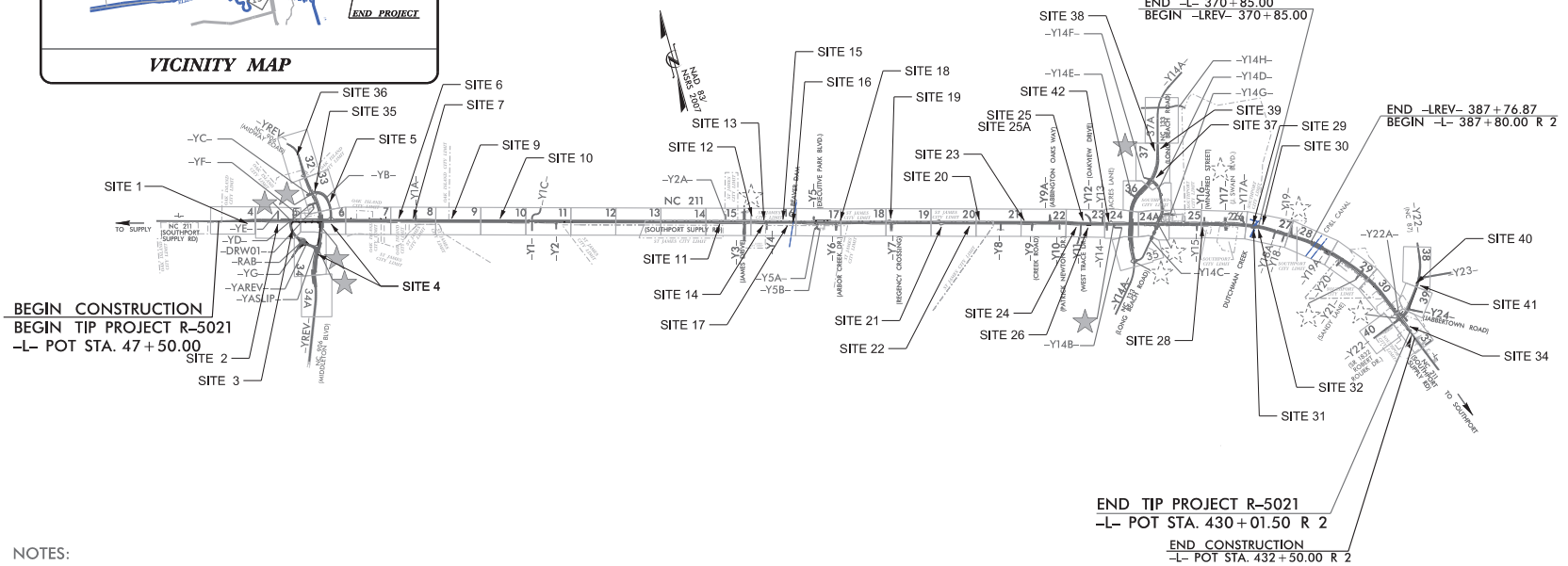
EXISTING TRAFFIC SIGNAL

PROPOSED TRAFFIC SIGNAL

WETLAND AND SURFACE WATER IMPACTS PERMIT



VICINITY MAP



NOTES:

1. THIS IS A PARTIAL CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

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 =	28,000
ADT 2039 =	44,000
K =	8 %
D =	55 %
T =	6 % *
V =	40-60 MPH
* (TTST 2% + DUAL 4%)	
FUNC CLASS =	
RURAL MAJOR COLLECTOR	
REGIONAL TIER	

PROJECT LENGTH

LENGTH OF ROADWAY T.I.P. PROJECT R-5021 = 7.158 MILES

LENGTH OF STRUCTURES T.I.P. PROJECT R-5021 = 0.086 MILES

TOTAL LENGTH OF T.I.P. PROJECT R-5021 = 7.244 MILES

ALL LENGTH BASED ON -L- CENTERLINE
STRUCTURES LENGTH BASED ON EBL

ALL LENGTH BASED ON -L- CENTERLINE

Prepared In the Office of:
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JANUARY 28, 2016

LETTING DATE: NOVEMBER 16, 2021

DOUGLAS M. WHEATLEY, PE
PROJECT ENGINEER

ANDREW HALL, PE
PROJECT DESIGN ENGINEER

MICHAEL BASS
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

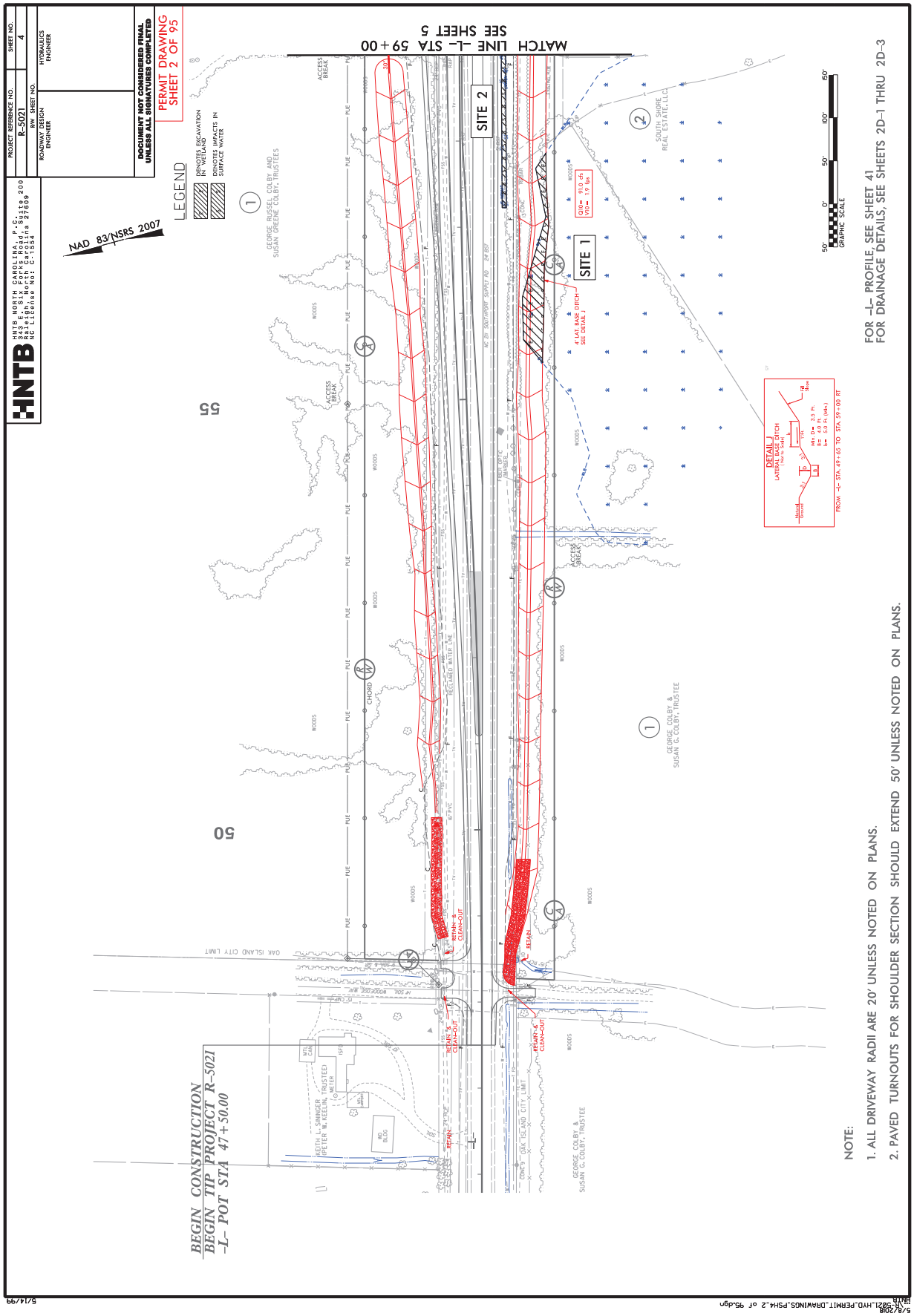
ROADWAY DESIGN ENGINEER

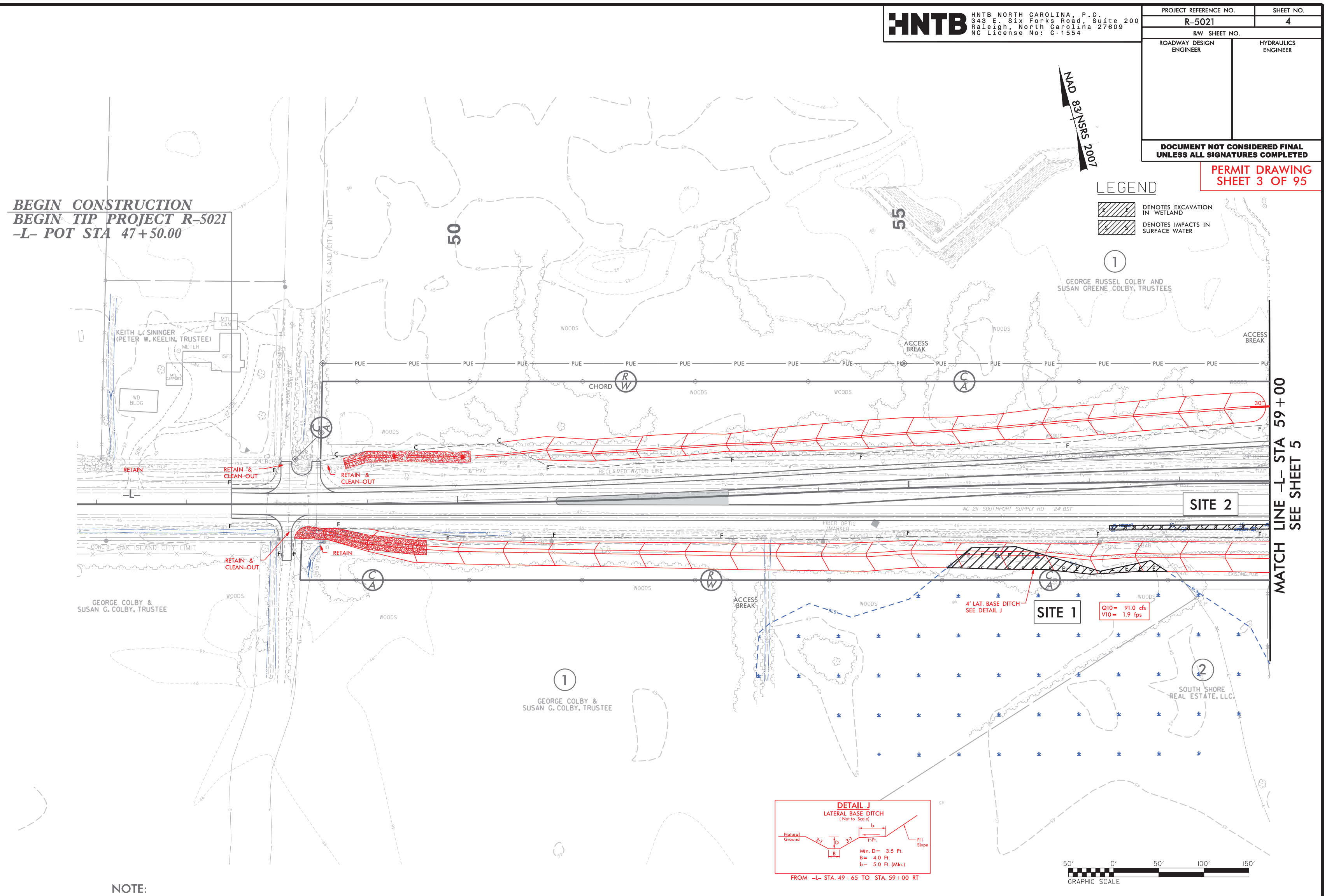
SIGNATURE: P.E.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

10/5/2021
HNTB
R5021_HYD_PERMIT_DRAWINGS_PSH_1of 95_TSH.dgn

P-106


HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
SHEET NO.
4
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 2 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
MATCH LINE -L- STA 59+00
SEE SHEET 5
SITE 1
SITE 2
BEGIN CONSTRUCTION
BEGIN TIP PROJECT R-5021
-L- POT STA 47+50.00
OAK ISLAND CITY LIMIT
GEORGE RUSSELL COLBY AND SUSAN IRENE COLBY, TRUSTEES
GEORGE COLBY & SUSAN G. COLBY, TRUSTEE
SOUTH SHORE REAL ESTATE, LLC
KEITH L. SINNIGER (PETER W. KEELIN, TRUSTEE)
RETAIN & CLEAN-OUT
4' LAT. BASE DITCH SEE DETAIL J
DETAIL J
LATERAL BASE DITCH
FROM -L- STA. 49+65 TO STA. 59+00 RT
GRAPHIC SCALE
50' 0' 50' 100' 150'
FOR -L- PROFILE, SEE SHEET 41
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
5/4/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH4-2 of 95.dgn
HNTB
5/4/299



NOTE:

1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

FOR -L- PROFILE, SEE SHEET 41
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3

5/8/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH4_3 of 95.dgn

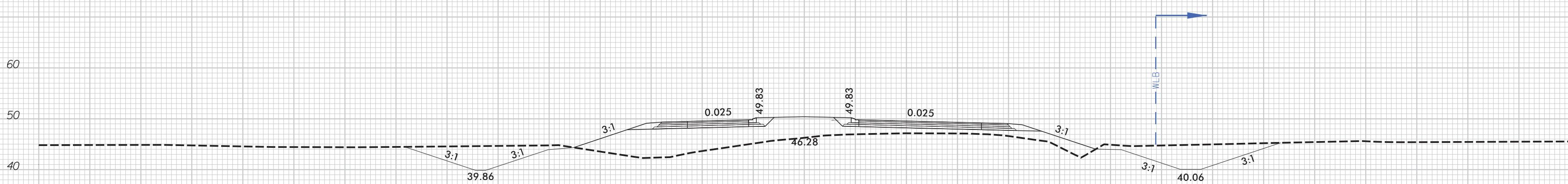
5/14/99

5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-5021	

PERMIT DRAWING
SHEET 4 OF 95

WETLAND CROSS SECTIONS

SITE 1
-L- 56+00.00

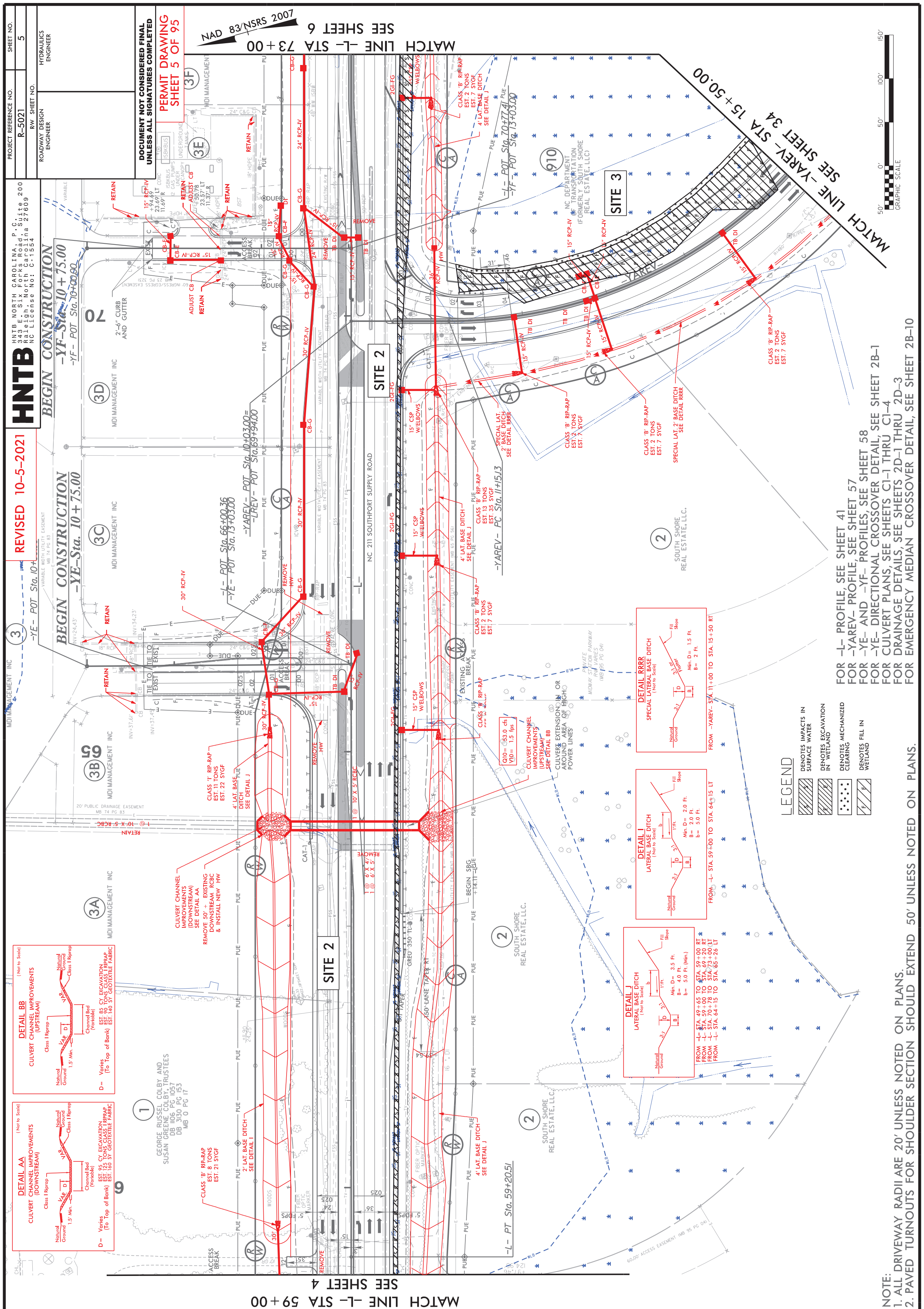


SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

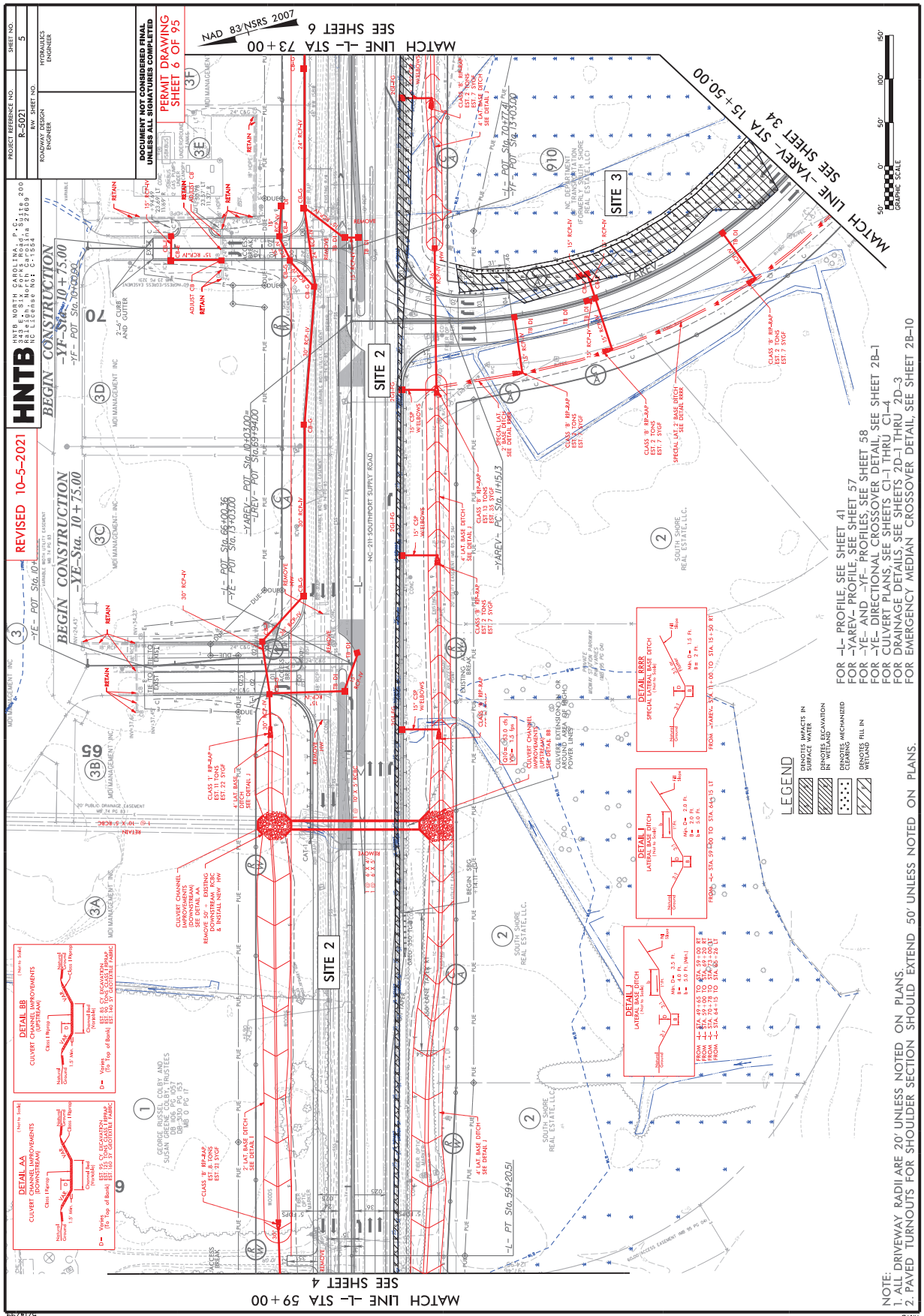
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16

5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB


HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
REVISED 10-5-2021
PROJECT REFERENCE NO. R-5021
SHEET NO. 5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 5 OF 95
NAD 83/NSRS 2007
MATCH LINE -L- STA 73+00 SEE SHEET 6
MATCH LINE -L- STA 59+00 SEE SHEET 4
MATCH LINE -YAREV- STA 15+50.00 SEE SHEET 34
BEGIN CONSTRUCTION -YF- Sta. 10+75.00
BEGIN CONSTRUCTION -YE- Sta. 10+75.00
NC 211 SOUTHPORT SUPPLY ROAD
SITE 2
SITE 3
DETAIL AA
CULVERT CHANNEL IMPROVEMENTS (DOWNSTREAM)
EST. 95 CY EXCAVATION
EST. 125 TONS CLASS I RIPRAP
EST. 160 SY GEOTEXTILE FABRIC
DETAIL BB
CULVERT CHANNEL IMPROVEMENTS (UPSTREAM)
EST. 85 CY EXCAVATION
EST. 90 TONS CLASS I RIPRAP
EST. 140 SY GEOTEXTILE FABRIC
DETAIL J
LATERAL BASE DITCH
DETAIL I
LATERAL BASE DITCH
DETAIL RRRR
SPECIAL LATERAL BASE DITCH
GEORGE RUSSEL COLBY AND SUSAN GREENE COLBY, TRUSTEES
MDI MANAGEMENT INC
SOUTH SHORE REAL ESTATE, LLC.
NC DEPARTMENT OF TRANSPORTATION (FORMERLY SOUTH SHORE REAL ESTATE, LLC)
LEGEND
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
FOR -L- PROFILE, SEE SHEET 41
FOR -YAREV- PROFILE, SEE SHEET 57
FOR -YE- AND -YF- PROFILES, SEE SHEET 58
FOR -YE- DIRECTIONAL CROSSOVER DETAIL, SEE SHEET 2B-1
FOR CULVERT PLANS, SEE SHEETS C1-1 THRU C1-4
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
FOR EMERGENCY MEDIAN CROSSOVER DETAIL, SEE SHEET 2B-10
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
GRAPHIC SCALE

P-111


HNTB
REVISED 10-5-2021
PERMIT DRAWING SHEET 6 OF 95
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. R-5021
SHEET NO. 5
BEGIN CONSTRUCTION -YE- Sta. 10+75.00
-YE- POT Sta. 10+00.00
-L- POT Sta. 66+00.36
-YE- POT Sta. 13+03.00
-YAREV- POT Sta. 10+03.00
-LREV- POT Sta. 69+19.00
-YAREV- PC Sta. 11+15.13
-L- PT Sta. 59+20.51
-YF- POT Sta. 10+77.41
-YF- POT Sta. 13+03.00
MATCH LINE -L- STA 73+00 SEE SHEET 6
MATCH LINE -L- STA 59+00 SEE SHEET 4
MATCH LINE -YAREV- STA 15+50.00 SEE SHEET 34
SITE 2
SITE 3
NC-211 SOUTHPORT SUPPLY ROAD
DETAIL AA
DETAIL BB
DETAIL I
DETAIL RRRR
LEGEND
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES WETLAND FILL IN
FOR -L- PROFILE, SEE SHEET 41
FOR -YAREV- PROFILE, SEE SHEET 57
FOR -YE- AND -YF- PROFILES, SEE SHEET 58
FOR -YE- DIRECTIONAL CROSSOVER DETAIL, SEE SHEET 2B-1
FOR CULVERT PLANS, SEE SHEETS C1-1 THRU C1-4
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
FOR EMERGENCY MEDIAN CROSSOVER DETAIL, SEE SHEET 2B-10
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

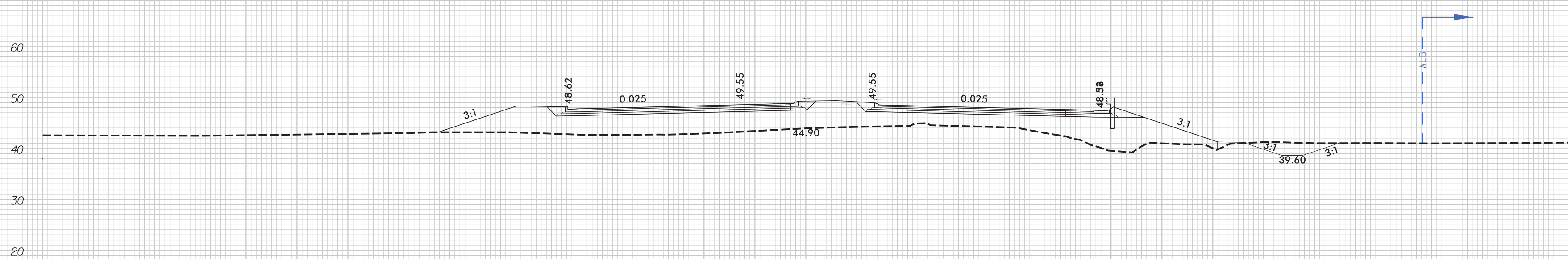
5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 7 OF 95

WETLAND CROSS SECTIONS

SITE 2

-L- 70+50.00



SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16
5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB

6/23/16

REVISED 10-5-2021

5 10

PROJ. REFERENCE NO.	SHEET NO.
R-5021	

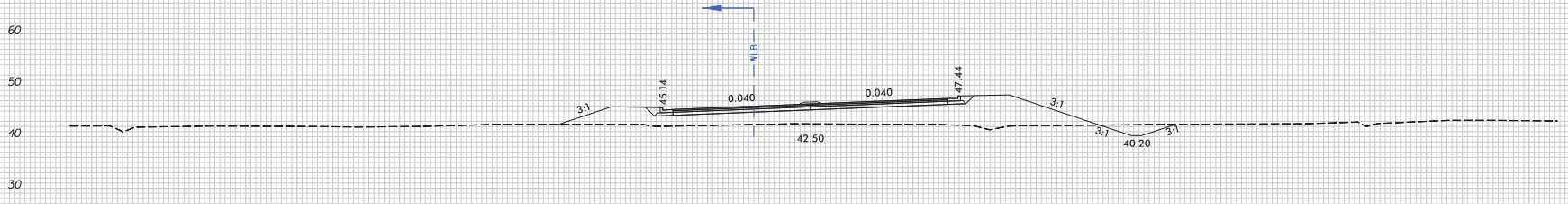
PERMIT DRAWING
SHEET 8 OF 95

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130

WETLAND CROSS SECTIONS

SITE 3

-YAREV- 13+50.00



SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

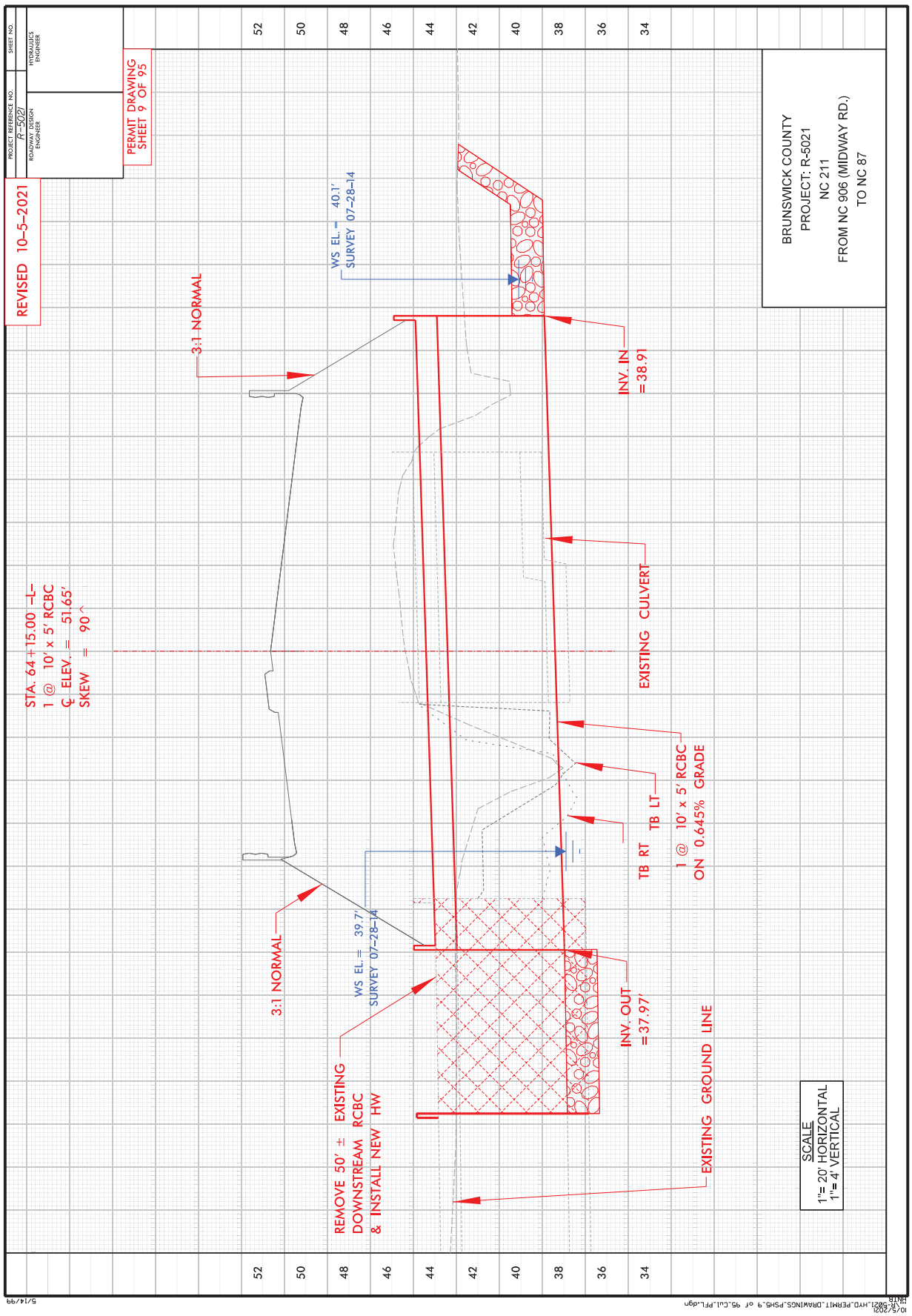
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM NC 906 (MIDWAY RD.)
TO NC 87

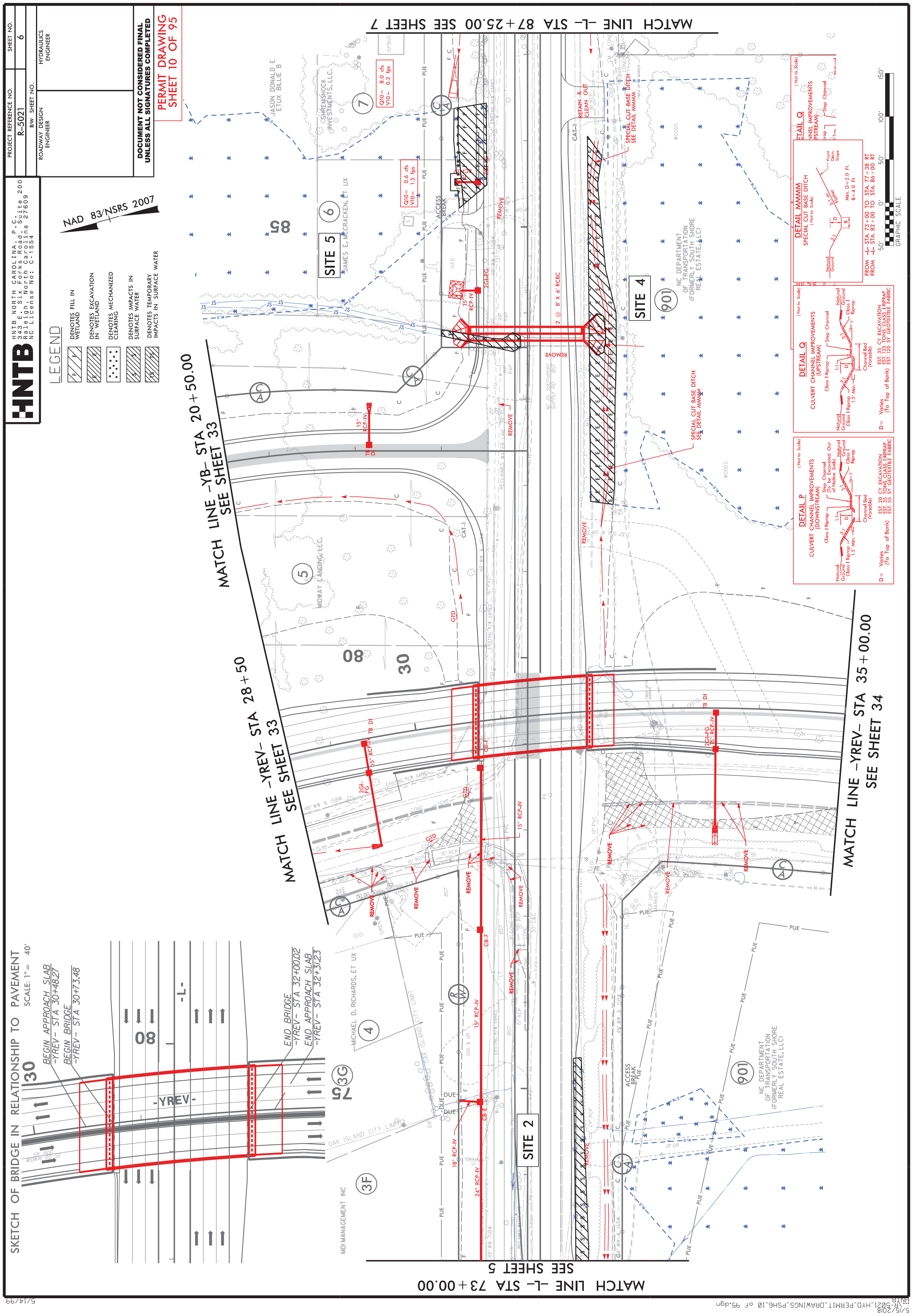
150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 10

10/5/202
HNB
Drawings\r-5021_hyd_prm_xpl.dgn

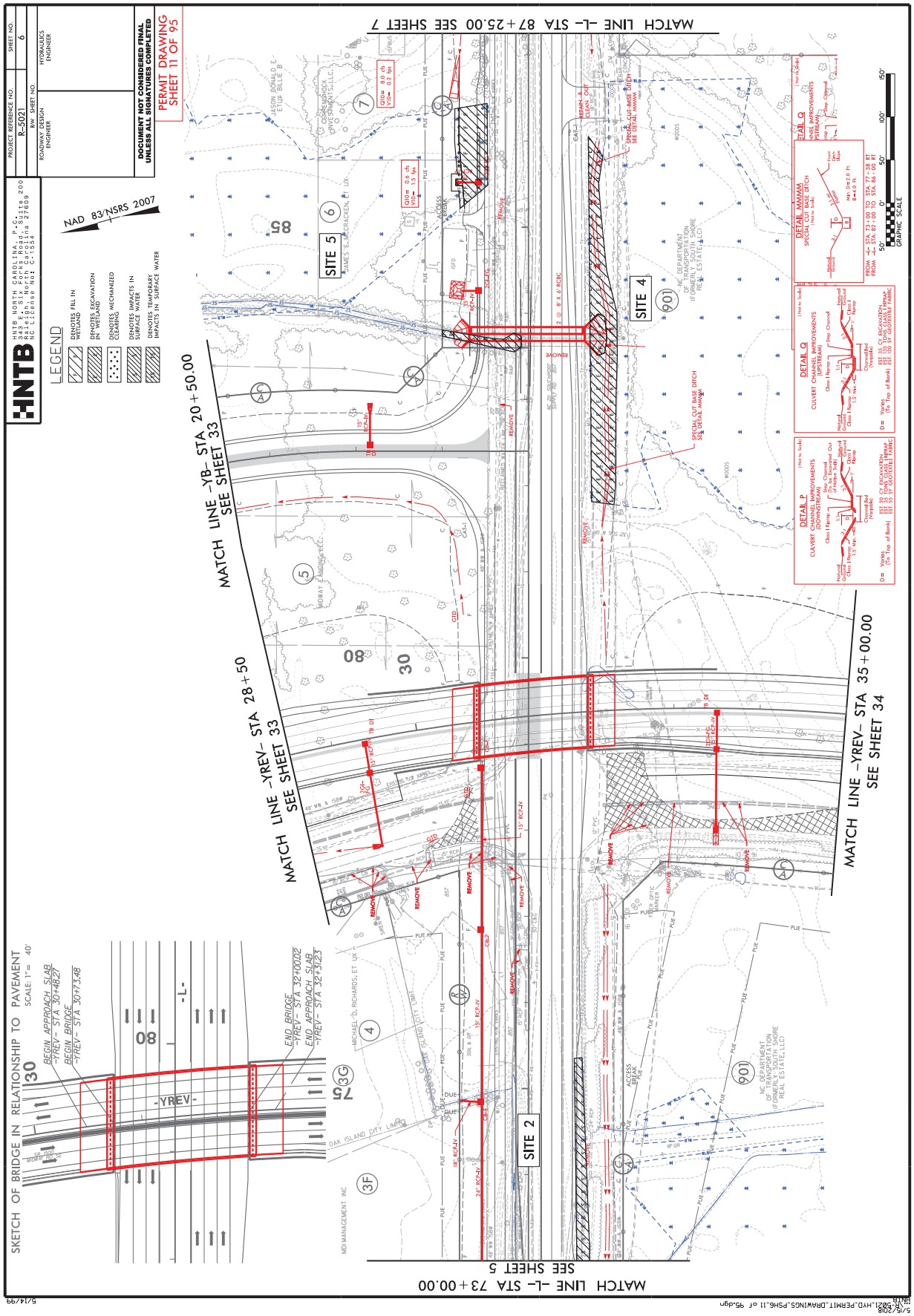
P-113

P-114

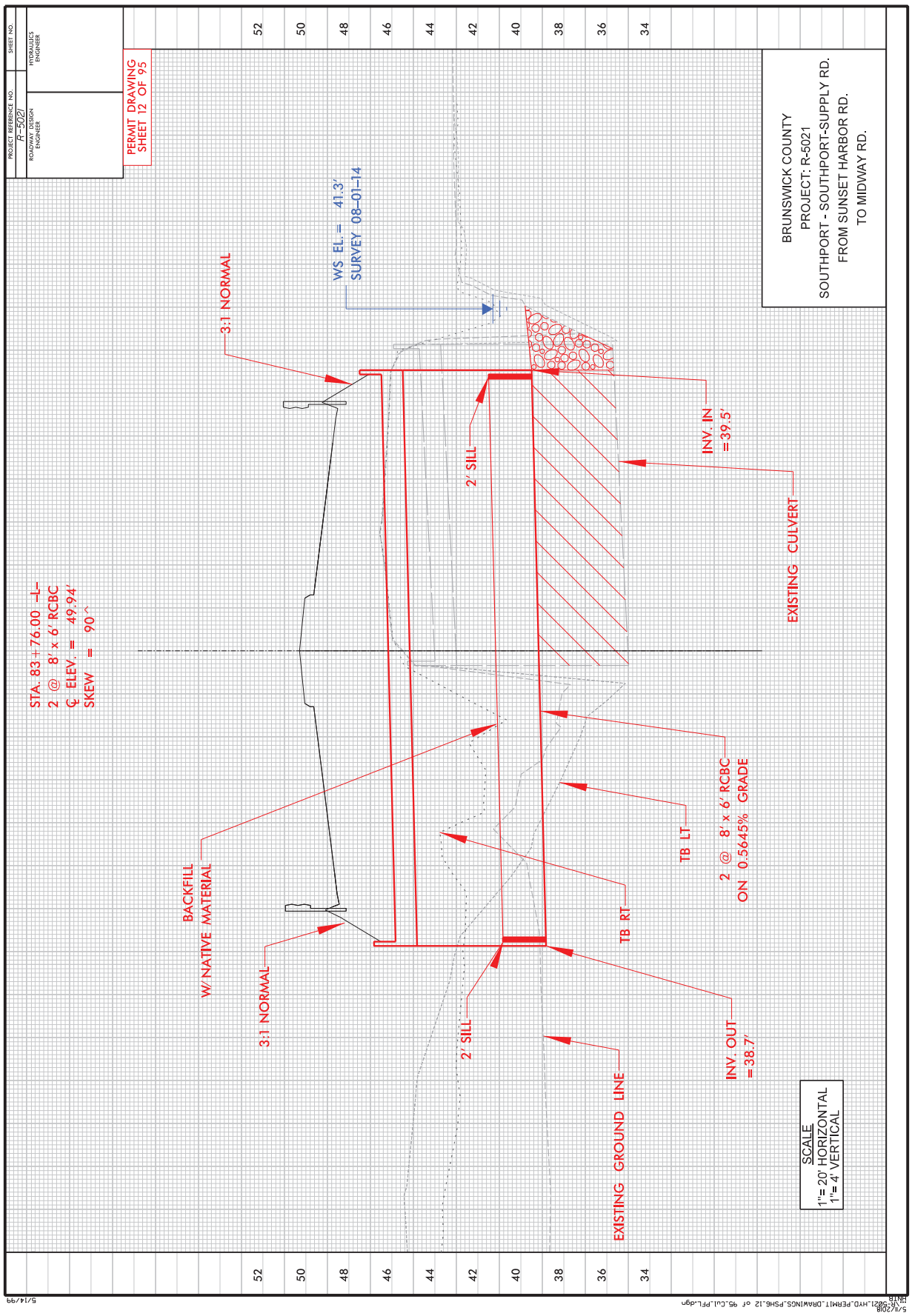

REVISED 10-5-2021
PERMIT DRAWING SHEET 9 OF 95
PROJECT REFERENCE NO. R-5021
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM NC 906 (MIDWAY RD.)
TO NC 87
STA. 64+15.00 -L-
1 @ 10' x 5' RCBC
℄ ELEV. = 51.65'
SKEW = 90°
3:1 NORMAL
WS EL. = 40.1'
SURVEY 07-28-14
INV. IN = 38.91
EXISTING CULVERT
TB RT
TB LT
1 @ 10' x 5' RCBC
ON 0.645% GRADE
3:1 NORMAL
WS EL. = 39.7'
SURVEY 07-28-14
REMOVE 50' ± EXISTING
DOWNSTREAM RCBC
& INSTALL NEW HW
INV. OUT = 37.97'
EXISTING GROUND LINE
SCALE
1"= 20' HORIZONTAL
1"= 4' VERTICAL
52
50
48
46
44
42
40
38
36
34


PERMIT DRAWING
SHEET 10 OF 95
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO. R-5021
SHEET NO. 6
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
HNTB
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/NSRS 2007
MATCH LINE -L- STA 87+25.00 SEE SHEET 7
MATCH LINE -L- STA 73+00.00 SEE SHEET 5
MATCH LINE -YB- STA 20+50.00 SEE SHEET 33
MATCH LINE -YREV- STA 28+50 SEE SHEET 33
MATCH LINE -YREV- STA 35+00.00 SEE SHEET 34
SITE 2
SITE 4
SITE 5
2 @ 8' X 6' RCBC
NC DEPARTMENT OF TRANSPORTATION (FORMERLY SOUTH SHORE REAL ESTATE, LLC)
MIDWAY LANDING LLC
MICHAEL D. RICHARDS, ET UX
JAMES E. MCCRACKEN, ET UX
JASON DONALD E ETUX BILLIE B
MDI MANAGEMENT INC
DETAIL P
DETAIL Q
DETAIL MMMM
SPECIAL CUT BASE DITCH
SKETCH OF BRIDGE IN RELATIONSHIP TO PAVEMENT
SCALE: 1" = 40'
BEGIN APPROACH SLAB -YREV- STA 30+48.27
BEGIN BRIDGE -YREV- STA 30+73.48
END BRIDGE -YREV- STA 32+00.02
END APPROACH SLAB -YREV- STA 32+31.23
-YREV-
-L-
GRAPHIC SCALE

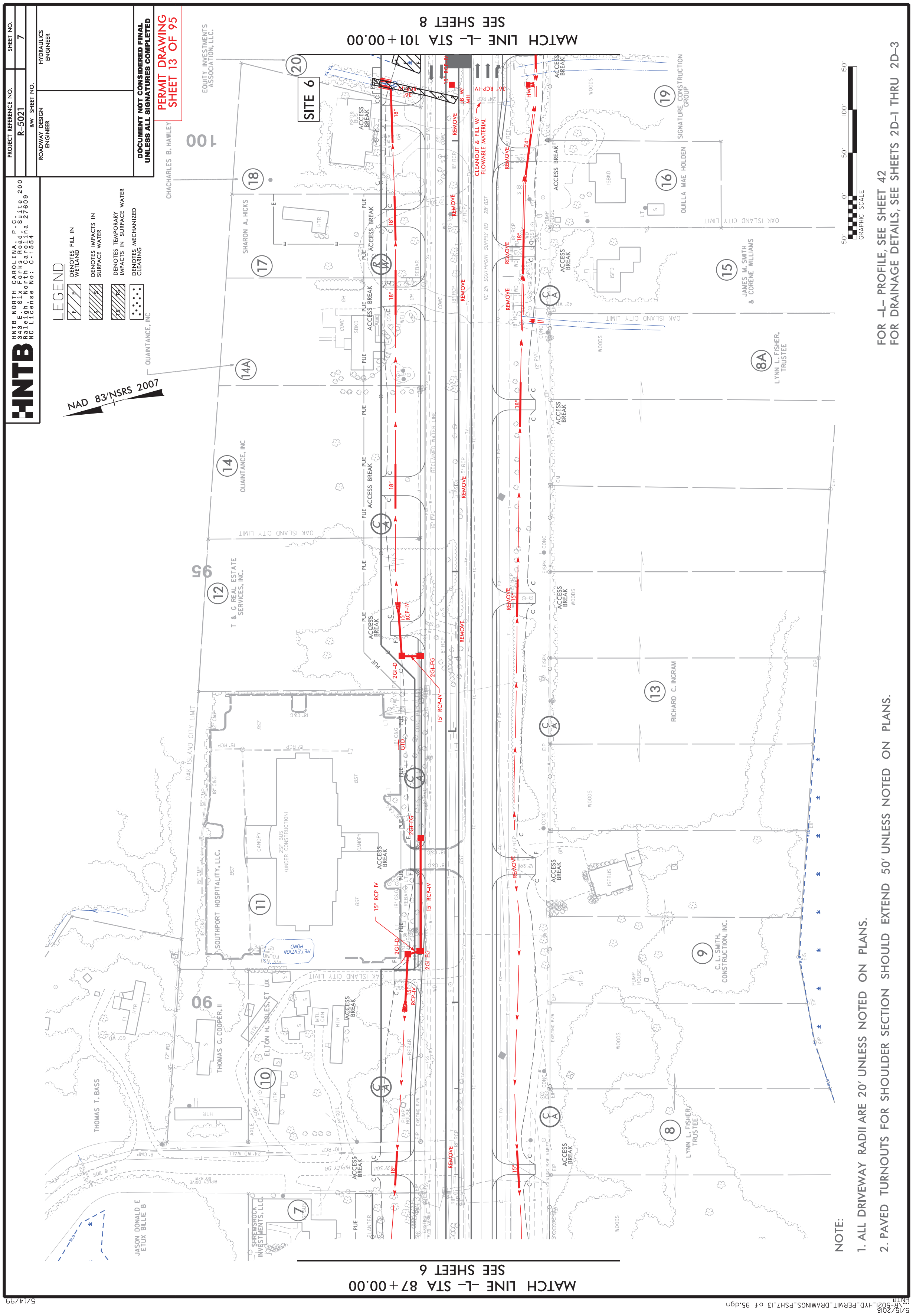
P-116


HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
SHEET NO.
6
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 11 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLANDS
DENOTES EXCAVATION IN WETLANDS
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCH LINE -L- STA 87+25.00 SEE SHEET 7
MATCH LINE -YB- STA 20+50.00 SEE SHEET 33
MATCH LINE -YREV- STA 28+50 SEE SHEET 33
MATCH LINE -YREV- STA 35+00.00 SEE SHEET 34
MATCH LINE -L- STA 73+00.00 SEE SHEET 5
SITE 2
SITE 4
SITE 5
SKETCH OF BRIDGE IN RELATIONSHIP TO PAVEMENT
SCALE: 1" = 40'
BEGIN APPROACH SLAB -YREV- STA. 30+48.27
BEGIN BRIDGE -YREV- STA. 30+73.48
END BRIDGE -YREV- STA. 32+00.02
END APPROACH SLAB -YREV- STA. 32+53.23
-YREV-
-L-
DETAIL M
SPECIAL CUT BASE DITCH
DETAIL Q
CULVERT CHANNEL IMPROVEMENTS (UPSTREAM)
DETAIL P
CULVERT CHANNEL IMPROVEMENTS (DOWNSTREAM)
DETAIL MMMM
SPECIAL CUT BASE DITCH
GRAPHIC SCALE

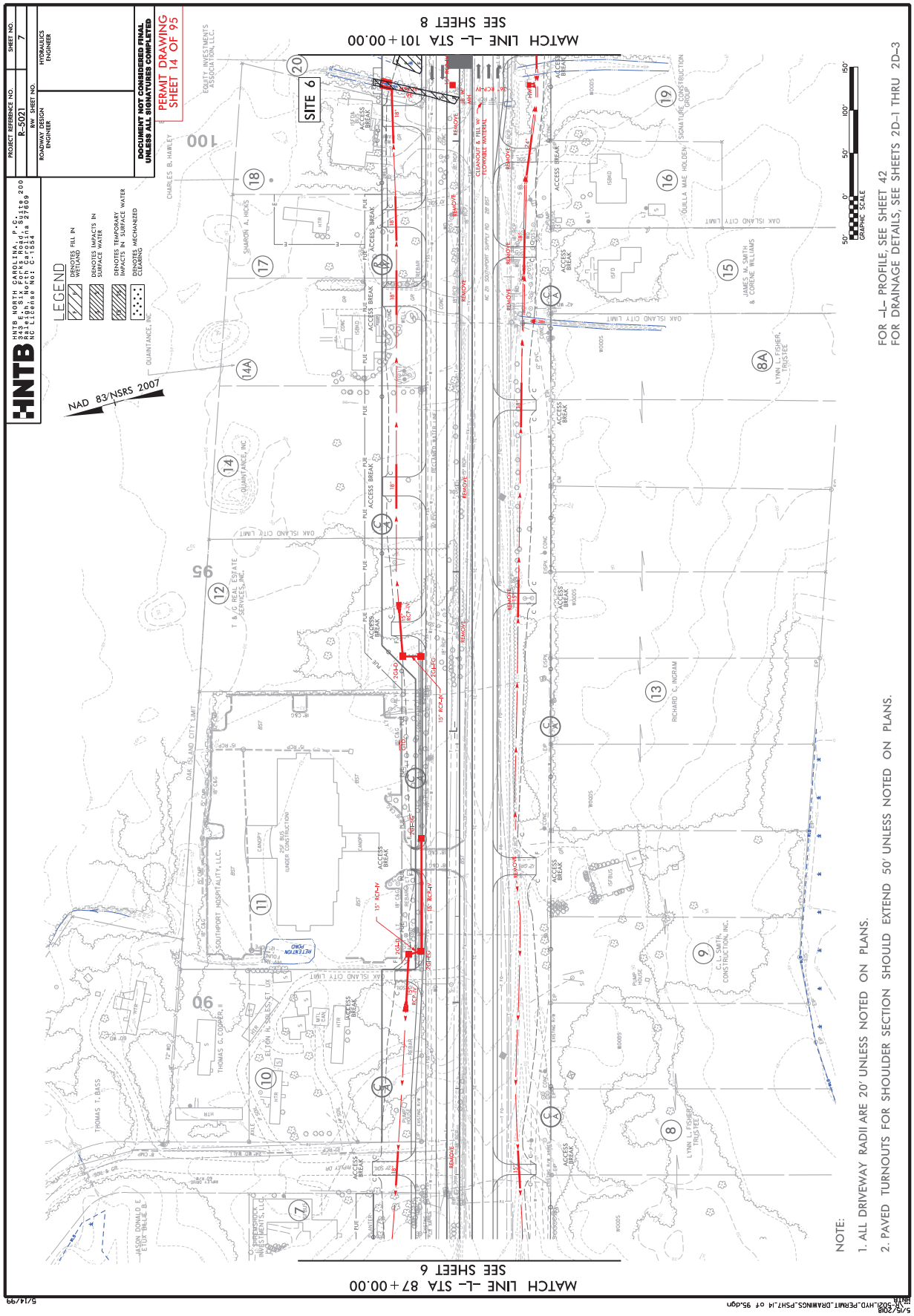
P-117


PROJECT REFERENCE NO.
R-5021
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PERMIT DRAWING SHEET 12 OF 95
BRUNSWICK COUNTY
PROJECT: R-5021
SOUTHPORT - SOUTHPORT-SUPPLY RD.
FROM SUNSET HARBOR RD.
TO MIDWAY RD.
STA. 83+76.00 -L-
2 @ 8' x 6' RCBC
℄ ELEV. = 49.94'
SKEW = 90°
WS EL. = 41.3'
SURVEY 08-01-14
3:1 NORMAL
2' SILL
INV. IN
=39.5'
EXISTING CULVERT
BACKFILL
W/ NATIVE MATERIAL
3:1 NORMAL
2' SILL
TB RT
TB LT
2 @ 8' x 6' RCBC
ON 0.5645% GRADE
EXISTING GROUND LINE
INV. OUT
=38.7'
SCALE
1"= 20' HORIZONTAL
1"= 4' VERTICAL
52
50
48
46
44
42
40
38
36
34
5/14/99
5/8/2018
R-5021_HYD_PERMIT_DRAWINGS_PSHG_12 of 95_Cul_PFL.dgn
BNTB

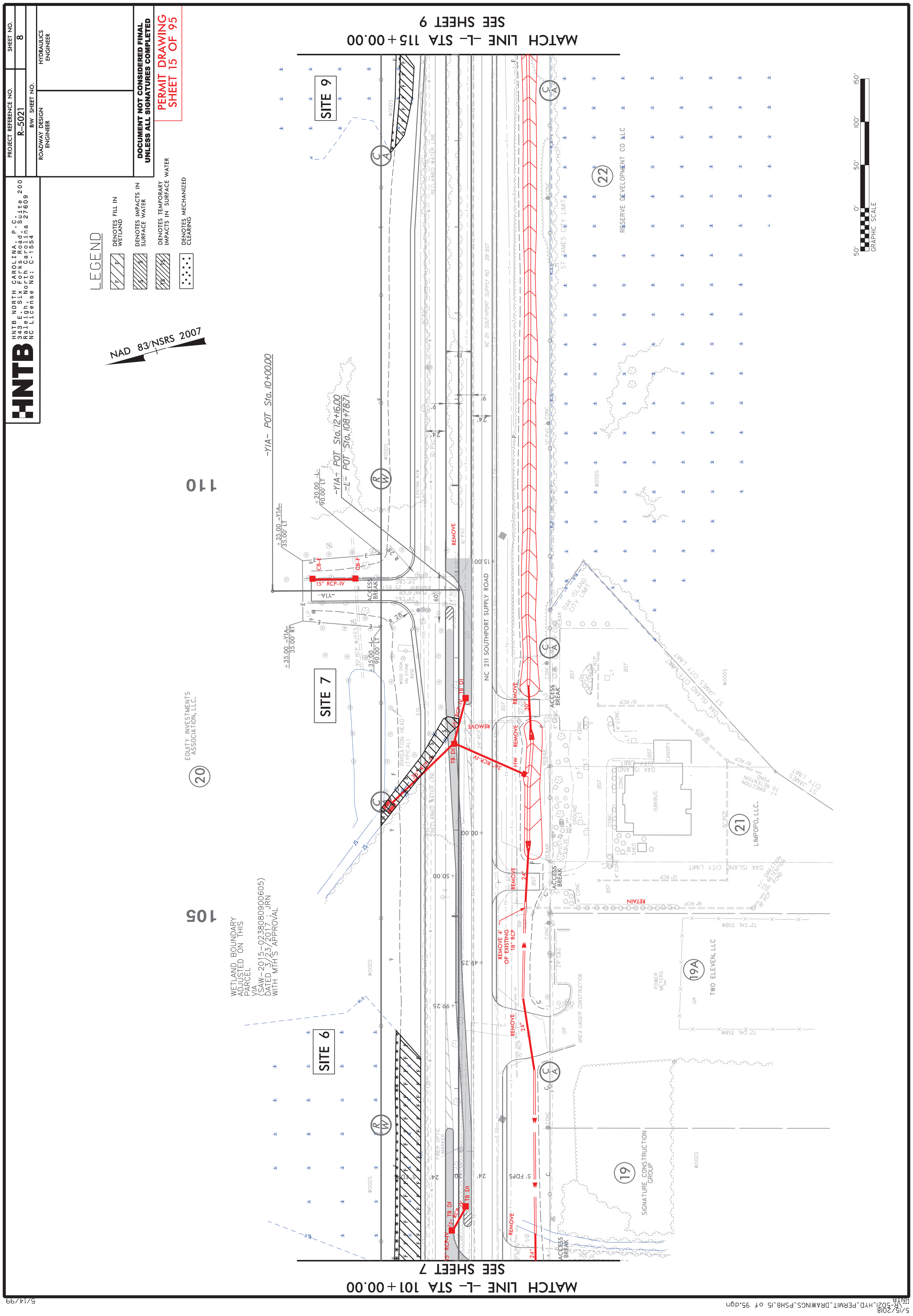
P-118


MATCH LINE -L- STA 101+00.00
SEE SHEET 8
MATCH LINE -L- STA 87+00.00
SEE SHEET 6
PROJECT REFERENCE NO. R-5021
SHEET NO. 7
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 13 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
SITE 6
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 42
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
GRAPHIC SCALE

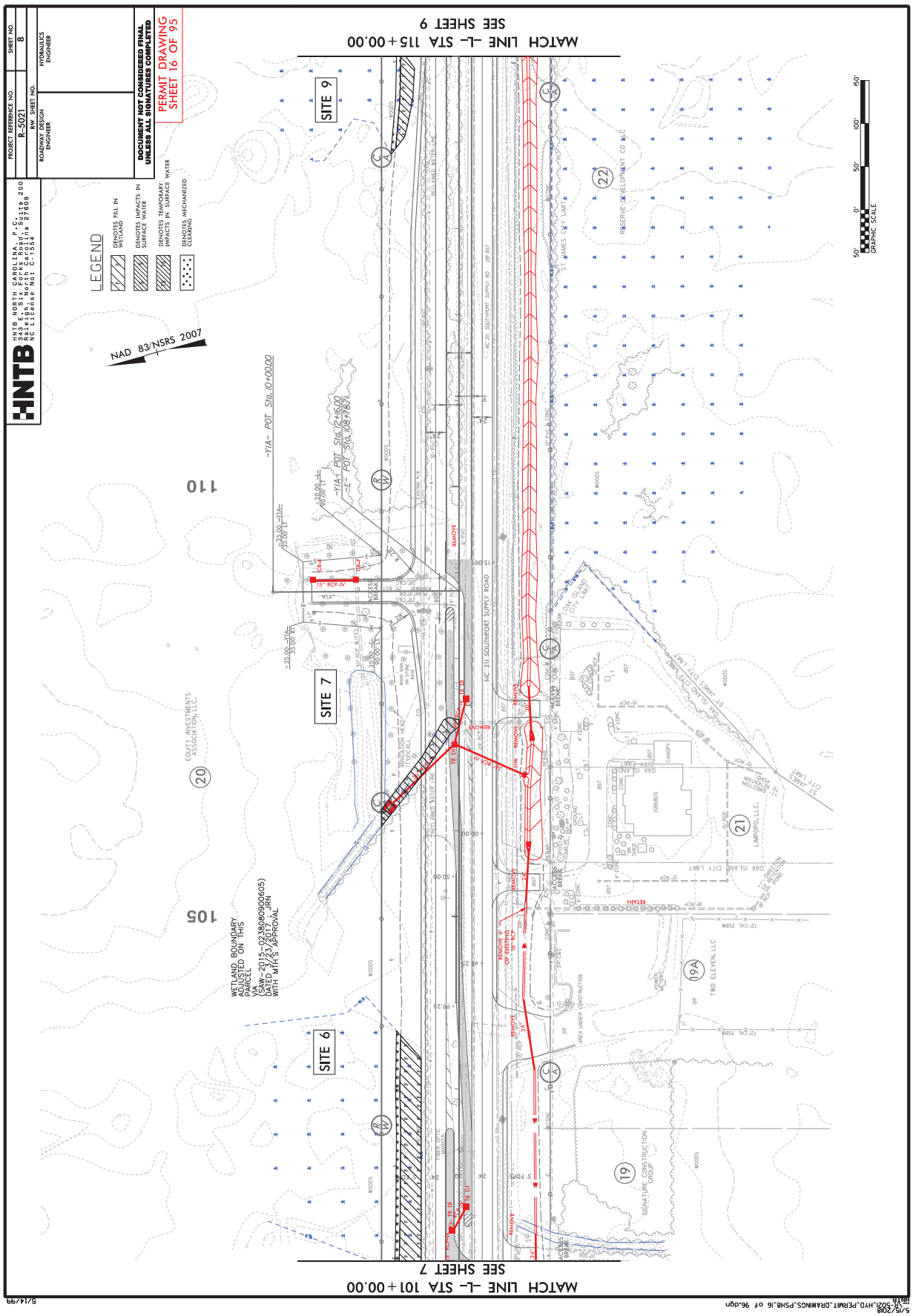
P-119


HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
7
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 14 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 101+00.00
SEE SHEET 8
MATCH LINE -L- STA 87+00.00
SEE SHEET 6
SITE 6
FOR -L- PROFILE, SEE SHEET 42
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
GRAPHIC SCALE
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

P-120


PROJECT REFERENCE NO.
R-5021
SHEET NO.
8
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 15 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 115+00.00
SEE SHEET 9
MATCH LINE -L- STA 101+00.00
SEE SHEET 7
SITE 9
SITE 7
SITE 6
110
105
NC 211 SOUTHPORT SUPPLY ROAD
-Y1A- POT Sta. 10+00.00
-Y1A- POT Sta. 12+16.00
-L- POT Sta. 108+78.71
EQUITY INVESTMENTS ASSOCIATION, LLC.
20
RESERVE DEVELOPMENT CO LLC
22
LIMPOPO, LLC.
21
TWO ELEVEN, LLC
19A
SIGNATURE CONSTRUCTION GROUP
19
WETLAND BOUNDARY ADJUSTED ON THIS PARCEL VIA (SAW-2015-02380809000605) DATED 3/23/2017 : JRN WITH MTH'S APPROVAL
ACCESS BREAK
REMOVE
RETAIN
GRAPHIC SCALE
5/14/99
5/15/2018

P-121



5/14/99

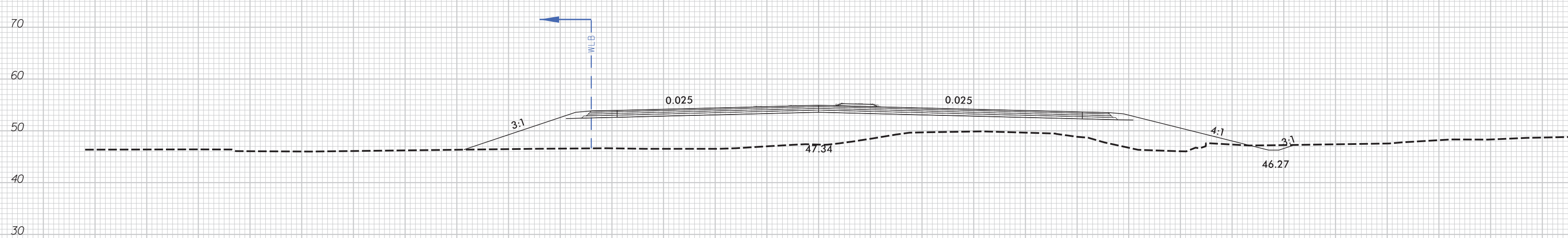
5/5/2020
...\R-5021_HYD_PERMIT_DRAWINGS_PSH8_16 of 96.dgn

5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 17 OF 95

WETLAND CROSS SECTIONS

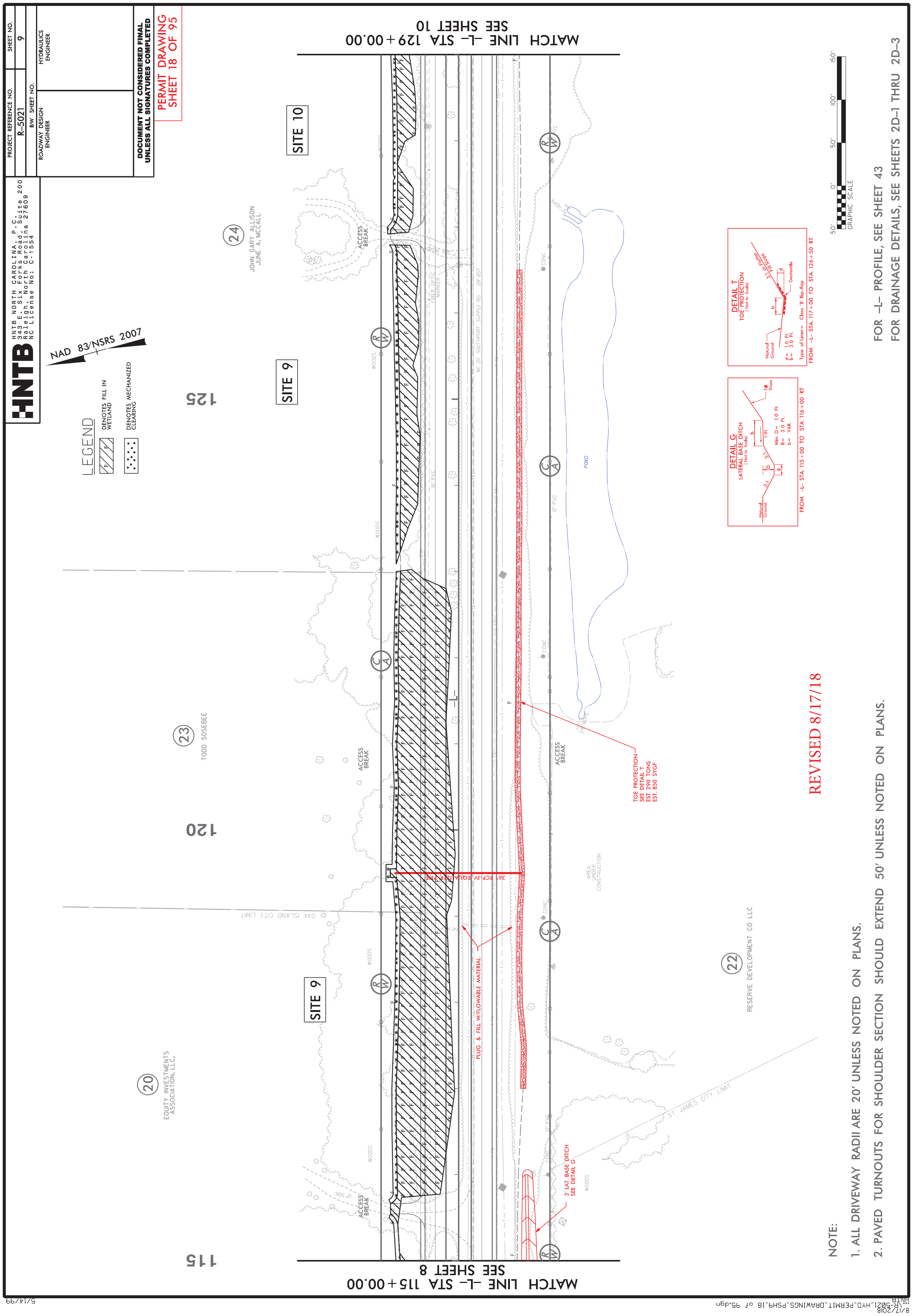
SITE 6
-L- 103+00.00



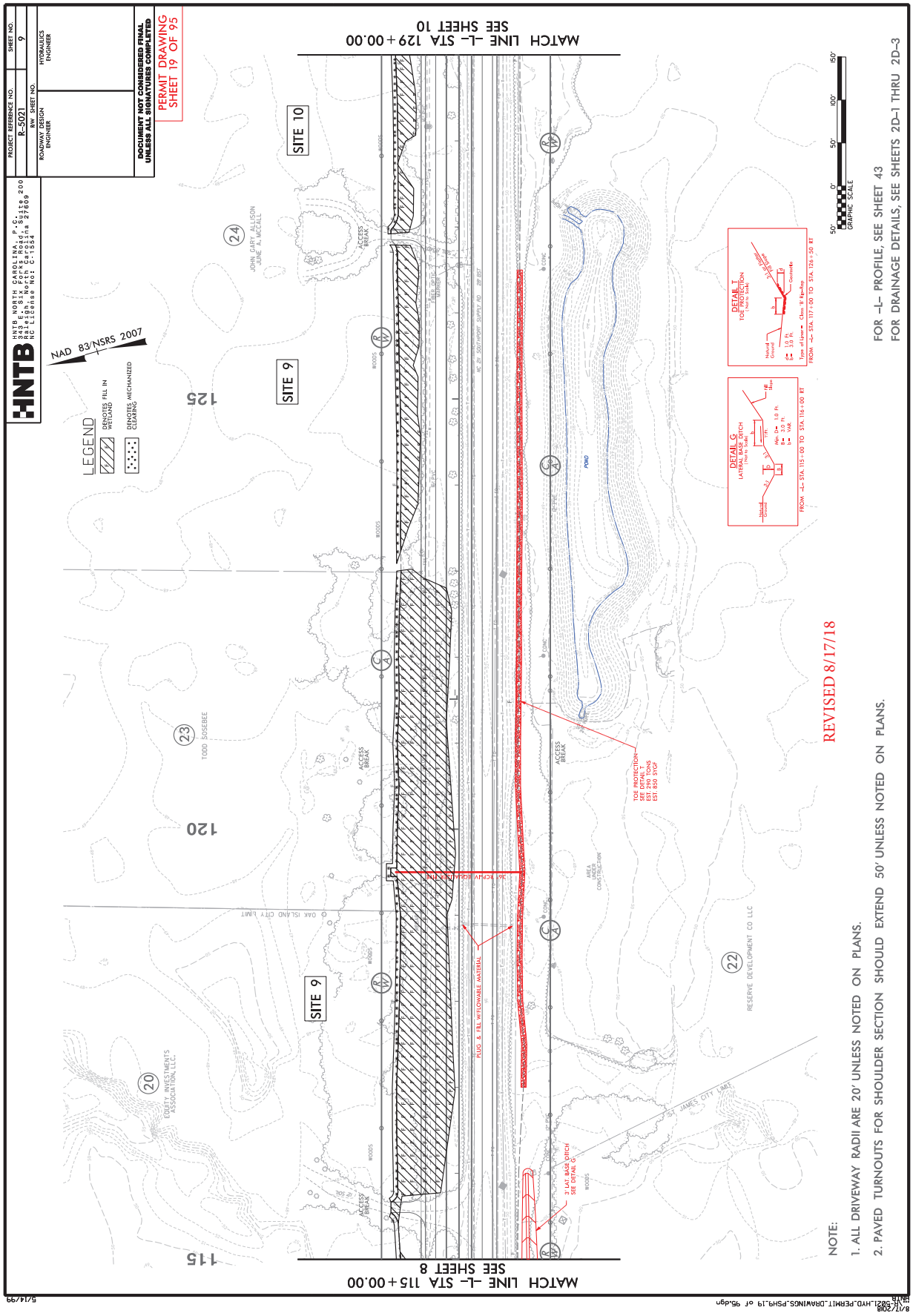
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16
5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB



PROJECT REFERENCE NO. R-5021
SHEET NO. 9
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 18 OF 95
HNTB NORTH CAROLINA, P.C. 343 E. Six Forks Road, Suite 200 Raleigh, North Carolina 27609 NC License No: C-1554
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH LINE -L- STA 129+00.00 SEE SHEET 10
MATCH LINE -L- STA 115+00.00 SEE SHEET 8
SITE 10
SITE 9
SITE 9
125
120
115
JOHN GARY ALLISON JUNE A. MCCALL
TODD SOSEBEE
EQUITY INVESTMENTS ASSOCIATION, LLC.
RESERVE DEVELOPMENT CO LLC
ACCESS BREAK
POND
OAK ISLAND CITY LIMIT
ST. JAMES CITY LIMIT
36" RCP-IV EQUALIZER PIPE
PLUG & FILL W/FLOWABLE MATERIAL
TOE PROTECTION SEE DETAIL T EST. 290 TONS EST. 850 SY GF
3' LAT BASE DITCH SEE DETAIL G
DETAIL T TOE PROTECTION (Not to Scale)
FROM -L- STA. 117+00 TO STA. 126+50 RT
DETAIL G LATERAL BASE DITCH (Not to Scale)
FROM -L- STA. 115+00 TO STA. 116+00 RT
REVISED 8/17/18
GRAPHIC SCALE
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 43
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3


HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
SHEET NO.
9
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 19 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH LINE -L- STA 129+00.00
SEE SHEET 10
MATCH LINE -L- STA 115+00.00
SEE SHEET 8
SITE 10
SITE 9
SITE 9
JOHN GARY ALLISON
JUNE A. MCCALL
TODD BOSEBEE
EQUITY INVESTMENTS ASSOCIATION, LLC
RESERVE DEVELOPMENT CO LLC
OAK ISLAND CITY LIMIT
JAMES CITY LAKE
POND
AREA UNDER CONSTRUCTION
TOE PROTECTION SEE DETAILS EST 850 SYCF
PLUG & FILL W/FILLWABLE MATERIAL
3' LAT. BASE DITCH SEE DETAIL G
ACCESS BREAK
WOODS
DETAIL G
LATERAL BASE DITCH
DETAIL T
TOE PROTECTION
FROM -L- STA. 115+00 TO STA. 116+00 RT
FROM -L- STA. 117+00 TO STA. 126+50 RT
REVISED 8/17/18
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 43
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
GRAPHIC SCALE
50' 0' 50' 100' 150'
8/17/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH9_19 of 95.dgn
5/14/99

6/23/16

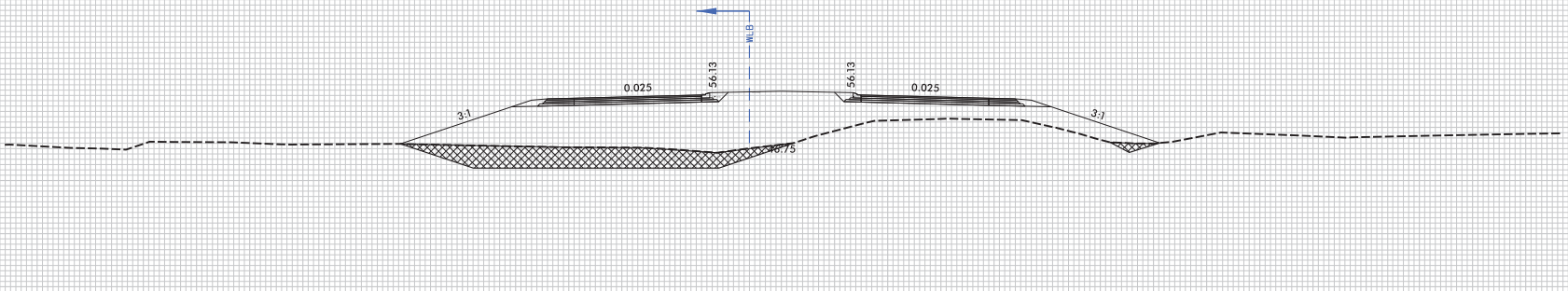
PROJ. REFERENCE NO.	SHEET NO.
R-5021	

PERMIT DRAWING
SHEET 20 OF 95

WETLAND CROSS SECTIONS

SITE 9

-L- 120+00.00



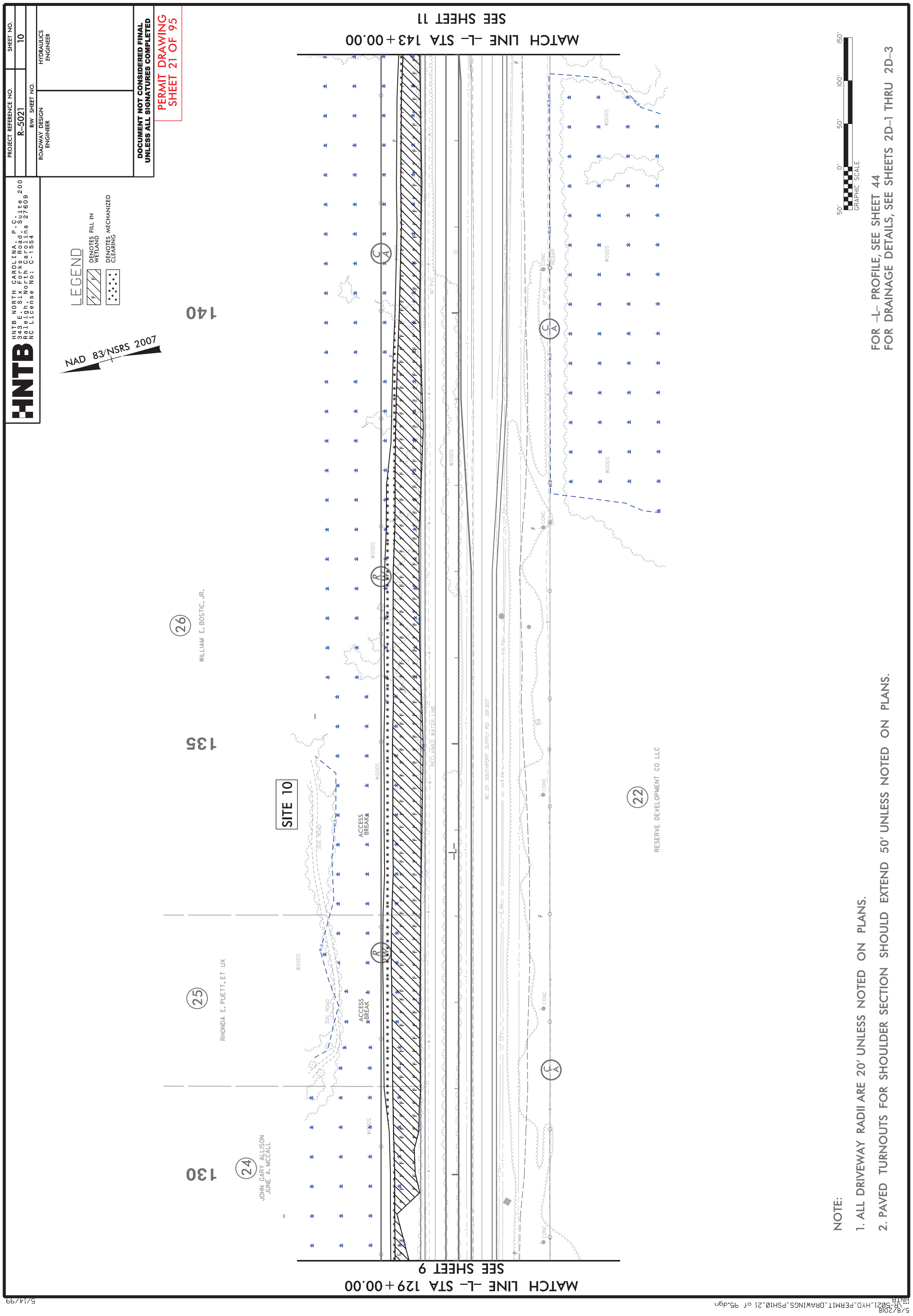
UNDERCUT EXCAVATION

SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

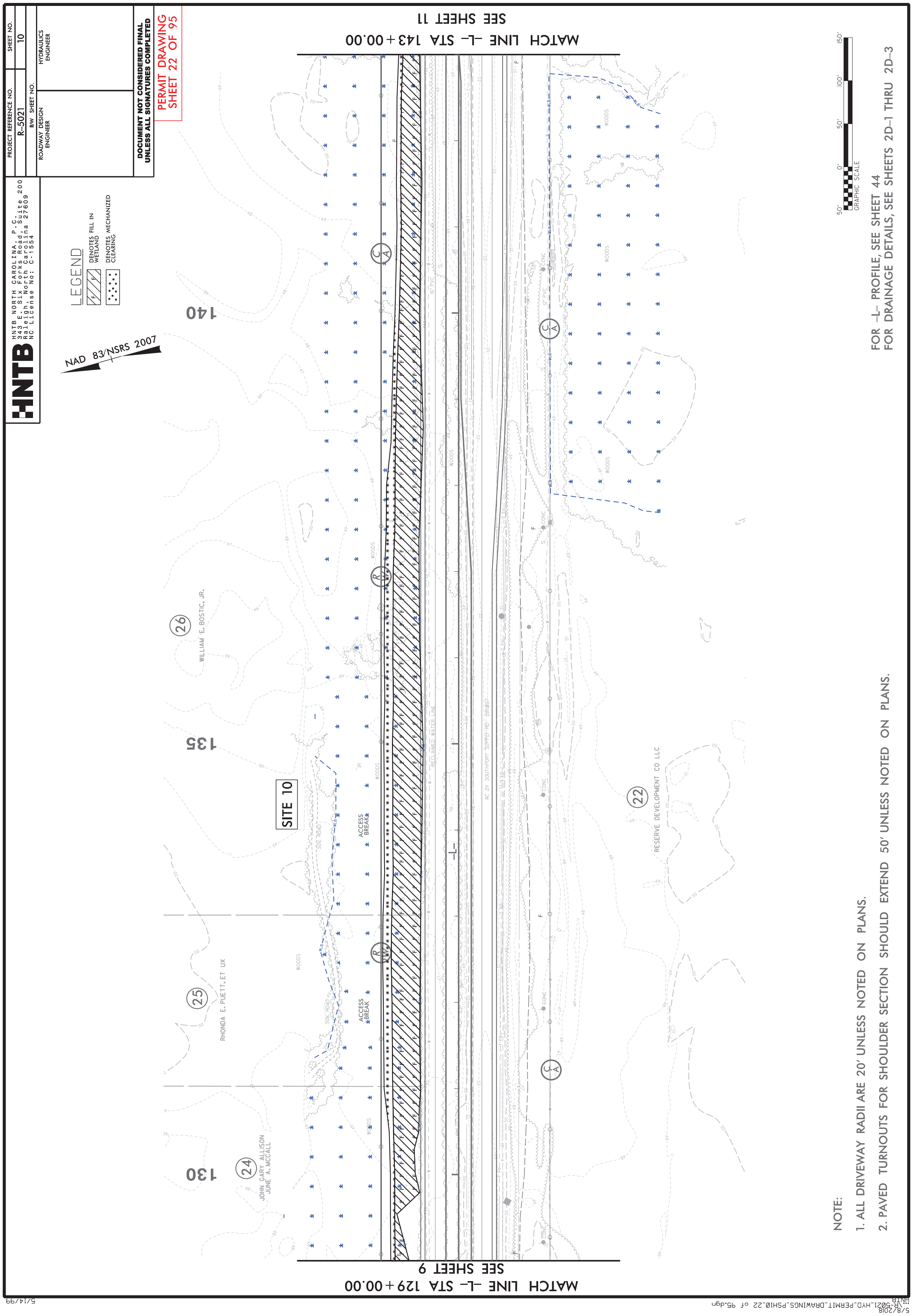
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

5/15/2018
H:\Projects\Drawings\r-5021_hyd_prm_xpl.dgn

P-126



PROJECT REFERENCE NO. R-5021
SHEET NO. 10
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 21 OF 95
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH LINE -L- STA 143+00.00
SEE SHEET 11
MATCH LINE -L- STA 129+00.00
SEE SHEET 9
140
135
130
SITE 10
26 WILLIAM E. BOSTIC, JR.
25 RHONDA E. PUETT, ET UX
24 JOHN GARY ALLISON JUNE A. MCCALL
22 RESERVE DEVELOPMENT CO LLC
ACCESS BREAK
WOODS
SOIL ROAD
NC 211 SOUTHPORT SUPPLY RD
RECLAIMED WATER LINE
GRAPHIC SCALE
50' 0 50' 100' 150'
FOR -L- PROFILE, SEE SHEET 44
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
5/14/99
5/8/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH10_21 of 95.dgn


PROJECT REFERENCE NO. R-5021
SHEET NO. 10
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 22 OF 95
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH LINE -L- STA 143+00.00
SEE SHEET 11
MATCH LINE -L- STA 129+00.00
SEE SHEET 9
SITE 10
WILLIAM E. BOSTIC, JR.
RHONDA E. PUETT, ET UX
JOHN GARY ALLISON
JUNE A. MCCALL
RESERVE DEVELOPMENT CO LLC
ACCESS BREAK
WOODS
130
135
140
GRAPHIC SCALE
FOR -L- PROFILE, SEE SHEET 44
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

6/23/16

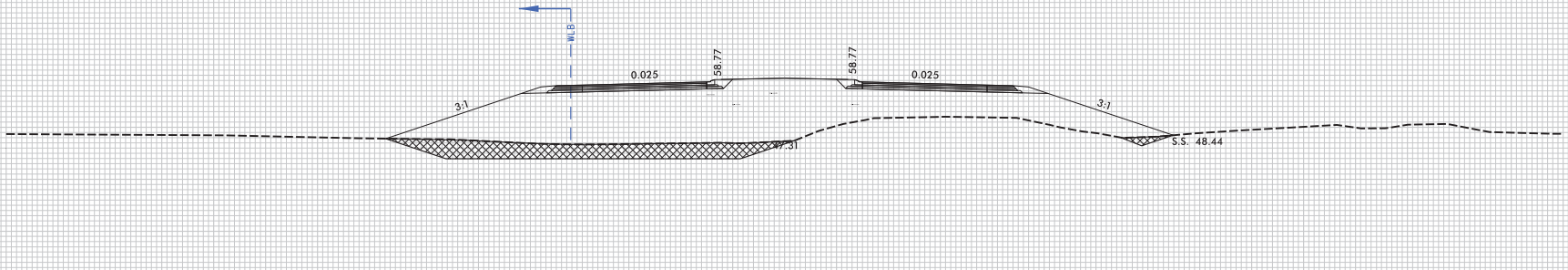
5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-5021	

PERMIT DRAWING
SHEET 23 OF 95

WETLAND CROSS SECTIONS

SITE 10

–L– 135+00.00



UNDERCUT EXCAVATION

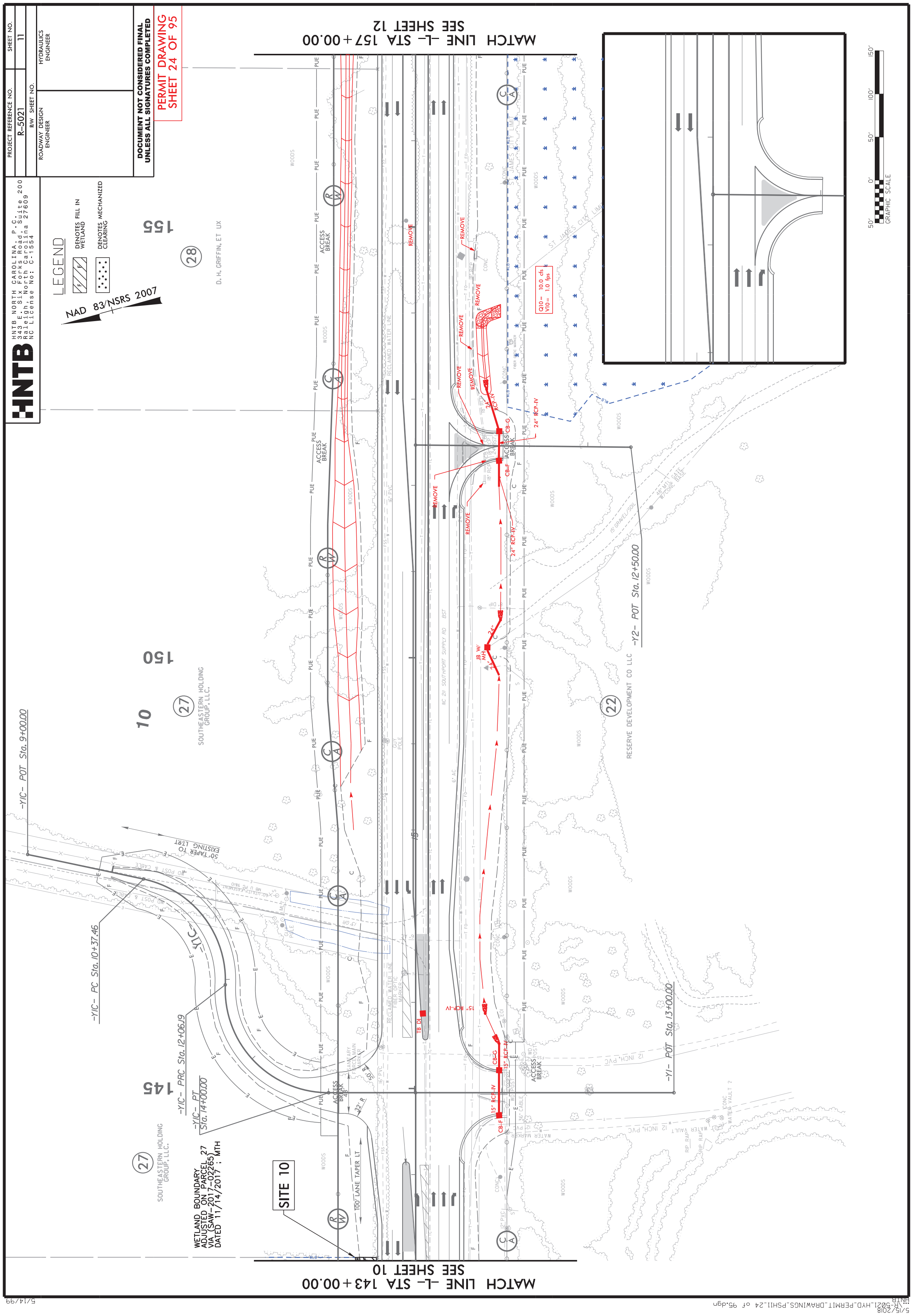
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

5/15/2018
H:\TIP Drawings\r-5021_hyd_prm_xpl.dgn

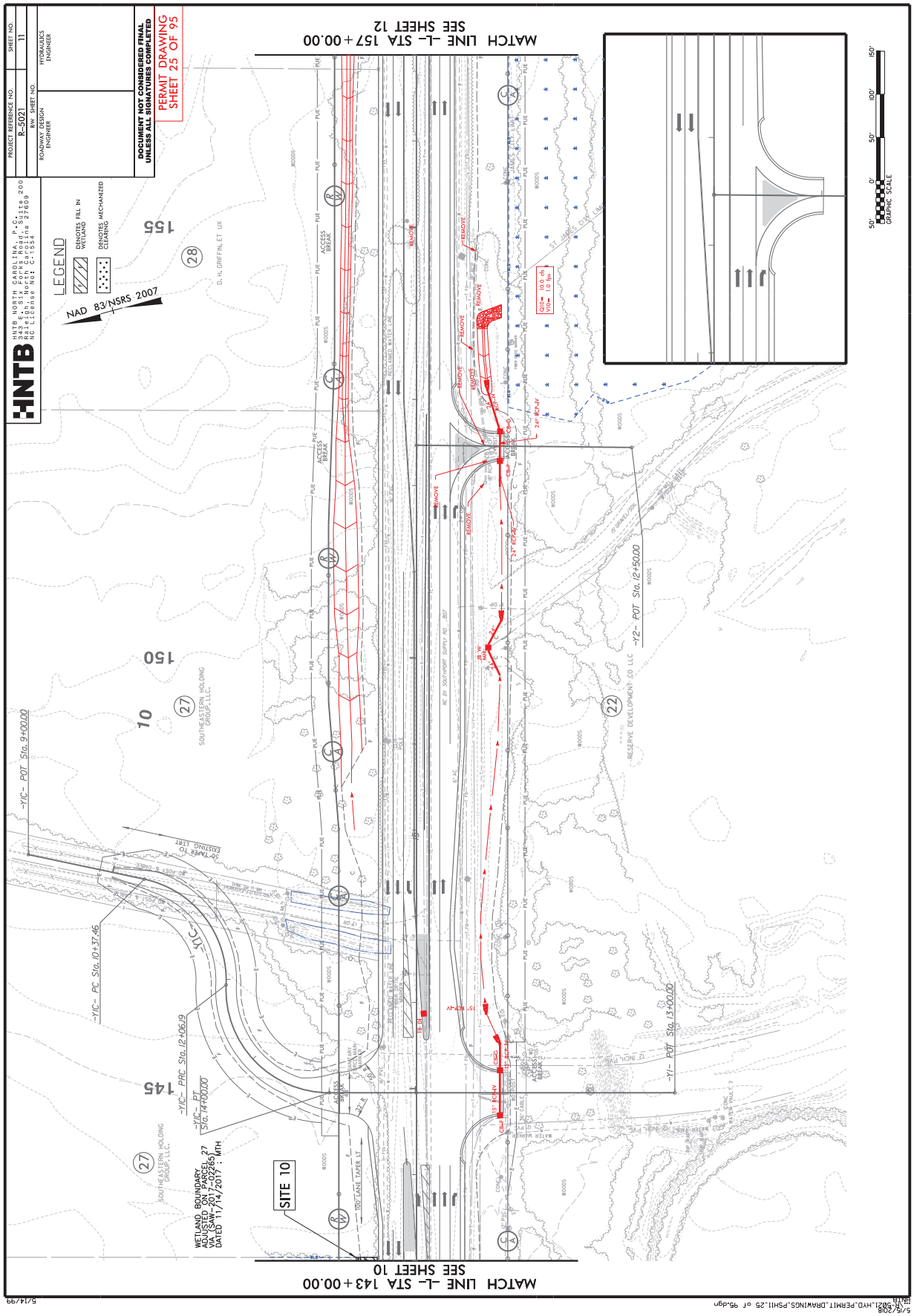
P-128

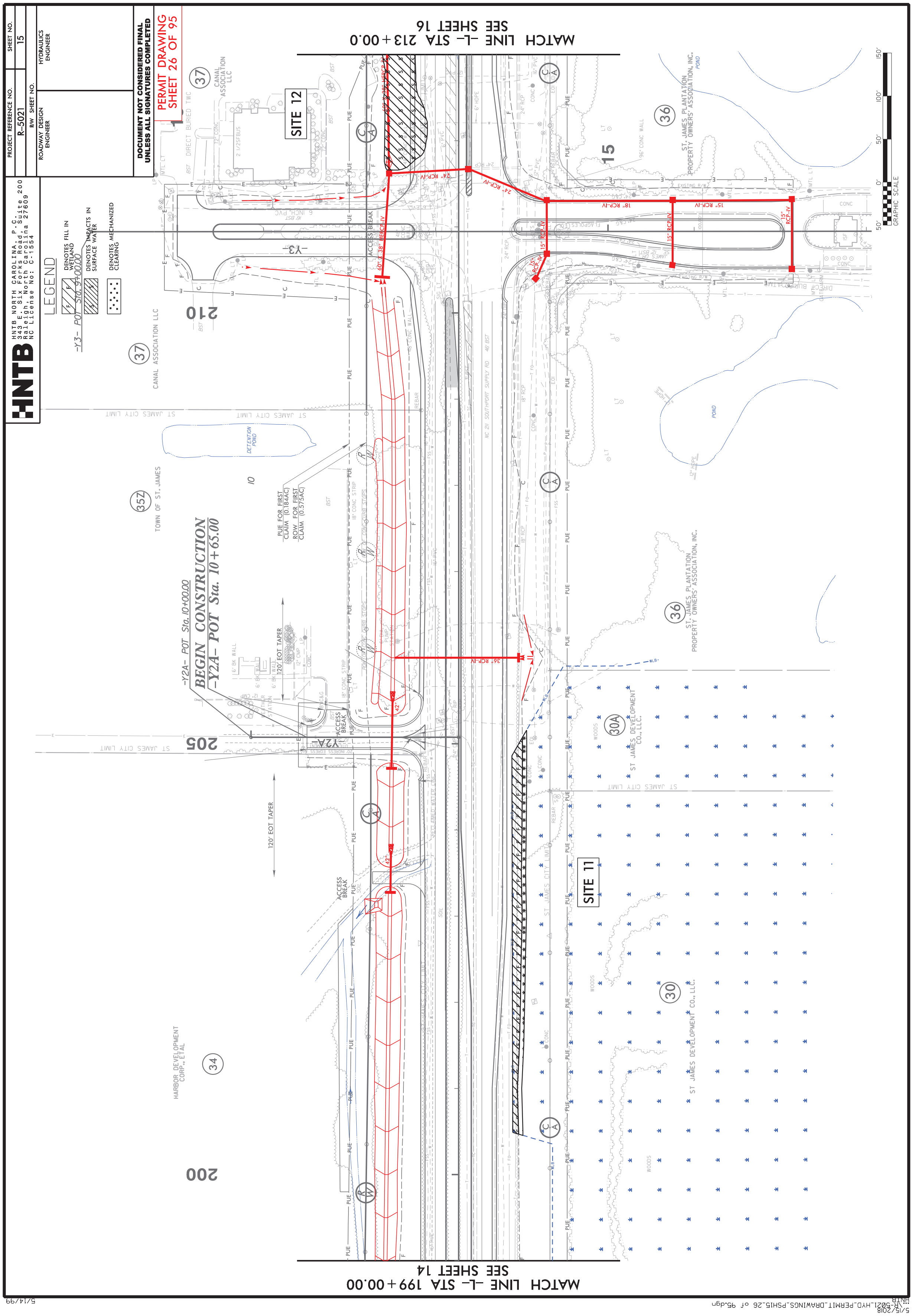
P-129

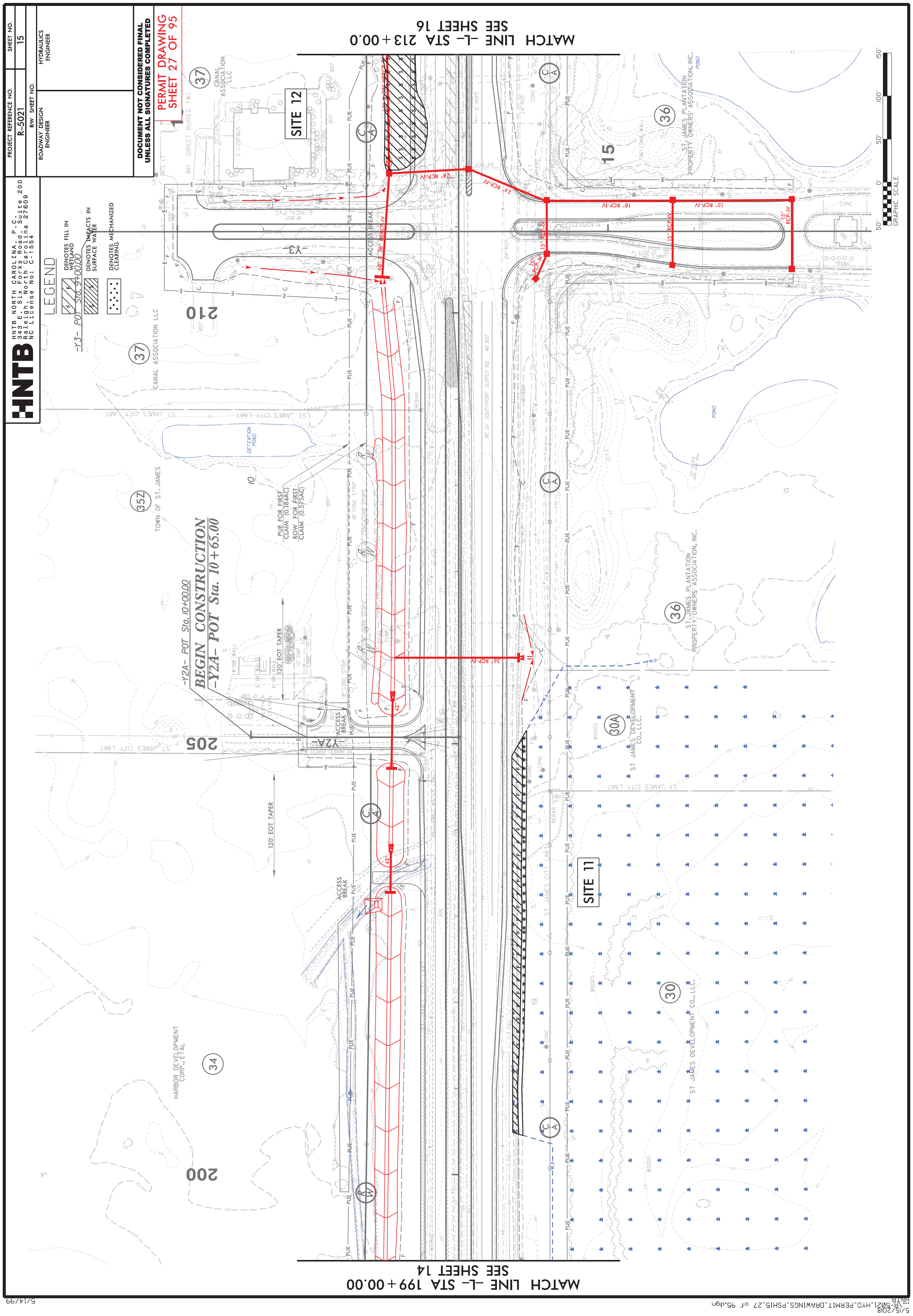


PROJECT REFERENCE NO. R-5021
SHEET NO. 11
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 24 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 157+00.00 SEE SHEET 12
MATCH LINE -L- STA 143+00.00 SEE SHEET 10
SITE 10
WETLAND BOUNDARY ADJUSTED ON PARCEL 27 VIA (SAW-2017-02265) DATED 11/14/2017 : MTH
SOUTHEASTERN HOLDING GROUP, LLC.
RESERVE DEVELOPMENT CO LLC
D. H. GRIFFIN, ET UX
-Y1C- POT Sta. 9+00.00
-Y1C- PC Sta. 10+37.46
-Y1C- PRC Sta. 12+06.19
-Y1C- PT Sta. 14+00.00
-Y1- POT Sta. 13+00.00
-Y2- POT Sta. 12+50.00
Q10 = 10.0 cfs
V10 = 1.0 fps
GRAPHIC SCALE

P-130


HNTB
HNTB NORTH CAROLINA, P.C.
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
SHEET NO.
11
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 25 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 157+00.00
SEE SHEET 12
MATCH LINE -L- STA 143+00.00
SEE SHEET 10
SITE 10
-Y1C- PC Sta. 10+37.46
-Y1C- PRC Sta. 12+06.19
-Y1C- PT Sta. 14+00.00
-Y1C- POT Sta. 9+00.00
-Y1- POT Sta. 13+00.00
-Y2- POT Sta. 12+50.00
WETLAND BOUNDARY
SURVEYED ON PARCEL 27
VIA SAW-2017-02265
DATED 11/14/2017 ; MTH
SOUTHEASTERN HOLDING GROUP, LLC.
RESERVE DEVELOPMENT CO LLC
D.H. GRIFFIN, ET UX
ST. JAMES CEMETERY
RECLAIMED WATER LINE
AC 29 SOUTHPORT SUPPLY RD
REMOVE
100' LANE TAPER LT
GRAPHIC SCALE


MATCH LINE -L- STA 213+00.0
SEE SHEET 16
MATCH LINE -L- STA 199+00.00
SEE SHEET 14
SITE 12
SITE 11
BEGIN CONSTRUCTION
-Y2A- POT Sta. 10+65.00
PERMIT DRAWING
SHEET 26 OF 95
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HNTB
LEGEND
R-5021


MATCH LINE -L- STA 213+00.0
SEE SHEET 16
MATCH LINE -L- STA 199+00.00
SEE SHEET 14
PROJECT REFERENCE NO.
R-5021
SHEET NO.
15
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING
SHEET 27 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
-Y3- POT Sta. 9+00.00
SITE 12
SITE 11
BEGIN CONSTRUCTION
-Y2A- POT Sta. 10+65.00
-Y2A- POT Sta. 10+00.00
CANAL ASSOCIATION LLC
TOWN OF ST. JAMES
HARBOR DEVELOPMENT CORP., ETAL
ST. JAMES PLANTATION PROPERTY OWNERS' ASSOCIATION, INC.
ST. JAMES DEVELOPMENT CO., LLC
DETENTION POND
POND
120' EOT TAPER
ACCESS BREAK
NC 211 SOUTHPORT SUPPLY RD
ST. JAMES CITY LIMIT
GRAPHIC SCALE
210
205
200

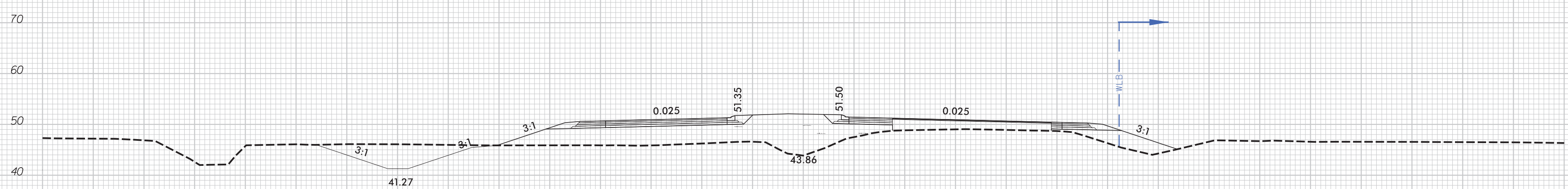
5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 28 OF 95

WETLAND CROSS SECTIONS

SITE 11

-L- 203+00.00



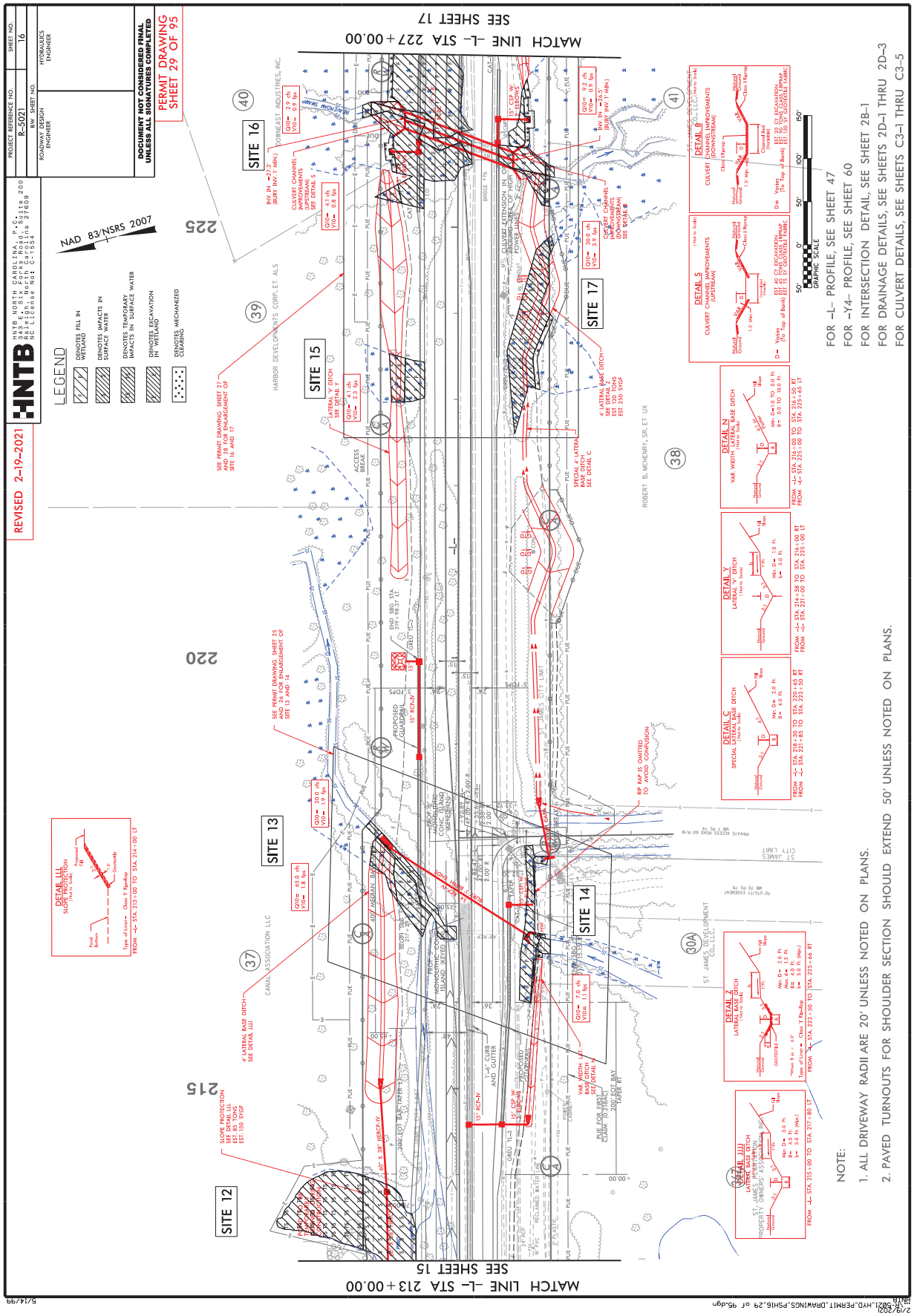
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

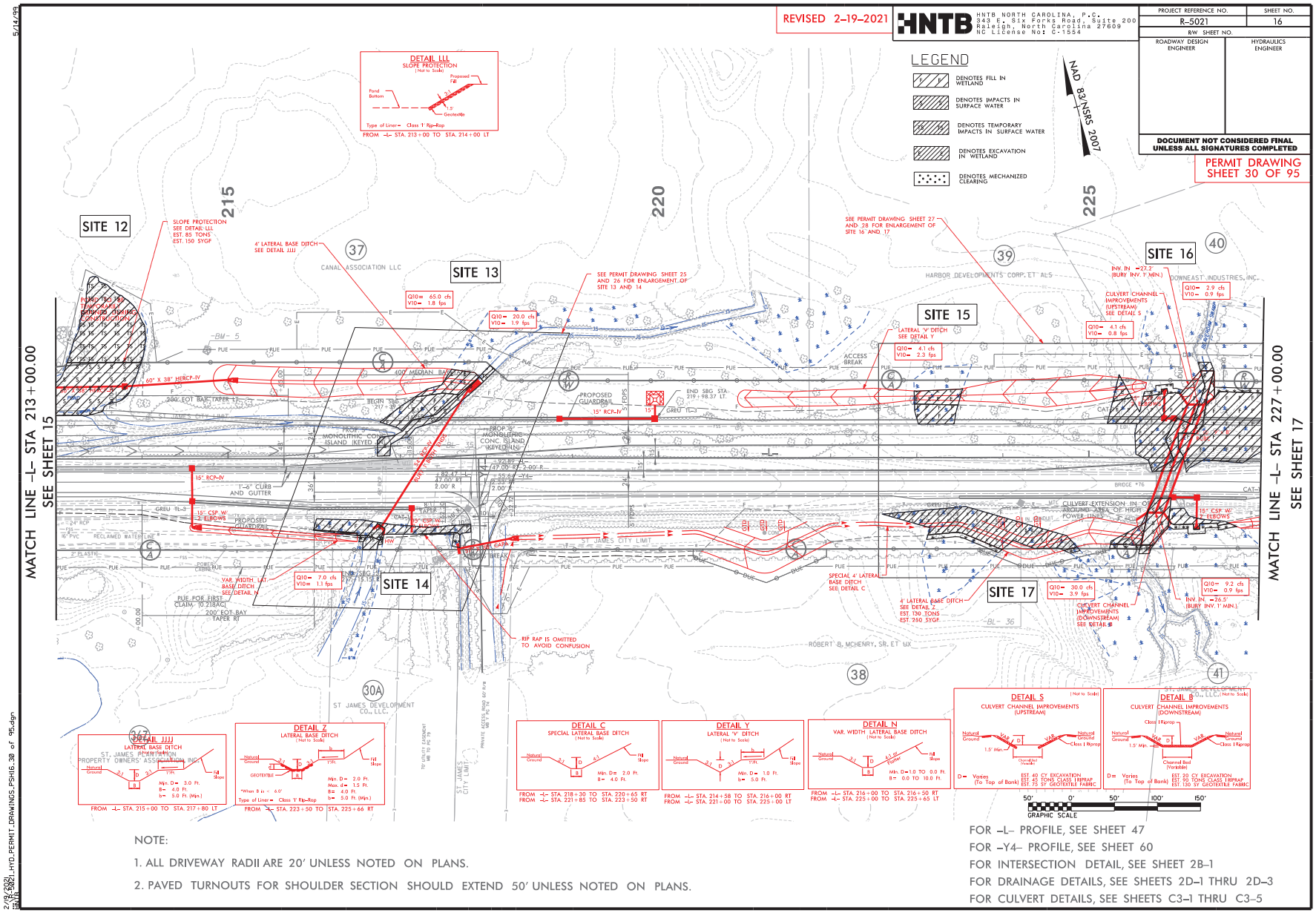
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16

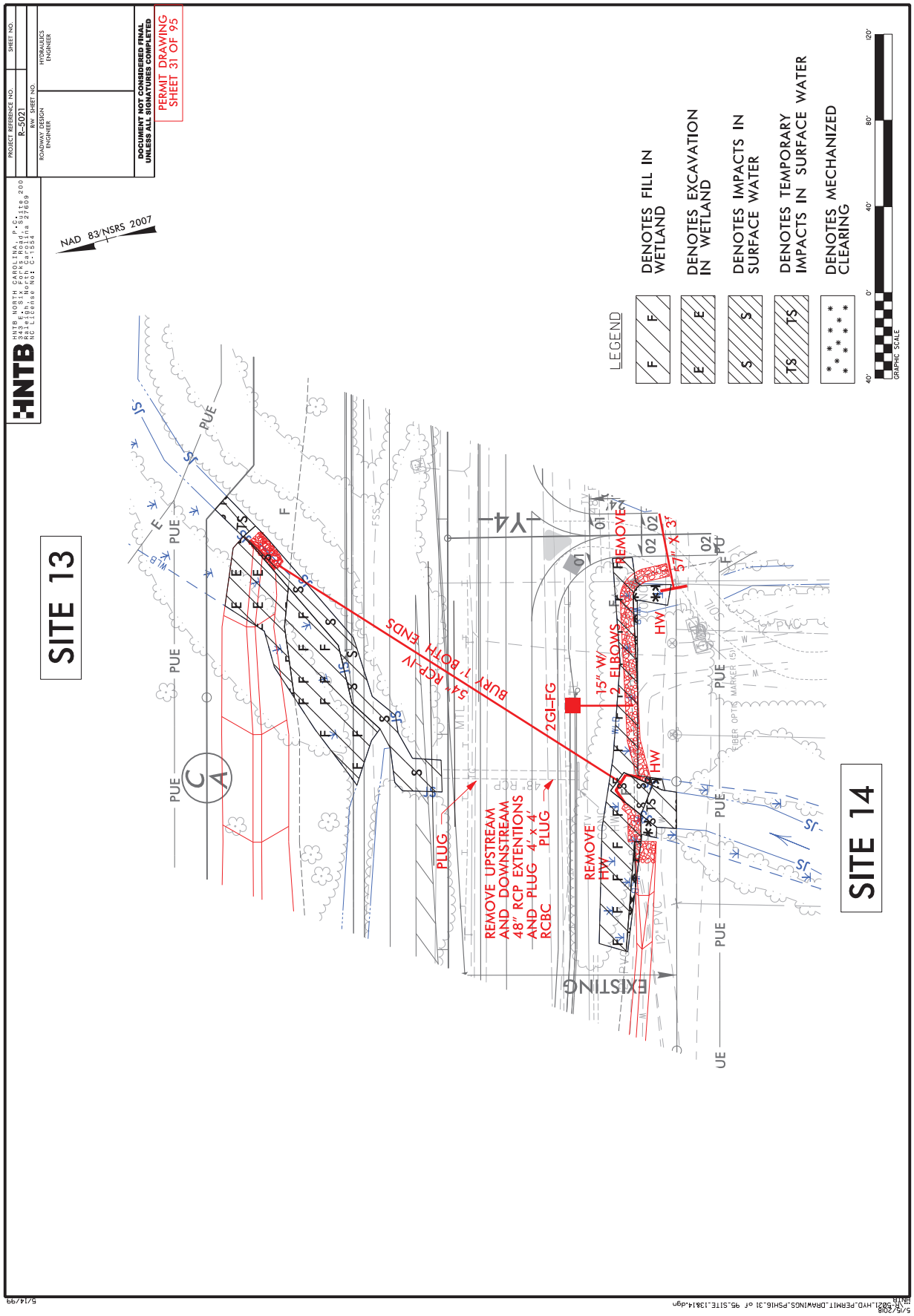
5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB

P-134


REVISED 2-19-2021
HNTB
HNTB NORTH CAROLINA, P.C.
434 Fayetteville Street, Suite 2200
Raleigh, North Carolina 27601
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
16
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 29 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
MATCH LINE -L- STA 213+00.00
SEE SHEET 15
MATCH LINE -L- STA 227+00.00
SEE SHEET 17
SITE 12
SITE 13
SITE 14
SITE 15
SITE 16
SITE 17
215
220
225
FOR -L- PROFILE, SEE SHEET 47
FOR -Y4- PROFILE, SEE SHEET 60
FOR INTERSECTION DETAIL, SEE SHEET 2B-1
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
FOR CULVERT DETAILS, SEE SHEETS C3-1 THRU C3-5
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
GRAPHIC SCALE
50' 0' 50' 100' 150'


REVISED 2-19-2021
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO. R-5021
SHEET NO. 16
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 30 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 213+00.00 SEE SHEET 15
MATCH LINE -L- STA 227+00.00 SEE SHEET 17
SITE 12
SITE 13
SITE 14
SITE 15
SITE 16
SITE 17
DETAIL LLL SLOPE PROTECTION
DETAIL JJJJ LATERAL BASE DITCH
DETAIL Z LATERAL BASE DITCH
DETAIL C SPECIAL LATERAL BASE DITCH
DETAIL Y LATERAL 'V' DITCH
DETAIL N VAR. WIDTH LATERAL BASE DITCH
DETAIL S CULVERT CHANNEL IMPROVEMENTS (UPSTREAM)
DETAIL B CULVERT CHANNEL IMPROVEMENTS (DOWNSTREAM)
GRAPHIC SCALE
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 47
FOR -Y4- PROFILE, SEE SHEET 60
FOR INTERSECTION DETAIL, SEE SHEET 2B-1
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
FOR CULVERT DETAILS, SEE SHEETS C3-1 THRU C3-5

P-135



5/14/99

5/5/2018
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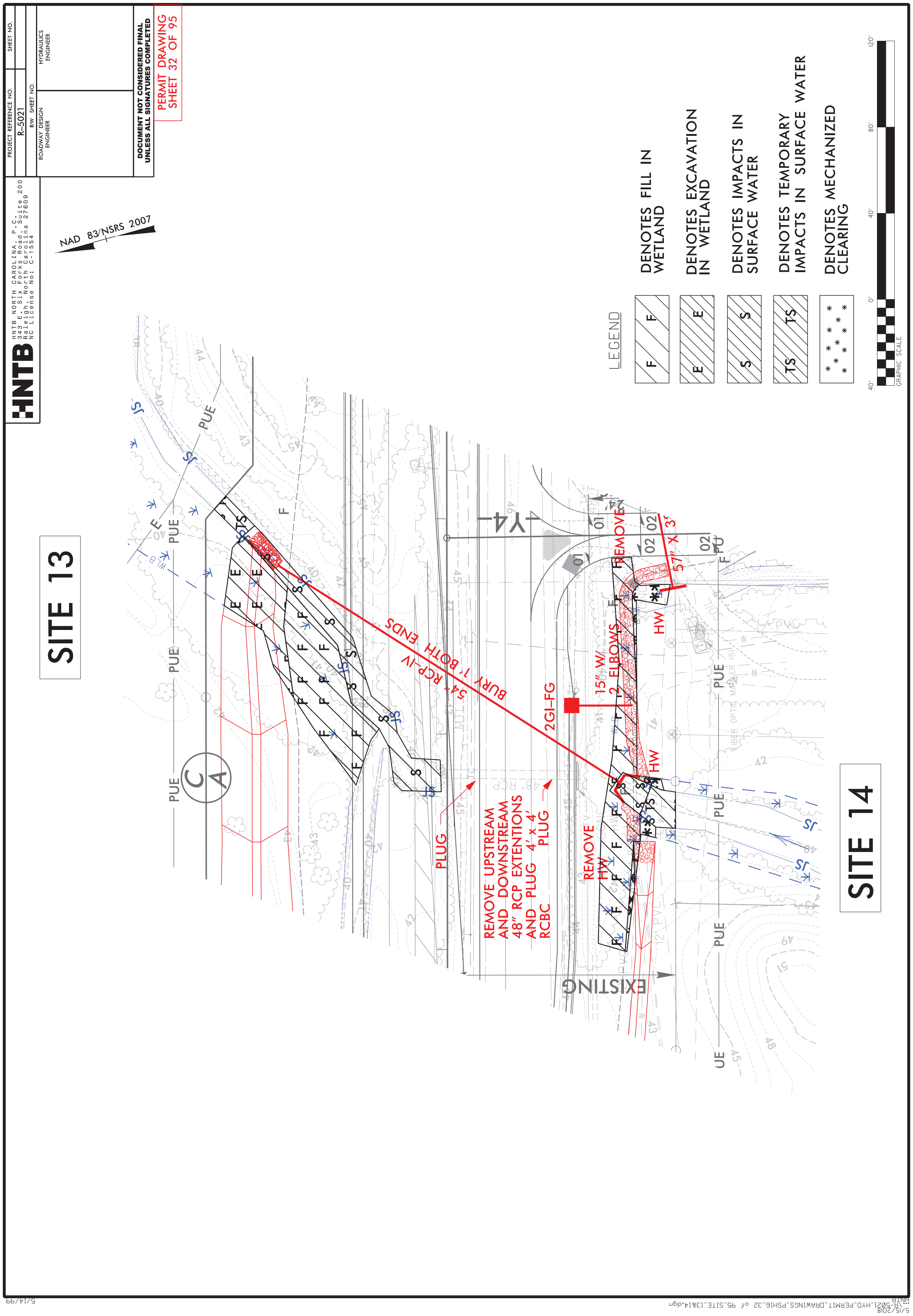
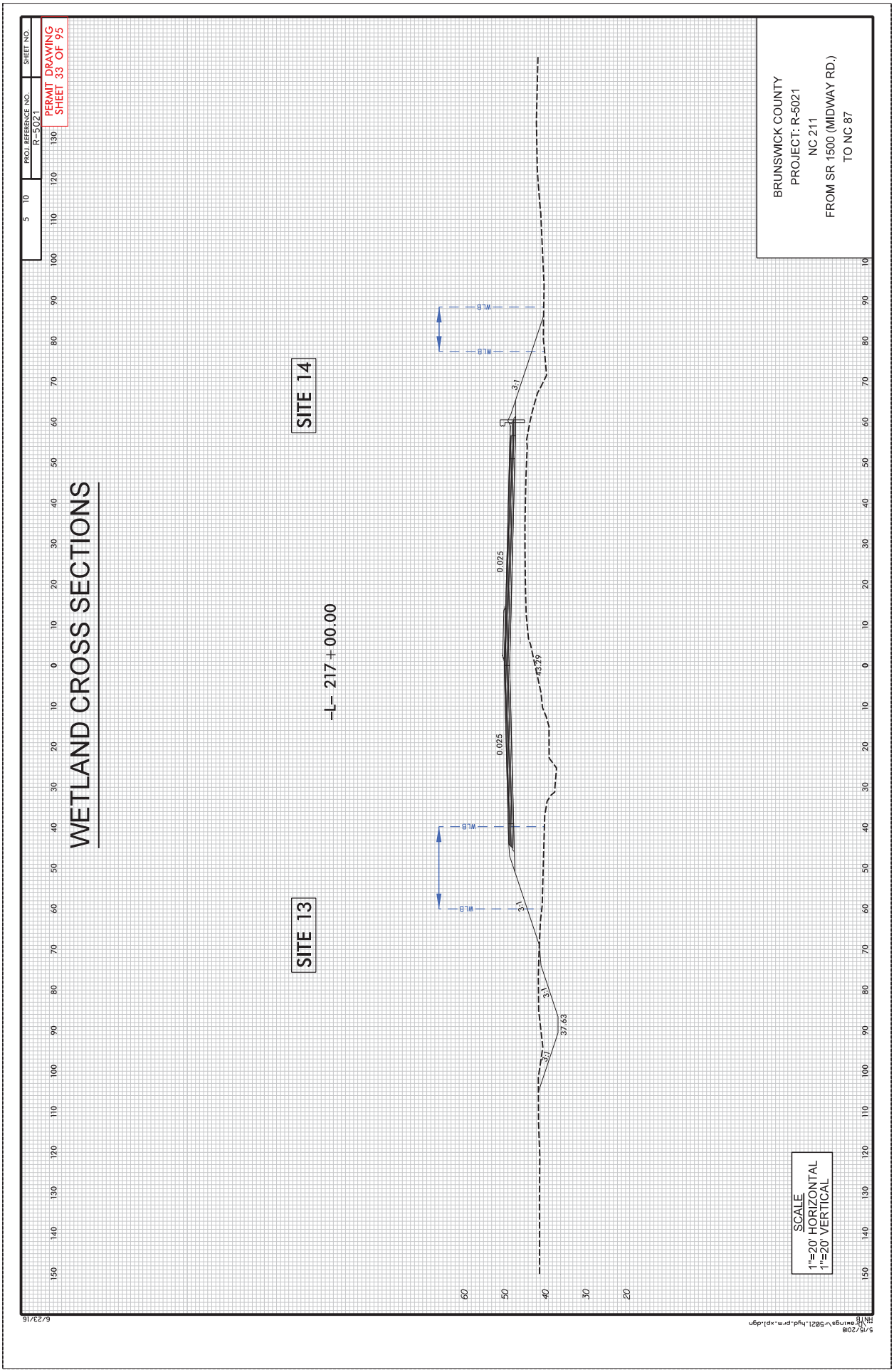
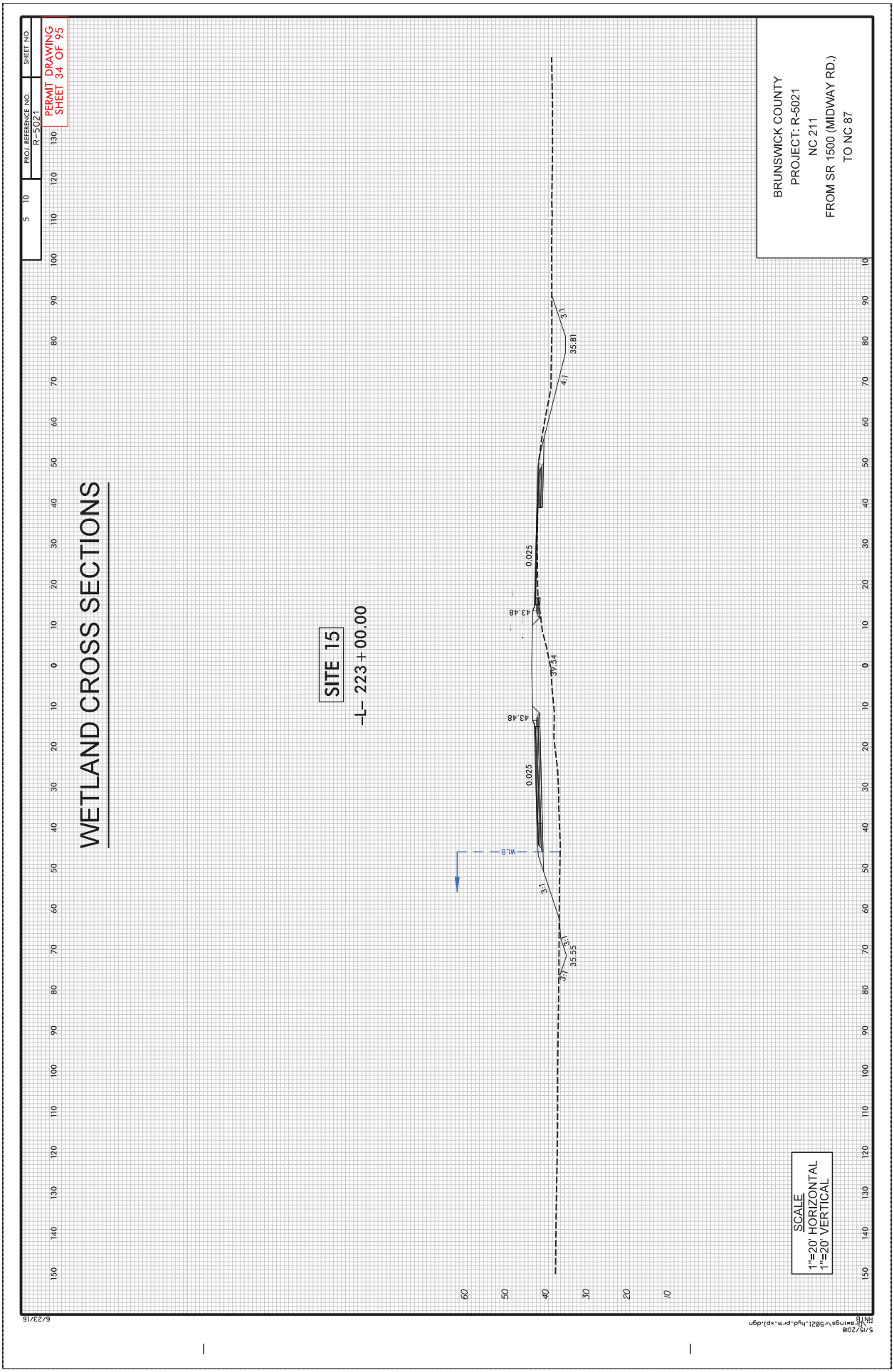
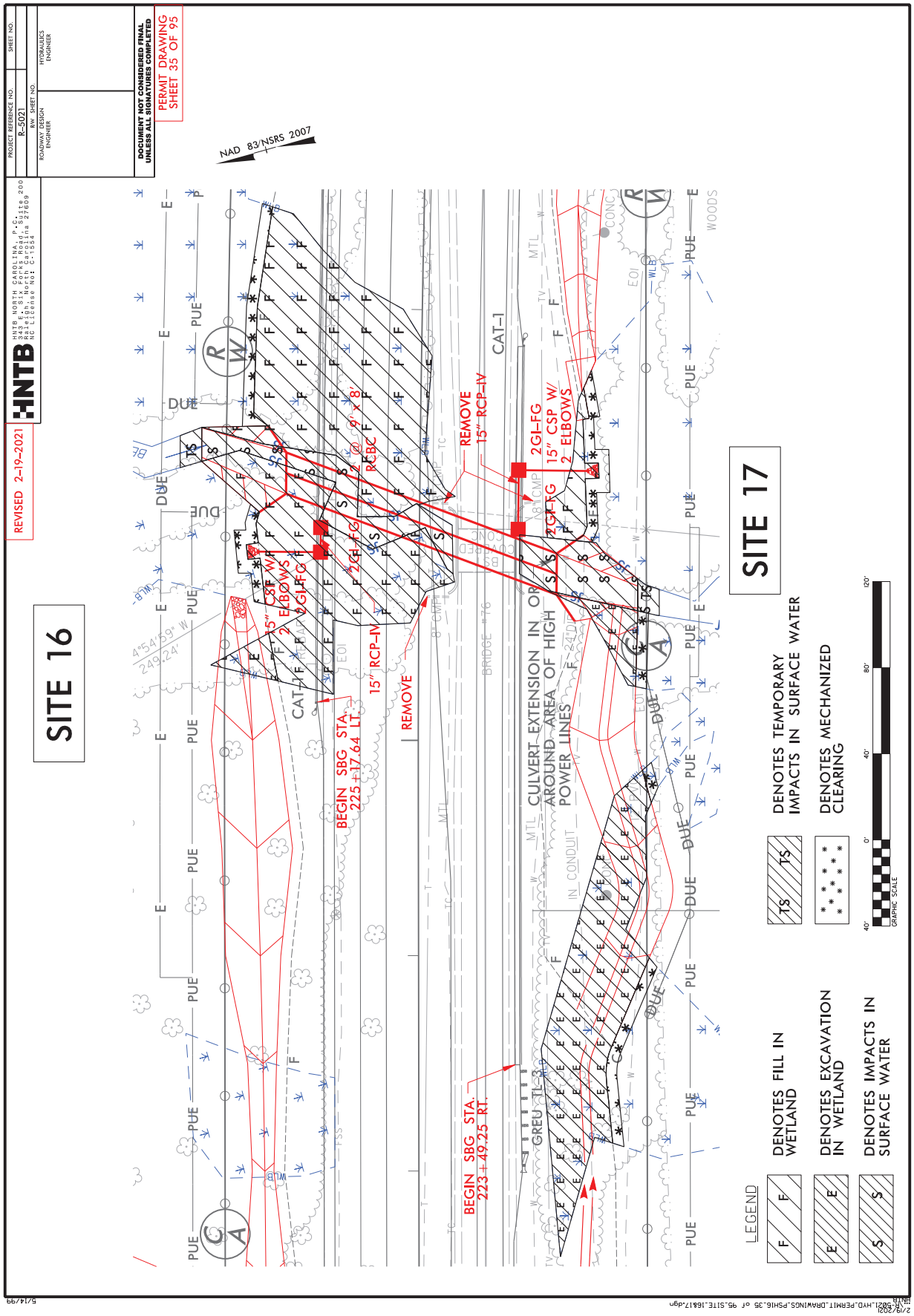
P-137



PROJECT REFERENCE NO.
R-5021
SHEET NO.
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 32 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
NAD 83/NSRS 2007
SITE 13
SITE 14
54" RCP-IV
BURY 1' BOTH ENDS
2GI-FG
15" W/ 2 ELBOWS
REMOVE
57" X 3
HW
REMOVE HW
PLUG
REMOVE UPSTREAM AND DOWNSTREAM 48" RCP EXTENTIONS AND PLUG 4' x 4' RCBC
PLUG
EXISTING
-Y4-
PUE
UE
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
40'
0'
40'
80'
120'
GRAPHIC SCALE
5/15/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH16_32 of 95_SITE_13&14.dgn
5/14/99


WETLAND CROSS SECTIONS
SITE 13
SITE 14
-L- 217+00.00
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87
PROJ. REFERENCE NO. R-5021
SHEET NO.
PERMIT DRAWING SHEET 33 OF 95
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL
WLB
3:1
0.025
43.29
37.63


WETLAND CROSS SECTIONS
SITE 15
-L- 223+00.00
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87
PROJ. REFERENCE NO.
R-5021
SHEET NO.
5 10
PERMIT DRAWING
SHEET 34 OF 95
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL
WLB
0.025
43.48
37.34
35.81
35.55
3:1
4:1
3.7
5/15/2018
6/23/16


PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
SHEET NO.
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 35 OF 95
REVISED 2-19-2021
HNTB NORTH CAROLINA, P.C.
NC License No: C-1554
NAD 83/NSRS 2007
SITE 16
SITE 17
BEGIN SBG STA. 225+17.64 LT.
BEGIN SBG STA. 223+49.25 RT.
REMOVE
15" RCP-IV
2GI-FG
15" CSP W/ 2 ELBOWS
9' x 8' RCBC
CULVERT EXTENSION IN OR AROUND AREA OF HIGH POWER LINES
IN CONDUIT
CAT-1
GREU-TL-3
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
GRAPHIC SCALE

REVISED 2-19-2021

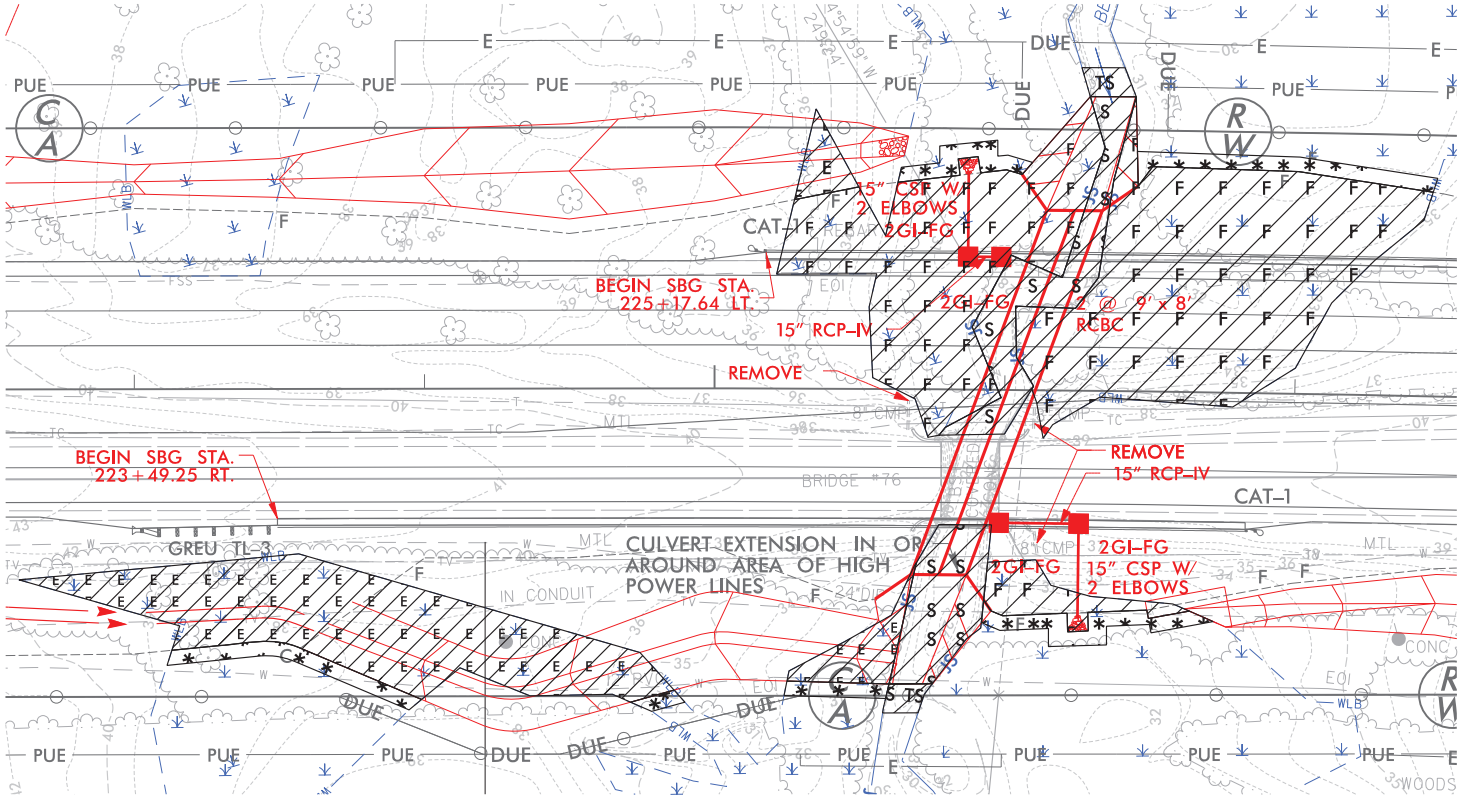
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 36 OF 95

SITE 16



SITE 17

LEGEND

- F F — DENOTES FILL IN WETLAND
- E E — DENOTES EXCAVATION IN WETLAND
- S S — DENOTES IMPACTS IN SURFACE WATER
- TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- DENOTES MECHANIZED CLEARING

40' 0' 40' 80' 120'
GRAPHIC SCALE

P-141

5/14/99
2/19/2021
R-5021_HYD_PERMIT_DRAWINGS_PSH16_36 of 95_SITE_16&17.dgn

P-142

5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

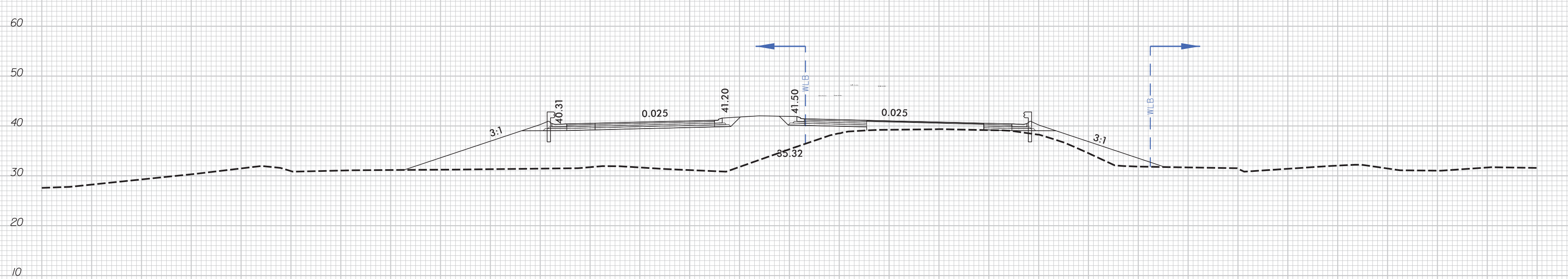
PERMIT DRAWING
SHEET 37 OF 95

WETLAND CROSS SECTIONS

SITE 16

-L- 226+50.00

SITE 17



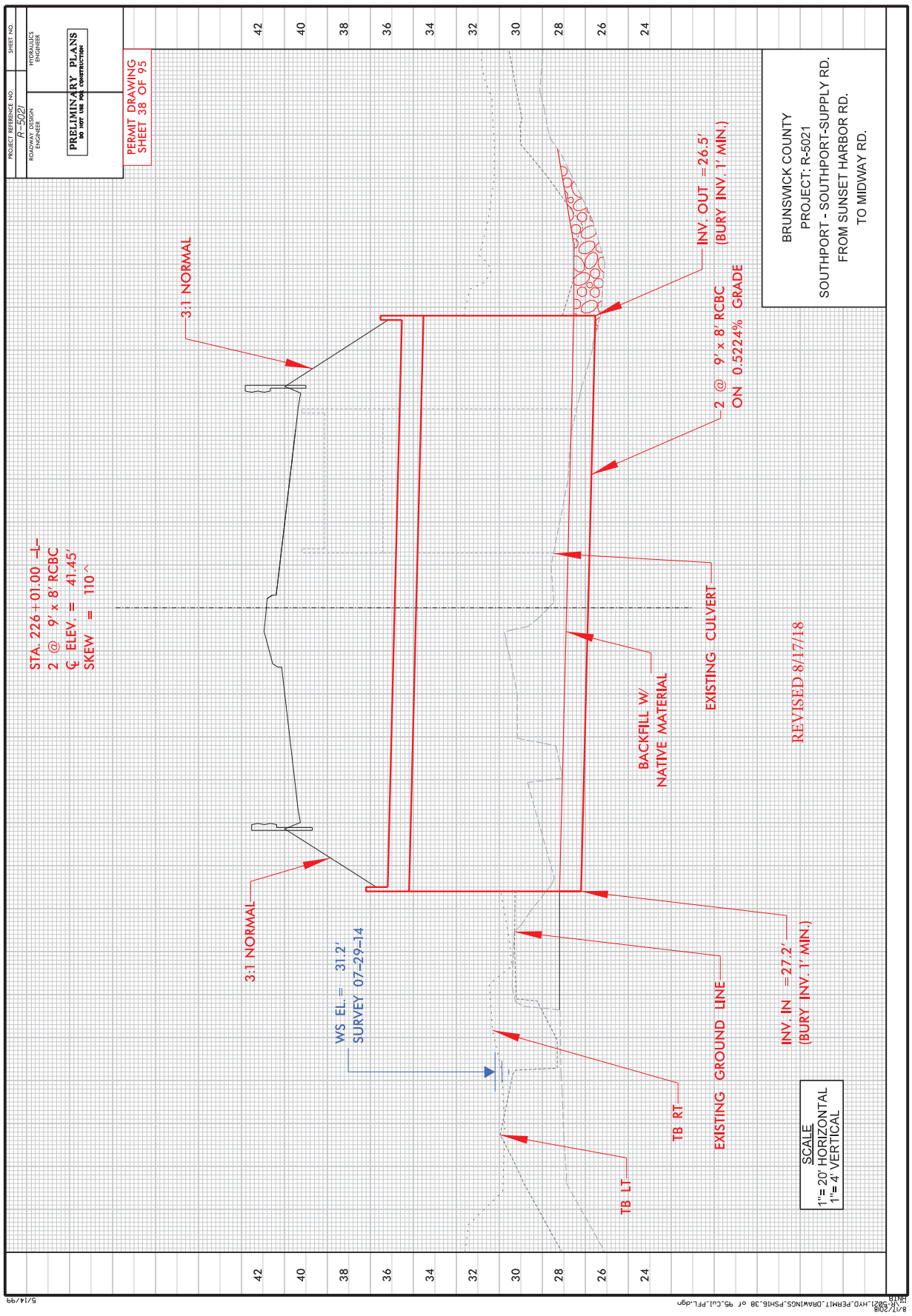
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

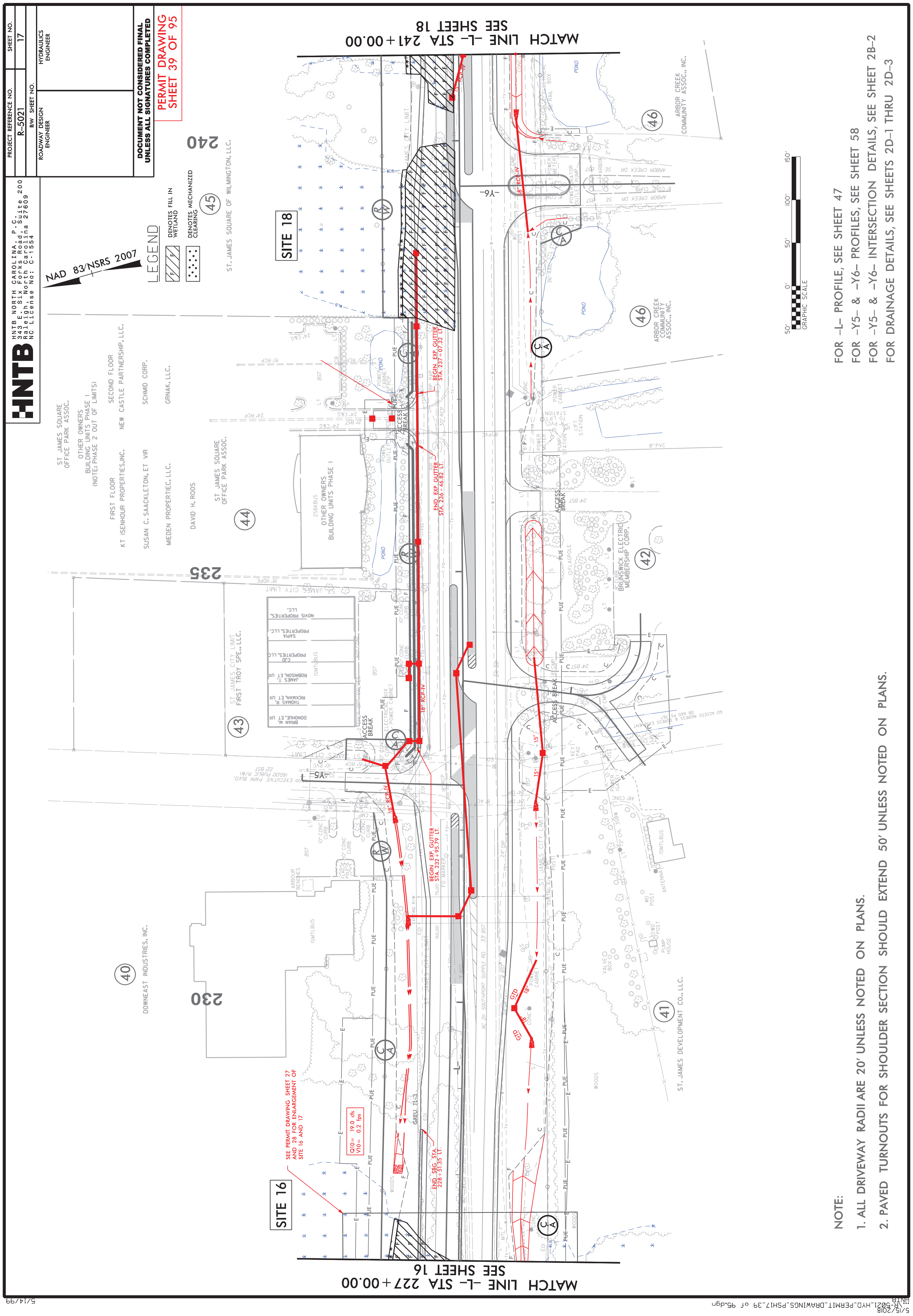
6/23/16

5/15/2018
HNTB

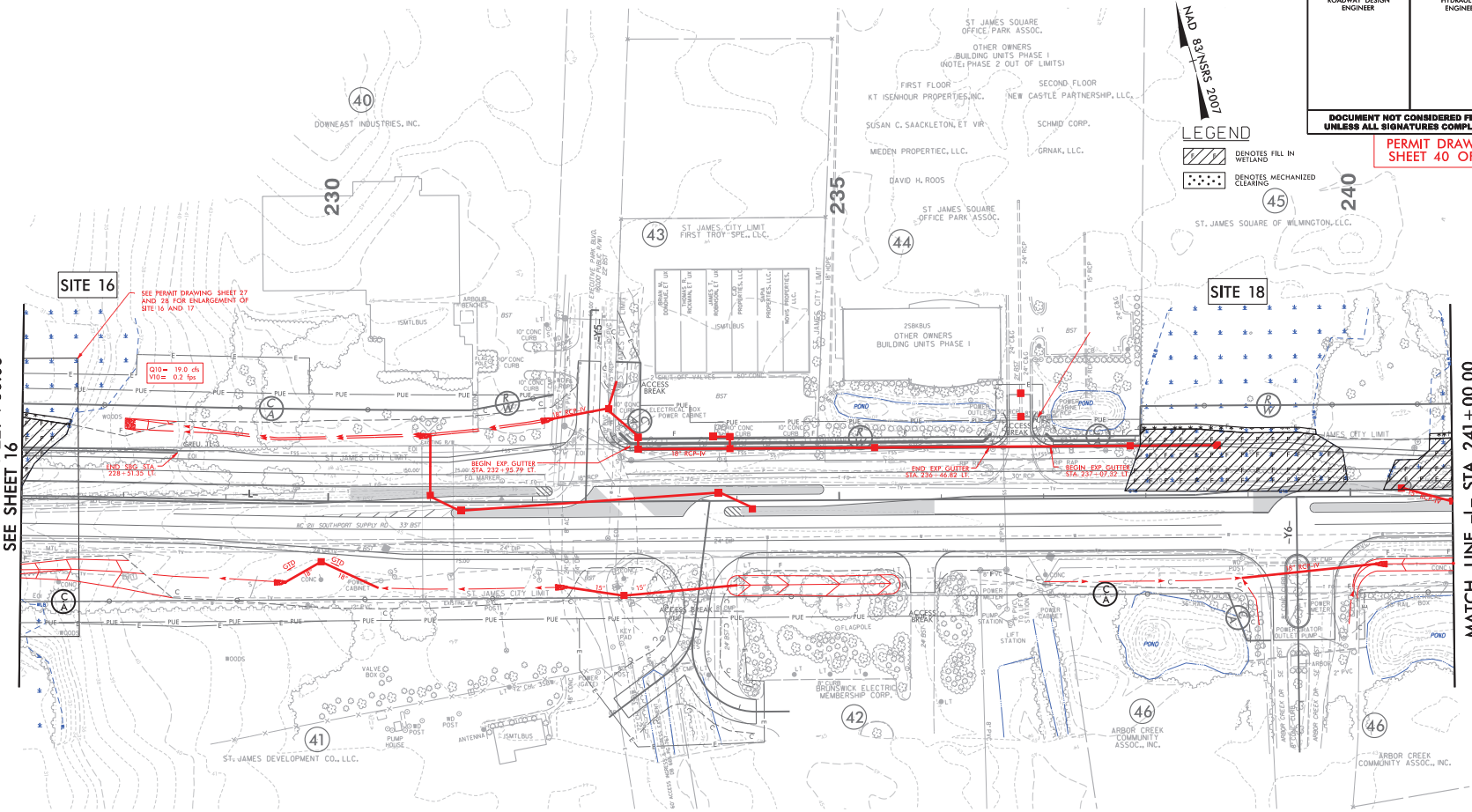
P-143


PROJECT REFERENCE NO.
R-5021
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWING
SHEET 38 OF 95
BRUNSWICK COUNTY
PROJECT: R-5021
SOUTHPORT - SOUTHPORT-SUPPLY RD.
FROM SUNSET HARBOR RD.
TO MIDWAY RD.
STA. 226+01.00 -L-
2 @ 9' x 8' RCBC
℄ ELEV. = 41.45'
SKEW = 110°
3:1 NORMAL
3:1 NORMAL
WS EL. = 31.2'
SURVEY 07-29-14
TB - LT
TB - RT
EXISTING GROUND LINE
INV. IN = 27.2'
(BURY INV. 1' MIN.)
BACKFILL W/
NATIVE MATERIAL
EXISTING CULVERT
2 @ 9' x 8' RCBC
ON 0.5224% GRADE
INV. OUT = 26.5'
(BURY INV. 1' MIN.)
REVISED 8/17/18
SCALE
1"= 20' HORIZONTAL
1"= 4' VERTICAL
42
40
38
36
34
32
30
28
26
24
5/14/99
8/17/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH16_38 of 95_Cul_Pfl_.dgn
BNTB

P-144



MATCH LINE -L- STA 241+00.00
SEE SHEET 18
MATCH LINE -L- STA 227+00.00
SEE SHEET 16
PROJECT REFERENCE NO.
R-5021
SHEET NO.
17
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 39 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
NAD 83/NSRS 2007
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
SITE 18
SITE 16
FOR -L- PROFILE, SEE SHEET 47
FOR -Y5- & -Y6- PROFILES, SEE SHEET 58
FOR -Y5- & -Y6- INTERSECTION DETAILS, SEE SHEET 2B-2
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
SEE PERMIT DRAWING SHEET 27 AND 28 FOR ENLARGEMENT OF SITE 16 AND 17
Q10= 19.0 cfs
V10= 0.2 fps
ST. JAMES DEVELOPMENT CO., LLC.
DOWNEAST INDUSTRIES, INC.
ARBOR CREEK COMMUNITY ASSOC., INC.
BRUNSWICK ELECTRIC MEMBERSHIP CORP.
ST. JAMES SQUARE OF WILMINGTON, LLC.
5/14/99
5/15/2018



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343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	17
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING SHEET 40 OF 95

NOTE:

1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

FOR –L– PROFILE, SEE SHEET 47
FOR –Y5– & –Y6– PROFILES, SEE SHEET 58
FOR –Y5– & –Y6– INTERSECTION DETAILS, SEE SHEET 2B-2
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3

5/14/99

5/15/2018
R-5021_HYD_PERMIT_DRAWINGS.PSH17.40 of 95.dgn
jsmith

P-145

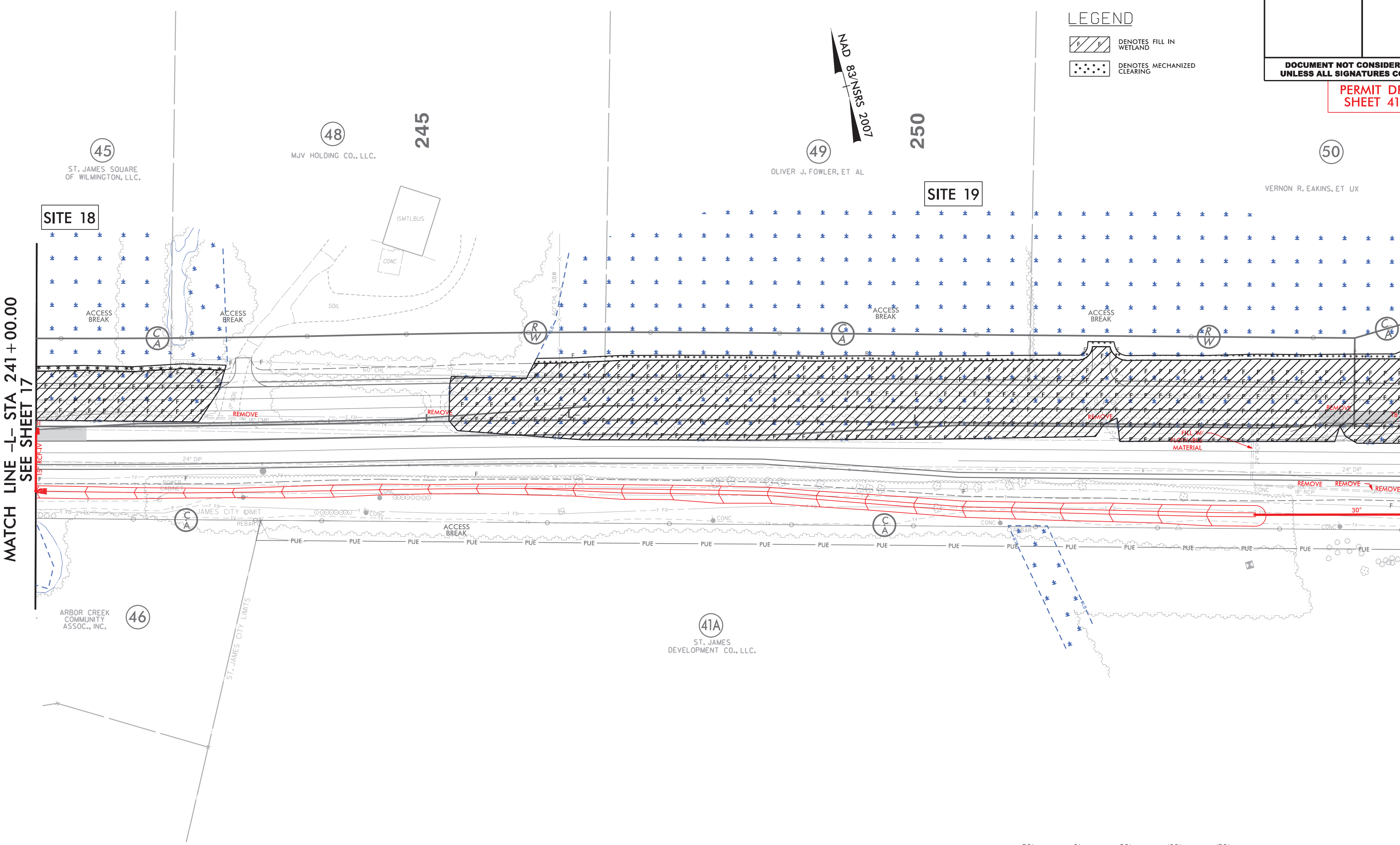
P-146

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	18
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 41 OF 95



NOTE:

1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.

2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

50' 0' 50' 100' 150'
GRAPHIC SCALE

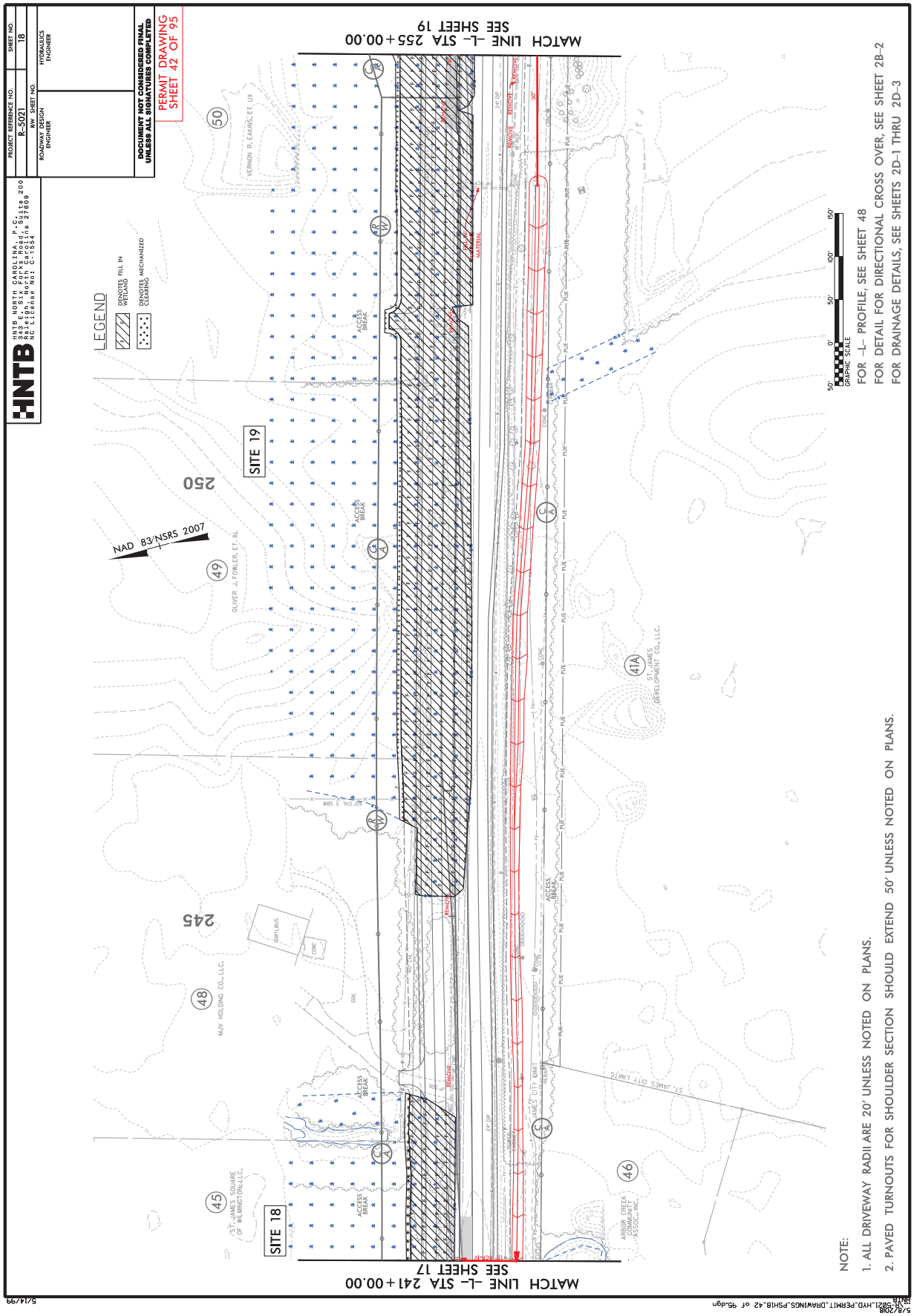
FOR -L- PROFILE, SEE SHEET 48

FOR DETAIL FOR DIRECTIONAL CROSS OVER, SEE SHEET 2B-2

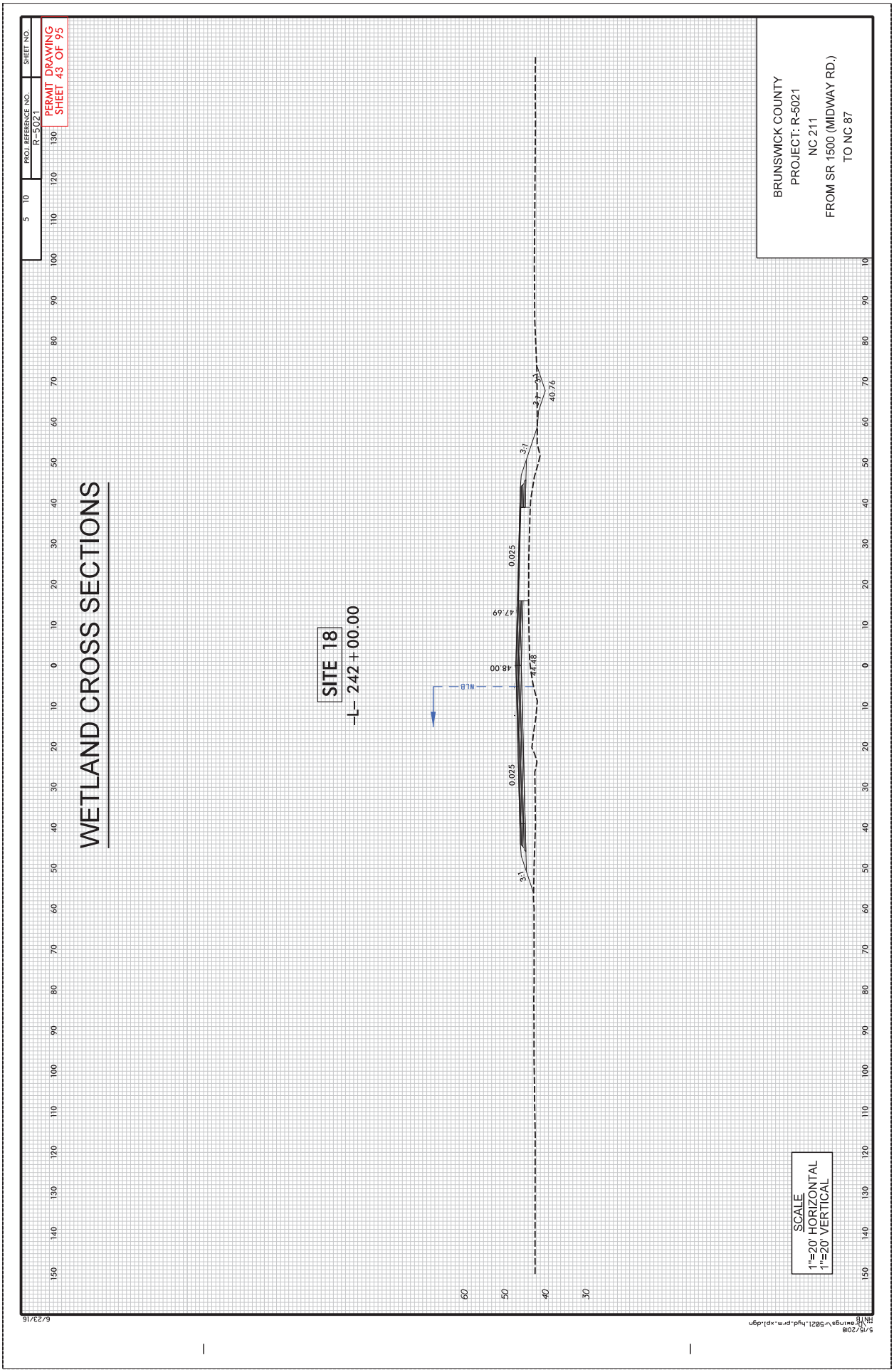
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3

5/8/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH18_41 of 95.dgn

5/14/99



5/8/2008
...\R-5021_HYD_PERMIT_DRAWINGS_PSH18-42 of 95.dgn
HNTB


WETLAND CROSS SECTIONS
SITE 18
-L- 242+00.00
WLB
48.00
47.69
44.48
40.76
0.025
0.025
3:1
3:1
3:1
3:1
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL
PROJ. REFERENCE NO.
R-5021
SHEET NO.
PERMIT DRAWING
SHEET 43 OF 95
5/15/2018
H:\Drawings\r5021_hyd_prm_xpl.dgn
6/23/16

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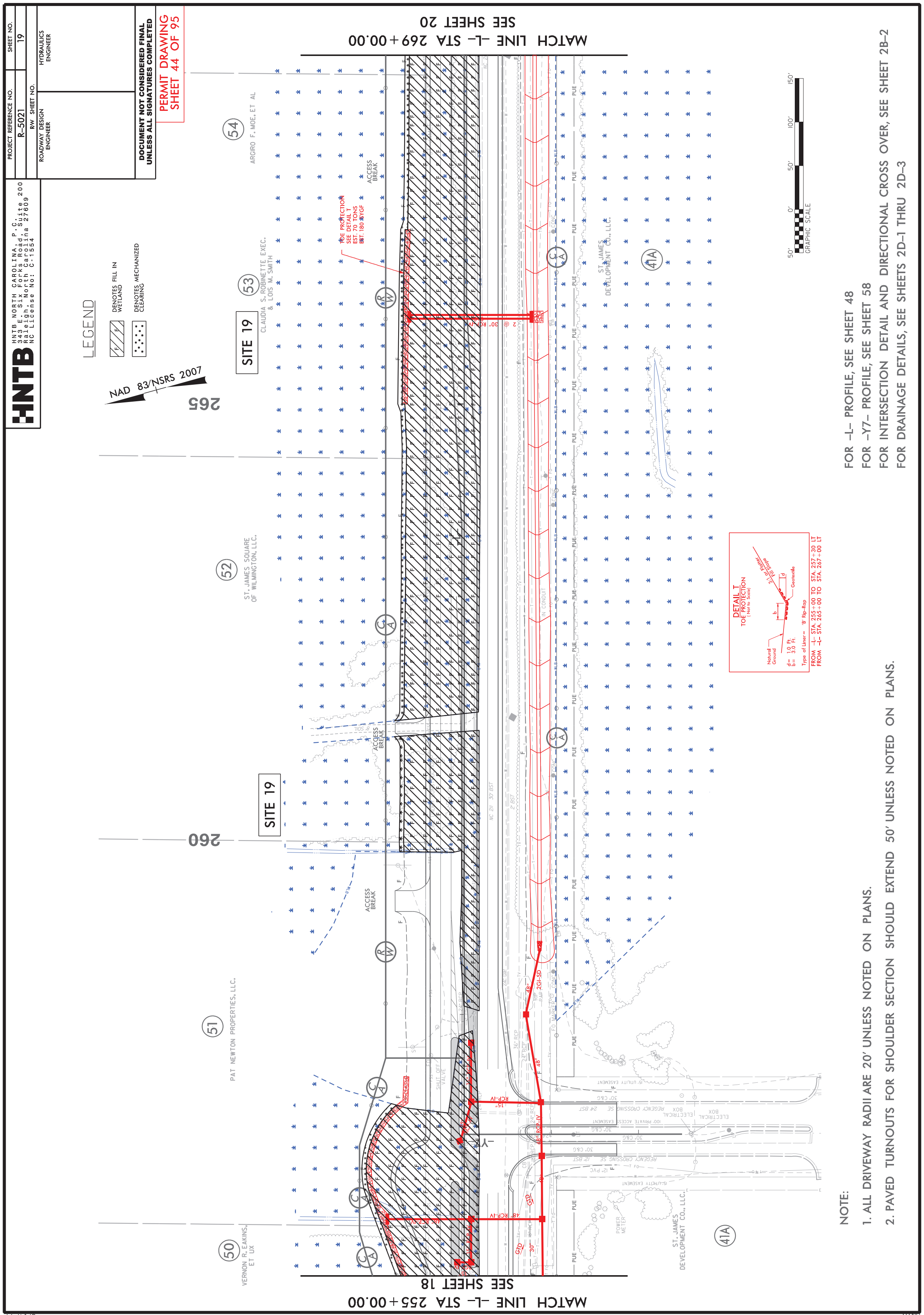
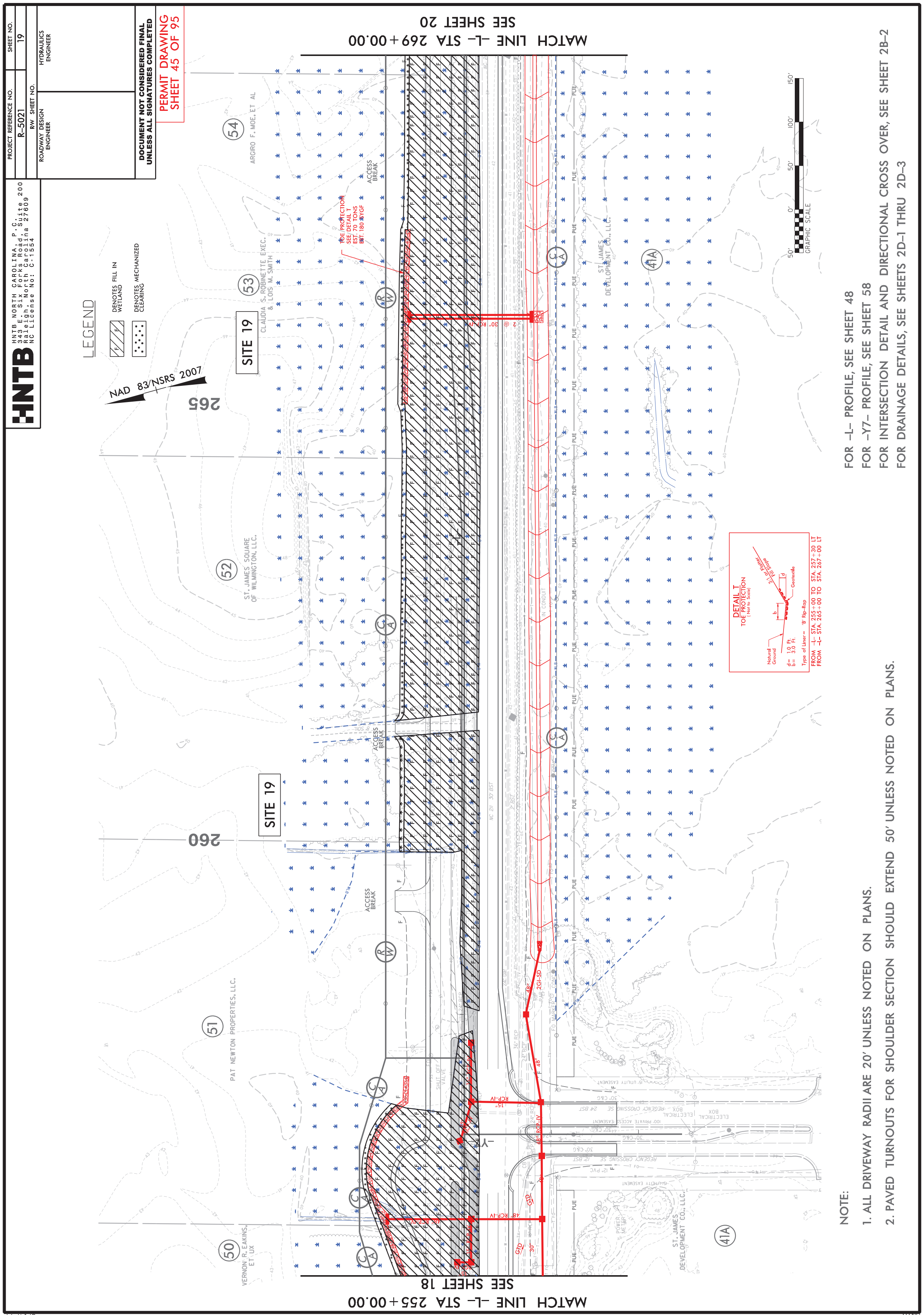

PROJECT REFERENCE NO. R-5021
SHEET NO. 19
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 44 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 269+00.00
SEE SHEET 20
MATCH LINE -L- STA 255+00.00
SEE SHEET 18
SITE 19
SITE 19
265
260
ACCESS BREAK
ARGIRO F. MOE, ET AL
CLAUDIA S. ROBINETTE EXEC. & LOIS M. SMITH
ST. JAMES SQUARE OF WILMINGTON, LLC.
PAT NEWTON PROPERTIES, LLC.
VERNON R. EAKINS, ET UX
ST. JAMES DEVELOPMENT CO., LLC.
DETAIL T
TOE PROTECTION
GRAPHIC SCALE
FOR -L- PROFILE, SEE SHEET 48
FOR -Y7- PROFILE, SEE SHEET 58
FOR INTERSECTION DETAIL AND DIRECTIONAL CROSS OVER, SEE SHEET 2B-2
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

P-150



HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
SHEET NO.
19
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 45 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 269+00.00
SEE SHEET 20
MATCH LINE -L- STA 255+00.00
SEE SHEET 18
SITE 19
SITE 19
265
260
ARGIRO F. MOE, ET AL
CLAUDIA S. ROBINETTE EXEC. & LOIS M. SMITH
ST. JAMES SQUARE OF WILMINGTON, LLC.
PAT NEWTON PROPERTIES, LLC.
VERNON R. EAKINS, ET UX
ST. JAMES DEVELOPMENT CO., LLC.
ACCESS BREAK
DETAIL T
TOE PROTECTION
(Not to Scale)
FROM -L- STA. 255+00 TO STA. 257+30 LT
FROM -L- STA. 265+00 TO STA. 267+00 LT
GRAPHIC SCALE
50' 0' 50' 100' 150'
FOR -L- PROFILE, SEE SHEET 48
FOR -Y7- PROFILE, SEE SHEET 58
FOR INTERSECTION DETAIL AND DIRECTIONAL CROSS OVER, SEE SHEET 2B-2
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
5/14/99
5/8/2018

6/23/16

5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-5021	

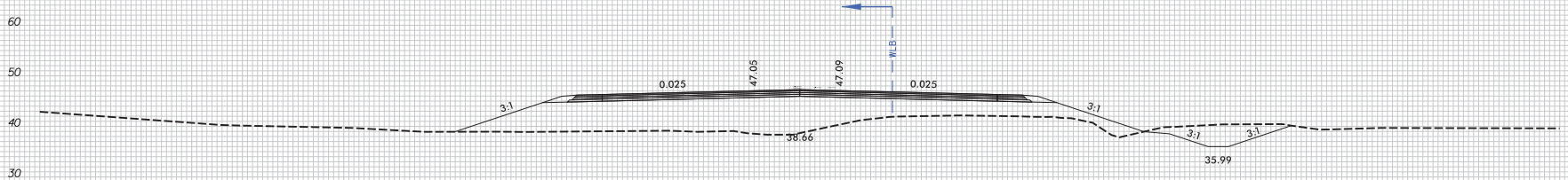
PERMIT DRAWING
SHEET 46 OF 95

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130

WETLAND CROSS SECTIONS

SITE 19

–L– 265+00.00



SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 10

5/15/2018
H:\TIP Drawings\r-5021_hyd_prm_xpl.dgn
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REVISED 2-19-2021

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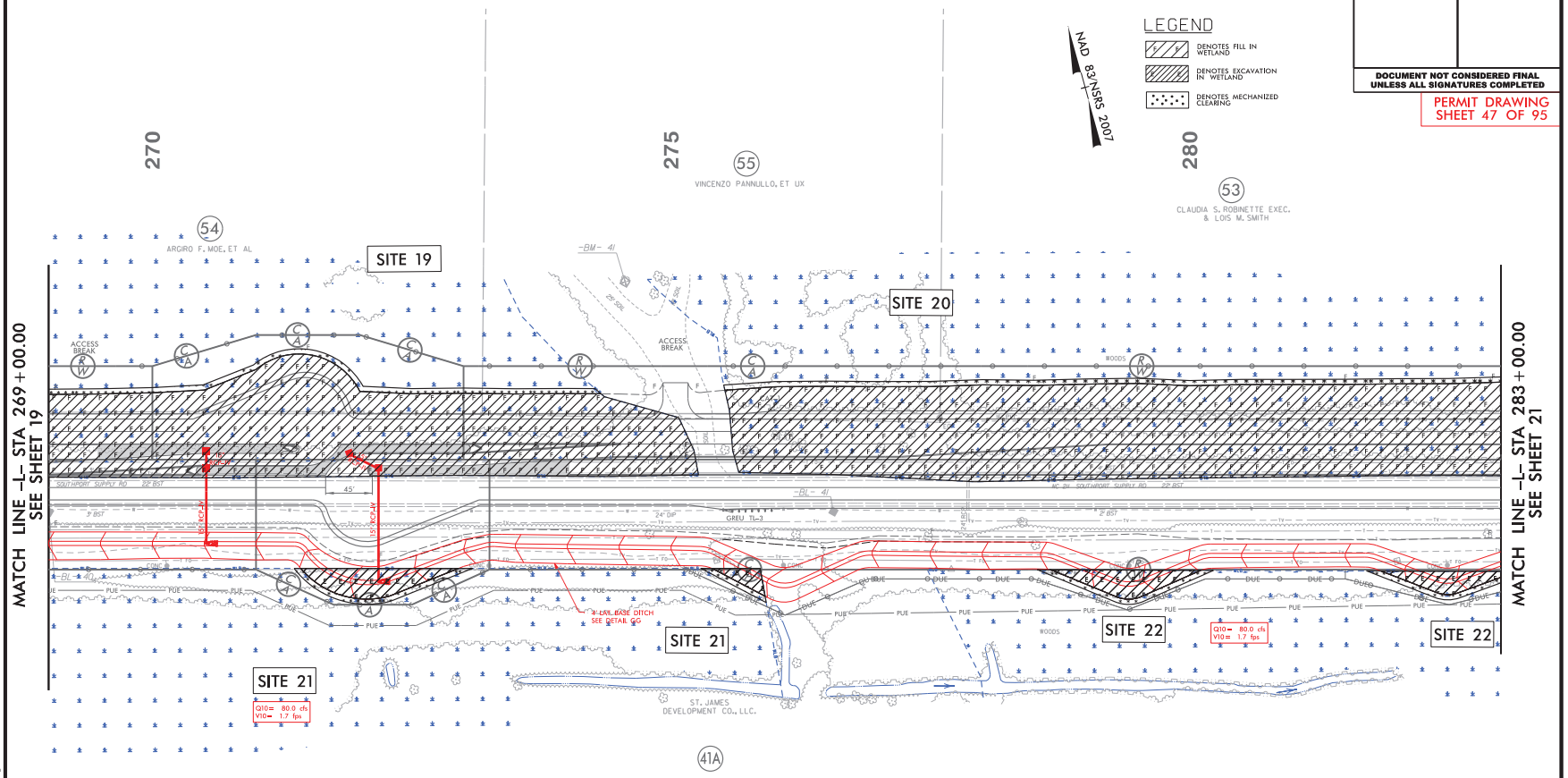
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

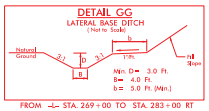
PROJECT REFERENCE NO.	SHEET NO.
R-5021	20
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 47 OF 95



DETAIL GG
LATERAL BASE DITCH
(Not to Scale)



NOTE:

1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

FOR -L- PROFILE, SEE SHEET 49
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3

P-152

5/14/99
2/19/2021 R-5021_HYD_PERMIT_DRAWINGS.PSH28_47 of 95.dgn

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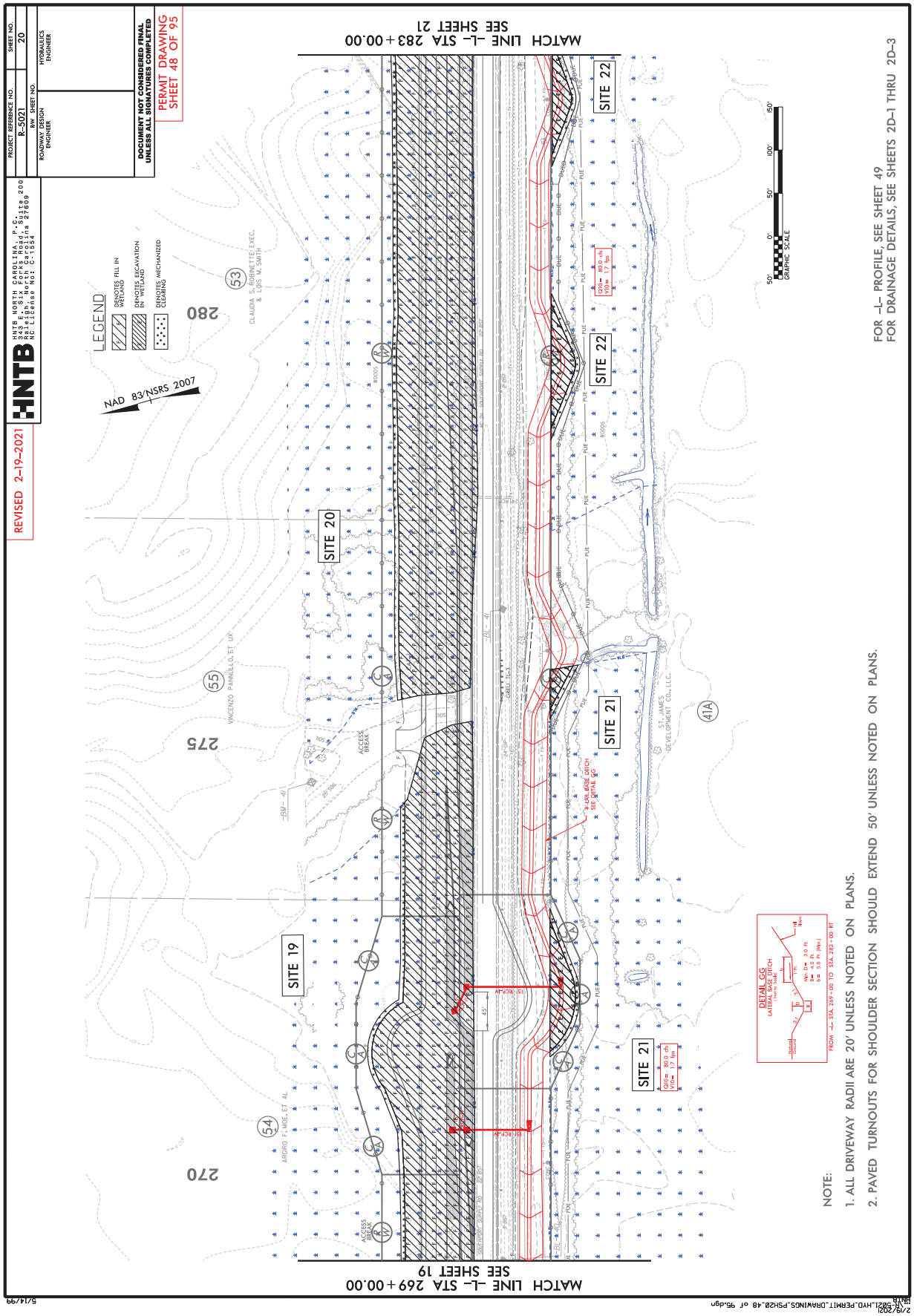
REVISED 2-19-2021
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HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
SHEET NO.
20
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 48 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 283+00.00
SEE SHEET 21
MATCH LINE -L- STA 269+00.00
SEE SHEET 19
SITE 19
SITE 20
SITE 21
SITE 22
280
275
270
53
55
54
41A
CLAUDIA S. ROBINETTE, EXEC. & LOIS M. SMITH
VINCENZO PANNULLO, ET UX
ARGIRO F. MOE, ET AL
ST. JAMES DEVELOPMENT CO., LLC.
WOODS
ACCESS BREAK
DETAIL GG
LATERAL BASE DITCH
FROM -L- STA. 269+00 TO STA. 283+00 RT
GRAPHIC SCALE
0' 50' 100' 150'
FOR -L- PROFILE, SEE SHEET 49
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

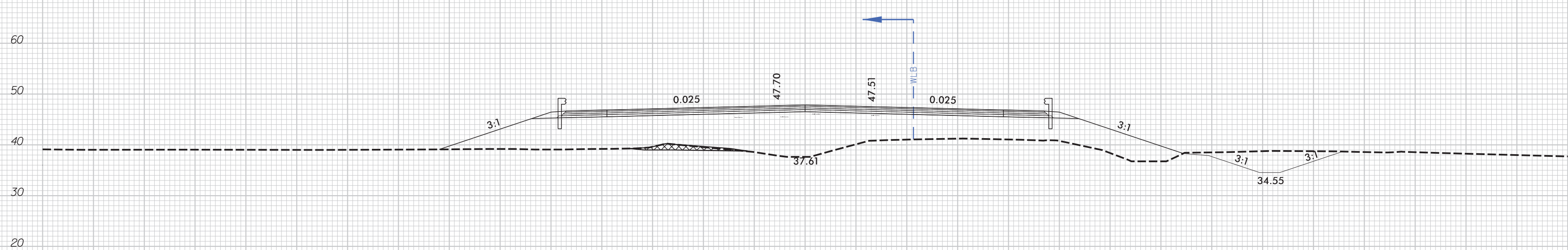
5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 49 OF 95

WETLAND CROSS SECTIONS

SITE 20

-L- 278+00.00



SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16

5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
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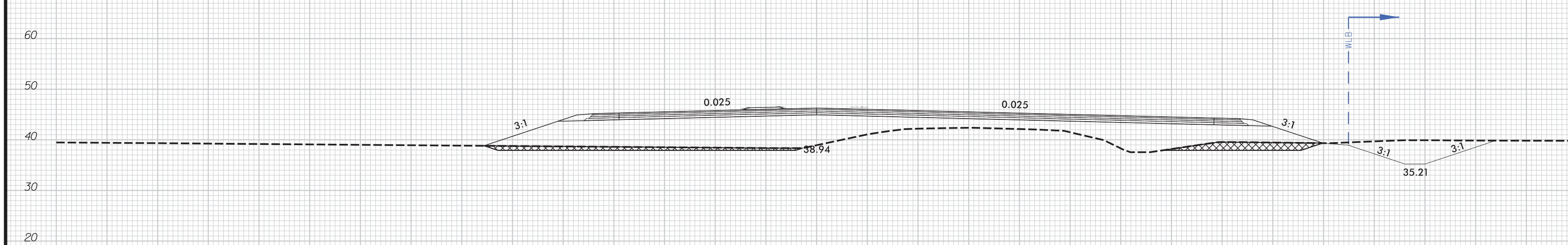
5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 50 OF 95

WETLAND CROSS SECTIONS

SITE 21

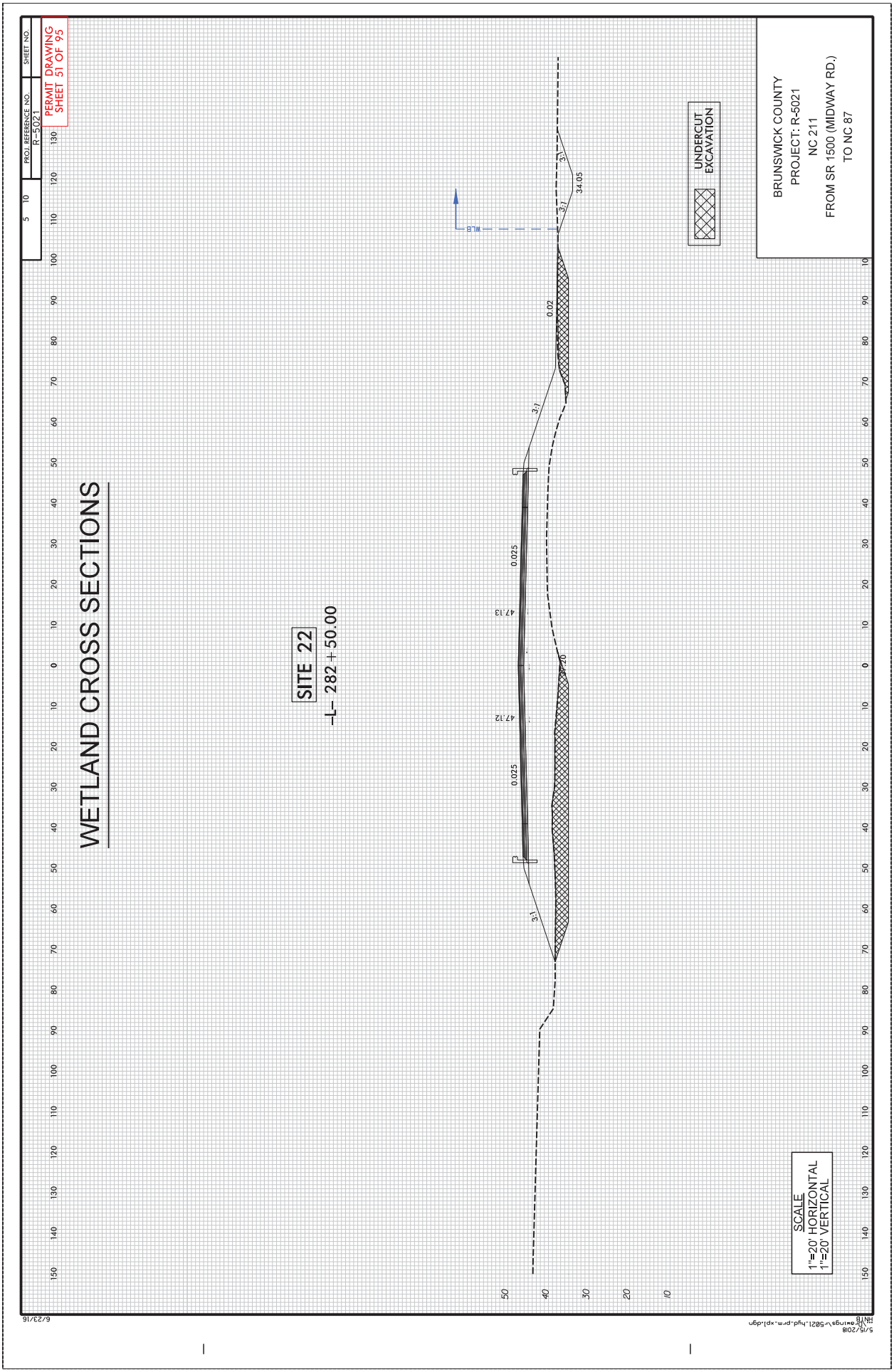
–L– 272+00.00

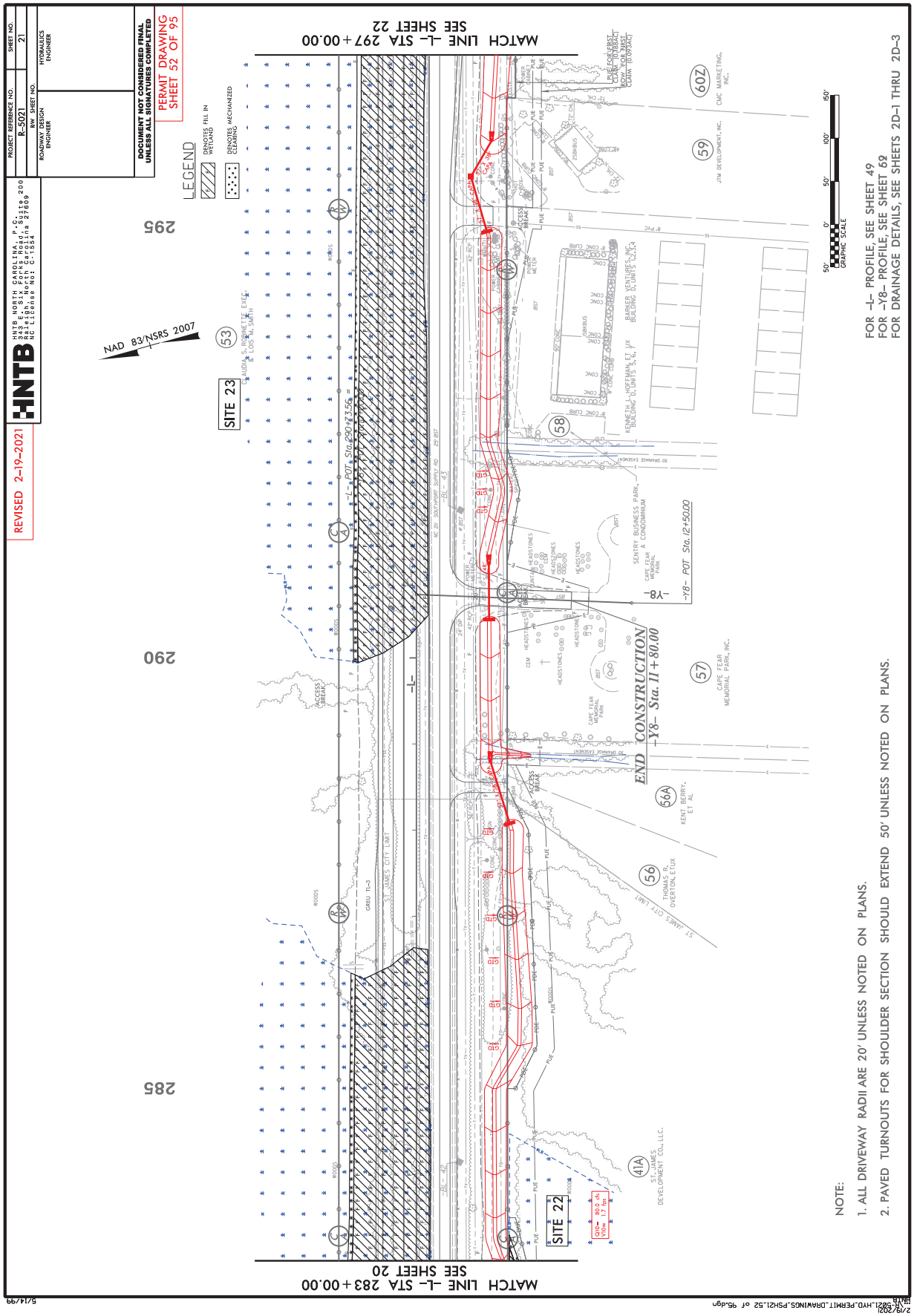


UNDERCUT EXCAVATION

SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87


WETLAND CROSS SECTIONS
SITE 22
-L- 282 + 50.00
BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87
UNDERCUT EXCAVATION
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL
PERMIT DRAWING
SHEET 51 OF 95
PROJ. REFERENCE NO.
R-5021
SHEET NO.
5 10
3:1
0.02
0.025
47.13
47.12
34.05
WLB
6/23/16
5/15/2018
H:\Drawings\5021_hyd_prm_xpl.dgn


REVISED 2-19-2021
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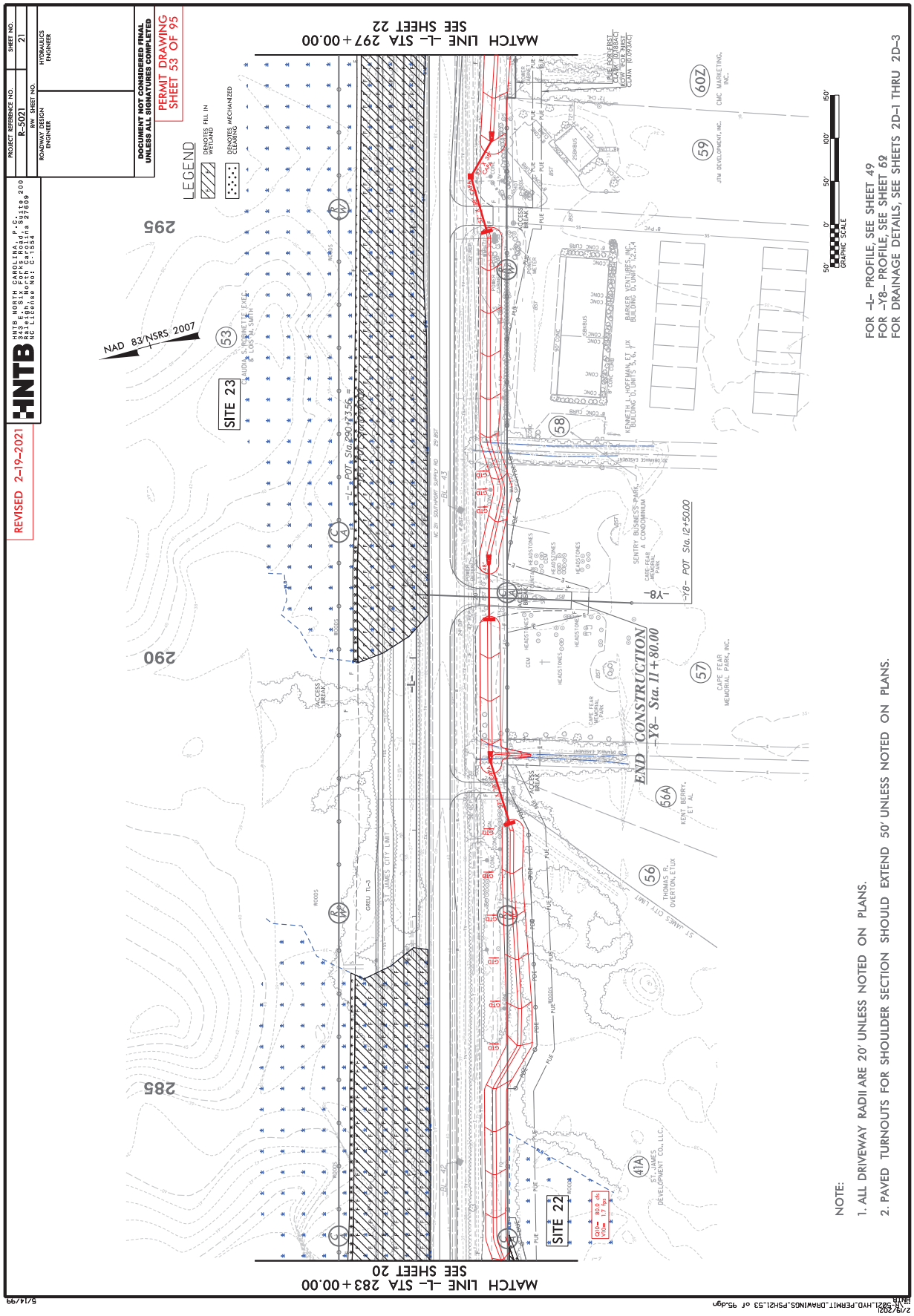
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
21
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 52 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 283+00.00 SEE SHEET 20
MATCH LINE -L- STA 297+00.00 SEE SHEET 22
SITE 22
SITE 23
-L- POT Sta.290+23.56
-Y8- POT Sta.12+50.00
END CONSTRUCTION -Y8- Sta. 11+80.00
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 49
FOR -Y8- PROFILE, SEE SHEET 62
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
GRAPHIC SCALE
295
290
285


REVISED 2-19-2021
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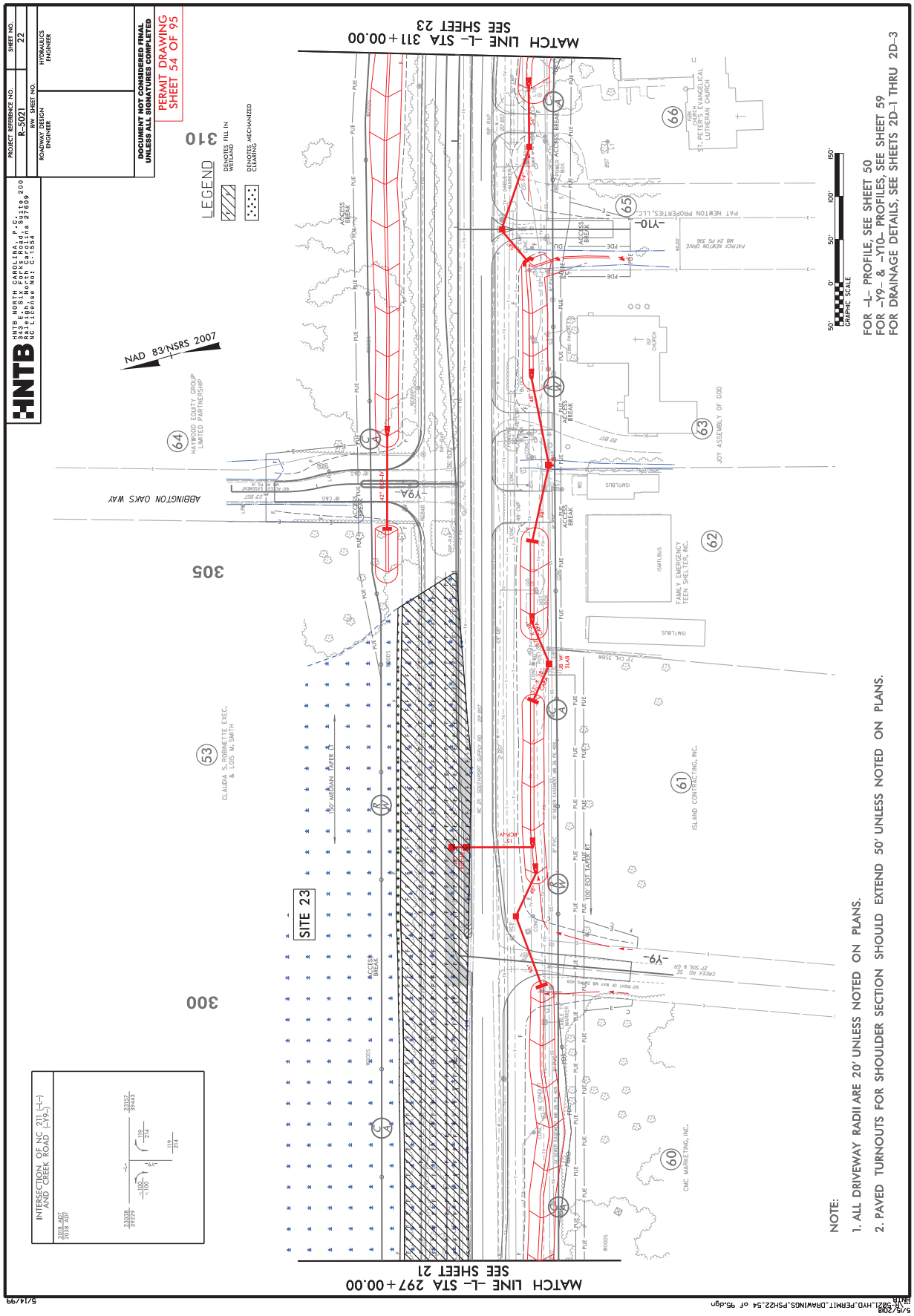
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
21
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 53 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 283+00.00
SEE SHEET 20
MATCH LINE -L- STA 297+00.00
SEE SHEET 22
SITE 22
SITE 23
-L- POT Sta.290+23.56
-Y8- POT Sta.12+50.00
END CONSTRUCTION
-Y8- Sta. 11+80.00
295
290
285
GRAPHIC SCALE
50' 0' 50' 100' 150'
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 49
FOR -Y8- PROFILE, SEE SHEET 62
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3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HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
22
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 54 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 311+00.00
SEE SHEET 23
MATCH LINE -L- STA 297+00.00
SEE SHEET 21
SITE 23
ABBINGTON OAKS WAY
-Y9A-
-Y9-
-Y10-
310
305
300
53 CLAUDIA S. ROBINETTE EXEC. & LOIS M. SMITH
60 CMC MARKETING, INC.
61 ISLAND CONTRACTING, INC.
62 FAMILY EMERGENCY TEEN SHELTER, INC.
63 JOY ASSEMBLY OF GOD
64 HAYWOOD EQUITY GROUP LIMITED PARTNERSHIP
65 PAT NEWTON PROPERTIES, LLC
66 ST. PETER'S EVANGELICAL LUTHERAN CHURCH
INTERSECTION OF NC 211 (-L-) AND CREEK ROAD (-Y9-)
2018 ADT
2038 ADT
23038
39239
23167
39443
119
214
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.
FOR -L- PROFILE, SEE SHEET 50
FOR -Y9- & -Y10- PROFILES, SEE SHEET 59
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
GRAPHIC SCALE
5/4/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH22-54 of 95.dgn
HNTB
5/4/2018

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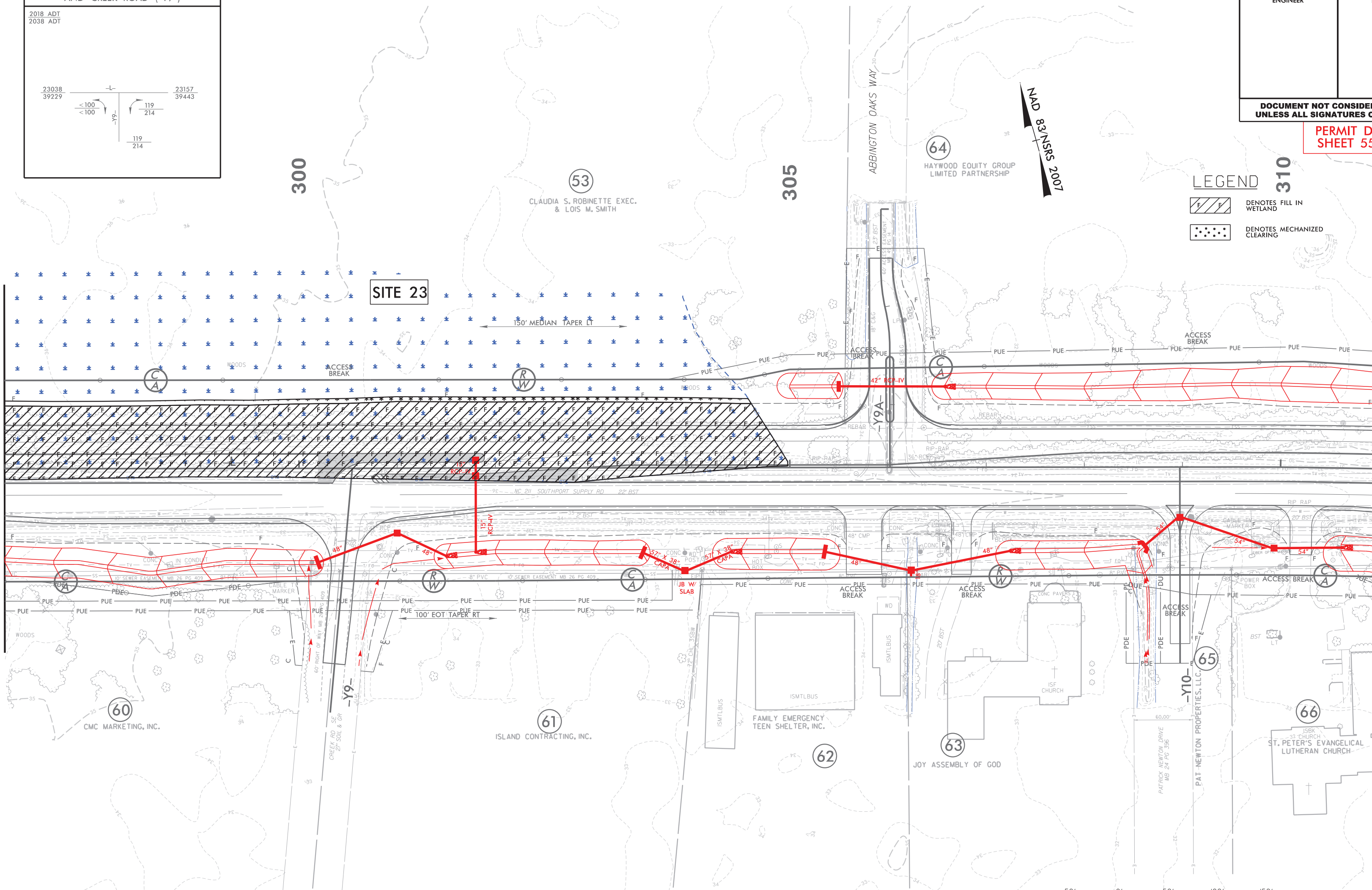
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	22
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 55 OF 95

INTERSECTION OF NC 211 (-L-) AND CREEK ROAD (-Y9-)
2018 ADT
2038 ADT



NOTE:

1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

FOR -L- PROFILE, SEE SHEET 50
FOR -Y9- & -Y10- PROFILES, SEE SHEET 59
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3

5/14/99

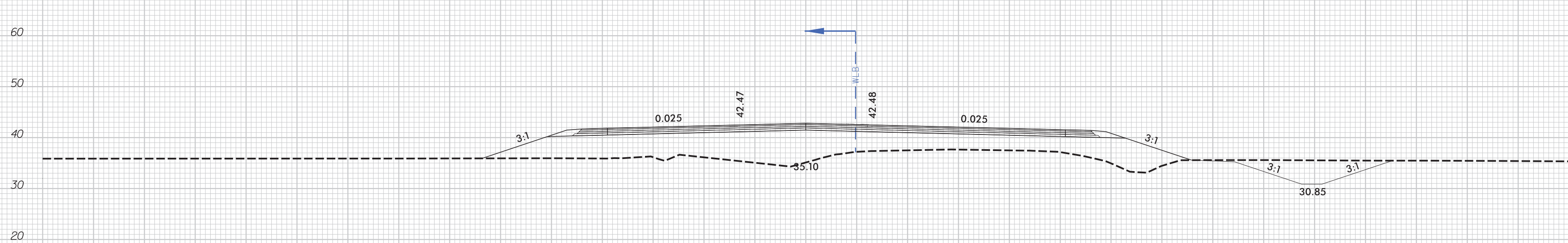
5/15/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH22_55 of 95.dgn

5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 56 OF 95

WETLAND CROSS SECTIONS

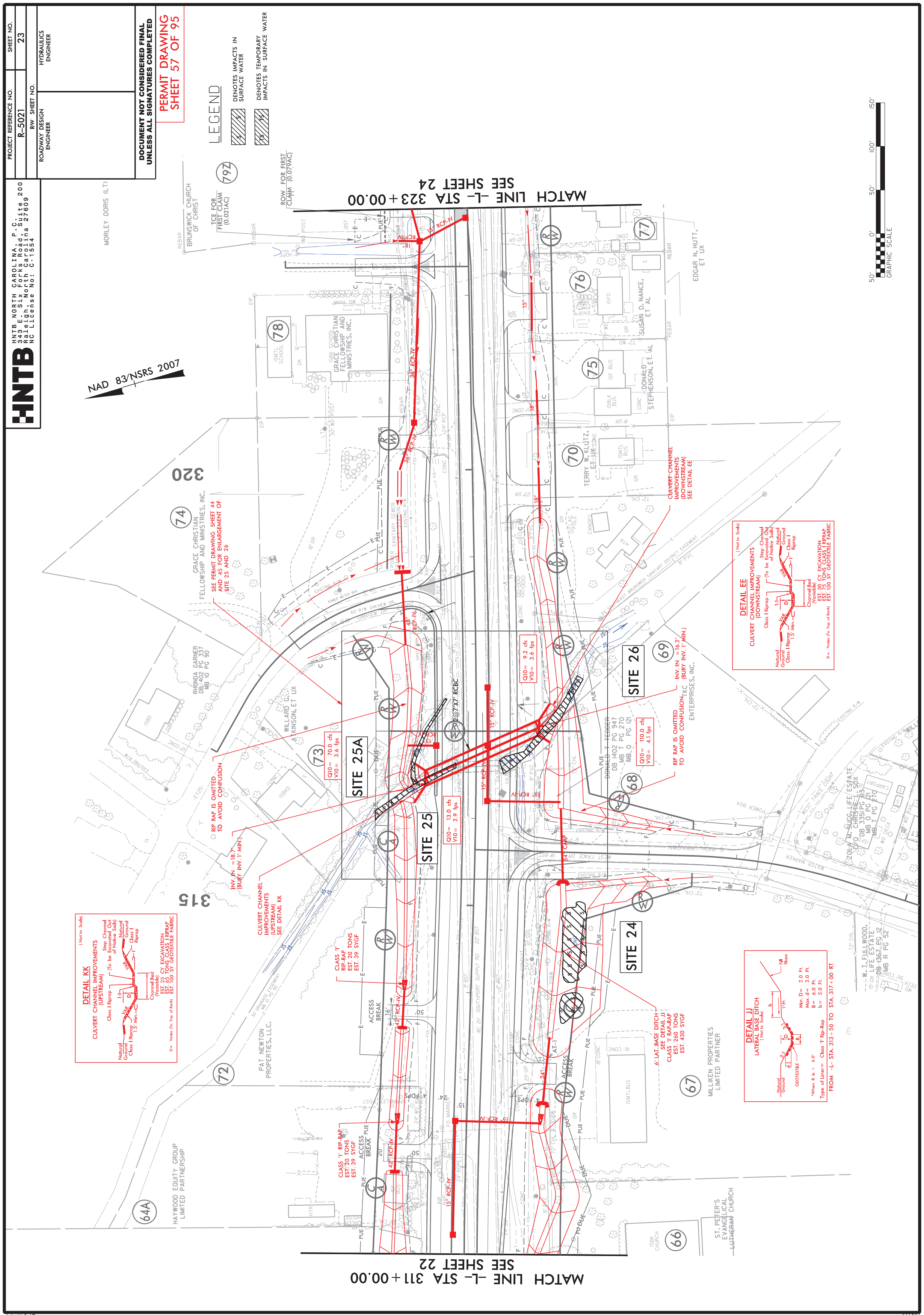
SITE 23
-L- 298+00.00

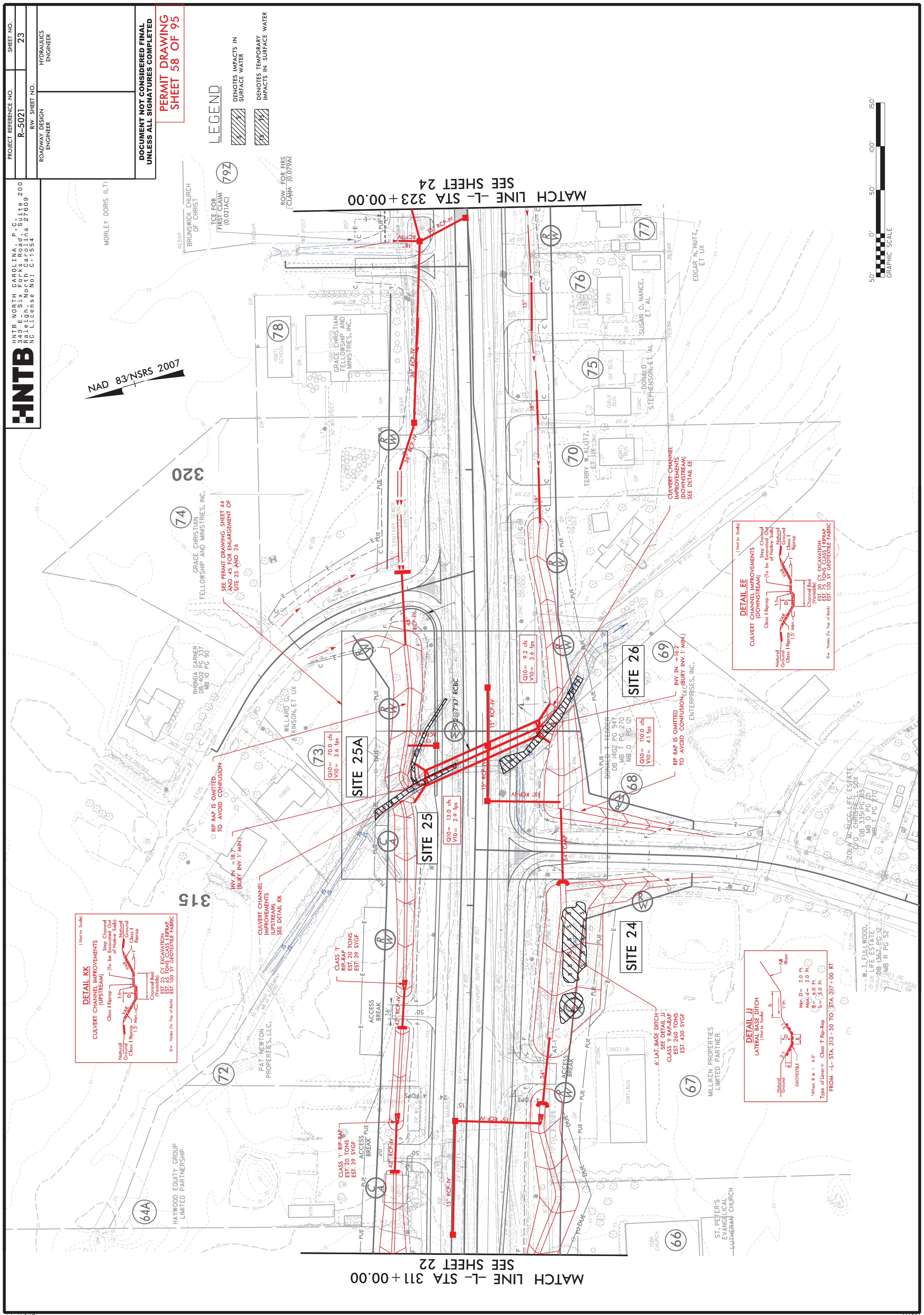


SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16
5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB


PERMIT DRAWING
SHEET 57 OF 95
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HNTB
NAD 83/NSRS 2007
LEGEND
MATCH LINE -L- STA 323+00.00
SEE SHEET 24
MATCH LINE -L- STA 311+00.00
SEE SHEET 22
SITE 24
SITE 25
SITE 25A
SITE 26
DETAIL EE
DETAIL JJ
DETAIL KK
GRAPHIC SCALE



PROJECT REFERENCE NO.
R-5021
SHEET NO.
23
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 58 OF 95
HNTB
LEGEND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NAD 83/NSRS 2007
MATCH LINE -L- STA 323+00.00 SEE SHEET 24
MATCH LINE -L- STA 311+00.00 SEE SHEET 22
SITE 24
SITE 25
SITE 25A
SITE 26
DETAIL EE
DETAIL KK
DETAIL JJ
GRAPHIC SCALE

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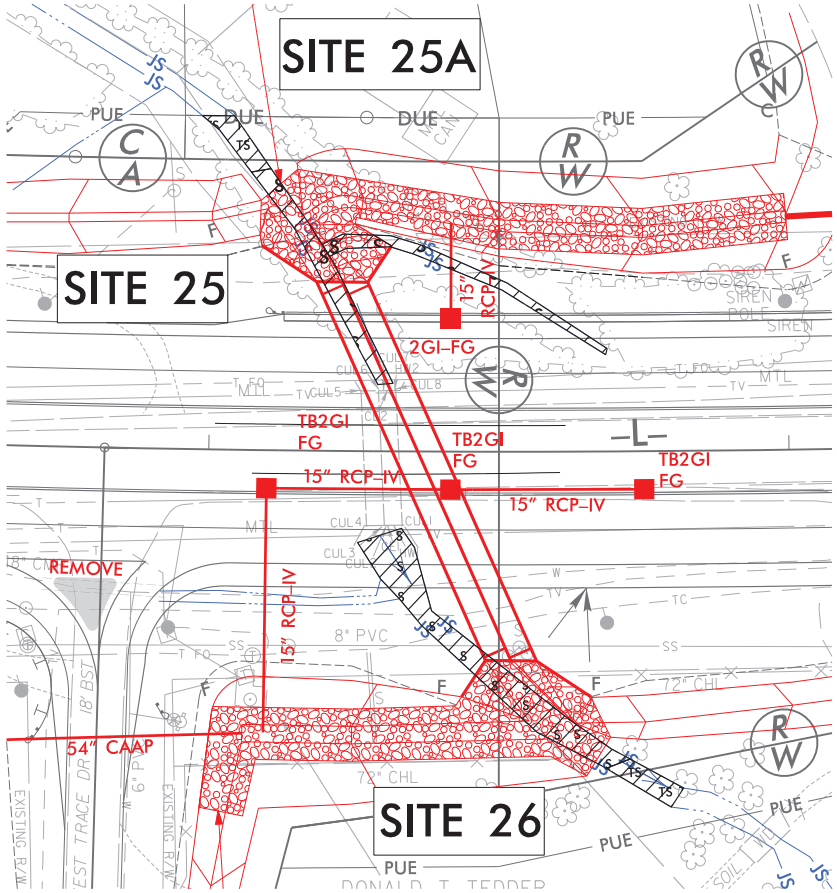
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 59 OF 95

NAD 83/NSRS 2007



LEGEND

S S DENOTES IMPACTS IN SURFACE WATER

TS TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

40' 0' 40' 80' 120'
GRAPHIC SCALE

P-164

5/14/09
5/15/2018
R-5021_HYD_PERMIT_DRAWINGS.PSH23.59 of 95.SITE_25A26.dgn

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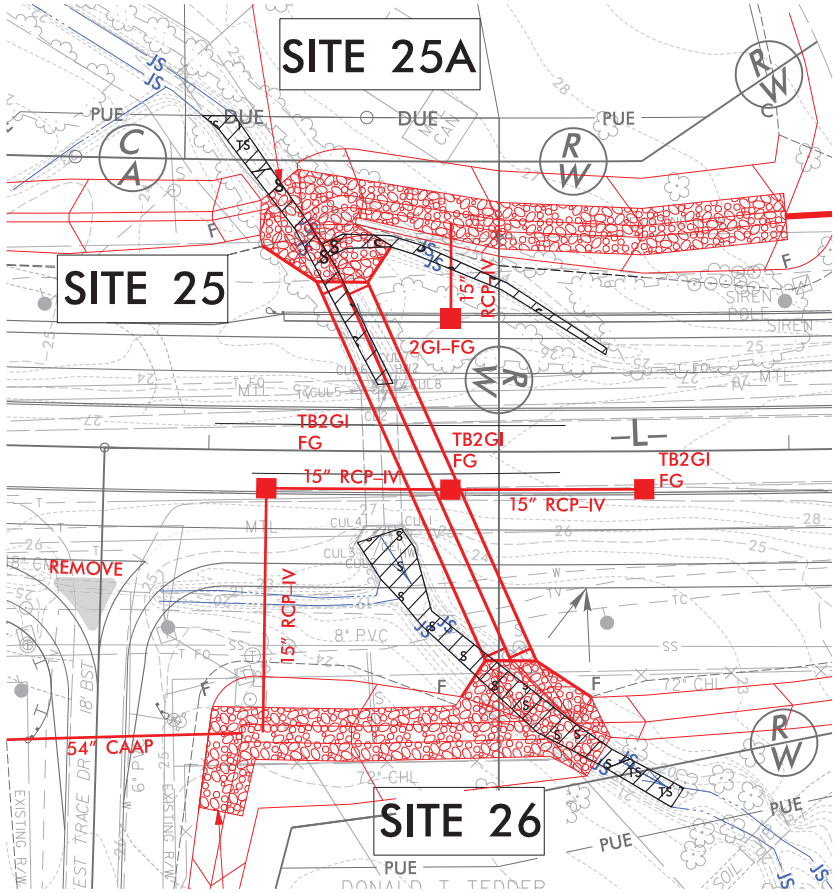
Raleigh, North Carolina 27609
NC License No: C-1554

PROJECT REFERENCE NO.	SHEET NO.
R-5021	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PERMIT DRAWING
SHEET 60 OF 95

NAD 83/NSRS 2007



LEGEND

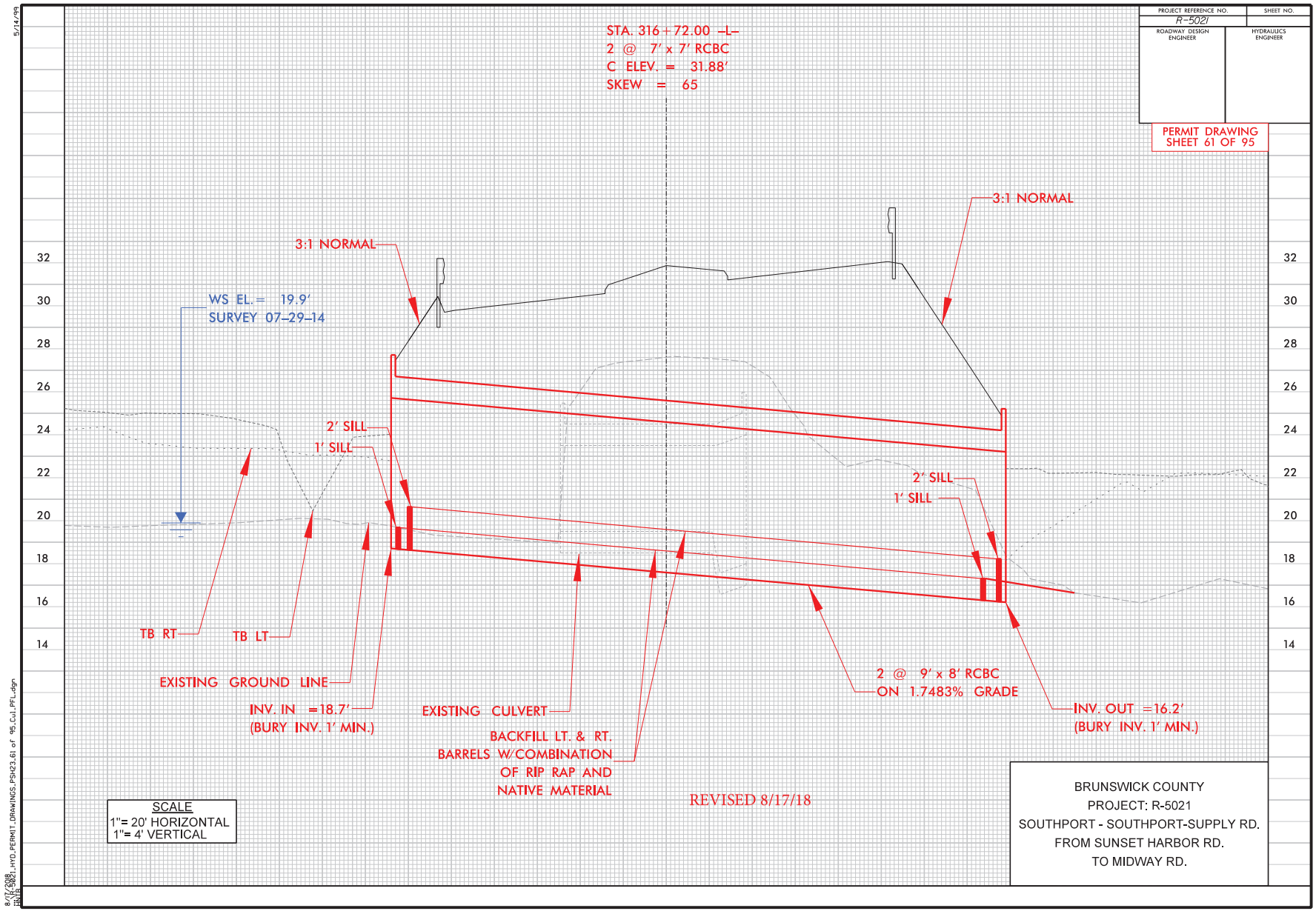
S S — DENOTES IMPACTS IN SURFACE WATER

TS TS — DENOTES TEMPORARY IMPACTS IN SURFACE WATER

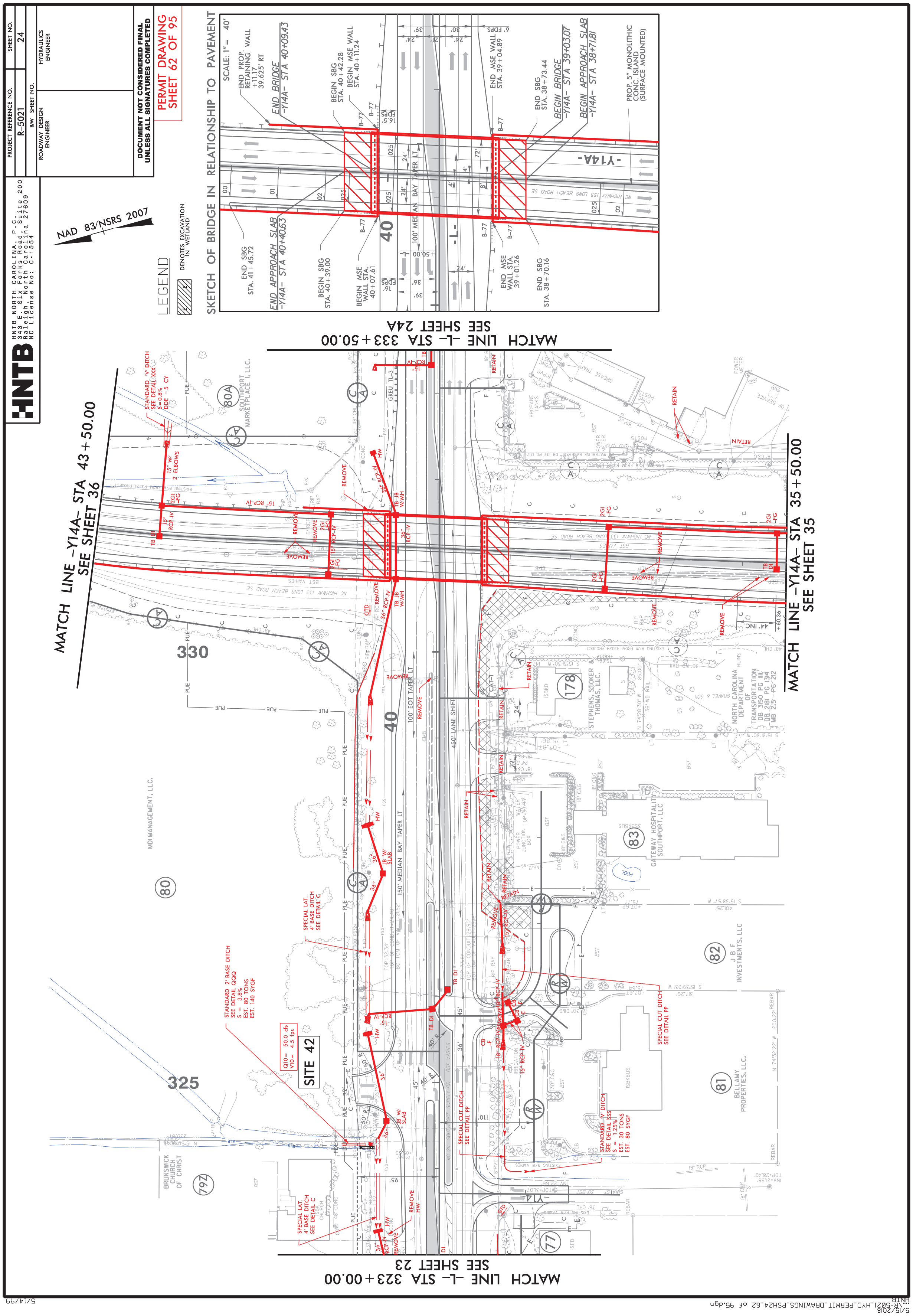
40' 0' 40' 80' 120'
GRAPHIC SCALE

P-165

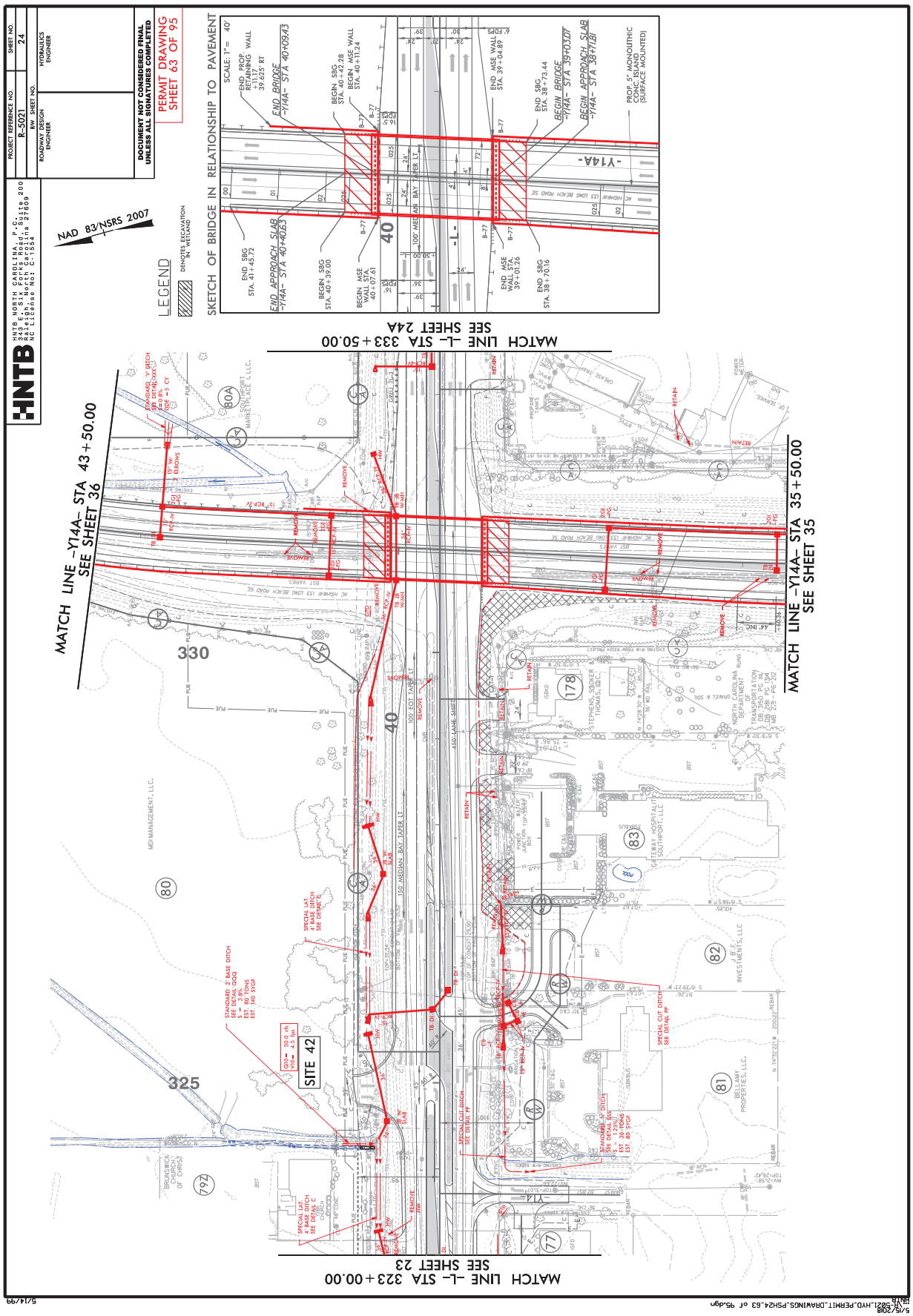
5/14/09
5/15/2018
R-5021_HYD_PERMIT_DRAWINGS.PSH23.60 of 95.SITE_25A26.dgn


STA. 316+72.00 –L–
2 @ 7′ x 7′ RCBC
C ELEV. = 31.88′
SKEW = 65
PROJECT REFERENCE NO.
R-5021
SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PERMIT DRAWING
SHEET 61 OF 95
3:1 NORMAL
3:1 NORMAL
WS EL.= 19.9′
SURVEY 07–29–14
2′ SILL
1′ SILL
2′ SILL
1′ SILL
TB RT
TB LT
EXISTING GROUND LINE
INV. IN =18.7′
(BURY INV. 1′ MIN.)
EXISTING CULVERT
BACKFILL LT. & RT.
BARRELS W/COMBINATION
OF RIP RAP AND
NATIVE MATERIAL
2 @ 9′ x 8′ RCBC
ON 1.7483% GRADE
INV. OUT =16.2′
(BURY INV. 1′ MIN.)
REVISED 8/17/18
SCALE
1"= 20′ HORIZONTAL
1"= 4′ VERTICAL
BRUNSWICK COUNTY
PROJECT: R-5021
SOUTHPORT - SOUTHPORT-SUPPLY RD.
FROM SUNSET HARBOR RD.
TO MIDWAY RD.
32
30
28
26
24
22
20
18
16
14
5/14/99
8/17/2018
R-5021_HYD_PERMIT_DRAWINGS_PSH23.61 of 95_Cul_PFL.dgn

P-167


HNTB
PROJECT REFERENCE NO.
R-5021
SHEET NO.
24
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 62 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES EXCAVATION IN WETLAND
SKETCH OF BRIDGE IN RELATIONSHIP TO PAVEMENT
SCALE: 1" = 40'
MATCH LINE -L- STA 333+50.00
SEE SHEET 24A
MATCH LINE -Y14A- STA 43+50.00
SEE SHEET 36
MATCH LINE -Y14A- STA 35+50.00
SEE SHEET 35
SITE 42
MATCH LINE -L- STA 323+00.00
SEE SHEET 23

P-168

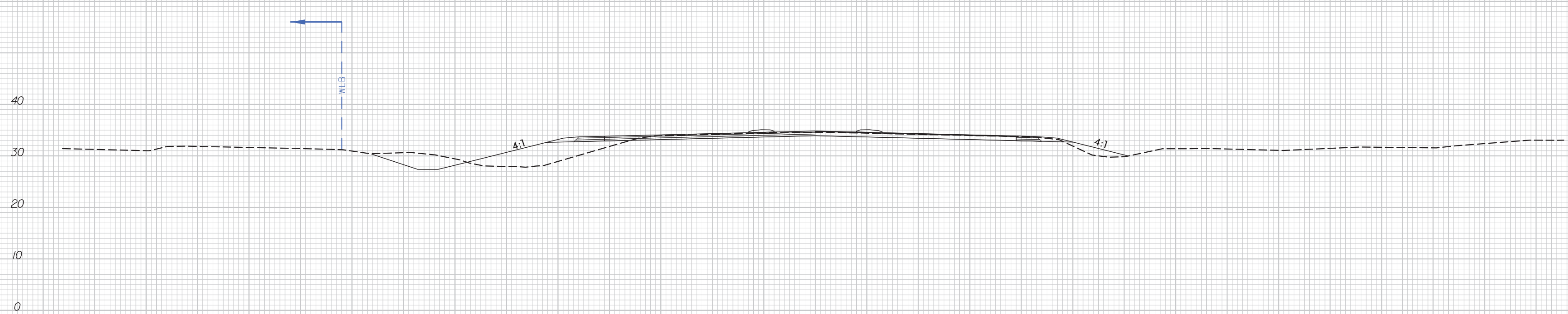

HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
SHEET NO.
24
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 63 OF 95
NAD 83/NSRS 2007
LEGEND
DENOTES EXCAVATION IN WETLAND
SKETCH OF BRIDGE IN RELATIONSHIP TO PAVEMENT
SCALE: 1"= 40'
END BRIDGE -Y14A- STA 40+09.43
END APPROACH SLAB -Y14A- STA 40+40.63
BEGIN APPROACH SLAB -Y14A- STA 38+71.81
BEGIN BRIDGE -Y14A- STA 39+03.07
-Y14A-
MATCH LINE -L- STA 333+50.00
SEE SHEET 24A
MATCH LINE -Y14A- STA 43+50.00
SEE SHEET 36
MATCH LINE -Y14A- STA 35+50.00
SEE SHEET 35
MATCH LINE -L- STA 323+00.00
SEE SHEET 23
SITE 42
330
325
40
5/4/2018
-N-5021_HYD_PERMIT_DRAWINGS_PSH24-63 of 95.dgn

5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 64 OF 95

WETLAND CROSS SECTIONS

SITE 42
-L- 324+24.00

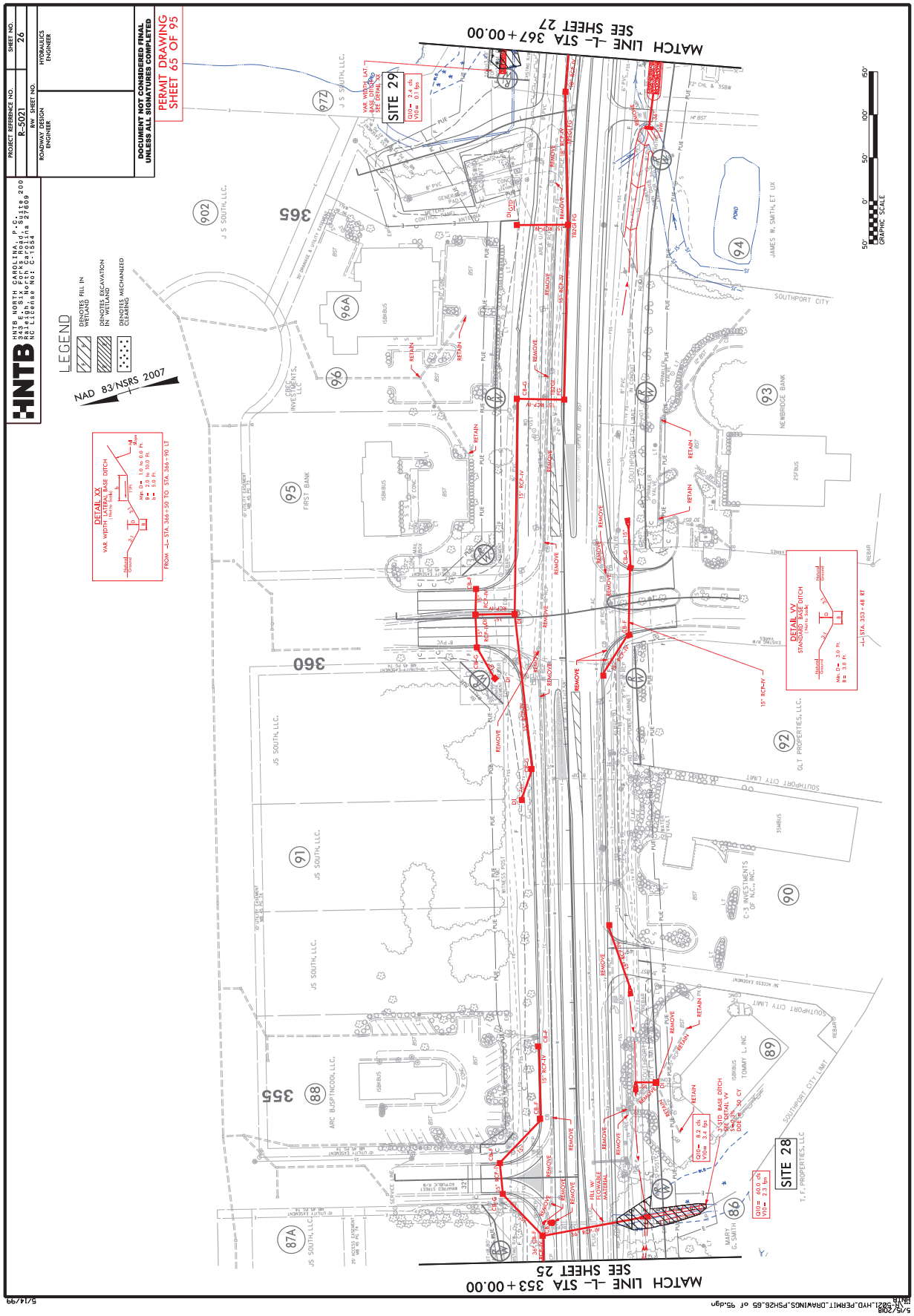


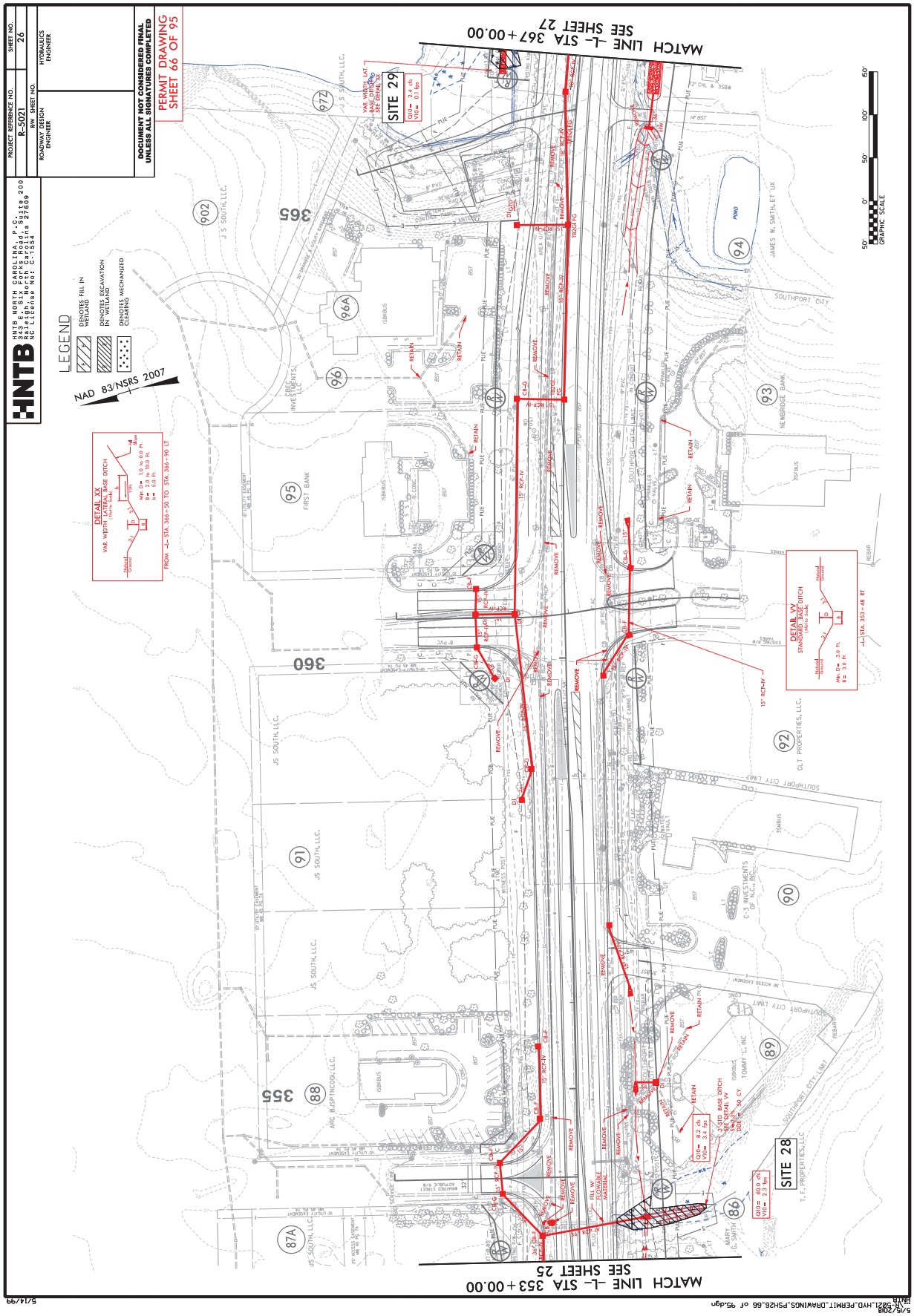
SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16
5/15/2018
...\Drawings\r5021_hyd_prm_xpl.dgn
HNTB

P-170


HNTB
HNTB NORTH CAROLINA, P.C.
PROJECT REFERENCE NO.
R-5021
SHEET NO.
26
RW SHEET NO.
HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 65 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
DETAIL XX
VAR. WIDTH LATERAL BASE DITCH
FROM -L- STA. 366+50 TO STA. 366+90 LT
DETAIL VV
STANDARD BASE DITCH
-L- STA. 353+48 RT
MATCH LINE -L- STA 367+00.00
SEE SHEET 27
MATCH LINE -L- STA 353+00.00
SEE SHEET 25
SITE 29
SITE 28
SOUTHPORT CITY LIMIT
JAMES W. SMITH, ET UX
NEWBRIDGE BANK
FIRST BANK
GLT PROPERTIES, LLC
T. F. PROPERTIES, LLC
JS SOUTH, LLC
ARC BJSPTNCOOL, LLC
TOMMY L. INC
MARY G. SMITH
C-3 INVESTMENTS OF N.C., INC.
GREG INVESTMENTS, LLC
365
360
355
GRAPHIC SCALE

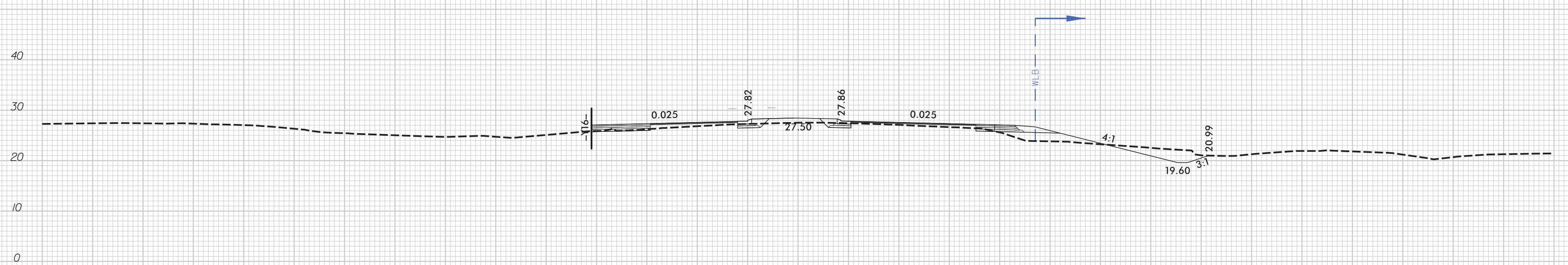

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
PROJECT REFERENCE NO.
R-5021
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
SHEET NO.
26
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PERMIT DRAWING SHEET 66 OF 95
LEGEND
DENOTES FILL IN WETLAND
DENOTES EXCAVATION IN WETLAND
DENOTES MECHANIZED CLEARING
NAD 83/NSRS 2007
MATCH LINE -L- STA 367+00.00 SEE SHEET 27
MATCH LINE -L- STA 353+00.00 SEE SHEET 25
SITE 29
SITE 28
DETAIL XX
VAR. WIDTH LATERAL BASE DITCH
DETAIL VV
STANDARD BASE DITCH
FROM -L- STA. 366+50 TO STA. 366+90 LT
-L- STA. 353+48 RT
365
360
355
JS SOUTH, LLC.
FIRST BANK
NEWBRIDGE BANK
SOUTHPORT CITY
GLT PROPERTIES, LLC
T. F. PROPERTIES, LLC
GRAPHIC SCALE

5	10	PROJ. REFERENCE NO.	SHEET NO.
		R-5021	

PERMIT DRAWING
SHEET 67 OF 95

WETLAND CROSS SECTIONS

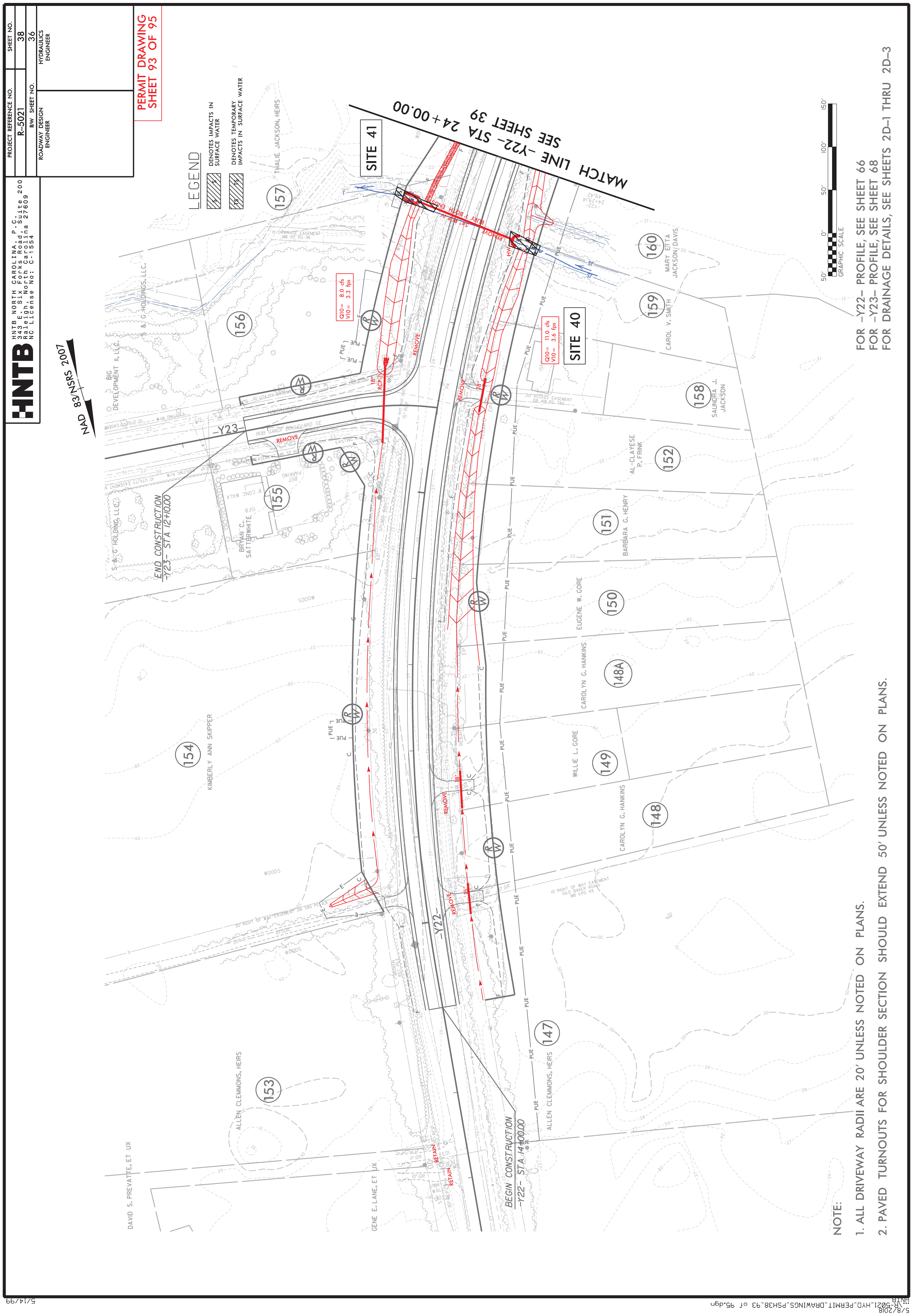
SITE 28
-L- 353+50.00



SCALE
1"=20' HORIZONTAL
1"=20' VERTICAL

BRUNSWICK COUNTY
PROJECT: R-5021
NC 211
FROM SR 1500 (MIDWAY RD.)
TO NC 87

6/23/16
5/15/2018
HNTB


PROJECT REFERENCE NO.
R-5021
SHEET NO.
38
RW SHEET NO.
36
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PERMIT DRAWING
SHEET 93 OF 95
HNTB
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554
NAD 83/NSRS 2007
LEGEND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCH LINE -Y22- STA 24+00.00
SEE SHEET 39
SITE 41
SITE 40
-Y23-
-Y22-
END CONSTRUCTION
-Y23- STA 12+10.00
BEGIN CONSTRUCTION
-Y22- STA 14+00.00
REMOVE
RETAIN
WOODS
KIMBERLY ANN SKIPPER
ALLEN CLEMMONS, HEIRS
DAVID S. PREVATTE, ET UX
GENE E. LANE, ET UX
BRYAN C. SATTERWHITE
CAROLYN G. HANKINS
WILLIE L. CORE
EUGENE W. CORE
BARBARA G. HENRY
AL-CLAYESE P. FRINK
SAUNDRA J. JACKSON
CAROL V. SMITH
MARY ETTA JACKSON DAVIS
THALIE JACKSON, HEIRS
GRAPHIC SCALE
FOR -Y22- PROFILE, SEE SHEET 66
FOR -Y23- PROFILE, SEE SHEET 68
FOR DRAINAGE DETAILS, SEE SHEETS 2D-1 THRU 2D-3
NOTE:
1. ALL DRIVEWAY RADII ARE 20' UNLESS NOTED ON PLANS.
2. PAVED TURNOUTS FOR SHOULDER SECTION SHOULD EXTEND 50' UNLESS NOTED ON PLANS.

REVISED 10/05/21

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	-L- 55+39 - 57+85 RT	4' Base Ditch			0.172							
2	-L- 57+22 - 75+36 RT	Roadway Fill						0.290				
3	-YAREV- 11+24 - 15+52 LT	Roadway Fill	0.316			0.044						
4	-YREV- 38+47 - 48+34 LT	15" & 48" RCP / Roadway Fill	0.906			0.068						
4	-L- 81+78 - 86+05 RT	Special Cut Ditch			0.211							
5	-L- 85+22 - 86+44 LT	15" RCP / Roadway Fill	0.076			0.015						
5	-L- 83+55 - 83+84 LT	2 @ 8' X 6' RCBC						0.021	0.002	82	14	
5	-YB- 16+72 - 19+00 LT	Roadway Fill	0.084			0.025						
6	-L- 100+43 - 100+73 LT	36" RCP						0.014	0.001	91	9	
6	-L- 100+78 - 103+67 LT	Roadway Fill	0.149			0.032						
7	-L- 106+05 - 107+32 LT	36' RCP						0.414	0.003	133	13	
9	-L- 113+86 - 126+79 LT	Roadway Fill	1.186			0.147						
10	-L- 126+92 - 144+52 LT	Roadway Fill	0.985			0.271						
11	-L- 200+46 - 205+16 RT	Roadway Fill	0.101			0.053						
12	-L- 211+66 - 214+04 LT	60" X 38" HERCP / Roadway Fill (Pond)						0.237	0.142			
13	-L- 216+73 - 218+28 LT	54" RCP						0.031	0.003	153	19	
13	-L- 216+76 - 217+92 LT	Roadway Fill / 4' Lateral Base Ditch	0.039		0.024							
14	-L- 216+53 - 216+82 RT	54" RCP						0.005	0.006	16	15	
14	-L- 215+99 - 217+82 RT	Roadway Fill / Lateral 'V' Ditch	0.046		0.001	0.007						
15	-L- 222+97 - 223+54 LT	Roadway Fill / 'V' Ditch	0.024		0.020							
15	-L- 222+97 - 223+54 LT	Indirect Impacts - Total Take	0.040									
16	-L- 225+77 - 226+44 LT	2 @ 9' X 8' RCBC						0.037	0.004	150	10	
16	-L- 225+21 - 227+48 LT	Roadway Fill / Var. Width Base Ditch	0.303		0.008	0.019						
17	-L- 225+59 - 225+92 RT	2 @ 9' X 8' RCBC						0.029	0.003	59	10	
17	-L- 222+60 - 226+73 RT	4' Base Ditch	0.015		0.131	0.027						
SUBTOTALS*:			4.270		0.567	0.708		1.078	0.164	684	90	

NOTES: Site 1: The Total Site Impact of 0.17 acres includes 0.10 acres of drainage effect from ditching.
Site 8: This Site has been eliminated.
Site 15: Total Site Impact of 0.08 acres includes 0.04 acres of direct impacts and 0.04 acres of indirect impacts. Total Take impacts 1:1 mitigation.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
10/5/2021
Brunswick County
R-5021

Revised 2016 09 09

REVISED 10/05/21

WETLAND AND SURACE WATER IMPACTS SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND IMPACTS					SURFACE WATER IMPACTS				
			Permanent Fill In Wetlands (ac)	Temp. Fill In Wetlands (ac)	Excavation in Wetlands (ac)	Mechanized Clearing in Wetlands (ac)	Hand Clearing in Wetlands (ac)	Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
18	-L- 237+79 - 242+95 LT	Roadway Fill	0.540			0.045						
19	-L- 245+23 - 275+27 LT	Roadway Fill	5.350			0.296						
20	-L- 275+51 - 286+64 LT	Roadway Fill	2.206			0.124						
21	-L- 271+43 - 275+91 RT	4' Base Ditch			0.079	0.028						
22	-L- 278+65 - 283+16 RT	4' Base Ditch			0.087	0.037						
23	-L- 289+94 - 304+98 LT	Roadway Fill	2.564			0.168						
24	-L- 313+81 - 314+96 RT	6' Base Ditch (Pond)						0.065				
25	-L- 315+96 - 316+63 LT	2 @ 7' X 7' RCBC						0.011	0.004	85	24	
25A	-L- 316+38 - 317+38 LT	Roadway Fill						0.008		107		
26	-L- 316+52 - 317+84 RT	2 @ 7' X 7' RCBC						0.025	0.004	116	24	
42	-L- 324+23 - 324.26 LT	2' Base Ditch			0.001							
28	-L- 353+34 - 353+73 RT	Special 'V' Ditch / 3' base Ditch	0.006			0.040						
29	-L- 366+77 - 369+06 LT	Roadway Fill	0.277			0.069	0.019					
30	-L- 370+03 - 375+93 LT	Roadway Fill / Var. Base Ditch	0.492			0.071						
31	-L- 369+37 - 369+59 RT	Bank Stabilization						0.001	0.004	18	29	
32	-L- 370+83 - 370+94 RT	Roadway Fill	0.001			0.001						
34	-L- 428+24 - 428+68 LT	66" RCP						0.029	0.002	73	8	
35	-YB- 11+41 - 13+72 LT	Roadway Fill						0.068	0.008			
36	-YREV- 9+47 - 9+77 RT	3' Base Ditch			0.003							
37	-Y14D- 19+91 - 20+15 LT	Special 'V' Ditch						0.005	0.005			
37	-Y14A- 52+57 - 59+22 RT	2 @ 60" RCP EXT. / Roadway Fill	0.222			0.048		0.311	0.005			
38	-Y14A- 55+80 - 66+12 LT	2 @ 60" RCP EXT. / Roadway Fill	0.058		0.009	0.029		0.287	0.004			
39	-Y14A- 64+77 - 66+24 RT	Roadway Fill	0.009			0.021						
40	-Y22- 23+04 - 23+21 RT	54" RCP						0.009	0.003	26	10	
41	-Y22- 23+17 - 23+32 LT	54" RCP						0.009	0.002	40	10	
42	-L- 324+23 - 324+26 LT	2' Base Ditch			0.001							
SUBTOTALS*:			11.725		0.180	0.977	0.019	0.828	0.041	465	105	
FINAL TOTALS*:			15.995		0.747	1.685	0.019	1.905	0.204	1149	195	

NOTES: Site 27: This Site has been eliminated.
Site 33: This Site has been eliminated.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
10/5/2021
Brunswick County
R-5021

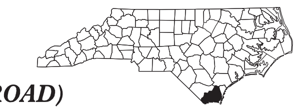
SHEET 95 OF 95

Revised 2016 09 09

P-200

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.
N.C.	R-5021	UE-01
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
41582.1.1	STP-0211(21)	PE
41582.2.2	STP-0211(21)	UTILITIES
41582.2.3	STP-0211(21)	R/W

SHEET 1 OF 28



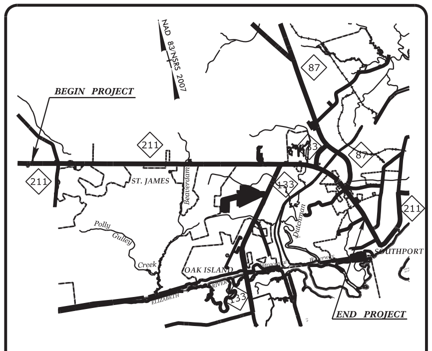
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

EAU PERMIT DRAWING PLANS

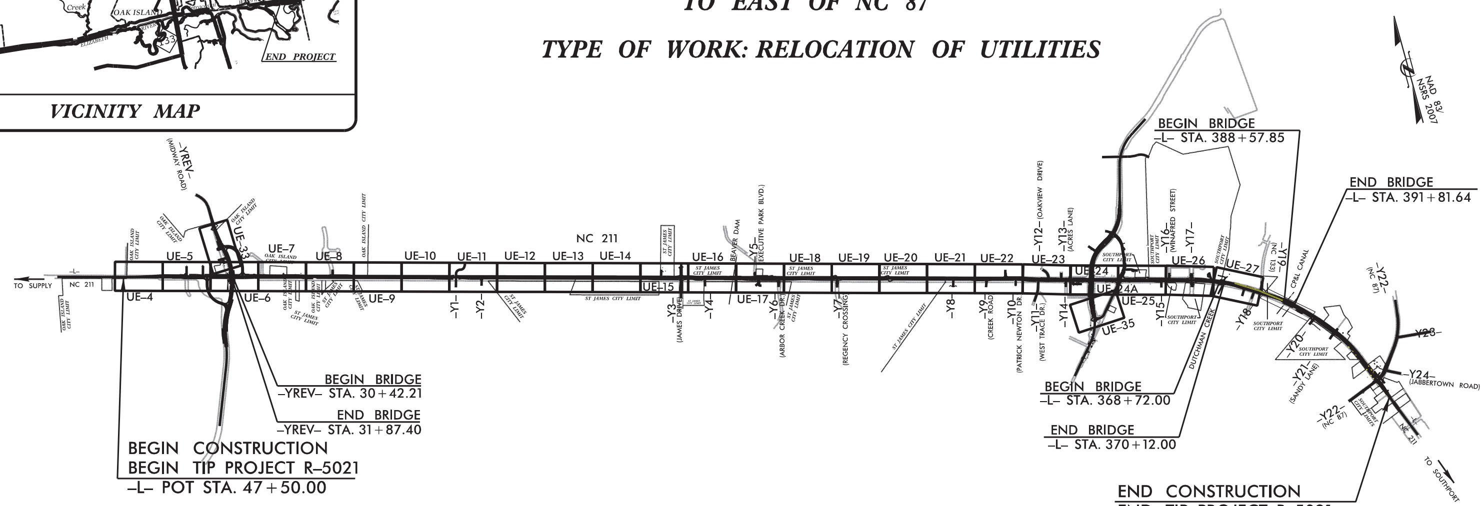
BRUNSWICK COUNTY

LOCATION: NC 211 FROM WEST OF SR 1500 (MIDWAY ROAD) TO EAST OF NC 87

TYPE OF WORK: RELOCATION OF UTILITIES



VICINITY MAP



PERMIT DRAWING 1 of 5
06/16/2021

NOTES:

1. This is a partial controlled-access project with access being limited to points as shown on the plans.
2. A portion of this project is within the municipal boundaries of Oak Island, St. James, and Southport.
3. Clearing on this project shall be performed to the limits established by Method III.

HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Suite 200
Raleigh, North Carolina 27609
NC License No: C-1554

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALE

50 25 0 50 100
PLANS

INDEX OF SHEETS

SHEET NO.:	*DESCRIPTION:*
UE-01	*TITLE SHEET*
UE-04 THRU UE-27, UE-33 & UE-35	*PLAN SHEETS*

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JANUARY 28, 2016

LETTING DATE:
JUNE 19, 2018

PREPARED IN THE OFFICE OF:
RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1, Suite 700
Raleigh, North Carolina 27615-3960
NC License No. F-0112
Engineers | Construction Managers | Planners | Scientists
www.rkk.com
Responsive People | Creative Solutions

Howard Woodall, PE	*UTILITY PROJECT MANAGER*
Mark Lawson	*PROJECT UTILITY COORDINATOR*
Nate Harris	*PROJECT UTILITY CADD DESIGNER*

DIVISION OF HIGHWAYS
UTILITIES UNIT
1020 BIRCH RIDGE DRIVE
RALEIGH, NC 27610

Bo Hemphill, PE	*EASTERN UTILITIES MANAGER*
Nabil S. Hamdan	*REGIONAL UTILITIES ENGINEER*
Ashley B. Cox, Jr, LG	*UTILITIES ENGINEER*
Chris Rivenbark	*ECAP REGIONAL MANAGER*

CONTRACT: ***TIP PROJECT: R-5021***

6/16/2021
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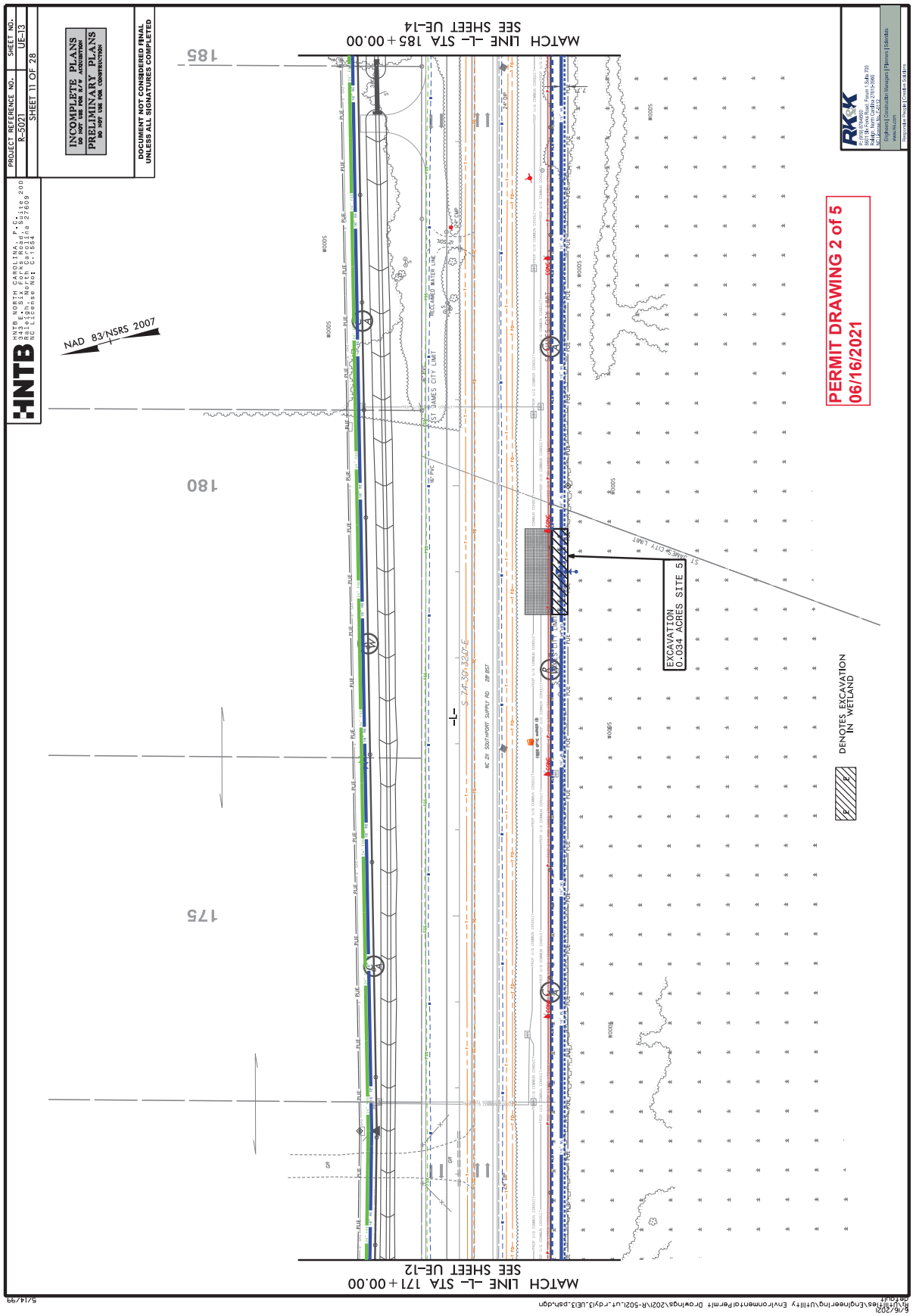
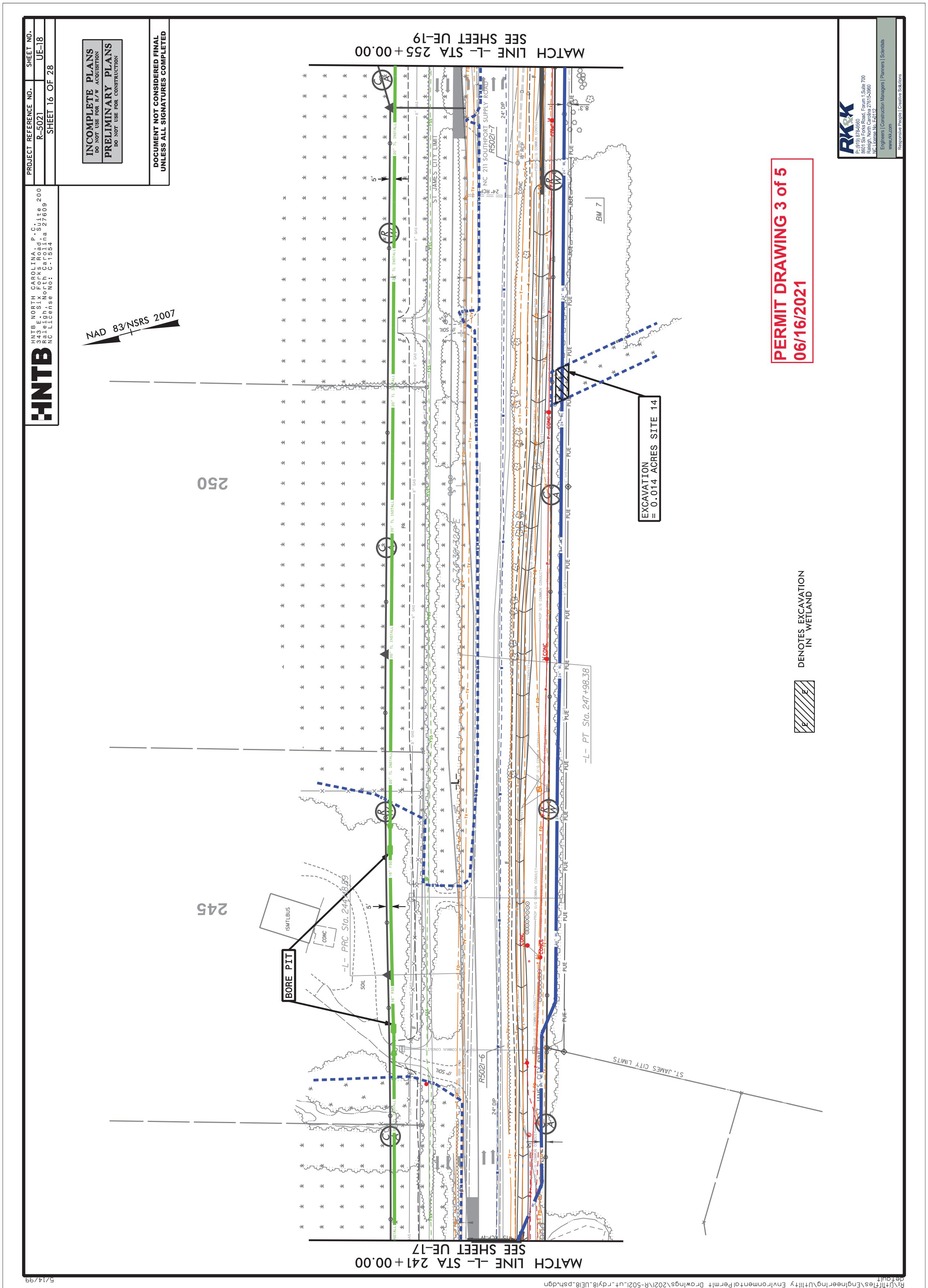
09/08/99

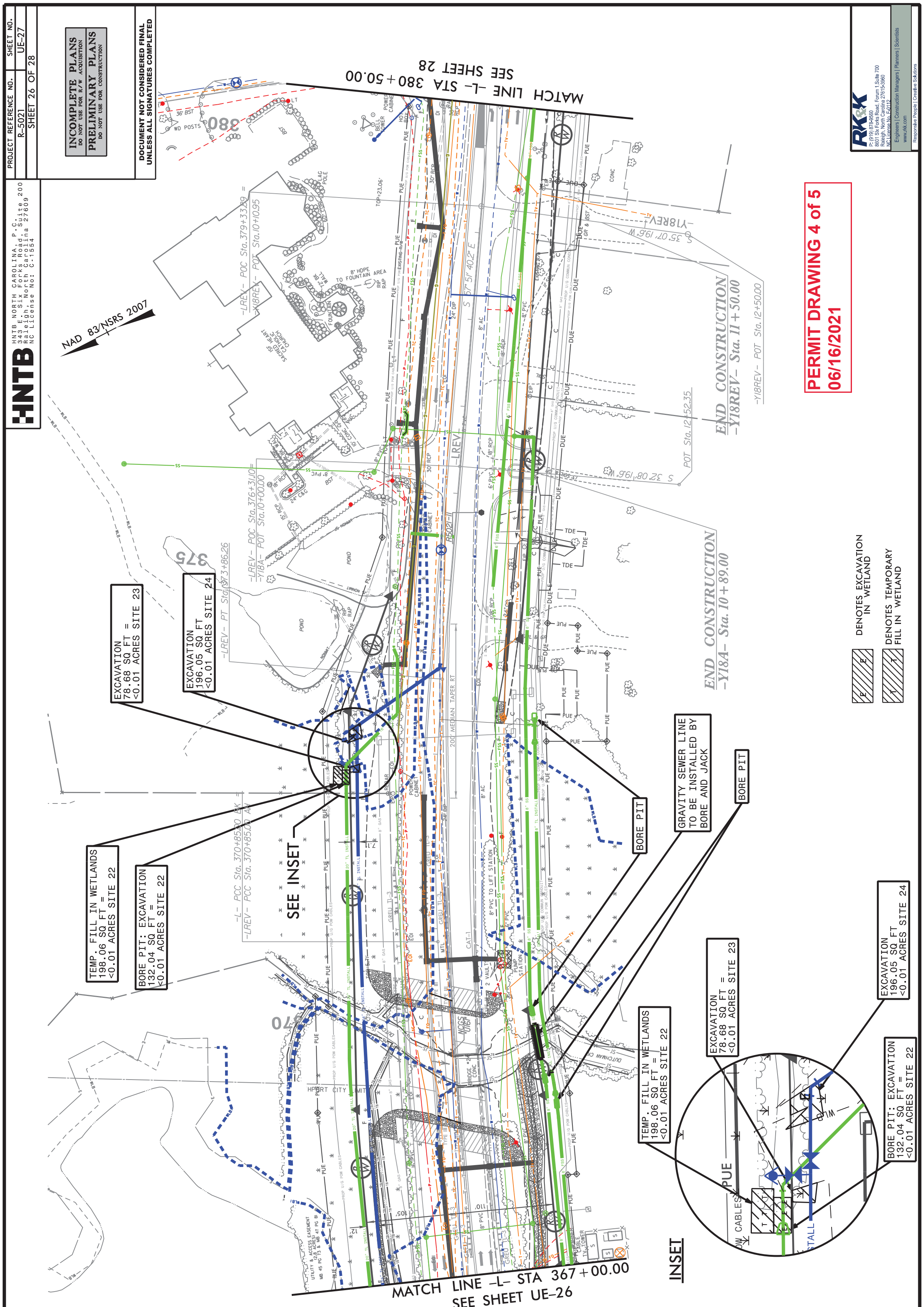
P-202


PERMIT DRAWING 2 of 5
06/16/2021
EXCAVATION
0.034 ACRES SITE 5
DENOTES EXCAVATION IN WETLAND
MATCH LINE -L- STA 171+00.00
SEE SHEET UE-12
MATCH LINE -L- STA 185+00.00
SEE SHEET UE-14
NAD 83/NSRS 2007
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
PROJECT REFERENCE NO.
R-5021
SHEET NO.
UE-13
SHEET 11 OF 28
HNTB
RKK
175
180
185

P-203


PROJECT REFERENCE NO. R-5021
SHEET NO. UE-18
SHEET 16 OF 28
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
HNTB
NAD 83/NSRS 2007
MATCH LINE -L- STA 255+00.00 SEE SHEET UE-19
MATCH LINE -L- STA 241+00.00 SEE SHEET UE-17
250
245
EXCAVATION = 0.014 ACRES SITE 14
BORE PIT
-L- PT Sta. 247+98.38
ST. JAMES CITY LIMITS
BM 7
DENOTES EXCAVATION IN WETLAND
PERMIT DRAWING 3 of 5
06/16/2021

P-204



5/14/99

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WETLAND PERMIT IMPACT 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	-L- 178+50.00 to -L- 179+50.00	18" WL			0.034							
	(Sheet UE-13)											
14	-L- 250+99.11 to -L- 251+46.21	24" WL			0.014							
	(Sheet UE-18)											
22	-L- 372+67.43 to -L- 372+83.57	Bore Pit for 20" Sewer		0.005	0.003							
	(Sheet UE-27)											
23	-L- 372+76.27 to -L- 372+85.21	24" WL			0.002							
	(Sheet UE-27)											
24	-L- 373+02.45 to -L- 373+19.21	24" WL			0.005							
	(Sheet UE-27)											
TOTALS:			0.000	0.005	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000

* Temporary excavation for pits that will be restored.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
BRUNSWICK COUNTY
TIP PROJECT (R-5021)

PERMIT DRAWING 5 of 5
06/16/2021

County : Brunswick

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	0000700000-N	SP	FIELD OFFICE	Lump Sum	L.S.	
0004	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0005	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	3 ACR		
0006	0015000000-N	205	SEALING ABANDONED WELLS	8 EA		
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	90,000 CY		
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (369+42.00 -L- EBL)	Lump Sum	L.S.	
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (369+42.00 -L- WBL)	Lump Sum	L.S.	
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (390+15.00 -L- LT)	Lump Sum	L.S.	
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (390+15.00 -L- RT)	Lump Sum	L.S.	
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (31+30.81 -Y REV-)	Lump Sum	L.S.	
0013	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (39+52.37 -Y14A-)	Lump Sum	L.S.	
0014	0036000000-E	225	UNDERCUT EXCAVATION	55,000 CY		
0015	0106000000-E	230	BORROW EXCAVATION	1,200,000 CY		
0016	0134000000-E	240	DRAINAGE DITCH EXCAVATION	62,215 CY		
0017	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	19,500 SY		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	63,810 SY		
0019	0192000000-N	260	PROOF ROLLING	100 HR		
0020	0195000000-E	265	SELECT GRANULAR MATERIAL	54,200 CY		
0021	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	40,190 SY		
0022	0199000000-E	SP	TEMPORARY SHORING	33,000 SF		
0023	0248000000-N	SP	GENERIC GRADING ITEM DE-WATERING	Lump Sum	L.S.	
0024	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETROLEUM CONTAMINATED SOIL	50 TON		
0025	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	7,378 TON		
0026	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	63,188 SY		
0027	0335000000-E	305	**" DRAINAGE PIPE (54")	288 LF		
0028	0335200000-E	305	15" DRAINAGE PIPE	1,480 LF		
0029	0335300000-E	305	18" DRAINAGE PIPE	1,344 LF		
0030	0335400000-E	305	24" DRAINAGE PIPE	752 LF		
0031	0335500000-E	305	30" DRAINAGE PIPE	520 LF		
0032	0335600000-E	305	36" DRAINAGE PIPE	604 LF		
0033	0335800000-E	305	48" DRAINAGE PIPE	636 LF		
0034	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (12")	76 LF		
0035	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	1,046 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0036	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	488 LF		
0037	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	1,240 LF		
0038	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (66")	408 LF		
0039	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	13,444 LF		
0040	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	2,646 LF		
0041	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	1,712 LF		
0042	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	4,372 LF		
0043	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	3,400 LF		
0044	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	1,144 LF		
0045	0546000000-E	310	**" CAA PIPE CULVERTS, *****" THICK (54", 0.109")	84 LF		
0046	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	632 LF		
0047	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	52 LF		
0048	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	30 EA		
0049	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	2 EA		
0050	0986000000-E	SP	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE	112 LF		
0051	0986000000-E	SP	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE	202 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0052	0986000000-E	SP	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE	104 LF		
0053	0986000000-E	SP	GENERIC PIPE ITEM 57" X 38" CORRUGATED ALUMINUM ALLOY PIPE ARCH CULVERT 0.109" THICK	348 LF		
0054	0986000000-E	SP	GENERIC PIPE ITEM 60" X 38" HORIZONTAL ELLIPTI-CAL RCP-IV	452 LF		
0055	0992000000-E	SP	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE ELBOW	2 EA		
0056	0992000000-E	SP	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE ELBOW	4 EA		
0057	0992000000-E	SP	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE ELBOW	2 EA		
0058	0995000000-E	340	PIPE REMOVAL	12,322 LF		
0059	0996000000-N	350	PIPE CLEAN OUT	5 EA		
0060	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0061	1099500000-E	505	SHALLOW UNDERCUT	1,100 CY		
0062	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	2,000 TON		
0063	1111000000-E	SP	CLASS IV AGGREGATE STABILIZA-TION	90,000 TON		
0064	1121000000-E	520	AGGREGATE BASE COURSE	28,150 TON		
0065	1220000000-E	545	INCIDENTAL STONE BASE	5,725 TON		
0066	1275000000-E	600	PRIME COAT	21,954 GAL		
0067	1330000000-E	607	INCIDENTAL MILLING	8,000 SY		
0068	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	180,000 TON		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0069	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	115,500 TON		
0070	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	25,900 TON		
0071	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	65,100 TON		
0072	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	19,300 TON		
0073	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	5,650 TON		
0074	2022000000-E	815	SUBDRAIN EXCAVATION	2,184 CY		
0075	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	6,500 SY		
0076	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	1,092 CY		
0077	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	6,500 LF		
0078	2070000000-N	815	SUBDRAIN PIPE OUTLET	13 EA		
0079	2077000000-E	815	6" OUTLET PIPE	78 LF		
0080	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	75 EA		
0081	2209000000-E	838	ENDWALLS	133.9 CY		
0082	2220000000-E	838	REINFORCED ENDWALLS	62.69 CY		
0083	2253000000-E	840	PIPE COLLARS	2.557 CY		
0084	2275000000-E	SP	FLOWABLE FILL	129 CY		
0085	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	388 EA		
0086	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	80.011 CY		
0087	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	146.9 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0088	2355000000-N	840	FRAME WITH GRATE, STD 840.29	1 EA		
0089	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	46 EA		
0090	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	125 EA		
0091	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	7 EA		
0092	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	6 EA		
0093	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	10 EA		
0094	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	30 EA		
0095	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	56 EA		
0096	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	69 EA		
0097	2396000000-N	840	FRAME WITH COVER, STD 840.54	15 EA		
0098	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	42 EA		
0099	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	97 EA		
0100	2535000000-E	846	**"X **" CONCRETE CURB (8" X 18")	1,580 LF		
0101	2538000000-E	846	**'-**" CONCRETE CURB & GUTTER (2'-9")	10,300 LF		
0102	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	46,660 LF		
0103	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	26,060 LF		
0104	2556000000-E	846	SHOULDER BERM GUTTER	8,330 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0105	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	340 LF		
0106	2591000000-E	848	4" CONCRETE SIDEWALK	2,870 SY		
0107	2605000000-N	848	CONCRETE CURB RAMPS	37 EA		
0108	2612000000-E	848	6" CONCRETE DRIVEWAY	280 SY		
0109	2619000000-E	850	4" CONCRETE PAVED DITCH	110 SY		
0110	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	15,845 SY		
0111	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	350 LF		
0112	2759000000-N	SP	GENERIC PAVING ITEM EMERGENCY VEHICLE ACCESS FOR CONCRETE ISLAND	2 EA		
0113	2800000000-N	858	ADJUSTMENT OF CATCH BASINS	14 EA		
0114	2815000000-N	858	ADJUSTMENT OF DROP INLETS	1 EA		
0115	2830000000-N	858	ADJUSTMENT OF MANHOLES	15 EA		
0116	2845000000-N	858	ADJUSTMENT OF METER BOXES OR VALVE BOXES	1 EA		
0117	2995000000-N	SP	GENERIC DRAINAGE ITEM CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX	1 EA		
0118	2995000000-N	SP	GENERIC DRAINAGE ITEM CONVERT EXISTING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	1 EA		
0119	3001000000-N	SP	IMPACT ATTENUATOR UNITS, TYPE TL-3	3 EA		
0120	3030000000-E	862	STEEL BEAM GUARDRAIL	19,725 LF		
0121	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	1,462.5 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0122	3145000000-E	862	EXTRA LENGTH GUARDRAIL POST (**' STEEL) (8')	25 EA		
0123	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	165 EA		
0124	3195000000-N	862	GUARDRAIL END UNITS, TYPE AT-1	17 EA		
0125	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	29 EA		
0126	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	16 EA		
0127	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	26 EA		
0128	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	3 EA		
0129	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	13 EA		
0130	3360000000-E	863	REMOVE EXISTING GUARDRAIL	5,600 LF		
0131	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	3,150 LF		
0132	3382000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL (SHOP CURVED)	637.5 LF		
0133	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	8 EA		
0134	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (AT-1)	10 EA		
0135	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	20 EA		
0136	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	61,000 LF		
0137	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	3,699 EA		
0138	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	1,213 EA		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0139	3628000000-E	876	RIP RAP, CLASS I	3,565 TON		
0140	3642000000-E	876	RIP RAP, CLASS A	40 TON		
0141	3649000000-E	876	RIP RAP, CLASS B	915 TON		
0142	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	13,555 SY		
0143	3659000000-N	873	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	3 EA		
0144	4048000000-E	902	REINFORCED CONCRETE SIGN FOUN-DATIONS	14 CY		
0145	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDA-TIONS	1 CY		
0146	4057000000-E	SP	OVERHEAD FOOTING	16 CY		
0147	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	15,793 LB		
0148	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	1,958 LB		
0149	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	7,639 LF		
0150	4082000000-E	903	SUPPORTS, WOOD	58 LF		
0151	4096000000-N	904	SIGN ERECTION, TYPE D	21 EA		
0152	4102000000-N	904	SIGN ERECTION, TYPE E	338 EA		
0153	4108000000-N	904	SIGN ERECTION, TYPE F	76 EA		
0154	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	18 EA		
0155	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	1 EA		
0156	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0157	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (B)	1 EA		
0158	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (D)	12 EA		
0159	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	2 EA		
0160	4141000000-N	907	DISPOSAL OF SUPPORT, WOOD	2 EA		
0161	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	4 EA		
0162	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	161 EA		
0163	4192000000-N	907	DISPOSAL OF SUPPORT, U-CHANNEL	17 EA		
0164	4360000000-N	SP	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS – OM3-C	19 EA		
0165	4360000000-N	SP	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS – OM3-L	44 EA		
0166	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	2,392 SF		
0167	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	1,217 SF		
0168	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	1,589 SF		
0169	4415000000-N	1115	FLASHING ARROW BOARD	8 EA		
0170	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	7 EA		
0171	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	105 DAY		
0172	4430000000-N	1130	DRUMS	1,990 EA		
0173	4435000000-N	1135	CONES	50 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0174	4445000000-E	1145	BARRICADES (TYPE III)	1,016 LF		
0175	4447000000-E	SP	PEDESTRIAN CHANNELIZING DEVICES	10 LF		
0176	4455000000-N	1150	FLAGGER	990 DAY		
0177	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	25 EA		
0178	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	9 EA		
0179	4480000000-N	1165	TMA	4 EA		
0180	4485000000-E	1170	PORTABLE CONCRETE BARRIER	4,090 LF		
0181	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	2,442 LF		
0182	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	1,072 LF		
0183	4505000000-E	1170	REMOVE & RESET PORTABLE CONCRETE BARRIER (ANCHORED)	404 LF		
0184	4507000000-E	1170	WATER FILLED BARRIER	300 LF		
0185	4510000000-N	1190	LAW ENFORCEMENT	2,640 HR		
0186	4516000000-N	1180	SKINNY DRUM	438 EA		
0187	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	1 EA		
0188	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM TEMPORARY CURB RAMPS	1 EA		
0189	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	8,796 EA		
0190	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	203,143 LF		
0191	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	17,367 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0192	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	5,668 LF		
0193	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	48 EA		
0194	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	584 EA		
0195	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	1,326,877 LF		
0196	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	104,122 LF		
0197	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	9,702 LF		
0198	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	13,705 LF		
0199	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	1,757 EA		
0200	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	85,561 LF		
0201	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	8,000 LF		
0202	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	1,000 LF		
0203	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	2,084 LF		
0204	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	301 EA		
0205	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4" 20 MILS (STANDARD GLASS BEADS)	2,979 LF		
0206	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 8" 20 MILS (STANDARD GLASS BEADS)	245 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0207	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	3,137 LF		
0208	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	3,151 EA		
0209	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	95 EA		
0210	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0211	5325000000-E	1510	**" WATER LINE (18")	8,603 LF		
0212	5325400000-E	1510	4" WATER LINE	10 LF		
0213	5325600000-E	1510	6" WATER LINE	4,699 LF		
0214	5325800000-E	1510	8" WATER LINE	2,843 LF		
0215	5326000000-E	1510	10" WATER LINE	406 LF		
0216	5326200000-E	1510	12" WATER LINE	3,172 LF		
0217	5326600000-E	1510	16" WATER LINE	2,275 LF		
0218	5327400000-E	1510	24" WATER LINE	11,108 LF		
0219	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	107,464 LB		
0220	5534000000-E	1515	**" VALVE (18")	6 EA		
0221	5538000000-E	1515	4" VALVE	2 EA		
0222	5540000000-E	1515	6" VALVE	35 EA		
0223	5546000000-E	1515	8" VALVE	9 EA		
0224	5552000000-E	1515	10" VALVE	3 EA		
0225	5558000000-E	1515	12" VALVE	9 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0226	5558600000-E	1515	16" VALVE	6 EA		
0227	5559400000-E	1515	24" VALVE	12 EA		
0228	5571000000-E	1515	**" TAPPING SLEEVE & VALVE (2-1/2")	1 EA		
0229	5571000000-E	1515	**" TAPPING SLEEVE & VALVE (3")	3 EA		
0230	5571400000-E	1515	4" TAPPING SLEEVE & VALVE	1 EA		
0231	5571800000-E	1515	8" TAPPING SLEEVE & VALVE	1 EA		
0232	5572200000-E	1515	12" TAPPING SLEEVE & VALVE	1 EA		
0233	5589200000-E	1515	2" AIR RELEASE VALVE	10 EA		
0234	5606600000-E	1515	6" BLOW OFF	6 EA		
0235	5643000000-E	1515	**" WATER METER (1")	3 EA		
0236	5643000000-E	1515	**" WATER METER (5/8")	2 EA		
0237	5643200000-E	1515	2" WATER METER	5 EA		
0238	5648000000-N	1515	RELOCATE WATER METER	53 EA		
0239	5649000000-N	1515	RECONNECT WATER METER	10 EA		
0240	5653210000-E	1515	RELOCATE 2" DCV BACKFLOW PRE-VENTION ASSEMBLY	2 EA		
0241	5656100000-E	1515	RELOCATE **" RPZ BACKFLOW PRE-VENTION ASSEMBLY (1")	3 EA		
0242	5656100000-E	1515	RELOCATE **" RPZ BACKFLOW PRE-VENTION ASSEMBLY (3/4")	33 EA		
0243	5656210000-E	1515	RELOCATE 2" RPZ BACKFLOW PRE-VENTION ASSEMBLY	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0244	5666000000-N	1515	FIRE HYDRANT	21 EA		
0245	5672000000-N	1515	RELOCATE FIRE HYDRANT	4 EA		
0246	5673000000-E	1515	FIRE HYDRANT LEG	324 LF		
0247	5678600000-E	1515	8" LINE STOP	5 EA		
0248	5679000000-E	1515	12" LINE STOP	5 EA		
0249	5679200000-E	1515	16" LINE STOP	6 EA		
0250	5679600000-E	1515	24" LINE STOP	5 EA		
0251	5686000000-E	1515	**" WATER SERVICE LINE (2")	171 LF		
0252	5686000000-E	1515	**" WATER SERVICE LINE (2-1/2")	35 LF		
0253	5686500000-E	1515	WATER SERVICE LINE	1,946 LF		
0254	5691000000-E	1520	**" SANITARY GRAVITY SEWER (8")	5,592 LF		
0255	5709000000-E	1520	**" FORCE MAIN SEWER (2")	69 LF		
0256	5709200000-E	1520	4" FORCE MAIN SEWER	60 LF		
0257	5709300000-E	1520	6" FORCE MAIN SEWER	2,053 LF		
0258	5709400000-E	1520	8" FORCE MAIN SEWER	2,627 LF		
0259	5709600000-E	1520	12" FORCE MAIN SEWER	605 LF		
0260	5709700000-E	1520	16" FORCE MAIN SEWER	20,555 LF		
0262	5709900000-E	1520	24" FORCE MAIN SEWER	34,740 LF		
0263	5769000000-E	1520	DUCTILE IRON SEWER PIPE FITTINGS	87,030 LB		
0264	5775000000-E	1525	4' DIA UTILITY MANHOLE	35 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0265	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	166 LF		
0266	5798000000-E	1530	ABANDON **" UTILITY PIPE (36")	180 LF		
0267	5798000000-E	1530	ABANDON **" UTILITY PIPE (4")	190 LF		
0268	5800000000-E	1530	ABANDON 6" UTILITY PIPE	9,026 LF		
0269	5801000000-E	1530	ABANDON 8" UTILITY PIPE	14,328 LF		
0270	5802000000-E	1530	ABANDON 10" UTILITY PIPE	170 LF		
0271	5804000000-E	1530	ABANDON 12" UTILITY PIPE	3,573 LF		
0272	5810000000-E	1530	ABANDON 16" UTILITY PIPE	53,607 LF		
0273	5811000000-E	1530	ABANDON 18" UTILITY PIPE	390 LF		
0274	5813000000-E	1530	ABANDON 24" UTILITY PIPE	19,242 LF		
0275	5814000000-E	1530	ABANDON 30" UTILITY PIPE	65 LF		
0276	5815000000-N	1530	REMOVE WATER METER	8 EA		
0277	5815500000-N	1530	REMOVE FIRE HYDRANT	9 EA		
0278	5828000000-N	1530	REMOVE UTILITY MANHOLE	35 EA		
0279	5835000000-E	1540	**" ENCASEMENT PIPE (14")	139 LF		
0280	5835000000-E	1540	**" ENCASEMENT PIPE (32")	521 LF		
0281	5835000000-E	1540	**" ENCASEMENT PIPE (48")	743 LF		
0282	5835700000-E	1540	16" ENCASEMENT PIPE	140 LF		
0283	5835900000-E	1540	20" ENCASEMENT PIPE	165 LF		
0284	5836000000-E	1540	24" ENCASEMENT PIPE	330 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0285	5872500000-E	1550	BORE AND JACK OF **" (14")	139 LF		
0286	5872500000-E	1550	BORE AND JACK OF **" (16")	120 LF		
0287	5872500000-E	1550	BORE AND JACK OF **" (20")	75 LF		
0288	5872500000-E	1550	BORE AND JACK OF **" (24")	170 LF		
0289	5872500000-E	1550	BORE AND JACK OF **" (32")	235 LF		
0290	5872500000-E	1550	BORE AND JACK OF **" (48")	271 LF		
0291	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (12")	935 LF		
0292	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (16")	7,293 LF		
0293	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (18")	6,805 LF		
0295	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (24")	17,863 LF		
0296	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (8")	497 LF		
0297	5882000000-N	SP	GENERIC UTILITY ITEM 12" CHECK VALVE AND VAULT	1 EA		
0298	5882000000-N	SP	GENERIC UTILITY ITEM 12" SEWER VALVE	1 EA		
0299	5882000000-N	SP	GENERIC UTILITY ITEM 16" SEWER VALVE	3 EA		
0300	5882000000-N	SP	GENERIC UTILITY ITEM 2" AIR AND VACUUM RELEASE VALVE	25 EA		
0301	5882000000-N	SP	GENERIC UTILITY ITEM 2" CHECK VALVE	4 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0302	5882000000-N	SP	GENERIC UTILITY ITEM 24" PRESSURE SUSTAINING VALVE ASSEMBLY	1 EA		
0303	5882000000-N	SP	GENERIC UTILITY ITEM 24" SEWER VALVE	30 EA		
0304	5882000000-N	SP	GENERIC UTILITY ITEM 6" SEWER VALVE	2 EA		
0305	5882000000-N	SP	GENERIC UTILITY ITEM ADJUST SANITARY SEWER CLEAN-OUT TO FINISH GRADE	4 EA		
0306	5882000000-N	SP	GENERIC UTILITY ITEM FLOW METER VAULT	1 EA		
0307	5882000000-N	SP	GENERIC UTILITY ITEM RECONNECT FORCE MAIN	12 EA		
0308	5882000000-N	SP	GENERIC UTILITY ITEM RELOCATE YARD HYDRANT	1 EA		
0309	5912000000-N	SP	GENERIC UTILITY ITEM PUMP STATION	Lump Sum	L.S.	
0310	5912000000-N	SP	GENERIC UTILITY ITEM REMOVE EXISTING PUMP STATION	Lump Sum	L.S.	
0311	6000000000-E	1605	TEMPORARY SILT FENCE	260,100 LF		
0312	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	2,125 TON		
0313	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	13,900 TON		
0314	6012000000-E	1610	SEDIMENT CONTROL STONE	10,500 TON		
0315	6015000000-E	1615	TEMPORARY MULCHING	864.5 ACR		
0316	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	32,700 LB		
0317	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	164.5 TON		
0318	6024000000-E	1622	TEMPORARY SLOPE DRAINS	18,000 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0319	6029000000-E	SP	SAFETY FENCE	28,000 LF		
0320	6030000000-E	1630	SILT EXCAVATION	45,950 CY		
0321	6036000000-E	1631	MATTING FOR EROSION CONTROL	170,000 SY		
0322	6037000000-E	SP	COIR FIBER MAT	180,000 SY		
0323	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	1,650 SY		
0324	6042000000-E	1632	1/4" HARDWARE CLOTH	25,980 LF		
0325	6043000000-E	SP	LOW PERMEABILITY GEOTEXTILE	1,500 SY		
0326	6045000000-E	SP	**" TEMPORARY PIPE (24")	155 LF		
0327	6045000000-E	SP	**" TEMPORARY PIPE (30")	275 LF		
0328	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	555 SY		
0329	6069000000-E	1638	STILLING BASINS	135 CY		
0330	6070000000-N	1639	SPECIAL STILLING BASINS	30 EA		
0331	6071012000-E	SP	COIR FIBER WATTLE	21,055 LF		
0332	6071020000-E	SP	POLYACRYLAMIDE (PAM)	8,105 LB		
0333	6071030000-E	1640	COIR FIBER BAFFLE	10,355 LF		
0334	6071050000-E	SP	**" SKIMMER (1-1/2")	16 EA		
0335	6071050000-E	SP	**" SKIMMER (2")	5 EA		
0336	6071050000-E	SP	**" SKIMMER (2-1/2")	3 EA		
0337	6071050000-E	SP	**" SKIMMER (3")	1 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0338	6084000000-E	1660	SEEDING & MULCHING	580 ACR		
0339	6087000000-E	1660	MOWING	290 ACR		
0340	6090000000-E	1661	SEED FOR REPAIR SEEDING	8,700 LB		
0341	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	26 TON		
0342	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	12,975 LB		
0343	6108000000-E	1665	FERTILIZER TOPDRESSING	389.25 TON		
0344	6111000000-E	SP	IMPERVIOUS DIKE	2,650 LF		
0345	6114500000-N	1667	SPECIALIZED HAND MOWING	150 MHR		
0346	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	150 EA		
0347	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	18 EA		
0348	6123000000-E	1670	REFORESTATION	1 ACR		
0349	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	20 EA		
0350	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	60 EA		
0351	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	12 EA		
0352	7060000000-E	1705	SIGNAL CABLE	50,280 LF		
0353	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	229 EA		
0354	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	49 EA		
0355	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	25 EA		
0356	7252000000-E	1710	MESSENGER CABLE (1/4")	920 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0357	7264000000-E	1710	MESSENGER CABLE (3/8")	6,500 LF		
0358	7279000000-E	1715	TRACER WIRE	39,410 LF		
0359	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	5,110 LF		
0360	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	18,120 LF		
0361	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 2")	80 LF		
0362	7300000000-E	1715	UNPAVED TRENCHING (**********) (4, 2")	170 LF		
0363	7300100000-E	1715	UNPAVED TRENCHING FOR TEMP-ORARY LEAD-IN	10 LF		
0364	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,670 LF		
0365	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	24,290 LF		
0366	7301000000-E	1715	DIRECTIONAL DRILL (**********) (3, 2")	880 LF		
0367	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	108 EA		
0368	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)	79 EA		
0369	7360000000-N	1720	WOOD POLE	42 EA		
0370	7372000000-N	1721	GUY ASSEMBLY	86 EA		
0371	7396000000-E	1722	1/2" RISER WITH WEATHERHEAD	10 EA		
0372	7420000000-E	1722	2" RISER WITH WEATHERHEAD	31 EA		
0373	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	4 EA		
0374	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	15,070 LF		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0375	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	31,000 LF		
0376	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (48)	41,060 LF		
0377	7528000000-E	1730	DROP CABLE	4,740 LF		
0378	7540000000-N	1731	SPLICE ENCLOSURE	21 EA		
0379	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	1 EA		
0380	7552000000-N	1731	INTERCONNECT CENTER	20 EA		
0381	7566000000-N	1733	DELINEATOR MARKER	49 EA		
0382	7574550000-N	SP	FURNISH WIRELESS LIGHTNING ARRESTOR	1 EA		
0383	7575142010-N	1736	900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO	10 EA		
0384	7575142060-N	SP	MODIFY RADIO INSTALLATION	6 EA		
0385	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	4,650 LF		
0386	7575200000-N	SP	GPS UNIT	2 EA		
0387	7588000000-N	SP	METAL POLE WITH SINGLE MAST ARM	29 EA		
0388	7590000000-N	SP	METAL POLE WITH DUAL MAST ARM	1 EA		
0389	7613000000-N	SP	SOIL TEST	34 EA		
0390	7614100000-E	SP	DRILLED PIER FOUNDATION	204 CY		
0391	7631000000-N	SP	MAST ARM WITH METAL POLE DE-SIGN	34 EA		
0392	7636000000-N	1745	SIGN FOR SIGNALS	106 EA		
0393	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	11 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0394	7642300000-N	1743	TYPE III PEDESTAL WITH FOUND-ATION	9 EA		
0395	7684000000-N	1750	SIGNAL CABINET FOUNDATION	13 EA		
0396	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE-MOUNTED)	13 EA		
0397	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, POLE-MOUNTED)	1 EA		
0398	7708000000-N	1751	DETECTOR CARD (**********) (2070E)	165 EA		
0399	7901000000-N	1753	CABINET BASE EXTENDER	13 EA		
0400	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	2 EA		
0401	7960000000-N	SP	METAL POLE FOUNDATION REMOVAL	19 EA		
0402	7972000000-N	SP	METAL POLE REMOVAL	19 EA		
0403	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	6 EA		
0404	7980000000-N	SP	GENERIC SIGNAL ITEM CONTROLLER (TYPE 2070E)	3 EA		
0405	7980000000-N	SP	GENERIC SIGNAL ITEM DECORATIVE METAL POLE WITH SINGLE MAST ARM	4 EA		
0406	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	7 EA		
0407	7980000000-N	SP	GENERIC SIGNAL ITEM DMS STRUCTURE (BACK-TO-BACK PEDESTAL)	2 EA		
0409	7980000000-N	SP	GENERIC SIGNAL ITEM ELECTRICAL SERVICE FOR ITS DEVICE	8 EA		
0410	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	20 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0411	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	3 EA		
0412	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH ETHERNET EDGE SWITCH	1 EA		
0413	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER-SIZED HEAVY DUTY)	24 EA		
0414	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX MARKER	19 EA		
0415	7980000000-N	SP	GENERIC SIGNAL ITEM LUMINAIRE MAST ARM	2 EA		
0416	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES	11 EA		
0417	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR SINGLE MAST ARM POLE (BLACK)	4 EA		
0418	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE 900MHZ RADIO	10 EA		
0419	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	3 EA		
0420	7990000000-E	SP	GENERIC SIGNAL ITEM BACK PULL FIBER OPTIC CABLE	310 LF		
0486	1891000000-E	SP	GENERIC PAVING ITEM 7" CONCRETE TRUCK APRON	580 SY		
0487	2535000000-E	846	**"X **" CONCRETE CURB (9" X 18")	350 LF		
0488	2627000000-E	852	4" CONCRETE ISLAND COVER	580 SY		
0489	6045000000-E	SP	**" TEMPORARY PIPE (18")	24 LF		
0490	7108000000-E	1705	VEHICLE SIGNAL HEAD (12", 1 SECTION)	4 EA		
0491	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 1C)	4 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0492	5882000000-N	SP	GENERIC UTILITY ITEM 8" SEWER VALVE	2 EA		
			CULVERT ITEMS			
0421	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (226+01.00 -L-)	Lump Sum	L.S.	
0422	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (316+72.00 -L-)	Lump Sum	L.S.	
0423	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (64+15.00 -L-)	Lump Sum	L.S.	
0424	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (83+76.00 -L-)	Lump Sum	L.S.	
0425	8126000000-N	414	CULVERT EXCAVATION, STA ****** (226+01.00 -L-)	Lump Sum	L.S.	
0426	8126000000-N	414	CULVERT EXCAVATION, STA ****** (316+72.00 -L-)	Lump Sum	L.S.	
0427	8126000000-N	414	CULVERT EXCAVATION, STA ****** (64+15.00 -L-)	Lump Sum	L.S.	
0428	8126000000-N	414	CULVERT EXCAVATION, STA ****** (83+76.00 -L-)	Lump Sum	L.S.	
0429	8133000000-E	414	FOUNDATION CONDITIONING MATER- IAL, BOX CULVERT	807 TON		
0430	8196000000-E	420	CLASS A CONCRETE (CULVERT)	887.2 CY		
0431	8245000000-E	425	REINFORCING STEEL (CULVERT)	119,524 LB		
0432	8804000000-N	SP	GENERIC CULVERT ITEM ASBESTOS ASSESSMENT	Lump Sum	L.S.	

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			WALL ITEMS			
0433	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	1,950 SF		
0434	8801000000-E	SP	MSE RETAINING WALL NO **** (10)	9,625 SF		
0435	8801000000-E	SP	MSE RETAINING WALL NO **** (11)	14,880 SF		
0436	8801000000-E	SP	MSE RETAINING WALL NO **** (12)	8,105 SF		
0437	8801000000-E	SP	MSE RETAINING WALL NO **** (13)	4,770 SF		
0438	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	460 SF		
0439	8801000000-E	SP	MSE RETAINING WALL NO **** (3)	4,540 SF		
0440	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	2,015 SF		
0441	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	6,270 SF		
0442	8801000000-E	SP	MSE RETAINING WALL NO **** (6)	2,765 SF		
0443	8801000000-E	SP	MSE RETAINING WALL NO **** (7)	8,265 SF		
0444	8801000000-E	SP	MSE RETAINING WALL NO **** (8)	4,135 SF		
0445	8801000000-E	SP	MSE RETAINING WALL NO **** (9)	16,210 SF		
			STRUCTURE ITEMS			
0446	8017000000-N	SP	CONSTRUCTION, MAINTENANCE, & REMOVAL OF TEMP ACCESS AT STA ********** (390+15.00 -L- LT)	Lump Sum	L.S.	

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0447	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (369+42.00 -L- EBL)	Lump Sum	L.S.	
0448	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (390+15.00 -L- RT)	Lump Sum	L.S.	
0449	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum	L.S.	
0450	8112730000-N	450	PDA TESTING	10 EA		
0451	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (369+42.00 -L- EBL)	Lump Sum	L.S.	
0452	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (390+15.00 -L- LT)	Lump Sum	L.S.	
0453	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (390+15.00 -L- RT)	Lump Sum	L.S.	
0454	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	49,880 SF		
0455	8161000000-E	420	GROOVING BRIDGE FLOORS	51,122.6 SF		
0456	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	399.9 CY		
0457	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	209.3 CY		
0458	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (31+30.81 -Y REV-)	Lump Sum	L.S.	
0459	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (369+42.00 -L- EBL)	Lump Sum	L.S.	
0460	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (369+42.00 -L- WBL)	Lump Sum	L.S.	
0461	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (39+52.37 -Y14A-)	Lump Sum	L.S.	

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0462	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (390+15.00 -L- LT)	Lump Sum	L.S.	
0463	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (390+15.00 -L- RT)	Lump Sum	L.S.	
0464	8217000000-E	425	REINFORCING STEEL (BRIDGE)	37,903 LB		
0465	8224000000-E	425	EPOXY COATED REINFORCING STEEL (BRIDGE)	61,921 LB		
0466	8259000000-E	430	36" PRESTRESSED CONCRETE GIR-DERS	1,361.3 LF		
0467	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	2,455.63 LF		
0468	8277000000-E	430	MODIFIED 72" PRESTRESSED CONC GIRDERS	2,068.2 LF		
0469	8328000000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** PRESTRESSED CONCRETE PILES (16")	28 EA		
0470	8328000000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** PRESTRESSED CONCRETE PILES (24")	24 EA		
0471	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	108 EA		
0472	8333000000-E	450	16" PRESTRESSED CONCRETE PILES	1,715 LF		
0473	8350000000-E	450	24" PRESTRESSED CONCRETE PILES	2,520 LF		
0474	8364000000-E	450	HP12X53 STEEL PILES	8,531 LF		
0475	8391000000-N	450	STEEL PILE POINTS	80 EA		
0476	8393000000-N	450	PILE REDRIVES	130 EA		
0477	8475000000-E	460	TWO BAR METAL RAIL	1,730.95 LF		

County : Brunswick

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0478	8503000000-E	460	CONCRETE BARRIER RAIL	515.7 LF		
0479	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 2'-6")	1,792.19 LF		
0480	8531000000-E	462	4" SLOPE PROTECTION	119 SY		
0481	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	2,190 TON		
0482	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,435 SY		
0483	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0484	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- LT)	Lump Sum	L.S.	
0485	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- RT)	Lump Sum	L.S.	

Vendor 1 of 3: BARNHILL CONTRACTING CO (3516)
Call Order 001 (Proposal: C204123)

Bid Information

Proposal County: BRUNSWICK
Vendor Address:
Signature Check: Tony Christopher Stroud
Time Bid Received: December 07, 2021 01:45 PM
Amendment Count: 1

Bid Checksum: 3074FB3B73
Bid Total: $217,260,048.60
Items Total: $217,260,048.60
Time Total: $0.00

Bidding Errors:
None.

Advertised DBE Goal 10.0%
DBE Participation Submitted: 11.70%

Vendor 1 of 3: BARNHILL CONTRACTING CO (3516)
Call Order 001 (Proposal: C204123)

Bid Bond Information

Projects:		**Bond Maximum:**	
Counties:		**State of Incorporation:**	NC
Bond ID:	SNC21282040	**Agency Execution Date:**	11/10/2021 09
Paid by Check:	No	**Surety Name:**	Surety2000
Bond Percent:	5%	**Bond Agency Name:**	Travelers North Carolina

DBE Load Information

Letting ID: L211207
Letting Date: 12/07/2021
Call Order: 001
Contract ID: C204123
Project: STP-0211(021)STP-0211(021)STP-0211(021)STP-0211(021)
Bid Total: $217,260,048.60
DBE Goal: 10.00% ($21,726,004.86)

Vendor ID: 3516
Vendor Name: Barnhill Contracting Company
DBE Entered: 11.70% ($25,422,054.75)

Vendor ID	DBE Name	Is Supplier?	City/State	Goods/Service	Amount
4720	MILITARY & FEDERAL CONSTRUCTION CO	False	317-C CENTER STREET , JACKSONVILLE, NC 28546	SubContractor	2,404,556.95
7621	DOSS TRUCKING INC	False	479 FOY LOCKAMY RD , JACKSONVILLE, NC 28540	SubContractor	145,000.00
10486	JAMES L MORGAN TRUCKING INC	False	2090 TURKEY TRAP RD SW , SUPPLY, NC 28462	SubContractor	93,800.00
4720	MILITARY & FEDERAL CONSTRUCTION CO	False	317-C CENTER STREET , JACKSONVILLE, NC 28546	SubContractor	8,462,350.06
4247	SEAL BROTHERS CONTRACTING LLC	False	131 W. CLEVE STREET , MOUNT AIRY, NC 27030	SubContractor	776,467.35
4247	SEAL BROTHERS CONTRACTING LLC	False	131 W. CLEVE STREET , MOUNT AIRY, NC 27030	SubContractor	271,558.43
3376	REYNOLDS FENCE & GUARDRAIL INC	False	9320 MACHADO DRIVE , INDIAN TRAIL, NC 28079	SubContractor	1,012,775.85
4880	TRICOR CONSTRUCTION INC	False	1983 CHESNEE HIGHWAY, SPARTANBURG, SC 29303	SubContractor	6,353,546.50
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114	SubContractor	274,070.64
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607	SubContractor	179,652.67
15521	4 D CONSTRUCTION	False	P.O. BOX 806 , MAXTON, NC	SubContractor	239,508.09

BondID: SNC21282040
Surety Registry Agency: Surety2000
Verified?: 1
Surety Agency: Travelers North Carolina
Bond Execution Date: 11/10/2021 09:58:47 AM

0241	5656100000-E	3.000	EA	$6,500.0000	$19,500.00
	RELOCATE **" RPZ BACKFLOW PRE-VENTION ASSEMBLY (1")				
0242	5656100000-E	33.000	EA	$5,000.0000	$165,000.00
	RELOCATE **" RPZ BACKFLOW PRE-VENTION ASSEMBLY (3/4")				
0243	5656210000-E	1.000	EA	$15,000.0000	$15,000.00
	RELOCATE 2" RPZ BACKFLOW PRE- VENTION ASSEMBLY				
0244	5666000000-N	21.000	EA	$7,200.0000	$151,200.00
	FIRE HYDRANT				
0245	5672000000-N	4.000	EA	$9,000.0000	$36,000.00
	RELOCATE FIRE HYDRANT				
0246	5673000000-E	324.000	LF	$70.0000	$22,680.00
	FIRE HYDRANT LEG				
0247	5678600000-E	5.000	EA	$22,000.0000	$110,000.00
	8" LINE STOP				
0248	5679000000-E	5.000	EA	$24,000.0000	$120,000.00
	12" LINE STOP				
0249	5679200000-E	6.000	EA	$40,000.0000	$240,000.00
	16" LINE STOP				
0250	5679600000-E	5.000	EA	$51,000.0000	$255,000.00
	24" LINE STOP				
0251	5686000000-E	171.000	LF	$35.0000	$5,985.00
	**" WATER SERVICE LINE (2")				
0252	5686000000-E	35.000	LF	$40.0000	$1,400.00
	**" WATER SERVICE LINE (2-1/2")				
0253	5686500000-E	1946.000	LF	$18.0000	$35,028.00
	WATER SERVICE LINE				
0254	5691000000-E	5592.000	LF	$213.0000	$1,191,096.00
	**" SANITARY GRAVITY SEWER (8")				
0255	5709000000-E	69.000	LF	$110.0000	$7,590.00
	**" FORCE MAIN SEWER (2")				
0256	5709200000-E	60.000	LF	$215.0000	$12,900.00
	4" FORCE MAIN SEWER				
0257	5709300000-E	2053.000	LF	$101.0000	$207,353.00
	6" FORCE MAIN SEWER				
0258	5709400000-E	2627.000	LF	$109.0000	$286,343.00
	8" FORCE MAIN SEWER				
0259	5709600000-E	605.000	LF	$174.0000	$105,270.00
	12" FORCE MAIN SEWER				
0260	5709700000-E	20555.000	LF	$228.0000	$4,686,540.00
	16" FORCE MAIN SEWER				
0262	5709900000-E	34740.000	LF	$399.5000	$13,878,630.00
	24" FORCE MAIN SEWER				
0263	5769000000-E	87030.000	LB	$16.0000	$1,392,480.00
	DUCTILE IRON SEWER PIPE FITTINGS				
0264	5775000000-E	35.000	EA	$13,000.0000	$455,000.00
	4' DIA UTILITY MANHOLE				
0265	5781000000-E	166.000	LF	$700.0000	$116,200.00
	UTILITY MANHOLE WALL 4' DIA				
0266	5798000000-E	180.000	LF	$150.0000	$27,000.00

		ABANDON **" UTILITY PIPE (36")			
0267	5798000000-E	190.000	LF	$40.0000	$7,600.00
		ABANDON **" UTILITY PIPE (4")			
0268	5800000000-E	9026.000	LF	$12.0000	$108,312.00
		ABANDON 6" UTILITY PIPE			
0269	5801000000-E	14328.000	LF	$15.0000	$214,920.00
		ABANDON 8" UTILITY PIPE			
0270	5802000000-E	170.000	LF	$50.0000	$8,500.00
		ABANDON 10" UTILITY PIPE			
0271	5804000000-E	3573.000	LF	$22.0000	$78,606.00
		ABANDON 12" UTILITY PIPE			
0272	5810000000-E	53607.000	LF	$27.0000	$1,447,389.00
		ABANDON 16" UTILITY PIPE			
0273	5811000000-E	390.000	LF	$45.0000	$17,550.00
		ABANDON 18" UTILITY PIPE			
0274	5813000000-E	19242.000	LF	$49.0000	$942,858.00
		ABANDON 24" UTILITY PIPE			
0275	5814000000-E	65.000	LF	$130.0000	$8,450.00
		ABANDON 30" UTILITY PIPE			
0276	5815000000-N	8.000	EA	$1,700.0000	$13,600.00
		REMOVE WATER METER			
0277	5815500000-N	9.000	EA	$4,000.0000	$36,000.00
		REMOVE FIRE HYDRANT			
0278	5828000000-N	35.000	EA	$4,700.0000	$164,500.00
		REMOVE UTILITY MANHOLE			
0279	5835000000-E	139.000	LF	$360.0000	$50,040.00
		**" ENCASEMENT PIPE (14")			
0280	5835000000-E	521.000	LF	$830.0000	$432,430.00
		**" ENCASEMENT PIPE (32")			
0281	5835000000-E	743.000	LF	$1,265.0000	$939,895.00
		**" ENCASEMENT PIPE (48")			
0282	5835700000-E	140.000	LF	$470.0000	$65,800.00
		16" ENCASEMENT PIPE			
0283	5835900000-E	165.000	LF	$515.0000	$84,975.00
		20" ENCASEMENT PIPE			
0284	5836000000-E	330.000	LF	$650.0000	$214,500.00
		24" ENCASEMENT PIPE			
0285	5872500000-E	139.000	LF	$330.0000	$45,870.00
		BORE AND JACK OF **" (14")			
0286	5872500000-E	120.000	LF	$375.0000	$45,000.00
		BORE AND JACK OF **" (16")			
0287	5872500000-E	75.000	LF	$400.0000	$30,000.00
		BORE AND JACK OF **" (20")			
0288	5872500000-E	170.000	LF	$460.0000	$78,200.00
		BORE AND JACK OF **" (24")			
0289	5872500000-E	235.000	LF	$590.0000	$138,650.00
		BORE AND JACK OF **" (32")			
0290	5872500000-E	271.000	LF	$845.0000	$228,995.00
		BORE AND JACK OF **" (48")			

0291	5872600000-E	935.000	LF	$176.0000	$164,560.00
	DIRECTIONAL DRILLING OF **" (12")				
0292	5872600000-E	7293.000	LF	$263.0000	$1,918,059.00
	DIRECTIONAL DRILLING OF **" (16")				
0293	5872600000-E	6805.000	LF	$284.0000	$1,932,620.00
	DIRECTIONAL DRILLING OF **" (18")				
0295	5872600000-E	17863.000	LF	$371.0000	$6,627,173.00
	DIRECTIONAL DRILLING OF **" (24")				
0296	5872600000-E	497.000	LF	$130.0000	$64,610.00
	DIRECTIONAL DRILLING OF **" (8")				
0297	5882000000-N	1.000	EA	$100,000.0000	$100,000.00
	GENERIC UTILITY ITEM 12" CHECK VALVE AND VAULT				
0298	5882000000-N	1.000	EA	$10,000.0000	$10,000.00
	GENERIC UTILITY ITEM 12" SEWER VALVE				
0299	5882000000-N	3.000	EA	$16,000.0000	$48,000.00
	GENERIC UTILITY ITEM 16" SEWER VALVE				
0300	5882000000-N	25.000	EA	$12,800.0000	$320,000.00
	GENERIC UTILITY ITEM 2" AIR AND VACUUM RELEASE VALVE				
0301	5882000000-N	4.000	EA	$2,600.0000	$10,400.00
	GENERIC UTILITY ITEM 2" CHECK VALVE				
0302	5882000000-N	1.000	EA	$350,000.0000	$350,000.00
	GENERIC UTILITY ITEM 24" PRESSURE SUSTAINING VALVE ASSEMBLY				
0303	5882000000-N	30.000	EA	$40,000.0000	$1,200,000.00
	GENERIC UTILITY ITEM 24" SEWER VALVE				
0304	5882000000-N	2.000	EA	$5,500.0000	$11,000.00
	GENERIC UTILITY ITEM 6" SEWER VALVE				
0305	5882000000-N	4.000	EA	$2,500.0000	$10,000.00
	GENERIC UTILITY ITEM ADJUST SANITARY SEWER CLEAN- OUT TO FINISH GRADE				
0306	5882000000-N	1.000	EA	$112,000.0000	$112,000.00
	GENERIC UTILITY ITEM FLOW METER VAULT				
0307	5882000000-N	12.000	EA	$11,500.0000	$138,000.00
	GENERIC UTILITY ITEM RECONNECT FORCE MAIN				
0308	5882000000-N	1.000	EA	$8,000.0000	$8,000.00
	GENERIC UTILITY ITEM RELOCATE YARD HYDRANT				
0309	5912000000-N	1.000	LS	$775,000.0000	$775,000.00
	GENERIC UTILITY ITEM PUMP STATION				
0310	5912000000-N	1.000	LS	$100,000.0000	$100,000.00
	GENERIC UTILITY ITEM REMOVE EXISTING PUMP STATION				
0311	6000000000-E	260100.000	LF	$0.0100	$2,601.00
	TEMPORARY SILT FENCE				
0312	6006000000-E	2125.000	TON	$75.0000	$159,375.00
	STONE FOR EROSION CONTROL, CLASS A				
0313	6009000000-E	13900.000	TON	$40.0000	$556,000.00
	STONE FOR EROSION CONTROL, CLASS B				
0314	6012000000-E	10500.000	TON	$40.0000	$420,000.00
	SEDIMENT CONTROL STONE				
0315	6015000000-E	864.500	ACR	$1,500.0000	$1,296,750.00
	TEMPORARY MULCHING				
0316	6018000000-E	32700.000	LB	$2.0000	$65,400.00

		SEED FOR TEMPORARY SEEDING			
0317	6021000000-E	164.500	TON	$600.0000	$98,700.00
	FERTILIZER FOR TEMPORARY SEED-ING				
0318	6024000000-E	18000.000	LF	$5.0000	$90,000.00
	TEMPORARY SLOPE DRAINS				
0319	6029000000-E	28000.000	LF	$2.1500	$60,200.00
	SAFETY FENCE				
0320	6030000000-E	45950.000	CY	$5.0000	$229,750.00
	SILT EXCAVATION				
0321	6036000000-E	170000.000	SY	$1.5500	$263,500.00
	MATTING FOR EROSION CONTROL				
0322	6037000000-E	180000.000	SY	$6.0000	$1,080,000.00
	COIR FIBER MAT				
0323	6038000000-E	1650.000	SY	$12.0000	$19,800.00
	PERMANENT SOIL REINFORCEMENT MAT				
0324	6042000000-E	25980.000	LF	$10.0000	$259,800.00
	1/4" HARDWARE CLOTH				
0325	6043000000-E	1500.000	SY	$2.7500	$4,125.00
	LOW PERMEABILITY GEOTEXTILE				
0326	6045000000-E	155.000	LF	$100.0000	$15,500.00
	**" TEMPORARY PIPE (24")				
0327	6045000000-E	275.000	LF	$112.5000	$30,937.50
	**" TEMPORARY PIPE (30")				
0328	6048000000-E	555.000	SY	$59.0000	$32,745.00
	FLOATING TURBIDITY CURTAIN				
0329	6069000000-E	135.000	CY	$35.0000	$4,725.00
	STILLING BASINS				
0330	6070000000-N	30.000	EA	$1,300.0000	$39,000.00
	SPECIAL STILLING BASINS				
0331	6071012000-E	21055.000	LF	$18.6000	$391,623.00
	COIR FIBER WATTLE				
0332	6071020000-E	8105.000	LB	$10.4000	$84,292.00
	POLYACRYLAMIDE (PAM)				
0333	6071030000-E	10355.000	LF	$6.5000	$67,307.50
	COIR FIBER BAFFLE				
0334	6071050000-E	16.000	EA	$1,356.0000	$21,696.00
	**" SKIMMER (1-1/2")				
0335	6071050000-E	5.000	EA	$1,470.0000	$7,350.00
	**" SKIMMER (2")				
0336	6071050000-E	3.000	EA	$1,687.0000	$5,061.00
	**" SKIMMER (2-1/2")				
0337	6071050000-E	1.000	EA	$2,182.0000	$2,182.00
	**" SKIMMER (3")				
0338	6084000000-E	580.000	ACR	$2,600.0000	$1,508,000.00
	SEEDING & MULCHING				
0339	6087000000-E	290.000	ACR	$240.0000	$69,600.00
	MOWING				
0340	6090000000-E	8700.000	LB	$6.0000	$52,200.00
	SEED FOR REPAIR SEEDING				

0341	6093000000-E	26.000	TON	$1,500.0000	$39,000.00
	FERTILIZER FOR REPAIR SEEDING				
0342	6096000000-E	12975.000	LB	$6.0000	$77,850.00
	SEED FOR SUPPLEMENTAL SEEDING				
0343	6108000000-E	389.250	TON	$990.0000	$385,357.50
	FERTILIZER TOPDRESSING				
0344	6111000000-E	2650.000	LF	$480.0000	$1,272,000.00
	IMPERVIOUS DIKE				
0345	6114500000-N	150.000	MHR	$175.0000	$26,250.00
	SPECIALIZED HAND MOWING				
0346	6117000000-N	150.000	EA	$275.0000	$41,250.00
	RESPONSE FOR EROSION CONTROL				
0347	6117500000-N	18.000	EA	$1,250.0000	$22,500.00
	CONCRETE WASHOUT STRUCTURE				
0348	6123000000-E	1.000	ACR	$7,500.0000	$7,500.00
	REFORESTATION				
0349	6132000000-N	20.000	EA	$426.0000	$8,520.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE				
0350	6132000000-N	60.000	EA	$197.0000	$11,820.00
	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT				
0351	7048500000-E	12.000	EA	$933.0000	$11,196.00
	PEDESTRIAN SIGNAL HEAD (16", 1SECTION W/COUNTDOWN)				
0352	7060000000-E	50280.000	LF	$2.7000	$135,756.00
	SIGNAL CABLE				
0353	7120000000-E	229.000	EA	$820.0000	$187,780.00
	VEHICLE SIGNAL HEAD (12", 3 SECTION)				
0354	7132000000-E	49.000	EA	$980.0000	$48,020.00
	VEHICLE SIGNAL HEAD (12", 4 SECTION)				
0355	7144000000-E	25.000	EA	$1,335.0000	$33,375.00
	VEHICLE SIGNAL HEAD (12", 5 SECTION)				
0356	7252000000-E	920.000	LF	$3.5500	$3,266.00
	MESSENGER CABLE (1/4")				
0357	7264000000-E	6500.000	LF	$4.9000	$31,850.00
	MESSENGER CABLE (3/8")				
0358	7279000000-E	39410.000	LF	$0.8000	$31,528.00
	TRACER WIRE				
0359	7300000000-E	5110.000	LF	$10.0000	$51,100.00
	UNPAVED TRENCHING (**********) (1, 2")				
0360	7300000000-E	18120.000	LF	$10.0000	$181,200.00
	UNPAVED TRENCHING (**********) (2, 2")				
0361	7300000000-E	80.000	LF	$19.0000	$1,520.00
	UNPAVED TRENCHING (**********) (3, 2")				
0362	7300000000-E	170.000	LF	$23.0000	$3,910.00
	UNPAVED TRENCHING (**********) (4, 2")				
0363	7300100000-E	10.000	LF	$15.0000	$150.00
	UNPAVED TRENCHING FOR TEMP- ORARY LEAD-IN				
0364	7301000000-E	1670.000	LF	$17.0000	$28,390.00
	DIRECTIONAL DRILL (**********) (1, 2")				
0365	7301000000-E	24290.000	LF	$22.0000	$534,380.00

		DIRECTIONAL DRILL (**********) (2, 2")			
0366	7301000000-E	880.000	LF	$23.0000	$20,240.00
		DIRECTIONAL DRILL (**********) (3, 2")			
0367	7324000000-N	108.000	EA	$360.0000	$38,880.00
		JUNCTION BOX (STANDARD SIZE)			
0368	7348000000-N	79.000	EA	$775.0000	$61,225.00
		JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)			
0369	7360000000-N	42.000	EA	$1,050.0000	$44,100.00
		WOOD POLE			
0370	7372000000-N	86.000	EA	$655.0000	$56,330.00
		GUY ASSEMBLY			
0371	7396000000-E	10.000	EA	$460.0000	$4,600.00
		1/2" RISER WITH WEATHERHEAD			
0372	7420000000-E	31.000	EA	$830.0000	$25,730.00
		2" RISER WITH WEATHERHEAD			
0373	7432000000-E	4.000	EA	$895.0000	$3,580.00
		2" RISER WITH HEAT SHRINK TUBING			
0374	7444000000-E	15070.000	LF	$8.6000	$129,602.00
		INDUCTIVE LOOP SAWCUT			
0375	7456000000-E	31000.000	LF	$1.7000	$52,700.00
		LEAD-IN CABLE (**********) (14-2)			
0376	7516000000-E	41060.000	LF	$3.5000	$143,710.00
		COMMUNICATIONS CABLE (**FIBER) (48)			
0377	7528000000-E	4740.000	LF	$2.7000	$12,798.00
		DROP CABLE			
0378	7540000000-N	21.000	EA	$1,755.0000	$36,855.00
		SPLICE ENCLOSURE			
0379	7541000000-N	1.000	EA	$1,582.0000	$1,582.00
		MODIFY SPLICE ENCLOSURE			
0380	7552000000-N	20.000	EA	$1,530.0000	$30,600.00
		INTERCONNECT CENTER			
0381	7566000000-N	49.000	EA	$145.0000	$7,105.00
		DELINEATOR MARKER			
0382	7574550000-N	1.000	EA	$208.0000	$208.00
		FURNISH WIRELESS LIGHTNING ARRESTOR			
0383	7575142010-N	10.000	EA	$4,100.0000	$41,000.00
		900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO			
0384	7575142060-N	6.000	EA	$1,210.0000	$7,260.00
		MODIFY RADIO INSTALLATION			
0385	7575160000-E	4650.000	LF	$0.8000	$3,720.00
		REMOVE EXISTING COMMUNICATIONSCABLE			
0386	7575200000-N	2.000	EA	$1,305.0000	$2,610.00
		GPS UNIT			
0387	7588000000-N	29.000	EA	$37,000.0000	$1,073,000.00
		METAL POLE WITH SINGLE MAST ARM			
0388	7590000000-N	1.000	EA	$57,500.0000	$57,500.00
		METAL POLE WITH DUAL MAST ARM			
0389	7613000000-N	34.000	EA	$970.0000	$32,980.00
		SOIL TEST			

0390	7614100000-E DRILLED PIER FOUNDATION	204.000	CY	$1,400.0000	$285,600.00
0391	7631000000-N MAST ARM WITH METAL POLE DE- SIGN	34.000	EA	$79.1000	$2,689.40
0392	7636000000-N SIGN FOR SIGNALS	106.000	EA	$402.0000	$42,612.00
0393	7642200000-N TYPE II PEDESTAL WITH FOUND- ATION	11.000	EA	$2,090.0000	$22,990.00
0394	7642300000-N TYPE III PEDESTAL WITH FOUND- ATION	9.000	EA	$5,050.0000	$45,450.00
0395	7684000000-N SIGNAL CABINET FOUNDATION	13.000	EA	$2,000.0000	$26,000.00
0396	7696000000-N CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE-MOUNTED)	13.000	EA	$16,355.0000	$212,615.00
0397	7696000000-N CONTROLLERS WITH CABINET (**********) (TYPE 2070E, POLE-MOUNTED)	1.000	EA	$14,500.0000	$14,500.00
0398	7708000000-N DETECTOR CARD (**********) (2070E)	165.000	EA	$120.0000	$19,800.00
0399	7901000000-N CABINET BASE EXTENDER	13.000	EA	$638.0000	$8,294.00
0400	7948000000-N TRAFFIC SIGNAL REMOVAL	2.000	EA	$19,000.0000	$38,000.00
0401	7960000000-N METAL POLE FOUNDATION REMOVAL	19.000	EA	$2,500.0000	$47,500.00
0402	7972000000-N METAL POLE REMOVAL	19.000	EA	$500.0000	$9,500.00
0403	7980000000-N GENERIC SIGNAL ITEM CCTV WOOD POLE	6.000	EA	$2,600.0000	$15,600.00
0404	7980000000-N GENERIC SIGNAL ITEM CONTROLLER (TYPE 2070E)	3.000	EA	$4,495.0000	$13,485.00
0405	7980000000-N GENERIC SIGNAL ITEM DECORATIVE METAL POLE WITH SINGLE MAST ARM	4.000	EA	$34,000.0000	$136,000.00
0406	7980000000-N GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	7.000	EA	$4,525.0000	$31,675.00
0407	7980000000-N GENERIC SIGNAL ITEM DMS STRUCTURE (BACK-TO-BACK PEDESTAL)	2.000	EA	$50,000.0000	$100,000.00
0409	7980000000-N GENERIC SIGNAL ITEM ELECTRICAL SERVICE FOR ITS DEVICE	8.000	EA	$1,510.0000	$12,080.00
0410	7980000000-N GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	20.000	EA	$2,200.0000	$44,000.00
0411	7980000000-N GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	3.000	EA	$7,035.0000	$21,105.00
0412	7980000000-N GENERIC SIGNAL ITEM FURNISH ETHERNET EDGE SWITCH	1.000	EA	$1,760.0000	$1,760.00
0413	7980000000-N GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER- SIZED HEAVY DUTY)	24.000	EA	$1,750.0000	$42,000.00
0414	7980000000-N	19.000	EA	$100.0000	$1,900.00

		GENERIC SIGNAL ITEM JUNCTION BOX MARKER		
0415	7980000000-N	2.000 EA	$2,030.0000	$4,060.00
		GENERIC SIGNAL ITEM LUMINAIRE MAST ARM		
0416	7980000000-N	11.000 EA	$48,250.0000	$530,750.00
		GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES		
0417	7980000000-N	4.000 EA	$2,130.0000	$8,520.00
		GENERIC SIGNAL ITEM PROTECTIVE COATING FOR SINGLE MAST ARM POLE (BLACK)		
0418	7980000000-N	10.000 EA	$350.0000	$3,500.00
		GENERIC SIGNAL ITEM REMOVE 900MHZ RADIO		
0419	7980000000-N	3.000 EA	$205.0000	$615.00
		GENERIC SIGNAL ITEM WOOD PEDESTAL		
0420	7990000000-E	310.000 LF	$3.4000	$1,054.00
		GENERIC SIGNAL ITEM BACK PULL FIBER OPTIC CABLE		
0486	1891000000-E	580.000 SY	$125.0000	$72,500.00
		GENERIC PAVING ITEM 7" CONCRETE TRUCK APRON		
0487	2535000000-E	350.000 LF	$30.0000	$10,500.00
		**"X **" CONCRETE CURB (9" X 18")		
0488	2627000000-E	580.000 SY	$54.0000	$31,320.00
		4" CONCRETE ISLAND COVER		
0489	6045000000-E	24.000 LF	$100.0000	$2,400.00
		**" TEMPORARY PIPE (18")		
0490	7108000000-E	4.000 EA	$500.0000	$2,000.00
		VEHICLE SIGNAL HEAD (12", 1 SECTION)		
0491	7980000000-N	4.000 EA	$103,000.0000	$412,000.00
		GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 1C)		
0492	5882000000-N	2.000 EA	$7,000.0000	$14,000.00
		GENERIC UTILITY ITEM 8" SEWER VALVE		
Section 0001 Total				$196,638,399.51

Section 0002
CULVERT ITEMS

0421	8056000000-N	1.000 LS	$19,575.0000	$19,575.00
		REMOVAL OF EXISTING STRUCTURE AT STATION ********** (226+01.00 -L-)		
0422	8056000000-N	1.000 LS	$19,575.0000	$19,575.00
		REMOVAL OF EXISTING STRUCTURE AT STATION ********** (316+72.00 -L-)		
0423	8056000000-N	1.000 LS	$22,750.0000	$22,750.00
		REMOVAL OF EXISTING STRUCTURE AT STATION ********** (64+15.00 -L-)		
0424	8056000000-N	1.000 LS	$19,575.0000	$19,575.00
		REMOVAL OF EXISTING STRUCTURE AT STATION ********** (83+76.00 -L-)		
0425	8126000000-N	1.000 LS	$56,795.0000	$56,795.00
		CULVERT EXCAVATION, STA ****** (226+01.00 -L-)		
0426	8126000000-N	1.000 LS	$63,595.0000	$63,595.00
		CULVERT EXCAVATION, STA ****** (316+72.00 -L-)		
0427	8126000000-N	1.000 LS	$53,490.0000	$53,490.00
		CULVERT EXCAVATION, STA ****** (64+15.00 -L-)		
0428	8126000000-N	1.000 LS	$71,560.0000	$71,560.00
		CULVERT EXCAVATION, STA ****** (83+76.00 -L-)		

0429	8133000000-E	807.000	TON	$80.0000	$64,560.00
	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT				
0430	8196000000-E	887.200	CY	$950.0000	$842,840.00
	CLASS A CONCRETE (CULVERT)				
0431	8245000000-E	119524.000	LB	$2.0500	$245,024.20
	REINFORCING STEEL (CULVERT)				
0432	8804000000-N	1.000	LS	$6,000.0000	$6,000.00
	GENERIC CULVERT ITEM ASBESTOS ASSESSMENT				
Section 0002 Total					$1,485,339.20

Section 0003
WALL ITEMS

0433	8801000000-E	1950.000	SF	$52.7900	$102,940.50
	MSE RETAINING WALL NO **** (1)				
0434	8801000000-E	9625.000	SF	$70.3900	$677,503.75
	MSE RETAINING WALL NO **** (10)				
0435	8801000000-E	14880.000	SF	$70.3900	$1,047,403.20
	MSE RETAINING WALL NO **** (11)				
0436	8801000000-E	8105.000	SF	$70.3900	$570,510.95
	MSE RETAINING WALL NO **** (12)				
0437	8801000000-E	4770.000	SF	$70.3900	$335,760.30
	MSE RETAINING WALL NO **** (13)				
0438	8801000000-E	460.000	SF	$52.7900	$24,283.40
	MSE RETAINING WALL NO **** (2)				
0439	8801000000-E	4540.000	SF	$70.3900	$319,570.60
	MSE RETAINING WALL NO **** (3)				
0440	8801000000-E	2015.000	SF	$70.3900	$141,835.85
	MSE RETAINING WALL NO **** (4)				
0441	8801000000-E	6270.000	SF	$70.3900	$441,345.30
	MSE RETAINING WALL NO **** (5)				
0442	8801000000-E	2765.000	SF	$70.3900	$194,628.35
	MSE RETAINING WALL NO **** (6)				
0443	8801000000-E	8265.000	SF	$70.3900	$581,773.35
	MSE RETAINING WALL NO **** (7)				
0444	8801000000-E	4135.000	SF	$70.3900	$291,062.65
	MSE RETAINING WALL NO **** (8)				
0445	8801000000-E	16210.000	SF	$70.3900	$1,141,021.90
	MSE RETAINING WALL NO **** (9)				
Section 0003 Total					$5,869,640.10

Section 0004
STRUCTURE ITEMS

0446	8017000000-N	1.000	LS	$2,245,000.0000	$2,245,000.00
	CONSTRUCTION, MAINTENANCE, & REMOVAL OF TEMP ACCESS AT STA (390+15.00 -L- LT)				
0447	8035000000-N	1.000	LS	$92,000.0000	$92,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (369+42.00 -L- EBL)				

0448	8035000000-N	1.000	LS	$350,000.0000	$350,000.00
	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (390+15.00 -L- RT)				
0449	8065000000-N	1.000	LS	$2,600.0000	$2,600.00
	ASBESTOS ASSESSMENT				
0450	8112730000-N	10.000	EA	$2,250.0000	$22,500.00
	PDA TESTING				
0451	8121000000-N	1.000	LS	$11,000.0000	$11,000.00
	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (369+42.00 -L- EBL)				
0452	8121000000-N	1.000	LS	$10,000.0000	$10,000.00
	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (390+15.00 -L- LT)				
0453	8121000000-N	1.000	LS	$10,000.0000	$10,000.00
	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (390+15.00 -L- RT)				
0454	8147000000-E	49880.000	SF	$69.5000	$3,466,660.00
	REINFORCED CONCRETE DECK SLAB				
0455	8161000000-E	51122.600	SF	$0.6500	$33,229.69
	GROOVING BRIDGE FLOORS				
0456	8175000000-E	399.900	CY	$1,500.0000	$599,850.00
	CLASS AA CONCRETE (BRIDGE)				
0457	8182000000-E	209.300	CY	$800.0000	$167,440.00
	CLASS A CONCRETE (BRIDGE)				
0458	8210000000-N	1.000	LS	$125,000.0000	$125,000.00
	BRIDGE APPROACH SLABS, STATION********** (31+30.81 -Y REV-)				
0459	8210000000-N	1.000	LS	$52,000.0000	$52,000.00
	BRIDGE APPROACH SLABS, STATION********** (369+42.00 -L- EBL)				
0460	8210000000-N	1.000	LS	$52,000.0000	$52,000.00
	BRIDGE APPROACH SLABS, STATION********** (369+42.00 -L- WBL)				
0461	8210000000-N	1.000	LS	$110,000.0000	$110,000.00
	BRIDGE APPROACH SLABS, STATION********** (39+52.37 -Y14A-)				
0462	8210000000-N	1.000	LS	$52,000.0000	$52,000.00
	BRIDGE APPROACH SLABS, STATION********** (390+15.00 -L- LT)				
0463	8210000000-N	1.000	LS	$52,000.0000	$52,000.00
	BRIDGE APPROACH SLABS, STATION********** (390+15.00 -L- RT)				
0464	8217000000-E	37903.000	LB	$1.5000	$56,854.50
	REINFORCING STEEL (BRIDGE)				
0465	8224000000-E	61921.000	LB	$1.7000	$105,265.70
	EPOXY COATED REINFORCING STEEL(BRIDGE)				
0466	8259000000-E	1361.300	LF	$300.0000	$408,390.00
	36" PRESTRESSED CONCRETE GIR- DERS				
0467	8265000000-E	2455.630	LF	$350.0000	$859,470.50
	54" PRESTRESSED CONCRETE GIR- DERS				
0468	8277000000-E	2068.200	LF	$500.0000	$1,034,100.00
	MODIFIED 72" PRESTRESSED CONC GIRDERS				
0469	8328000000-E	28.000	EA	$2,700.0000	$75,600.00
	PILE DRIVING EQUIPMENT SETUP (16")				
0470	8328000000-E	24.000	EA	$4,300.0000	$103,200.00
	PILE DRIVING EQUIPMENT SETUP (24")				
0471	8328200000-E	108.000	EA	$2,000.0000	$216,000.00
	PILE DRIVING EQUIPMENT SETUP (HP 12 X 53)				
0472	8333000000-E	1715.000	LF	$180.0000	$308,700.00

		16" PRESTRESSED CONCRETE PILES			
0473	8350000000-E	2520.000	LF	$200.0000	$504,000.00
	24" PRESTRESSED CONCRETE PILES				
0474	8364000000-E	8531.000	LF	$125.0000	$1,066,375.00
	HP12X53 STEEL PILES				
0475	8391000000-N	80.000	EA	$125.0000	$10,000.00
	STEEL PILE POINTS				
0476	8393000000-N	130.000	EA	$650.0000	$84,500.00
	PILE REDRIVES				
0477	8475000000-E	1730.950	LF	$128.0000	$221,561.60
	TWO BAR METAL RAIL				
0478	8503000000-E	515.700	LF	$140.0000	$72,198.00
	CONCRETE BARRIER RAIL				
0479	8517000000-E	1792.190	LF	$120.0000	$215,062.80
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-6")				
0480	8531000000-E	119.000	SY	$110.0000	$13,090.00
	4" SLOPE PROTECTION				
0481	8608000000-E	2190.000	TON	$90.0000	$197,100.00
	RIP RAP CLASS II (2'-0" THICK)				
0482	8622000000-E	2435.000	SY	$1.2000	$2,922.00
	GEOTEXTILE FOR DRAINAGE				
0483	8657000000-N	1.000	LS	$110,000.0000	$110,000.00
	ELASTOMERIC BEARINGS				
0484	8727000000-N	1.000	LS	$74,500.0000	$74,500.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- LT)				
0485	8727000000-N	1.000	LS	$74,500.0000	$74,500.00
	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- RT)				
Section 0004 Total					$13,266,669.79
Item Total					$217,260,048.60

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: STP-0211(021)
Bid Total: 217,260,048.60
Goal: 10.00% (21,726,004.86)
Total Entered: 11.70% (25,422,054.75)

Bidder ID: 3516
Business Name: Barnhill Contracting Company

ID	Name	Is Supplier?	Item Count	Amount	Is Complete?
4720	MILITARY & FEDERAL CONSTRUCTION CO	False	21	2,404,556.95	True
7621	DOSS TRUCKING INC	False	4	145,000.00	True
10486	JAMES L MORGAN TRUCKING INC	False	4	93,800.00	True
4720	MILITARY & FEDERAL CONSTRUCTION CO	False	40	8,462,350.06	True
4247	SEAL BROTHERS CONTRACTING LLC	False	5	776,467.35	True
4247	SEAL BROTHERS CONTRACTING LLC	False	4	271,558.43	True
3376	REYNOLDS FENCE & GUARDRAIL INC	False	18	1,012,775.85	True
4880	TRICOR CONSTRUCTION INC	False	14	6,353,546.50	True
4761	TRAFFIC CONTROL SAFETY SERVICES, INC.	False	23	274,070.64	True
15755	GOSALIA CONCRETE CONSTRUCTORS INC.	False	2	179,652.67	True
15521	4 D CONSTRUCTION	False	11	239,508.09	True
12278	CLIFTON CONSTRUCTION CO INC	False	7	365,590.00	True
5659	SOUTHERN CONCRETE & CONSTRUCTION INC	False	17	4,843,178.21	True

Name: MILITARY & FEDERAL CONSTRUCTION CO ID: 4720

Address: 317-C CENTER STREET , JACKSONVILLE, NC 28546

Used As: SubContractor DBE Items Total:$2,404,556.95

Items for MILITARY & FEDERAL CONSTRUCTION CO

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$32,503.7500	$32,503.75
Note: Mob					
0085	2286000000-N MASONRY DRAINAGE STRUCTURES	388.000	EA	$3,400.0000	$1,319,200.00
0086	2297000000-E MASONRY DRAINAGE STRUCTURES	80.011	CY	$4,000.0000	$320,044.00
0087	2308000000-E MASONRY DRAINAGE STRUCTURES	146.900	LF	$328.0000	$48,183.20
0088	2355000000-N FRAME WITH GRATE, STD 840.29	1.000	EA	$1,200.0000	$1,200.00
0089	2364000000-N FRAME WITH TWO GRATES, STD 840.16	46.000	EA	$1,279.0000	$58,834.00
0090	2364200000-N FRAME WITH TWO GRATES, STD 840.20	125.000	EA	$1,259.0000	$157,375.00
0091	2365000000-N FRAME WITH TWO GRATES, STD 840.22	7.000	EA	$1,362.0000	$9,534.00
0092	2366000000-N FRAME WITH TWO GRATES, STD 840.24	6.000	EA	$1,257.0000	$7,542.00
0093	2367000000-N FRAME WITH TWO GRATES, STD 840.29	10.000	EA	$1,200.0000	$12,000.00
0094	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	30.000	EA	$1,359.0000	$40,770.00
0095	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	56.000	EA	$1,491.0000	$83,496.00
0096	2374000000-N FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	69.000	EA	$1,761.0000	$121,509.00
0097	2396000000-N FRAME WITH COVER, STD 840.54	15.000	EA	$1,037.0000	$15,555.00
0098	2407000000-N STEEL FRAME WITH TWO GRATES, STD 840.37	42.000	EA	$2,311.0000	$97,062.00
0113	2800000000-N ADJUSTMENT OF CATCH BASINS	14.000	EA	$1,696.0000	$23,744.00
0114	2815000000-N ADJUSTMENT OF DROP INLETS	1.000	EA	$1,693.0000	$1,693.00
0115	2830000000-N ADJUSTMENT OF MANHOLES	15.000	EA	$2,059.0000	$30,885.00

0116	2845000000-N	1.000 EA	$1,693.0000	$1,693.00
	ADJUSTMENT OF METER BOXES OR VALVE BOXES			
0117	2995000000-N	1.000 EA	$10,867.0000	$10,867.00
	GENERIC DRAINAGE ITEM CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX			
0118	2995000000-N	1.000 EA	$10,867.0000	$10,867.00
	GENERIC DRAINAGE ITEM CONVERT EXISTING DROP INLET TO TRAFFIC BEARING JUNCTION BOX			
Section 0001 Total				$2,404,556.95
Item Total				$2,404,556.95

Name: DOSS TRUCKING INC ID: 7621

Address: 479 FOY LOCKAMY RD , JACKSONVILLE, NC 28540

Used As: SubContractor DBE Items Total:$145,000.00

Items for DOSS TRUCKING INC

0001 ROADWAY ITEMS					
0068	1491000000-E	2500	TON	$14.5000	$36,250.00
	ASPHALT CONC BASE COURSE, TYPE B25.0C				
Note: Hauling asphalt to job					
0069	1503000000-E	2500	TON	$14.5000	$36,250.00
	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C				
Note: Hauling asphalt to job					
0070	1519000000-E	2500	TON	$14.5000	$36,250.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5B				
Note: Hauling asphalt to job					
0071	1523000000-E	2500	TON	$14.5000	$36,250.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5C				
Note: Hauling asphalt to job					
Section 0001 Total					$145,000.00
Item Total					$145,000.00

Name: JAMES L MORGAN TRUCKING INC ID: 10486

Address: 2090 TURKEY TRAP RD SW , SUPPLY, NC 28462

Used As: SubContractor DBE Items Total:$93,800.00

Items for JAMES L MORGAN TRUCKING INC

0001 ROADWAY ITEMS					
0068	1491000000-E	2500	TON	$9.3800	$23,450.00
	ASPHALT CONC BASE COURSE, TYPE B25.0C				
Note: Hauling asphalt to job					
0069	1503000000-E	2500	TON	$9.3800	$23,450.00
	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C				
Note: Hauling asphalt to job					
0070	1519000000-E	2500	TON	$9.3800	$23,450.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5B				
Note: Hauling asphalt to job					
0071	1523000000-E	2500	TON	$9.3800	$23,450.00
	ASPHALT CONC SURFACE COURSE, TYPE S9.5C				
Note: Hauling asphalt to job					
Section 0001 Total					$93,800.00
Item Total					$93,800.00

Name: MILITARY & FEDERAL CONSTRUCTION CO ID: 4720

Address: 317-C CENTER STREET , JACKSONVILLE, NC 28546

Used As: SubContractor DBE Items Total:$8,462,350.06

Items for MILITARY & FEDERAL CONSTRUCTION CO

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$97,511.2500	$97,511.25
0025	0318000000-E FOUNDATION CONDITIONING MATE- RIAL, MINOR STRUCTURES	7378.000	TON	$48.0000	$354,144.00
0026	0320000000-E FOUNDATION CONDITIONING GEO- TEXTILE	63188.000	SY	$5.0000	$315,940.00
0027	0335000000-E **" DRAINAGE PIPE (54")	288.000	LF	$432.0000	$124,416.00
0028	0335200000-E 15" DRAINAGE PIPE	1480.000	LF	$89.0000	$131,720.00
0029	0335300000-E 18" DRAINAGE PIPE	1344.000	LF	$80.0000	$107,520.00
0030	0335400000-E 24" DRAINAGE PIPE	752.000	LF	$97.0000	$72,944.00
0031	0335500000-E 30" DRAINAGE PIPE	520.000	LF	$113.0000	$58,760.00
0032	0335600000-E 36" DRAINAGE PIPE	604.000	LF	$141.0000	$85,164.00
0033	0335800000-E 48" DRAINAGE PIPE	636.000	LF	$264.0000	$167,904.00
0034	0448000000-E ****" RC PIPE CULVERTS, CLASS IV (12")	76.000	LF	$74.0000	$5,624.00
0035	0448000000-E ****" RC PIPE CULVERTS, CLASS IV (48")	1046.000	LF	$317.0000	$331,582.00
0036	0448000000-E ****" RC PIPE CULVERTS, CLASS IV (54")	488.000	LF	$634.0000	$309,392.00
0037	0448000000-E ****" RC PIPE CULVERTS, CLASS IV (60")	1240.000	LF	$469.0000	$581,560.00
0038	0448000000-E ****" RC PIPE CULVERTS, CLASS IV (66")	408.000	LF	$600.0000	$244,800.00
0039	0448200000-E 15" RC PIPE CULVERTS, CLASS IV	13444.000	LF	$65.0000	$873,860.00
0040	0448300000-E 18" RC PIPE CULVERTS, CLASS IV	2646.000	LF	$94.0000	$248,724.00
0041	0448400000-E 24" RC PIPE CULVERTS, CLASS IV	1712.000	LF	$96.0000	$164,352.00

0042	0448500000-E	4372.000	LF	$157.0000	$686,404.00
	30" RC PIPE CULVERTS, CLASS IV				
0043	0448600000-E	3400.000	LF	$222.0000	$754,800.00
	36" RC PIPE CULVERTS, CLASS IV				
0044	0448700000-E	1144.000	LF	$330.0000	$377,520.00
	42" RC PIPE CULVERTS, CLASS IV				
0045	0546000000-E	84.000	LF	$588.0000	$49,392.00
	" CAA PIPE CULVERTS, ***" THICK (54", 0.109")				
0046	0582000000-E	632.000	LF	$53.0000	$33,496.00
	15" CS PIPE CULVERTS, 0.064" THICK				
0047	0588000000-E	52.000	LF	$52.0000	$2,704.00
	18" CS PIPE CULVERTS, 0.064" THICK				
0048	0636000000-E	30.000	EA	$428.0000	$12,840.00
	" CS PIPE ELBOWS, ***" THICK (15", 0.064")				
0049	0636000000-E	2.000	EA	$871.0000	$1,742.00
	" CS PIPE ELBOWS, ***" THICK (18", 0.064")				
0050	0986000000-E	112.000	LF	$217.0000	$24,304.00
	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE				
0051	0986000000-E	202.000	LF	$227.0000	$45,854.00
	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE				
0052	0986000000-E	104.000	LF	$290.0000	$30,160.00
	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE				
0053	0986000000-E	348.000	LF	$916.0000	$318,768.00
	GENERIC PIPE ITEM 57" X 38" CORRUGATED ALUMINUM ALLOY PIPE ARCH CULVERT 0.109"THICK				
0054	0986000000-E	452.000	LF	$1,372.0000	$620,144.00
	GENERIC PIPE ITEM 60" X 38" HORIZONTAL ELLIPTI- CAL RCP-IV				
0055	0992000000-E	2.000	EA	$1,477.0000	$2,954.00
	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE ELBOW				
0056	0992000000-E	4.000	EA	$1,983.0000	$7,932.00
	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE ELBOW				
0057	0992000000-E	2.000	EA	$3,027.0000	$6,054.00
	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE ELBOW				
0058	0995000000-E	12322.000	LF	$50.0000	$616,100.00
	PIPE REMOVAL				
0080	2190000000-N	75.000	EA	$1,674.0000	$125,550.00
	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE				
0081	2209000000-E	133.900	CY	$1,832.0000	$245,304.80
	ENDWALLS				
0082	2220000000-E	62.690	CY	$2,748.0000	$172,272.12
	REINFORCED ENDWALLS				
0083	2253000000-E	2.557	CY	$2,077.0000	$5,310.89
	PIPE COLLARS				
0084	2275000000-E	129.000	CY	$363.0000	$46,827.00
	FLOWABLE FILL				
Section 0001 Total					$8,462,350.06

Item Total	$8,462,350.06

Name: SEAL BROTHERS CONTRACTING LLC ID: 4247

Address: 131 W. CLEVE STREET , MOUNT AIRY, NC 27030

Used As: SubContractor DBE Items Total:$776,467.35

Items for SEAL BROTHERS CONTRACTING LLC

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$15,224.8500	$15,224.85
Note: Bond					
0311	6000000000-E TEMPORARY SILT FENCE	260100.000	LF	$2.3500	$611,235.00
0319	6029000000-E SAFETY FENCE	28000.000	LF	$2.1500	$60,200.00
0333	6071030000-E COIR FIBER BAFFLE	10355.000	LF	$6.5000	$67,307.50
0346	6117000000-N RESPONSE FOR EROSION CONTROL	75	EA	$300.0000	$22,500.00
Section 0001 Total					$776,467.35
Item Total					$776,467.35

Name: SEAL BROTHERS CONTRACTING LLC ID: 4247

Address: 131 W. CLEVE STREET , MOUNT AIRY, NC 27030

Used As: SubContractor DBE Items Total:$271,558.43

Items for SEAL BROTHERS CONTRACTING LLC

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$10,324.6800	$10,324.68
Note: Bond and					
0136	3503000000-E WOVEN WIRE FENCE, 47" FABRIC	61000.000	LF	$2.8000	$170,800.00
0137	3509000000-E 4" TIMBER FENCE POSTS, 7'-6" LONG	3699.000	EA	$16.2500	$60,108.75
0138	3515000000-E 5" TIMBER FENCE POSTS, 8'-0" LONG	1213.000	EA	$25.0000	$30,325.00
Section 0001 Total					$271,558.43
Item Total					$271,558.43

Name: REYNOLDS FENCE & GUARDRAIL INC ID: 3376

Address: 9320 MACHADO DRIVE , INDIAN TRAIL, NC 28079

Used As: SubContractor DBE Items Total:$1,012,775.85

Items for REYNOLDS FENCE & GUARDRAIL INC

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$19,858.3500	$19,858.35
Note: Bond					
0119	3001000000-N IMPACT ATTENUATOR UNITS, TYPE TL-3	3.000	EA	$25,500.0000	$76,500.00
0120	3030000000-E STEEL BEAM GUARDRAIL	19725.000	LF	$27.5000	$542,437.50
0121	3045000000-E STEEL BEAM GUARDRAIL, SHOP CURVED	1462.500	LF	$29.0000	$42,412.50
0122	3145000000-E EXTRA LENGTH GUARDRAIL POST (**' STEEL) (8')	25.000	EA	$100.0000	$2,500.00
0123	3150000000-N ADDITIONAL GUARDRAIL POSTS	165.000	EA	$57.0000	$9,405.00
0124	3195000000-N GUARDRAIL END UNITS, TYPE AT-1	17.000	EA	$850.0000	$14,450.00
0125	3210000000-N GUARDRAIL END UNITS, TYPE CAT-1	29.000	EA	$1,050.0000	$30,450.00
0126	3215000000-N GUARDRAIL ANCHOR UNITS, TYPE III	16.000	EA	$2,000.0000	$32,000.00
0127	3287000000-N GUARDRAIL END UNITS, TYPE TL-3	26.000	EA	$3,100.0000	$80,600.00
0128	3288000000-N GUARDRAIL END UNITS, TYPE TL-2	3.000	EA	$3,000.0000	$9,000.00
0129	3317000000-N GUARDRAIL ANCHOR UNITS, TYPE B-77	13.000	EA	$2,900.0000	$37,700.00
0130	3360000000-E REMOVE EXISTING GUARDRAIL	5600.000	LF	$1.5000	$8,400.00
0131	3380000000-E TEMPORARY STEEL BEAM GUARDRAIL	3150.000	LF	$10.0000	$31,500.00
0132	3382000000-E TEMPORARY STEEL BEAM GUARDRAIL (SHOP CURVED)	637.500	LF	$15.0000	$9,562.50
0133	3387000000-N TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	8.000	EA	$2,000.0000	$16,000.00
0134	3389150000-N TEMPORARY GUARDRAIL END UNITS, TYPE ***** (AT-1)	10.000	EA	$600.0000	$6,000.00
0135	3389150000-N TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	20.000	EA	$2,200.0000	$44,000.00

Section 0001 Total	$1,012,775.85

Item Total	$1,012,775.85

Name: TRICOR CONSTRUCTION INC ID: 4880

Address: 1983 CHESNEE HIGHWAY, SPARTANBURG, SC 29303

Used As: SubContractor DBE Items Total:$6,353,546.50

Items for TRICOR CONSTRUCTION INC

0001 ROADWAY ITEMS				
0001	0000100000-N MOBILIZATION	1.000 LS	$483,906.4000	$483,906.40
Section 0001 Total				$483,906.40
0003 WALL ITEMS				
0433	8801000000-E MSE RETAINING WALL NO **** (1)	1950.000 SF	$52.7900	$102,940.50
0434	8801000000-E MSE RETAINING WALL NO **** (10)	9625.000 SF	$70.3900	$677,503.75
0435	8801000000-E MSE RETAINING WALL NO **** (11)	14880.000 SF	$70.3900	$1,047,403.20
0436	8801000000-E MSE RETAINING WALL NO **** (12)	8105.000 SF	$70.3900	$570,510.95
0437	8801000000-E MSE RETAINING WALL NO **** (13)	4770.000 SF	$70.3900	$335,760.30
0438	8801000000-E MSE RETAINING WALL NO **** (2)	460.000 SF	$52.7900	$24,283.40
0439	8801000000-E MSE RETAINING WALL NO **** (3)	4540.000 SF	$70.3900	$319,570.60
0440	8801000000-E MSE RETAINING WALL NO **** (4)	2015.000 SF	$70.3900	$141,835.85
0441	8801000000-E MSE RETAINING WALL NO **** (5)	6270.000 SF	$70.3900	$441,345.30
0442	8801000000-E MSE RETAINING WALL NO **** (6)	2765.000 SF	$70.3900	$194,628.35
0443	8801000000-E MSE RETAINING WALL NO **** (7)	8265.000 SF	$70.3900	$581,773.35
0444	8801000000-E MSE RETAINING WALL NO **** (8)	4135.000 SF	$70.3900	$291,062.65
0445	8801000000-E MSE RETAINING WALL NO **** (9)	16210.000 SF	$70.3900	$1,141,021.90
Section 0003 Total				$5,869,640.10

Item Total	$6,353,546.50

Name: TRAFFIC CONTROL SAFETY SERVICES, INC. ID: 4761

Address: POST OFFICE BOX 24511 , WINSTON-SALEM, NC 27114

Used As: SubContractor DBE Items Total:$274,070.64

Items for TRAFFIC CONTROL SAFETY SERVICES, INC.

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$17,982.6400	$17,982.64
Note: Mob & bond					
0144	4048000000-E REINFORCED CONCRETE SIGN FOUN-DATIONS	14.000	CY	$950.0000	$13,300.00
0145	4054000000-E PLAIN CONCRETE SIGN FOUNDA- TIONS	1.000	CY	$10.0000	$10.00
0146	4057000000-E OVERHEAD FOOTING	16.000	CY		$0.00
0147	4060000000-E SUPPORTS, BREAKAWAY STEEL BEAM	15793.000	LB	$6.0000	$94,758.00
0148	4066000000-E SUPPORTS, SIMPLE STEEL BEAM	1958.000	LB	$6.0000	$11,748.00
0149	4072000000-E SUPPORTS, 3-LB STEEL U-CHANNEL	7639.000	LF	$8.0000	$61,112.00
0150	4082000000-E SUPPORTS, WOOD	58.000	LF	$15.0000	$870.00
0151	4096000000-N SIGN ERECTION, TYPE D	21.000	EA	$100.0000	$2,100.00
0152	4102000000-N SIGN ERECTION, TYPE E	338.000	EA	$100.0000	$33,800.00
0153	4108000000-N SIGN ERECTION, TYPE F	76.000	EA	$100.0000	$7,600.00
0154	4110000000-N SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	18.000	EA	$750.0000	$13,500.00
0155	4110000000-N SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	1.000	EA	$350.0000	$350.00
0156	4116100000-N SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	1.000	EA	$750.0000	$750.00
0157	4116100000-N SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (B)	1.000	EA	$350.0000	$350.00
0158	4116100000-N SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (D)	12.000	EA	$200.0000	$2,400.00
0159	4138000000-N DISPOSAL OF SUPPORT, STEEL BEAM	2.000	EA	$500.0000	$1,000.00
0160	4141000000-N DISPOSAL OF SUPPORT, WOOD	2.000	EA	$50.0000	$100.00

0161	4152000000-N	4.000	EA	$500.0000	$2,000.00
	DISPOSAL OF SIGN SYSTEM, STEELBEAM				
0162	4155000000-N	161.000	EA	$5.0000	$805.00
	DISPOSAL OF SIGN SYSTEM, U- CHANNEL				
0163	4192000000-N	17.000	EA	$5.0000	$85.00
	DISPOSAL OF SUPPORT, U-CHANNEL				
0164	4360000000-N	19.000	EA	$150.0000	$2,850.00
	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS OM3-C				
0165	4360000000-N	44.000	EA	$150.0000	$6,600.00
	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS OM3-L				
Section 0001 Total					$274,070.64
Item Total					$274,070.64

Name: GOSALIA CONCRETE CONSTRUCTORS INC. ID: 15755

Address: SUITE 200 WESTSHORE BLVD , TAMPA, FL 33607

Used As: SubContractor DBE Items Total:$179,652.67

Items for GOSALIA CONCRETE CONSTRUCTORS INC.

0004 STRUCTURE ITEMS					
0478	8503000000-E	515.700	LF	$96.4800	$49,754.74
	CONCRETE BARRIER RAIL				
0479	8517000000-E	1792.190	LF	$72.4800	$129,897.93
	1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-6")				
Section 0004 Total					$179,652.67
Item Total					$179,652.67

Name: 4 D CONSTRUCTION ID: 15521

Address: P.O. BOX 806 , MAXTON, NC 28364

Used As: SubContractor DBE Items Total:$239,508.09

Items for 4 D CONSTRUCTION

0004 STRUCTURE ITEMS					
0454	8147000000-E REINFORCED CONCRETE DECK SLAB	49880.000	SF	$3.0200	$150,637.60
0458	8210000000-N BRIDGE APPROACH SLABS, STATION********** (31+30.81 -Y REV-)	1.000	LS	$10,162.0000	$10,162.00
0459	8210000000-N BRIDGE APPROACH SLABS, STATION********** (369+42.00 -L- EBL)	1.000	LS	$3,751.0000	$3,751.00
0460	8210000000-N BRIDGE APPROACH SLABS, STATION********** (369+42.00 -L- WBL)	1.000	LS	$3,751.0000	$3,751.00
0461	8210000000-N BRIDGE APPROACH SLABS, STATION********** (39+52.37 -Y14A-)	1.000	LS	$8,770.0000	$8,770.00
0462	8210000000-N BRIDGE APPROACH SLABS, STATION********** (390+15.00 -L- LT)	1.000	LS	$3,728.0000	$3,728.00
0463	8210000000-N BRIDGE APPROACH SLABS, STATION********** (390+15.00 -L- RT)	1.000	LS	$3,728.0000	$3,728.00
0464	8217000000-E REINFORCING STEEL (BRIDGE)	37903.000	LB	$0.3700	$14,024.11
0465	8224000000-E EPOXY COATED REINFORCING STEEL(BRIDGE)	61921.000	LB	$0.3700	$22,910.77
0478	8503000000-E CONCRETE BARRIER RAIL	515.700	LF	$8.6500	$4,460.81
0479	8517000000-E 1'-**"X *****" CONCRETE PARA- PET (1'-2" X 2'-6")	1792.190	LF	$7.5800	$13,584.80
Section 0004 Total					$239,508.09
Item Total					$239,508.09

Name: CLIFTON CONSTRUCTION CO INC ID: 12278

Address: 1435 GIDDENSVILLE ROAD , FAISON, NC 28341

Used As: SubContractor DBE Items Total:$365,590.00

Items for CLIFTON CONSTRUCTION CO INC

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$9,000.0000	$9,000.00
Note: Mob					
0074	2022000000-E SUBDRAIN EXCAVATION	2184.000	CY	$30.0000	$65,520.00
0075	2026000000-E GEOTEXTILE FOR SUBSURFACE DRAINS	6500.000	SY	$13.0000	$84,500.00
0076	2036000000-E SUBDRAIN COARSE AGGREGATE	1092.000	CY	$75.0000	$81,900.00
0077	2044000000-E 6" PERFORATED SUBDRAIN PIPE	6500.000	LF	$18.0000	$117,000.00
0078	2070000000-N SUBDRAIN PIPE OUTLET	13.000	EA	$350.0000	$4,550.00
0079	2077000000-E 6" OUTLET PIPE	78.000	LF	$40.0000	$3,120.00
Section 0001 Total					$365,590.00
Item Total					$365,590.00

Name: SOUTHERN CONCRETE & CONSTRUCTION INC ID: 5659

Address: P.O. BOX 1673 , ANDERSON, SC 29622

Used As: SubContractor DBE Items Total:$4,843,178.21

Items for SOUTHERN CONCRETE & CONSTRUCTION INC

0001 ROADWAY ITEMS					
0001	0000100000-N MOBILIZATION	1.000	LS	$477,533.2100	$477,533.21
0099	2451000000-N CONCRETE TRANSITIONAL SECTION FOR DROP INLET	97.000	EA	$1,200.0000	$116,400.00
0100	2535000000-E **"X **" CONCRETE CURB (8" X 18")	1580.000	LF	$25.0000	$39,500.00
0101	2538000000-E **'-**" CONCRETE CURB & GUTTER (2'-9")	10300.000	LF	$35.0000	$360,500.00
0102	2542000000-E 1'-6" CONCRETE CURB & GUTTER	46660.000	LF	$18.0000	$839,880.00
0103	2549000000-E 2'-6" CONCRETE CURB & GUTTER	26060.000	LF	$30.0000	$781,800.00
0104	2556000000-E SHOULDER BERM GUTTER	8330.000	LF	$28.0000	$233,240.00
0105	2577000000-E CONCRETE EXPRESSWAY GUTTER	340.000	LF	$60.0000	$20,400.00
0106	2591000000-E 4" CONCRETE SIDEWALK	2870.000	SY	$54.0000	$154,980.00
0107	2605000000-N CONCRETE CURB RAMPS	37.000	EA	$3,500.0000	$129,500.00
0108	2612000000-E 6" CONCRETE DRIVEWAY	280.000	SY	$125.0000	$35,000.00
0109	2619000000-E 4" CONCRETE PAVED DITCH	110.000	SY	$135.0000	$14,850.00
0110	2655000000-E 5" MONOLITHIC CONCRETE ISLANDS(KEYED IN)	15845.000	SY	$95.0000	$1,505,275.00
0112	2759000000-N GENERIC PAVING ITEM EMERGENCY VEHICLE ACCESS FOR CONCRETE ISLAND	2.000	EA	$10,000.0000	$20,000.00
0486	1891000000-E GENERIC PAVING ITEM 7" CONCRETE TRUCK APRON	580.000	SY	$125.0000	$72,500.00
0487	2535000000-E **"X **" CONCRETE CURB (9" X 18")	350.000	LF	$30.0000	$10,500.00
0488	2627000000-E 4" CONCRETE ISLAND COVER	580.000	SY	$54.0000	$31,320.00
Section 0001 Total					$4,843,178.21

Item Total	$4,843,178.21

THIS PROPOSAL CONTAINS THE FOLLOWING ERRORS/WARNINGS (IF ANY)
SEAL BROTHERS CONTRACTING LLC/DBE: 0311 Price is over committed.
CLIFTON CONSTRUCTION CO INC/DBE: 0074 Price is over committed.
CLIFTON CONSTRUCTION CO INC/DBE: 0075 Price is over committed.
CLIFTON CONSTRUCTION CO INC/DBE: 0076 Price is over committed.
CLIFTON CONSTRUCTION CO INC/DBE: 0077 Price is over committed.

This Bid contains 1 amendment files

000001 11/15/2021 ADD, MODIFY & DELETE ITEMS

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 C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum LS	10,800,000.00	10,800,000.00
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum LS	5,000,000.00	5,000,000.00
0003	0000700000-N	SP	FIELD OFFICE	Lump Sum LS	1,500,000.00	1,500,000.00
0004	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum LS	15,000,000.00	15,000,000.00
0005	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUBBING	3 ACR	15,000.00	45,000.00
0006	0015000000-N	205	SEALING ABANDONED WELLS	8 EA	1,200.00	9,600.00
0007	0022000000-E	225	UNCLASSIFIED EXCAVATION	90,000 CY	10.00	900,000.00
0008	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (369+42.00 -L- EBL)	Lump Sum LS	50,000.00	50,000.00
0009	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (369+42.00 -L- WBL)	Lump Sum LS	50,000.00	50,000.00
0010	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (390+15.00 -L- LT)	Lump Sum LS	75,000.00	75,000.00
0011	0028000000-N	SP	TYPE I STANDARD APPROACH FILL STATION ********** (390+15.00 -L- RT)	Lump Sum LS	75,000.00	75,000.00
0012	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (31+30.81 -Y REV-)	Lump Sum LS	90,000.00	90,000.00
0013	0029000000-N	SP	TYPE III REINFORCED APPROACH FILL, STATION ******* (39+52.37 -Y14A-)	Lump Sum LS	75,000.00	75,000.00
0014	0036000000-E	225	UNDERCUT EXCAVATION	55,000 CY	10.00	550,000.00
0015	0106000000-E	230	BORROW EXCAVATION	1,200,000 CY	8.00	9,600,000.00
0016	0134000000-E	240	DRAINAGE DITCH EXCAVATION	62,215 CY	9.30	578,599.50
0017	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	19,500 SY	15.10	294,450.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0018	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	63,810 SY	5.80	370,098.00
0019	0192000000-N	260	PROOF ROLLING	100 HR	365.00	36,500.00
0020	0195000000-E	265	SELECT GRANULAR MATERIAL	54,200 CY	8.00	433,600.00
0021	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA-TION	40,190 SY	2.10	84,399.00
0022	0199000000-E	SP	TEMPORARY SHORING	33,000 SF	79.80	2,633,400.00
0023	0248000000-N	SP	GENERIC GRADING ITEM DE-WATERING	Lump Sum LS	62,950.00	62,950.00
0024	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO-LEUM CONTAMINATED SOIL	50 TON	68.00	3,400.00
0025	0318000000-E	300	FOUNDATION CONDITIONING MATE-RIAL, MINOR STRUCTURES	7,378 TON	48.00	354,144.00
0026	0320000000-E	300	FOUNDATION CONDITIONING GEO-TEXTILE	63,188 SY	5.00	315,940.00
0027	0335000000-E	305	**" DRAINAGE PIPE (54")	288 LF	432.00	124,416.00
0028	0335200000-E	305	15" DRAINAGE PIPE	1,480 LF	89.00	131,720.00
0029	0335300000-E	305	18" DRAINAGE PIPE	1,344 LF	80.00	107,520.00
0030	0335400000-E	305	24" DRAINAGE PIPE	752 LF	97.00	72,944.00
0031	0335500000-E	305	30" DRAINAGE PIPE	520 LF	113.00	58,760.00
0032	0335600000-E	305	36" DRAINAGE PIPE	604 LF	141.00	85,164.00
0033	0335800000-E	305	48" DRAINAGE PIPE	636 LF	264.00	167,904.00
0034	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (12")	76 LF	74.00	5,624.00
0035	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	1,046 LF	317.00	331,582.00

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0036	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (54")	488 LF	634.00	309,392.00
0037	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	1,240 LF	469.00	581,560.00
0038	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (66")	408 LF	600.00	244,800.00
0039	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	13,444 LF	65.00	873,860.00
0040	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	2,646 LF	94.00	248,724.00
0041	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	1,712 LF	96.00	164,352.00
0042	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	4,372 LF	157.00	686,404.00
0043	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	3,400 LF	222.00	754,800.00
0044	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	1,144 LF	330.00	377,520.00
0045	0546000000-E	310	**" CAA PIPE CULVERTS, *****" THICK (54", 0.109")	84 LF	588.00	49,392.00
0046	0582000000-E	310	15" CS PIPE CULVERTS, 0.064" THICK	632 LF	53.00	33,496.00
0047	0588000000-E	310	18" CS PIPE CULVERTS, 0.064" THICK	52 LF	52.00	2,704.00
0048	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (15", 0.064")	30 EA	428.00	12,840.00
0049	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.064")	2 EA	871.00	1,742.00
0050	0986000000-E	SP	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE	112 LF	217.00	24,304.00
0051	0986000000-E	SP	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE	202 LF	227.00	45,854.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0052	0986000000-E	SP	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE	104 LF	290.00	30,160.00
0053	0986000000-E	SP	GENERIC PIPE ITEM 57" X 38" CORRUGATED ALUMINUM ALLOY PIPE ARCH CULVERT 0.109" THICK	348 LF	916.00	318,768.00
0054	0986000000-E	SP	GENERIC PIPE ITEM 60" X 38" HORIZONTAL ELLIPTI-CAL RCP-IV	452 LF	1,372.00	620,144.00
0055	0992000000-E	SP	GENERIC PIPE ITEM 18" DUCTILE IRON PIPE ELBOW	2 EA	1,477.00	2,954.00
0056	0992000000-E	SP	GENERIC PIPE ITEM 24" DUCTILE IRON PIPE ELBOW	4 EA	1,983.00	7,932.00
0057	0992000000-E	SP	GENERIC PIPE ITEM 30" DUCTILE IRON PIPE ELBOW	2 EA	3,027.00	6,054.00
0058	0995000000-E	340	PIPE REMOVAL	12,322 LF	50.00	616,100.00
0059	0996000000-N	350	PIPE CLEAN OUT	5 EA	5,000.00	25,000.00
0060	1011000000-N	500	FINE GRADING	Lump Sum LS	10,771,738.00	10,771,738.00
0061	1099500000-E	505	SHALLOW UNDERCUT	1,100 CY	11.00	12,100.00
0062	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	2,000 TON	53.40	106,800.00
0063	1111000000-E	SP	CLASS IV AGGREGATE STABILIZA-TION	90,000 TON	54.90	4,941,000.00
0064	1121000000-E	520	AGGREGATE BASE COURSE	28,150 TON	58.70	1,652,405.00
0065	1220000000-E	545	INCIDENTAL STONE BASE	5,725 TON	60.70	347,507.50
0066	1275000000-E	600	PRIME COAT	21,954 GAL	6.00	131,724.00
0067	1330000000-E	607	INCIDENTAL MILLING	8,000 SY	16.00	128,000.00
0068	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	180,000 TON	77.50	13,950,000.00
0069	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	115,500 TON	81.50	9,413,250.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0070	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	25,900 TON	103.50	2,680,650.00
0071	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	65,100 TON	83.50	5,435,850.00
0072	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	19,300 TON	525.00	10,132,500.00
0073	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	5,650 TON	182.00	1,028,300.00
0074	2022000000-E	815	SUBDRAIN EXCAVATION	2,184 CY	10.00	21,840.00
0075	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	6,500 SY	5.00	32,500.00
0076	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	1,092 CY	25.00	27,300.00
0077	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	6,500 LF	10.00	65,000.00
0078	2070000000-N	815	SUBDRAIN PIPE OUTLET	13 EA	350.00	4,550.00
0079	2077000000-E	815	6" OUTLET PIPE	78 LF	40.00	3,120.00
0080	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	75 EA	1,674.00	125,550.00
0081	2209000000-E	838	ENDWALLS	133.9 CY	1,832.00	245,304.80
0082	2220000000-E	838	REINFORCED ENDWALLS	62.69 CY	2,748.00	172,272.12
0083	2253000000-E	840	PIPE COLLARS	2.557 CY	2,077.00	5,310.89
0084	2275000000-E	SP	FLOWABLE FILL	129 CY	363.00	46,827.00
0085	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	388 EA	3,400.00	1,319,200.00
0086	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	80.011 CY	4,000.00	320,044.00
0087	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	146.9 LF	328.00	48,183.20
0088	2355000000-N	840	FRAME WITH GRATE, STD 840.29	1 EA	1,200.00	1,200.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0089	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	46 EA	1,279.00	58,834.00
0090	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	125 EA	1,259.00	157,375.00
0091	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	7 EA	1,362.00	9,534.00
0092	2366000000-N	840	FRAME WITH TWO GRATES, STD 840.24	6 EA	1,257.00	7,542.00
0093	2367000000-N	840	FRAME WITH TWO GRATES, STD 840.29	10 EA	1,200.00	12,000.00
0094	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	30 EA	1,359.00	40,770.00
0095	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	56 EA	1,491.00	83,496.00
0096	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	69 EA	1,761.00	121,509.00
0097	2396000000-N	840	FRAME WITH COVER, STD 840.54	15 EA	1,037.00	15,555.00
0098	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	42 EA	2,311.00	97,062.00
0099	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	97 EA	1,200.00	116,400.00
0100	2535000000-E	846	**"X **" CONCRETE CURB (8" X 18")	1,580 LF	25.00	39,500.00
0101	2538000000-E	846	**'-**" CONCRETE CURB & GUTTER (2'-9")	10,300 LF	35.00	360,500.00
0102	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	46,660 LF	18.00	839,880.00
0103	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	26,060 LF	30.00	781,800.00
0104	2556000000-E	846	SHOULDER BERM GUTTER	8,330 LF	28.00	233,240.00
0105	2577000000-E	846	CONCRETE EXPRESSWAY GUTTER	340 LF	60.00	20,400.00

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0106	2591000000-E	848	4" CONCRETE SIDEWALK	2,870 SY	54.00	154,980.00
0107	2605000000-N	848	CONCRETE CURB RAMPS	37 EA	3,500.00	129,500.00
0108	2612000000-E	848	6" CONCRETE DRIVEWAY	280 SY	125.00	35,000.00
0109	2619000000-E	850	4" CONCRETE PAVED DITCH	110 SY	135.00	14,850.00
0110	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	15,845 SY	95.00	1,505,275.00
0111	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	350 LF	150.00	52,500.00
0112	2759000000-N	SP	GENERIC PAVING ITEM EMERGENCY VEHICLE ACCESS FOR CONCRETE ISLAND	2 EA	10,000.00	20,000.00
0113	2800000000-N	858	ADJUSTMENT OF CATCH BASINS	14 EA	1,696.00	23,744.00
0114	2815000000-N	858	ADJUSTMENT OF DROP INLETS	1 EA	1,693.00	1,693.00
0115	2830000000-N	858	ADJUSTMENT OF MANHOLES	15 EA	2,059.00	30,885.00
0116	2845000000-N	858	ADJUSTMENT OF METER BOXES OR VALVE BOXES	1 EA	1,693.00	1,693.00
0117	2995000000-N	SP	GENERIC DRAINAGE ITEM CONVERT EXISTING CATCH BASIN TO TRAFFIC BEARING JUNCTION BOX	1 EA	10,867.00	10,867.00
0118	2995000000-N	SP	GENERIC DRAINAGE ITEM CONVERT EXISTING DROP INLET TO TRAFFIC BEARING JUNCTION BOX	1 EA	10,867.00	10,867.00
0119	3001000000-N	SP	IMPACT ATTENUATOR UNITS, TYPE TL-3	3 EA	25,500.00	76,500.00
0120	3030000000-E	862	STEEL BEAM GUARDRAIL	19,725 LF	27.50	542,437.50
0121	3045000000-E	862	STEEL BEAM GUARDRAIL, SHOP CURVED	1,462.5 LF	29.00	42,412.50
0122	3145000000-E	862	EXTRA LENGTH GUARDRAIL POST (**' STEEL) (8')	25 EA	100.00	2,500.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0123	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	165 EA	57.00	9,405.00
0124	3195000000-N	862	GUARDRAIL END UNITS, TYPE AT-1	17 EA	850.00	14,450.00
0125	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	29 EA	1,050.00	30,450.00
0126	3215000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE III	16 EA	2,000.00	32,000.00
0127	3287000000-N	SP	GUARDRAIL END UNITS, TYPE TL-3	26 EA	3,100.00	80,600.00
0128	3288000000-N	SP	GUARDRAIL END UNITS, TYPE TL-2	3 EA	3,000.00	9,000.00
0129	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	13 EA	2,900.00	37,700.00
0130	3360000000-E	863	REMOVE EXISTING GUARDRAIL	5,600 LF	1.50	8,400.00
0131	3380000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL	3,150 LF	10.00	31,500.00
0132	3382000000-E	862	TEMPORARY STEEL BEAM GUARDRAIL (SHOP CURVED)	637.5 LF	15.00	9,562.50
0133	3387000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	8 EA	2,000.00	16,000.00
0134	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (AT-1)	10 EA	600.00	6,000.00
0135	3389150000-N	SP	TEMPORARY GUARDRAIL END UNITS, TYPE ***** (TL-3)	20 EA	2,200.00	44,000.00
0136	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	61,000 LF	2.80	170,800.00
0137	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	3,699 EA	16.25	60,108.75
0138	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	1,213 EA	25.00	30,325.00
0139	3628000000-E	876	RIP RAP, CLASS I	3,565 TON	97.00	345,805.00
0140	3642000000-E	876	RIP RAP, CLASS A	40 TON	70.00	2,800.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0141	3649000000-E	876	RIP RAP, CLASS B	915 TON	98.40	90,036.00
0142	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	13,555 SY	3.00	40,665.00
0143	3659000000-N	873	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	3 EA	3,300.00	9,900.00
0144	4048000000-E	902	REINFORCED CONCRETE SIGN FOUN-DATIONS	14 CY	950.00	13,300.00
0145	4054000000-E	902	PLAIN CONCRETE SIGN FOUNDA-TIONS	1 CY	10.00	10.00
0146	4057000000-E	SP	OVERHEAD FOOTING	16 CY	1,500.00	24,000.00
0147	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	15,793 LB	6.00	94,758.00
0148	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	1,958 LB	6.00	11,748.00
0149	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	7,639 LF	8.00	61,112.00
0150	4082000000-E	903	SUPPORTS, WOOD	58 LF	15.00	870.00
0151	4096000000-N	904	SIGN ERECTION, TYPE D	21 EA	100.00	2,100.00
0152	4102000000-N	904	SIGN ERECTION, TYPE E	338 EA	100.00	33,800.00
0153	4108000000-N	904	SIGN ERECTION, TYPE F	76 EA	100.00	7,600.00
0154	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	18 EA	750.00	13,500.00
0155	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	1 EA	350.00	350.00
0156	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (A)	1 EA	750.00	750.00
0157	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (B)	1 EA	350.00	350.00
0158	4116100000-N	904	SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (D)	12 EA	200.00	2,400.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0159	4138000000-N	907	DISPOSAL OF SUPPORT, STEEL BEAM	2 EA	500.00	1,000.00
0160	4141000000-N	907	DISPOSAL OF SUPPORT, WOOD	2 EA	50.00	100.00
0161	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	4 EA	500.00	2,000.00
0162	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	161 EA	5.00	805.00
0163	4192000000-N	907	DISPOSAL OF SUPPORT, U-CHANNEL	17 EA	5.00	85.00
0164	4360000000-N	SP	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS – OM3-C	19 EA	150.00	2,850.00
0165	4360000000-N	SP	GENERIC SIGNING ITEM VERTICAL PANEL, TYPE 3 OBJECT MARKERS – OM3-L	44 EA	150.00	6,600.00
0166	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	2,392 SF	6.50	15,548.00
0167	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	1,217 SF	23.50	28,599.50
0168	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	1,589 SF	7.25	11,520.25
0169	4415000000-N	1115	FLASHING ARROW BOARD	8 EA	3,500.00	28,000.00
0170	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	7 EA	15,655.00	109,585.00
0171	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	105 DAY	66.00	6,930.00
0172	4430000000-N	1130	DRUMS	1,990 EA	68.50	136,315.00
0173	4435000000-N	1135	CONES	50 EA	61.60	3,080.00
0174	4445000000-E	1145	BARRICADES (TYPE III)	1,016 LF	41.00	41,656.00
0175	4447000000-E	SP	PEDESTRIAN CHANNELIZING DE-VICES	10 LF	405.00	4,050.00
0176	4455000000-N	1150	FLAGGER	990 DAY	521.00	515,790.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0177	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	25 EA	10,500.00	262,500.00
0178	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	9 EA	2,950.00	26,550.00
0179	4480000000-N	1165	TMA	4 EA	10,000.00	40,000.00
0180	4485000000-E	1170	PORTABLE CONCRETE BARRIER	4,090 LF	45.30	185,277.00
0181	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	2,442 LF	68.85	168,131.70
0182	4500000000-E	1170	REMOVE AND RESET PORTABLE CONCRETE BARRIER	1,072 LF	6.15	6,592.80
0183	4505000000-E	1170	REMOVE & RESET PORTABLE CONCRETE BARRIER (ANCHORED)	404 LF	25.00	10,100.00
0184	4507000000-E	1170	WATER FILLED BARRIER	300 LF	160.00	48,000.00
0185	4510000000-N	1190	LAW ENFORCEMENT	2,640 HR	74.00	195,360.00
0186	4516000000-N	1180	SKINNY DRUM	438 EA	60.00	26,280.00
0187	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM AUDIBLE WARNING DEVICES	1 EA	1,025.00	1,025.00
0188	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM TEMPORARY CURB RAMPS	1 EA	2,845.00	2,845.00
0189	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	8,796 EA	4.35	38,262.60
0190	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	203,143 LF	0.65	132,042.95
0191	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	17,367 LF	2.60	45,154.20
0192	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	5,668 LF	3.40	19,271.20
0193	4720000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS)	48 EA	75.00	3,600.00
0194	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	584 EA	137.00	80,008.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0195	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	1,326,877 LF	0.15	199,031.55
0196	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	104,122 LF	0.40	41,648.80
0197	4825000000-E	1205	PAINT PAVEMENT MARKING LINES (12")	9,702 LF	1.35	13,097.70
0198	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	13,705 LF	3.00	41,115.00
0199	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	1,757 EA	25.00	43,925.00
0200	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	85,561 LF	0.50	42,780.50
0201	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	8,000 LF	0.75	6,000.00
0202	4865000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (12")	1,000 LF	1.00	1,000.00
0203	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	2,084 LF	1.50	3,126.00
0204	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	301 EA	50.00	15,050.00
0205	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4" 20 MILS (STANDARD GLASS BEADS)	2,979 LF	10.00	29,790.00
0206	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 8" 20 MILS (STANDARD GLASS BEADS)	245 LF	15.00	3,675.00
0207	4891000000-E	1205	GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS)	3,137 LF	6.80	21,331.60
0208	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	3,151 EA	45.00	141,795.00
0209	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	95 EA	10.00	950.00
0210	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum LS	500,000.00	500,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0211	5325000000-E	1510	**" WATER LINE (18")	8,603 LF	306.00	2,632,518.00
0212	5325400000-E	1510	4" WATER LINE	10 LF	220.00	2,200.00
0213	5325600000-E	1510	6" WATER LINE	4,699 LF	100.00	469,900.00
0214	5325800000-E	1510	8" WATER LINE	2,843 LF	112.00	318,416.00
0215	5326000000-E	1510	10" WATER LINE	406 LF	145.00	58,870.00
0216	5326200000-E	1510	12" WATER LINE	3,172 LF	150.00	475,800.00
0217	5326600000-E	1510	16" WATER LINE	2,275 LF	209.00	475,475.00
0218	5327400000-E	1510	24" WATER LINE	11,108 LF	275.00	3,054,700.00
0219	5329000000-E	1510	DUCTILE IRON WATER PIPE FITTINGS	107,464 LB	11.75	1,262,702.00
0220	5534000000-E	1515	**" VALVE (18")	6 EA	12,000.00	72,000.00
0221	5538000000-E	1515	4" VALVE	2 EA	3,500.00	7,000.00
0222	5540000000-E	1515	6" VALVE	35 EA	2,700.00	94,500.00
0223	5546000000-E	1515	8" VALVE	9 EA	4,800.00	43,200.00
0224	5552000000-E	1515	10" VALVE	3 EA	4,500.00	13,500.00
0225	5558000000-E	1515	12" VALVE	9 EA	5,500.00	49,500.00
0226	5558600000-E	1515	16" VALVE	6 EA	11,500.00	69,000.00
0227	5559400000-E	1515	24" VALVE	12 EA	18,500.00	222,000.00
0228	5571000000-E	1515	**" TAPPING SLEEVE & VALVE (2-1/2")	1 EA	8,100.00	8,100.00
0229	5571000000-E	1515	**" TAPPING SLEEVE & VALVE (3")	3 EA	8,200.00	24,600.00
0230	5571400000-E	1515	4" TAPPING SLEEVE & VALVE	1 EA	8,500.00	8,500.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0231	5571800000-E	1515	8" TAPPING SLEEVE & VALVE	1 EA	15,000.00	15,000.00
0232	5572200000-E	1515	12" TAPPING SLEEVE & VALVE	1 EA	18,000.00	18,000.00
0233	5589200000-E	1515	2" AIR RELEASE VALVE	10 EA	13,000.00	130,000.00
0234	5606600000-E	1515	6" BLOW OFF	6 EA	16,500.00	99,000.00
0235	5643000000-E	1515	**" WATER METER (1")	3 EA	3,000.00	9,000.00
0236	5643000000-E	1515	**" WATER METER (5/8")	2 EA	2,700.00	5,400.00
0237	5643200000-E	1515	2" WATER METER	5 EA	10,000.00	50,000.00
0238	5648000000-N	1515	RELOCATE WATER METER	53 EA	3,200.00	169,600.00
0239	5649000000-N	1515	RECONNECT WATER METER	10 EA	2,600.00	26,000.00
0240	5653210000-E	1515	RELOCATE 2" DCV BACKFLOW PREVENTION ASSEMBLY	2 EA	15,000.00	30,000.00
0241	5656100000-E	1515	RELOCATE **" RPZ BACKFLOW PREVENTION ASSEMBLY (1")	3 EA	6,500.00	19,500.00
0242	5656100000-E	1515	RELOCATE **" RPZ BACKFLOW PREVENTION ASSEMBLY (3/4")	33 EA	5,000.00	165,000.00
0243	5656210000-E	1515	RELOCATE 2" RPZ BACKFLOW PREVENTION ASSEMBLY	1 EA	15,000.00	15,000.00
0244	5666000000-N	1515	FIRE HYDRANT	21 EA	7,200.00	151,200.00
0245	5672000000-N	1515	RELOCATE FIRE HYDRANT	4 EA	9,000.00	36,000.00
0246	5673000000-E	1515	FIRE HYDRANT LEG	324 LF	70.00	22,680.00
0247	5678600000-E	1515	8" LINE STOP	5 EA	22,000.00	110,000.00
0248	5679000000-E	1515	12" LINE STOP	5 EA	24,000.00	120,000.00
0249	5679200000-E	1515	16" LINE STOP	6 EA	40,000.00	240,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0250	5679600000-E	1515	24" LINE STOP	5 EA	51,000.00	255,000.00
0251	5686000000-E	1515	**" WATER SERVICE LINE (2")	171 LF	35.00	5,985.00
0252	5686000000-E	1515	**" WATER SERVICE LINE (2-1/2")	35 LF	40.00	1,400.00
0253	5686500000-E	1515	WATER SERVICE LINE	1,946 LF	18.00	35,028.00
0254	5691000000-E	1520	**" SANITARY GRAVITY SEWER (8")	5,592 LF	213.00	1,191,096.00
0255	5709000000-E	1520	**" FORCE MAIN SEWER (2")	69 LF	110.00	7,590.00
0256	5709200000-E	1520	4" FORCE MAIN SEWER	60 LF	215.00	12,900.00
0257	5709300000-E	1520	6" FORCE MAIN SEWER	2,053 LF	101.00	207,353.00
0258	5709400000-E	1520	8" FORCE MAIN SEWER	2,627 LF	109.00	286,343.00
0259	5709600000-E	1520	12" FORCE MAIN SEWER	605 LF	174.00	105,270.00
0260	5709700000-E	1520	16" FORCE MAIN SEWER	20,555 LF	228.00	4,686,540.00
0262	5709900000-E	1520	24" FORCE MAIN SEWER	34,740 LF	399.50	13,878,630.00
0263	5769000000-E	1520	DUCTILE IRON SEWER PIPE FITTINGS	87,030 LB	16.00	1,392,480.00
0264	5775000000-E	1525	4' DIA UTILITY MANHOLE	35 EA	13,000.00	455,000.00
0265	5781000000-E	1525	UTILITY MANHOLE WALL 4' DIA	166 LF	700.00	116,200.00
0266	5798000000-E	1530	ABANDON **" UTILITY PIPE (36")	180 LF	150.00	27,000.00
0267	5798000000-E	1530	ABANDON **" UTILITY PIPE (4")	190 LF	40.00	7,600.00
0268	5800000000-E	1530	ABANDON 6" UTILITY PIPE	9,026 LF	12.00	108,312.00
0269	5801000000-E	1530	ABANDON 8" UTILITY PIPE	14,328 LF	15.00	214,920.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0270	5802000000-E	1530	ABANDON 10" UTILITY PIPE	170 LF	50.00	8,500.00
0271	5804000000-E	1530	ABANDON 12" UTILITY PIPE	3,573 LF	22.00	78,606.00
0272	5810000000-E	1530	ABANDON 16" UTILITY PIPE	53,607 LF	27.00	1,447,389.00
0273	5811000000-E	1530	ABANDON 18" UTILITY PIPE	390 LF	45.00	17,550.00
0274	5813000000-E	1530	ABANDON 24" UTILITY PIPE	19,242 LF	49.00	942,858.00
0275	5814000000-E	1530	ABANDON 30" UTILITY PIPE	65 LF	130.00	8,450.00
0276	5815000000-N	1530	REMOVE WATER METER	8 EA	1,700.00	13,600.00
0277	5815500000-N	1530	REMOVE FIRE HYDRANT	9 EA	4,000.00	36,000.00
0278	5828000000-N	1530	REMOVE UTILITY MANHOLE	35 EA	4,700.00	164,500.00
0279	5835000000-E	1540	**" ENCASEMENT PIPE (14")	139 LF	360.00	50,040.00
0280	5835000000-E	1540	**" ENCASEMENT PIPE (32")	521 LF	830.00	432,430.00
0281	5835000000-E	1540	**" ENCASEMENT PIPE (48")	743 LF	1,265.00	939,895.00
0282	5835700000-E	1540	16" ENCASEMENT PIPE	140 LF	470.00	65,800.00
0283	5835900000-E	1540	20" ENCASEMENT PIPE	165 LF	515.00	84,975.00
0284	5836000000-E	1540	24" ENCASEMENT PIPE	330 LF	650.00	214,500.00
0285	5872500000-E	1550	BORE AND JACK OF **" (14")	139 LF	330.00	45,870.00
0286	5872500000-E	1550	BORE AND JACK OF **" (16")	120 LF	375.00	45,000.00
0287	5872500000-E	1550	BORE AND JACK OF **" (20")	75 LF	400.00	30,000.00
0288	5872500000-E	1550	BORE AND JACK OF **" (24")	170 LF	460.00	78,200.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0289	5872500000-E	1550	BORE AND JACK OF **" (32")	235 LF	590.00	138,650.00
0290	5872500000-E	1550	BORE AND JACK OF **" (48")	271 LF	845.00	228,995.00
0291	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (12")	935 LF	176.00	164,560.00
0292	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (16")	7,293 LF	263.00	1,918,059.00
0293	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (18")	6,805 LF	284.00	1,932,620.00
0295	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (24")	17,863 LF	371.00	6,627,173.00
0296	5872600000-E	1550	DIRECTIONAL DRILLING OF **" (8")	497 LF	130.00	64,610.00
0297	5882000000-N	SP	GENERIC UTILITY ITEM 12" CHECK VALVE AND VAULT	1 EA	100,000.00	100,000.00
0298	5882000000-N	SP	GENERIC UTILITY ITEM 12" SEWER VALVE	1 EA	10,000.00	10,000.00
0299	5882000000-N	SP	GENERIC UTILITY ITEM 16" SEWER VALVE	3 EA	16,000.00	48,000.00
0300	5882000000-N	SP	GENERIC UTILITY ITEM 2" AIR AND VACUUM RELEASE VALVE	25 EA	12,800.00	320,000.00
0301	5882000000-N	SP	GENERIC UTILITY ITEM 2" CHECK VALVE	4 EA	2,600.00	10,400.00
0302	5882000000-N	SP	GENERIC UTILITY ITEM 24" PRESSURE SUSTAINING VALVE ASSEMBLY	1 EA	350,000.00	350,000.00
0303	5882000000-N	SP	GENERIC UTILITY ITEM 24" SEWER VALVE	30 EA	40,000.00	1,200,000.00
0304	5882000000-N	SP	GENERIC UTILITY ITEM 6" SEWER VALVE	2 EA	5,500.00	11,000.00
0305	5882000000-N	SP	GENERIC UTILITY ITEM ADJUST SANITARY SEWER CLEAN-OUT TO FINISH GRADE	4 EA	2,500.00	10,000.00

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Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0306	5882000000-N	SP	GENERIC UTILITY ITEM FLOW METER VAULT	1 EA	112,000.00	112,000.00
0307	5882000000-N	SP	GENERIC UTILITY ITEM RECONNECT FORCE MAIN	12 EA	11,500.00	138,000.00
0308	5882000000-N	SP	GENERIC UTILITY ITEM RELOCATE YARD HYDRANT	1 EA	8,000.00	8,000.00
0309	5912000000-N	SP	GENERIC UTILITY ITEM PUMP STATION	Lump Sum LS	775,000.00	775,000.00
0310	5912000000-N	SP	GENERIC UTILITY ITEM REMOVE EXISTING PUMP STATION	Lump Sum LS	100,000.00	100,000.00
0311	6000000000-E	1605	TEMPORARY SILT FENCE	260,100 LF	0.01	2,601.00
0312	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	2,125 TON	75.00	159,375.00
0313	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	13,900 TON	40.00	556,000.00
0314	6012000000-E	1610	SEDIMENT CONTROL STONE	10,500 TON	40.00	420,000.00
0315	6015000000-E	1615	TEMPORARY MULCHING	864.5 ACR	1,500.00	1,296,750.00
0316	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	32,700 LB	2.00	65,400.00
0317	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	164.5 TON	600.00	98,700.00
0318	6024000000-E	1622	TEMPORARY SLOPE DRAINS	18,000 LF	5.00	90,000.00
0319	6029000000-E	SP	SAFETY FENCE	28,000 LF	2.15	60,200.00
0320	6030000000-E	1630	SILT EXCAVATION	45,950 CY	5.00	229,750.00
0321	6036000000-E	1631	MATTING FOR EROSION CONTROL	170,000 SY	1.55	263,500.00
0322	6037000000-E	SP	COIR FIBER MAT	180,000 SY	6.00	1,080,000.00
0323	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	1,650 SY	12.00	19,800.00
0324	6042000000-E	1632	1/4" HARDWARE CLOTH	25,980 LF	10.00	259,800.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0325	6043000000-E	SP	LOW PERMEABILITY GEOTEXTILE	1,500 SY	2.75	4,125.00
0326	6045000000-E	SP	**" TEMPORARY PIPE (24")	155 LF	100.00	15,500.00
0327	6045000000-E	SP	**" TEMPORARY PIPE (30")	275 LF	112.50	30,937.50
0328	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	555 SY	59.00	32,745.00
0329	6069000000-E	1638	STILLING BASINS	135 CY	35.00	4,725.00
0330	6070000000-N	1639	SPECIAL STILLING BASINS	30 EA	1,300.00	39,000.00
0331	6071012000-E	SP	COIR FIBER WATTLE	21,055 LF	18.60	391,623.00
0332	6071020000-E	SP	POLYACRYLAMIDE (PAM)	8,105 LB	10.40	84,292.00
0333	6071030000-E	1640	COIR FIBER BAFFLE	10,355 LF	6.50	67,307.50
0334	6071050000-E	SP	**" SKIMMER (1-1/2")	16 EA	1,356.00	21,696.00
0335	6071050000-E	SP	**" SKIMMER (2")	5 EA	1,470.00	7,350.00
0336	6071050000-E	SP	**" SKIMMER (2-1/2")	3 EA	1,687.00	5,061.00
0337	6071050000-E	SP	**" SKIMMER (3")	1 EA	2,182.00	2,182.00
0338	6084000000-E	1660	SEEDING & MULCHING	580 ACR	2,600.00	1,508,000.00
0339	6087000000-E	1660	MOWING	290 ACR	240.00	69,600.00
0340	6090000000-E	1661	SEED FOR REPAIR SEEDING	8,700 LB	6.00	52,200.00
0341	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	26 TON	1,500.00	39,000.00
0342	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	12,975 LB	6.00	77,850.00
0343	6108000000-E	1665	FERTILIZER TOPDRESSING	389.25 TON	990.00	385,357.50
0344	6111000000-E	SP	IMPERVIOUS DIKE	2,650 LF	480.00	1,272,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0345	6114500000-N	1667	SPECIALIZED HAND MOWING	150 MHR	175.00	26,250.00
0346	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	150 EA	275.00	41,250.00
0347	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	18 EA	1,250.00	22,500.00
0348	6123000000-E	1670	REFORESTATION	1 ACR	7,500.00	7,500.00
0349	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	20 EA	426.00	8,520.00
0350	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	60 EA	197.00	11,820.00
0351	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	12 EA	933.00	11,196.00
0352	7060000000-E	1705	SIGNAL CABLE	50,280 LF	2.70	135,756.00
0353	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	229 EA	820.00	187,780.00
0354	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	49 EA	980.00	48,020.00
0355	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	25 EA	1,335.00	33,375.00
0356	7252000000-E	1710	MESSENGER CABLE (1/4")	920 LF	3.55	3,266.00
0357	7264000000-E	1710	MESSENGER CABLE (3/8")	6,500 LF	4.90	31,850.00
0358	7279000000-E	1715	TRACER WIRE	39,410 LF	0.80	31,528.00
0359	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	5,110 LF	10.00	51,100.00
0360	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	18,120 LF	10.00	181,200.00
0361	7300000000-E	1715	UNPAVED TRENCHING (**********) (3, 2")	80 LF	19.00	1,520.00
0362	7300000000-E	1715	UNPAVED TRENCHING (**********) (4, 2")	170 LF	23.00	3,910.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0363	7300100000-E	1715	UNPAVED TRENCHING FOR TEMP-ORARY LEAD-IN	10 LF	15.00	150.00
0364	7301000000-E	1715	DIRECTIONAL DRILL (**********) (1, 2")	1,670 LF	17.00	28,390.00
0365	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	24,290 LF	22.00	534,380.00
0366	7301000000-E	1715	DIRECTIONAL DRILL (**********) (3, 2")	880 LF	23.00	20,240.00
0367	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	108 EA	360.00	38,880.00
0368	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)	79 EA	775.00	61,225.00
0369	7360000000-N	1720	WOOD POLE	42 EA	1,050.00	44,100.00
0370	7372000000-N	1721	GUY ASSEMBLY	86 EA	655.00	56,330.00
0371	7396000000-E	1722	1/2" RISER WITH WEATHERHEAD	10 EA	460.00	4,600.00
0372	7420000000-E	1722	2" RISER WITH WEATHERHEAD	31 EA	830.00	25,730.00
0373	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	4 EA	895.00	3,580.00
0374	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	15,070 LF	8.60	129,602.00
0375	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	31,000 LF	1.70	52,700.00
0376	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (48)	41,060 LF	3.50	143,710.00
0377	7528000000-E	1730	DROP CABLE	4,740 LF	2.70	12,798.00
0378	7540000000-N	1731	SPLICE ENCLOSURE	21 EA	1,755.00	36,855.00
0379	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	1 EA	1,582.00	1,582.00
0380	7552000000-N	1731	INTERCONNECT CENTER	20 EA	1,530.00	30,600.00
0381	7566000000-N	1733	DELINEATOR MARKER	49 EA	145.00	7,105.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0382	7574550000-N	SP	FURNISH WIRELESS LIGHTNING ARRESTOR	1 EA	208.00	208.00
0383	7575142010-N	1736	900MHZ SERIAL/ETHERNET SPREAD SPECTRUM RADIO	10 EA	4,100.00	41,000.00
0384	7575142060-N	SP	MODIFY RADIO INSTALLATION	6 EA	1,210.00	7,260.00
0385	7575160000-E	1734	REMOVE EXISTING COMMUNICATIONS CABLE	4,650 LF	0.80	3,720.00
0386	7575200000-N	SP	GPS UNIT	2 EA	1,305.00	2,610.00
0387	7588000000-N	SP	METAL POLE WITH SINGLE MAST ARM	29 EA	37,000.00	1,073,000.00
0388	7590000000-N	SP	METAL POLE WITH DUAL MAST ARM	1 EA	57,500.00	57,500.00
0389	7613000000-N	SP	SOIL TEST	34 EA	970.00	32,980.00
0390	7614100000-E	SP	DRILLED PIER FOUNDATION	204 CY	1,400.00	285,600.00
0391	7631000000-N	SP	MAST ARM WITH METAL POLE DE-SIGN	34 EA	79.10	2,689.40
0392	7636000000-N	1745	SIGN FOR SIGNALS	106 EA	402.00	42,612.00
0393	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	11 EA	2,090.00	22,990.00
0394	7642300000-N	1743	TYPE III PEDESTAL WITH FOUND-ATION	9 EA	5,050.00	45,450.00
0395	7684000000-N	1750	SIGNAL CABINET FOUNDATION	13 EA	2,000.00	26,000.00
0396	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, BASE-MOUNTED)	13 EA	16,355.00	212,615.00
0397	7696000000-N	1751	CONTROLLERS WITH CABINET (**********) (TYPE 2070E, POLE-MOUNTED)	1 EA	14,500.00	14,500.00
0398	7708000000-N	1751	DETECTOR CARD (**********) (2070E)	165 EA	120.00	19,800.00
0399	7901000000-N	1753	CABINET BASE EXTENDER	13 EA	638.00	8,294.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0400	7948000000-N	1757	TRAFFIC SIGNAL REMOVAL	2 EA	19,000.00	38,000.00
0401	7960000000-N	SP	METAL POLE FOUNDATION REMOVAL	19 EA	2,500.00	47,500.00
0402	7972000000-N	SP	METAL POLE REMOVAL	19 EA	500.00	9,500.00
0403	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV WOOD POLE	6 EA	2,600.00	15,600.00
0404	7980000000-N	SP	GENERIC SIGNAL ITEM CONTROLLER (TYPE 2070E)	3 EA	4,495.00	13,485.00
0405	7980000000-N	SP	GENERIC SIGNAL ITEM DECORATIVE METAL POLE WITH SINGLE MAST ARM	4 EA	34,000.00	136,000.00
0406	7980000000-N	SP	GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY	7 EA	4,525.00	31,675.00
0407	7980000000-N	SP	GENERIC SIGNAL ITEM DMS STRUCTURE (BACK-TO-BACK PEDESTAL)	2 EA	50,000.00	100,000.00
0409	7980000000-N	SP	GENERIC SIGNAL ITEM ELECTRICAL SERVICE FOR ITS DEVICE	8 EA	1,510.00	12,080.00
0410	7980000000-N	SP	GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH	20 EA	2,200.00	44,000.00
0411	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	3 EA	7,035.00	21,105.00
0412	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH ETHERNET EDGE SWITCH	1 EA	1,760.00	1,760.00
0413	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER-SIZED HEAVY DUTY)	24 EA	1,750.00	42,000.00
0414	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX MARKER	19 EA	100.00	1,900.00
0415	7980000000-N	SP	GENERIC SIGNAL ITEM LUMINAIRE MAST ARM	2 EA	2,030.00	4,060.00
0416	7980000000-N	SP	GENERIC SIGNAL ITEM MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE ZONES	11 EA	48,250.00	530,750.00

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0417	7980000000-N	SP	GENERIC SIGNAL ITEM PROTECTIVE COATING FOR SINGLE MAST ARM POLE (BLACK)	4 EA	2,130.00	8,520.00
0418	7980000000-N	SP	GENERIC SIGNAL ITEM REMOVE 900MHZ RADIO	10 EA	350.00	3,500.00
0419	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	3 EA	205.00	615.00
0420	7990000000-E	SP	GENERIC SIGNAL ITEM BACK PULL FIBER OPTIC CABLE	310 LF	3.40	1,054.00
0486	1891000000-E	SP	GENERIC PAVING ITEM 7" CONCRETE TRUCK APRON	580 SY	125.00	72,500.00
0487	2535000000-E	846	**"X **" CONCRETE CURB (9" X 18")	350 LF	30.00	10,500.00
0488	2627000000-E	852	4" CONCRETE ISLAND COVER	580 SY	54.00	31,320.00
0489	6045000000-E	SP	**" TEMPORARY PIPE (18")	24 LF	100.00	2,400.00
0490	7108000000-E	1705	VEHICLE SIGNAL HEAD (12", 1 SECTION)	4 EA	500.00	2,000.00
0491	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN (TYPE 1C)	4 EA	103,000.00	412,000.00
0492	5882000000-N	SP	GENERIC UTILITY ITEM 8" SEWER VALVE	2 EA	7,000.00	14,000.00

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0421	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (226+01.00 -L-)	Lump Sum LS	19,575.00	19,575.00
0422	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (316+72.00 -L-)	Lump Sum LS	19,575.00	19,575.00
0423	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (64+15.00 -L-)	Lump Sum LS	22,750.00	22,750.00
0424	8056000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (83+76.00 -L-)	Lump Sum LS	19,575.00	19,575.00
0425	8126000000-N	414	CULVERT EXCAVATION, STA ****** (226+01.00 -L-)	Lump Sum LS	56,795.00	56,795.00
0426	8126000000-N	414	CULVERT EXCAVATION, STA ****** (316+72.00 -L-)	Lump Sum LS	63,595.00	63,595.00
0427	8126000000-N	414	CULVERT EXCAVATION, STA ****** (64+15.00 -L-)	Lump Sum LS	53,490.00	53,490.00
0428	8126000000-N	414	CULVERT EXCAVATION, STA ****** (83+76.00 -L-)	Lump Sum LS	71,560.00	71,560.00
0429	8133000000-E	414	FOUNDATION CONDITIONING MATER-IAL, BOX CULVERT	807 TON	80.00	64,560.00
0430	8196000000-E	420	CLASS A CONCRETE (CULVERT)	887.2 CY	950.00	842,840.00
0431	8245000000-E	425	REINFORCING STEEL (CULVERT)	119,524 LB	2.05	245,024.20
0432	8804000000-N	SP	GENERIC CULVERT ITEM ASBESTOS ASSESSMENT	Lump Sum LS	6,000.00	6,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0433	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	1,950 SF	52.79	102,940.50
0434	8801000000-E	SP	MSE RETAINING WALL NO **** (10)	9,625 SF	70.39	677,503.75
0435	8801000000-E	SP	MSE RETAINING WALL NO **** (11)	14,880 SF	70.39	1,047,403.20
0436	8801000000-E	SP	MSE RETAINING WALL NO **** (12)	8,105 SF	70.39	570,510.95
0437	8801000000-E	SP	MSE RETAINING WALL NO **** (13)	4,770 SF	70.39	335,760.30
0438	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	460 SF	52.79	24,283.40
0439	8801000000-E	SP	MSE RETAINING WALL NO **** (3)	4,540 SF	70.39	319,570.60
0440	8801000000-E	SP	MSE RETAINING WALL NO **** (4)	2,015 SF	70.39	141,835.85
0441	8801000000-E	SP	MSE RETAINING WALL NO **** (5)	6,270 SF	70.39	441,345.30
0442	8801000000-E	SP	MSE RETAINING WALL NO **** (6)	2,765 SF	70.39	194,628.35
0443	8801000000-E	SP	MSE RETAINING WALL NO **** (7)	8,265 SF	70.39	581,773.35
0444	8801000000-E	SP	MSE RETAINING WALL NO **** (8)	4,135 SF	70.39	291,062.65
0445	8801000000-E	SP	MSE RETAINING WALL NO **** (9)	16,210 SF	70.39	1,141,021.90

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0446	8017000000-N	SP	CONSTRUCTION, MAINTENANCE, & REMOVAL OF TEMP ACCESS AT STA ********** (390+15.00 -L- LT)	Lump Sum LS	2,245,000.00	2,245,000.00
0447	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (369+42.00 -L- EBL)	Lump Sum LS	92,000.00	92,000.00
0448	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (390+15.00 -L- RT)	Lump Sum LS	350,000.00	350,000.00
0449	8065000000-N	SP	ASBESTOS ASSESSMENT	Lump Sum LS	2,600.00	2,600.00
0450	8112730000-N	450	PDA TESTING	10 EA	2,250.00	22,500.00
0451	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (369+42.00 -L- EBL)	Lump Sum LS	11,000.00	11,000.00
0452	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (390+15.00 -L- LT)	Lump Sum LS	10,000.00	10,000.00
0453	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVA-TION AT STATION ******** (390+15.00 -L- RT)	Lump Sum LS	10,000.00	10,000.00
0454	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	49,880 SF	69.50	3,466,660.00
0455	8161000000-E	420	GROOVING BRIDGE FLOORS	51,122.6 SF	0.65	33,229.69
0456	8175000000-E	420	CLASS AA CONCRETE (BRIDGE)	399.9 CY	1,500.00	599,850.00
0457	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	209.3 CY	800.00	167,440.00
0458	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (31+30.81 -Y REV-)	Lump Sum LS	125,000.00	125,000.00
0459	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (369+42.00 -L- EBL)	Lump Sum LS	52,000.00	52,000.00
0460	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (369+42.00 -L- WBL)	Lump Sum LS	52,000.00	52,000.00

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0461	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (39+52.37 -Y14A-)	Lump Sum LS	110,000.00	110,000.00
0462	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (390+15.00 -L- LT)	Lump Sum LS	52,000.00	52,000.00
0463	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (390+15.00 -L- RT)	Lump Sum LS	52,000.00	52,000.00
0464	8217000000-E	425	REINFORCING STEEL (BRIDGE)	37,903 LB	1.50	56,854.50
0465	8224000000-E	425	EPOXY COATED REINFORCING STEEL (BRIDGE)	61,921 LB	1.70	105,265.70
0466	8259000000-E	430	36" PRESTRESSED CONCRETE GIR-DERS	1,361.3 LF	300.00	408,390.00
0467	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	2,455.63 LF	350.00	859,470.50
0468	8277000000-E	430	MODIFIED 72" PRESTRESSED CONC GIRDERS	2,068.2 LF	500.00	1,034,100.00
0469	8328000000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** PRESTRESSED CONCRETE PILES (16")	28 EA	2,700.00	75,600.00
0470	8328000000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** PRESTRESSED CONCRETE PILES (24")	24 EA	4,300.00	103,200.00
0471	8328200000-E	450	PILE DRIVING EQUIPMENT SETUP FOR *** STEEL PILES (HP 12 X 53)	108 EA	2,000.00	216,000.00
0472	8333000000-E	450	16" PRESTRESSED CONCRETE PILES	1,715 LF	180.00	308,700.00
0473	8350000000-E	450	24" PRESTRESSED CONCRETE PILES	2,520 LF	200.00	504,000.00
0474	8364000000-E	450	HP12X53 STEEL PILES	8,531 LF	125.00	1,066,375.00
0475	8391000000-N	450	STEEL PILE POINTS	80 EA	125.00	10,000.00
0476	8393000000-N	450	PILE REDRIVES	130 EA	650.00	84,500.00

Contract Item Sheets For C204123

Line #	ItemNumber	Sec #	Description	Quantity Unit	Unit Bid Price	Amount Bid
0477	8475000000-E	460	TWO BAR METAL RAIL	1,730.95 LF	128.00	221,561.60
0478	8503000000-E	460	CONCRETE BARRIER RAIL	515.7 LF	140.00	72,198.00
0479	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 2'-6")	1,792.19 LF	120.00	215,062.80
0480	8531000000-E	462	4" SLOPE PROTECTION	119 SY	110.00	13,090.00
0481	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	2,190 TON	90.00	197,100.00
0482	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	2,435 SY	1.20	2,922.00
0483	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum LS	110,000.00	110,000.00
0484	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- LT)	Lump Sum LS	74,500.00	74,500.00
0485	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (390+15.00 -L- RT)	Lump Sum LS	74,500.00	74,500.00
			TOTAL AMOUNT OF BID FOR ENTIRE PROJECT			**$217,260,048.60**

Contract No. C204123

County BRUNSWICK

Rev. 1-16-18

EXECUTION OF CONTRACT
NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION

CORPORATION

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 CONTRACTOR

BARNHILL CONTRACTING COMPANY
Full name of Corporation

PO BOX 7948 ROCKY MOUNT NC 27804
Address as Prequalified

Attest William M Aycock
Secretary/~~Assistant Secretary~~
Select appropriate title

By Chris Stroud V-P
~~President~~/Vice President/~~Assistant Vice President~~
Select appropriate title

William M. Aycock
Print or type Signer's name

Chris Stroud V-P
Print or type Signer's name

CORPORATE SEAL

N.C. 1949 SEAL CORPORATE BARNHILL CONTRACTING CO. ROCKY MOUNT

Contract No. C 204123
County BRUNSWICK

Rev. 1-16-18

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. C204123
County BRUNSWICK

Rev. 1-16-18

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. **C204123**

County (ies): **Brunswick**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

DocuSigned by:
Ronald E. Davenport, Jr.
F81B6038A47A442...
Contract Officer

01/10/2022
Date

Execution of Contract and Bonds
Approved as to Form:

DocuSigned by:
Jessica Price
B584472DA33F432...
Attorney General

01/10/2022
Date

Contract No. C204123
County Brunswick

Rev. 11-1-12

Bond No. 107545757

North Carolina Department of Transportation

CONTRACT PAYMENT BOND

Date of Payment Bond Execution	December 13, 2021
Name of Principal Contractor	Barnhill Contracting Company
Name of Surety:	Travelers Casualty and Surety Company of America
Name of Contracting Body:	North Carolina Department of Transportation
	1591 Mail Service Center, Raleigh, NC 27699-1591
Amount of Bond:	Two Hundred Seventeen Million Two Hundred Sixty Thousand Forty Eight Dollars and 60/100 $217,260,048.60
Contract ID No.:	C204123
County Name:	Brunswick

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. C204123
County Brunswick

Rev. 11-1-12

CONTRACT PAYMENT BOND

Affix Seal of Surety Company

Travelers Casualty and Surety Company of America
Print or type Surety Company Name

By Michelle A. Adams, Attorney-in-Fact
Print, stamp or type name of Attorney-in-Fact

Signature of Attorney-in-Fact

Signature of Witness

Abbie L. Meyerhoeffer
Print or type Signer's name

8540 Colonnade Center Drive, Suite 111
Raleigh, NC 27615
Address of Attorney-in-Fact

Contract No. C204123
County Brunswick

Rev. 11-1-12

CONTRACT PAYMENT BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

Barnhill Contracting Company
Full name of Corporation

P.O. Box 7948, Rocky Mount, NC 27804
Address as prequalified

By Chris Stroud V-P
Signature of ~~President~~, Vice President, ~~Assistant Vice President~~
Select appropriate title

Chris Stroud V-P
Print or type Signer's name

BARNHILL CONTRACTING COMPANY CORPORATE SEAL 1949 N.C.

Affix Corporate Seal

Attest William M. Aycock
Signature of ~~Secretary~~, ~~Assistant Secretary~~
Select appropriate title

William M. Aycock
Print or type Signer's name

Contract No. C204123
County Brunswick

Rev. 11-1-12

Bond No. 107545757

North Carolina Department of Transportation

CONTRACT PERFORMANCE BOND

Date of Performance Bond Execution:	December 13, 2021
Name of Principal Contractor:	Barnhill Contracting Company
Name of Surety:	Travelers Casualty and Surety Company of America
Name of Contracting Body:	North Carolina Department of Transportation
	1591 Mail Service Center, Raleigh, NC 27699-1591
Amount of Bond:	Two Hundred Seventeen Million Two Hundred Sixty Thousand Forty Eight Dollars and 60/100 $217,260,048.60
Contract ID No.:	C204123
County Name:	Brunswick

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.

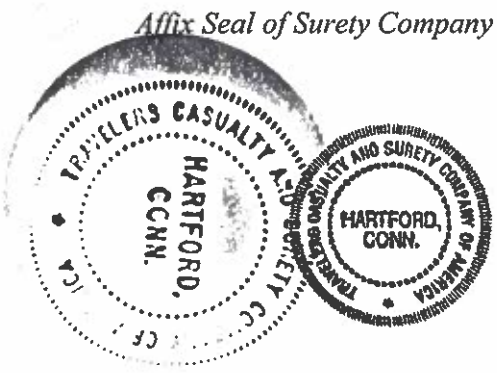
IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Contract No. C204123
County Brunswick

Rev. 11-1-12

CONTRACT PERFORMANCE BOND

Affix Seal of Surety Company



Travelers Casualty and Surety Company of America
Print or type Surety Company Name

By Michelle A. Adams, Attorney-in-Fact
Print, stamp or type name of Attorney-in-Fact

Michelle A. Adams
Signature of Attorney-in-Fact

Abbie L. Meyerhoeffer
Signature of Witness

Abbie L. Meyerhoeffer
Print or type Signer's name

8540 Colonnade Center Drive, Suite 111
Raleigh, NC 27615
Address of Attorney-in-Fact

Contract No. C204123
County Brunswick

Rev. 11-1-12

CONTRACT PERFORMANCE BOND

CORPORATION

SIGNATURE OF CONTRACTOR (Principal)

Barnhill Contracting Company
Full name of Corporation

P.O. Box 7948, Rocky Mount, NC 27804
Address as prequalified

By Chris Stroud V-P
Signature of ~~President~~, Vice President, ~~Assistant Vice President~~
Select appropriate title

Chris Stroud V-P
Print or type Signer's name

BARNHILL CONTRACTING COMANY CORPORATE SEAL N.C.

Affix Corporate Seal

Attest William M. Aycock
Signature of Secretary, ~~Assistant Secretary~~
Select appropriate title

William M. Aycock
Print or type Signer's name

TRAVELERS

Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company
Farmington Casualty Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, St. Paul Fire and Marine Insurance Company, and Farmington Casualty 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 Michelle A. Adams of Raleigh , NC , their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge the following bond:

Surety Bond No.: 107545757
OR
Project Description: Brunswick County C204123 (NC 211 from SR 1500 (Midway Rd) to NC 87)

Principal: Barnhill Contracting Company
Obligee: North Carolina Department of Transportation

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April, 2021.**

State of Connecticut

By: _____
Robert L. Raney, Senior Vice President

City of Hartford ss.

On this the **21st** day of **April, 2021**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, 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, 2026**

_____
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 each of the Companies, 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 each of the Companies, 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 13th day of December , 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(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.