



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

October 29, 2021

Addendum No. 1

RE: Contract # C204404

WBS # 39049.3.2

FEDERAL-AID NO. STPDA-0401(300)

Cumberland County (U-4405A)

US-401 FROM OLD RAEFORD RD TO EAST OF NC-162 (BUNCE RD)

November 16, 2021 Letting (Advertisement extended from October 19, 2021 Letting)

To Whom It May Concern:

Reference is made to the plans and proposal form furnished to you on this project.

The following revisions have been made to the Roadway plans.

| Sheet No. | Revision |
|-----------------------|----------------------|
| Sheet 1 (Title Sheet) | Letting Date Revised |

The following revisions have been made to the Utility Construction plans.

| Sheet No. | Revision |
|-----------|---|
| UC-1 | CHANGED UC-4A & UC-4B TO DASHED LINES SHOWING NO RELOCATION WORK ON THESE SHEETS. |
| UC-3 | REMOVED REF NOTE TO FAYPWC, PWC COORDINATOR...ENGINEER CHANGED "PROTECTO 401" TO "CERAMIC EPOXY" |
| UC-3A | ADJUSTED UC-9A SEQUENCE NOTES (REMOVED NOTE 1 REGARDING BYPASS PUMPING) |
| UC-3C | REMOVED REFERENCE TO LIQUIDATED DAMAGES IN DETAIL W.1 REMOVED W.2 & W.3/3B |
| UC-3D | 3 BRANDS PROVIDED ON W.6 & W.10 |
| UC-3E | 3 BRANDS PROVIDED ON W.11 & REMOVED BRAND NAME W.13 |

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
CONTRACT STANDARDS AND DEVELOPMENT
1591 MAIL SERVICE CENTER
RALEIGH, NC 27699-1591

Telephone: (919) 707-6900
Fax: (919) 250-4127
Customer Service: 1-877-368-4968

Location:
1020 BIRCH RIDGE DR.
RALEIGH, NC 27610

Website: www.ncdot.gov

| Sheet No. | Revision |
|-----------------|---|
| UC-3F | 3 BRANDS PROVIDED SOIL CONDITIONS TO W.17 |
| UC-3G | ADDED W.25 DETAIL |
| UC-3H | 3 BRANDS PROVIDED ON W.31 & M.6 REMOVED "REMOVABLE CURB DETAIL" REMOVED DETAIL N.2 |
| UC-3I | REMOVED DETAIL S.3 SHEET 2 OF 2 |
| UC-3J | REMOVED BRAND REFERENCE S.16 |
| UC-3K | REMOVED COFFERDAM DETAIL |
| UC-4 THRU UC-10 | REMOVED 6" GV FROM EACH FIRE HYDRANT CHANGED "2" WATER LINE" TO "2" WATER SERVICE LINE" |
| UC-4 | ADDED 24" GV REMOVED DUPLICATE NOTE CHANGED 641 LF TO 642 LF OF 24" WATER LINE |
| UC-4B | DELETED |
| UC-6 | CHANGED CL50 TO CL250/350 ROTATED METER AND RPZ AT LSTA 36+60 RT ADDED 9 LF OF WATER SERVICE LINE ADDED NOTE TO RETURN FH TO FAY PWC |
| UC-7 | ADDED SIZE OF PROPOSED 24" VALVE REMOVED VALVE W/ NO CALLOUT LSTA 51+40 RT REMOVED ERRANT FHA AT LSTA 56+85 RT LSTA 57+25 RT, ADDED TEXT UNDERNEATH REMOVE MH CALLOUT TO RETURN ARV TO FAY PWC |
| UC-8 | LSTA 68+15 RT, CHANGED "CAP AND PLUG..." TO "WATERMAIN KILLOUT SEE DETIAL..." |
| UC-9 | ADDED CALLOUT FOR BORE AND JACK PIPE MATERIAL CHANGED CL50 TO CL250/CL350 ADDED NOTE FOR EXISTING VALVES TO BE RETURNED TO FAY PWC |
| UC-9A | MH3 CHANGED TO DOGHOUSE MH UPDATED LENGTH OF MANHOLE WALL FOR MH2 & MH3 REMOVED DROP STRUCTURE FOR MH2 REMOVED REFERENCE TO PIPE SLIDE AT MH3 & CONNECTION MH REMOVED CALLOUT REGARDING BYPASS PUMPING |
| UC-9B | YSTA 24+00 RT, ADDED CALLOUTS FOR RELOCATED METER RPZ AND SERVICE LINE (2 EACH) |
| UC-11 | ADJUSTED WL-1 PROFILE ST 6+00 - 9+00 ADDED RJ PIPE SHADING |

| Sheet No. | Revision |
|-----------|---|
| | REMOVE BEVELED GEAR FROM RJ GATE VALVE CALLOUT |
| UC-13 | WL-7, CHANGED CONNECTION TO EXISTING SIZE AND MATERIAL REMOVED REFERENCE TO NOT USING A SADDLE |
| UC-14 | WL-10 STA1+07.78 & 18+89.17 REMOVED BEVELED GEAR FROM GATE VALVE CALLOUT WL-10 STA 4+97.16 ADDED "GATE" TO 24" VALVE |
| UC-17 | REDESIGNED SL-1 TO REMOVE BYPASS PUMPING |

Please void the above listed Sheets in your plans and staple the revised Sheets thereto. Remove Sheet UC-4B from your plan set.

The following revisions have been made to the proposal:

| Page No. | Revisions |
|------------------------|--|
| Proposal Cover | Note added that reads "Includes Addendum No. 1 Dated 10-29-2021" Letting Date revised to November 16, 2021 |
| Table of Contents | NOTE TO CONTRACTOR (Signal Communications) added |
| Page G-1 | Project Special Provision entitled CONTRACT TIME AND LIQUIDATED DAMAGES revised Project Special Provision entitled INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES revised |
| Page G-7 | Project Special Provision entitled SCHEDULE OF ESTIMATED COMPLETION PROGRESS revised |
| Page G-33 | Project Special Provision entitled NOTE TO CONTRACTOR (Signals Communications) added |
| Pages UC-49 thru UC-58 | Measurement and Payment removed for <i>Anti-Microbial Coating over Existing Utility Manhole</i> References to "Sewer Manhole Vent" deleted References to "Remove Existing Steel Piers" deleted References to "___ Encasement Pipe End Seal" deleted |
| Pages UC-59 thru UC-60 | Deleted |
| Pages TS-4 thru TS-14 | Added 14. BACK PULL FIBER OPTIC CABLE to the Table of Contents for the Unit Project Special Provision entitled Signals and Intelligent Transportation Systems |
| Pages TS-68 thru TS-94 | Revised the provision entitled DYNAMIC MESSAGE SIGN (DMS) in the Unit Project Special Provision entitled Signals and Intelligent Transportation Systems . This revision updated the DMS to a Front Access, Full Color 20mm, 96x208 pixel LED. The revisions also updated the NEMA standards to 2016 |
| Page TS-96 | Revised Measurement and Payment for the provision entitled NTCIP REQUIREMENTS in the Unit Project Special Provision entitled Signals and Intelligent Transportation Systems |

| Page No. | Revisions |
|-----------------|---|
| Page TS-104 | Added the provision entitled BACK PULL FIBER OPTIC CABLE to the Unit Project Special Provision entitled Signals and Intelligent Transportation Systems |

Please void the above listed existing Pages in your proposal and staple the revised Pages thereto. Delete Pages UC-59 thru UC-60 from your proposal.

On the item sheets the following pay item revisions have been made:

| <u>Item</u> | <u>Description</u> | <u>Old Quantity</u> | <u>New Quantity</u> |
|------------------------|--|----------------------------|----------------------------|
| 0127-5325200000-E-1510 | 2" WATER LINE | 747 LF | DELETED |
| 0128-5325600000-E-1510 | 6" WATER LINE | 609 LF | 858 LF |
| 0129-5325800000-E-1510 | 8" WATER LINE | 247 LF | 292 LF |
| 0130-5326200000-E-1510 | 12" WATER LINE | 4,199 LF | 4,094 LF |
| 0132-5327400000-E-1510 | 24" WATER LINE | 6,484 LF | 6,416 LF |
| 0136-5558000000-E-1515 | 12" VALVE | 7 EA | 8 EA |
| 0138-5559400000-E-1515 | 24" VALVE | 9 EA | 11 EA |
| 0142-5643000000-E-1515 | 1" WATER METER | 4 EA | DELETED |
| 0143-5643100000-E-1515 | 1-1/2" WATER METER | 5 EA | 6 EA |
| 0144-5648000000-N-1515 | RELOCATE WATER METER | 7 EA | 9 EA |
| 0145-5649000000-N-1515 | RECONNECT WATER METER | 2 EA | 1 EA |
| 0146-5656000000-N-1515 | 1-1/2 RPZ BACKFLOW PREVENTION ASSEMBLY | 7 EA | 6 EA |
| 0150-5686000000-E-1515 | 2" WATER SERVICE LINE | 56 LF | 627 LF |

C204404 (U-4405A)

Cumberland County

| | | | |
|------------------------|--|-----------|----------|
| 0156-5781000000-E-1525 | UTILITY MANHOLE WALL 4' DIAMETER | 12 LF | 8 LF |
| 0158-5813000000-E-1530 | ABANDON 24" UTILITY PIPE | 5,973 LF | 5,798 LF |
| 0160-5816000000-N-1530 | ABANDON UTILITY MANHOLE | 2 EA | 1 EA |
| 0173-5888000000-E-SP | MAJOR DRAINAGE STRUCTURES AND PRECAST MANHOLES | 3.5 LF | 2 LF |
| 0174-5888000000-E-SP | POLYETHYLENE ENCASEMENT ON 16" DIA MAIN | 220.5 LF | 101 LF |
| 0175-5888000000-E-SP | POLYETHYLENE ENCASEMENT ON 24" DIA MAIN | 220.5 LF | 340 LF |
| 0240-7516000000-E-1730 | COMMUNICATIONS CABLE (24 FIBER) | 14,000 LF | DELETED |
| 0241-7528000000-E-1730 | DROP CABLE | 1,212 LF | 100 LF |
| 0242-7540000000-N-1731 | SPLICE ENCLOSURE | 6 EA | 1 EA |
| 0243-7552000000-N-1731 | INTERCONNECT CENTER | 6 EA | 1 EA |
| 0244-7566000000-N-1733 | DELINEATOR MARKER | 4 EA | 1 EA |
| 0245-7575100000-E-1734 | REMOVE EXISTING COMMUNICATIONS CABLE | 7,706 LF | 100 LF |
| 0246-7576000000-N-SP | METAL STRAIN SIGNAL POLE | 18 EA | 10 EA |
| 0263-7980000000-N-SP | ETHERNET EDGE SWITCH | 5 EA | 1 EA |
| 0268-5571600000-E-1515 | 6" TAPPING SLEEVE & VALVE | NEW ITEM | 11 EA |
| 0269-5804000000-E-1530 | ABANDON 12" UTILITY PIPE | NEW ITEM | 434 LF |

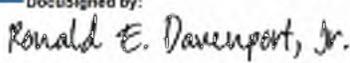
| | | | |
|------------------------|-------------------------------------|----------|--------|
| 0270-7430000000-N-1722 | HEAT SHRINK TUBING RETROFIT KIT | NEW ITEM | 5 EA |
| 0271-7432000000-E-1722 | 2" RISER WITH HEAT SHRINK TUBING | NEW ITEM | 1 EA |
| 0272-7541000000-N-1731 | MODIFY SPLICE ENCLOSURE | NEW ITEM | 5 EA |
| 0273-7990000000-E-SP | BACK PULL FIBER OPTIC CABLE | NEW ITEM | 500 LF |

The Contractor's bid must include these pay item revisions.

The electronic bidding file has been updated to reflect these revisions. Please download the Addendum File and follow the instructions for applying the addendum. Bid Express will not accept your bid unless the addendum has been applied.

The contract will be prepared accordingly.

Sincerely,

DocuSigned by:

 F81B8C38A47A442...

Ronald E. Davenport, Jr., PE
 State Contract Officer

RED/jjr
 Attachments

| | |
|-----------------------------|------------------------|
| cc: Mr. Lamar Sylvester, PE | Mr. Forrest Dungan, PE |
| H.L. "Drew" Cox, PE | Ms. Jaci Kincaid |
| Mr. Boyd Tharrington, PE | Ms. Lori Strickland |
| Mr. Jon Weathersbee, PE | Mr. Mike Gwyn |
| Mr. Ken Kennedy, PE | Ms. Penny Higgins |
| Project File (2) | Mr. Kyle Kempf |

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

PROPOSAL

INCLUDES ADDENDUM No.1 DATED 10-29-2021

DATE AND TIME OF BID OPENING: **NOVEMBER 16, 2021 AT 2:00 PM**

CONTRACT ID C204404
WBS 39049.3.2

FEDERAL-AID NO. STPDA-0401(300)
COUNTY CUMBERLAND
T.I.P. NO. U-4405A
MILES 2.102
ROUTE NO. US 401
LOCATION US-401 FROM OLD RAEFORD RD TO EAST OF NC-162 (BUNCE RD).

TYPE OF WORK GRADING, DRAINAGE, PAVING, SIGNALS, AND STRUCTURE.

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

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PROPOSAL SHEET**

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PROJECT SPECIAL PROVISIONS**GENERAL****CONTRACT TIME AND LIQUIDATED DAMAGES:**

(8-15-00) (Rev. 12-18-07)

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SPI G07 A

The date of availability for this contract is **February 1, 2022**, 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 **April 13, 2025**.

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

SPI 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 **February 1, 2022**.

The completion date for this intermediate contract time is **October 15, 2024**.

The liquidated damages for this intermediate contract time are **Three Thousand Dollars (\$ 3,000.00)** 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.

| | | |
|--|---------|--------------|
| 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.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

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

108-2

SPI 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:

| | <u>Fiscal Year</u> | <u>Progress (% of Dollar Value)</u> |
|------|---------------------------|--|
| 2022 | (7/01/21 - 6/30/22) | 21% of Total Amount Bid |
| 2023 | (7/01/22 - 6/30/23) | 41% of Total Amount Bid |
| 2024 | (7/01/23 - 6/30/24) | 33% of Total Amount Bid |
| 2025 | (7/01/24 - 6/30/25) | 5% 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.

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 (Parcel-55 Trees):

Coordinate with the Engineer prior to removing any trees on Parcel 55 as noted on plan sheet 6.

NOTE TO CONTRACTOR (Signals Communications):

The Signals Communications Plans will be revised as part of a future construction revision to reflect the fact that the Department and/or City of Fayetteville has already performed some of the Signals Communications work that was proposed under the U-4405A project. Work already performed includes the installation of fiber optic trunk cable as well as hooking up the fiber to the existing signal cabinets. The revised plans will show this fiber as existing, and will relocate fiber communications equipment to new and relocated signal cabinets being installed under U-4405A. Additionally, the revised plans will retain information for the relocation of an existing CCTV and installation of a new DMS. Signals Communications quantities and specifications have already been updated to reflect the changes and are included in these contract documents.

Owner for disposing of the test water from the system. If blow offs are not available at the high places, taps shall be made to provide blow offs.

Page 15-13, Sub-article 1520-4, Measurement and Payment

Add the following paragraphs to each respective item:

For Sanitary Gravity Sewer, removal and disposal of existing main shall be incidental to the installation of the new pipe and no separate payment will be made.

Sewer Service Line will be paid per linear foot and by size (four (4) inch or six (6) inch). All fittings will be incidental to Sewer Service Line. Removal and disposal of existing sewer service lateral shall be incidental to the installation of the new sewer service lateral and no separate payment will be made.

Section 1525-Utility Manholes

Page 15-14, Sub-article 1525-2 Materials:

Add the following sentences to Paragraph 3:

The frame and cover shall be manufactured by the same manufacturer. All castings shall be in accordance with the Utility Owner's standard details. Any defective castings shall be removed and replaced. In unpaved areas a cam-lock ring and cover shall be used. Camlock ring and covers shall be in accordance with the Utility Owner's standard details. Camlock bolt head shall be compatible with the standard tool for turning camlock mechanism. Camlock ring and covers shall be installed as indicated on the drawings, in accordance with the Utility Owner's standard details.

Page 15-14, Sub-article 1525-2, Materials:

Add the following provisions for precast concrete sanitary sewer manholes:

All manholes shall be constructed to these Special Provisions. Installation shall be in accordance with ASTM C-891 and these Special Provisions.

An eccentric cone shall be utilized on all manholes, unless otherwise approved by the Utility Owner.

Manhole steps shall be placed in all manholes and shall be steel reinforced (½" grade 60) copolymer polypropylene plastic steps in accordance with ASTM C-478 for material and design. The steps shall be made with serrated treads and wide enough to stand on with both feet.

All reinforced concrete precast manholes shall include a liquid anti-microbial admixture to render the concrete uninhabitable for bacterial growth. The admixture shall be included in the fabrication of the manhole by an approved concrete precast manhole manufacturer. Coatings applied to the interior walls of the manhole shall not be acceptable. The anti-microbial admixture shall be approved by the Utility Owner. A color identifier shall be applied to the interior of each concrete

piece fabricated with the anti-microbial admixture. Each piece shall also be plainly stenciled with the name of the anti-microbial admixture on the exterior of each.

Further, all field mixed mortar, utilized in concrete precast manholes, shall include the anti-microbial admixture. The intent and purpose of this specification is to render all concrete and mortar within sanitary sewer service uninhabitable for bacterial growth. Any defects shall be cause for the replacement and correction of such defect as directed by the Utility Owner, at no additional expense.

Any special linings and coatings that are specified for a manhole and installed at the production facility, in the field, or during repairs, shall be applied in accordance with the applicable special coatings specification and the manufacturer's specifications for that material.

Page 15-14, Sub-article 1525-2, Materials:

Add material specifications for Special Coatings, anti-microbial admixture, as follows:

The liquid anti-microbial admixture shall be used in accordance with the manufacturer's recommendations. The amount of the admixture shall be included in the total water content of the concrete or mortar mix design. The admixture shall be added to the concrete or mortar mix water, to ensure even distribution of the admixture throughout the concrete or mortar mix. When properly prepared, the anti-microbial admixture shall render the concrete or mortar uninhabitable for bacterial growth.

The anti-microbial admixture shall be approved by the Utility Owner. The cost of the admixture shall be included in the fabrication of all sewer manholes and manhole wall sections.

Page 15-14, Sub-article 1525-2, Materials:

Add the following material specification for pipe connections and resilient connector hardware:

Pipe connections to a manhole shall be by gasketed flexible watertight connections or as approved by the Utility Owner.

A watertight, flexible pipe-to-manhole connector shall be used on all pipe to manhole connections, for both new and existing manholes and pipes, unless otherwise specifically authorized in writing by the Utility Owner.

Installation of the connector shall be performed using a calibrated installation tool furnished by the connector manufacturer. Installation shall require no re-tightening after the initial installation. Installation shall be done in accordance with the manufacturer's instructions.

The external compression take-up clamps shall be installed in accordance with the manufacturer's instructions.

The Contractor shall use the proper size connector in accordance with the connector manufacturer's recommendations. All dead-end pipe stubs shall be restrained in accordance with ASTM C-923.

The internal expansion sleeve shall be comprised of Series 300 non-magnetic stainless steel. The external compression take-up clamps shall also be Series 300 non-magnetic stainless steel. No welds shall be utilized in the sleeve and clamp construction.

Page 15-14, Article 1525-3 Construction Methods:

Replace the third paragraph with:

Provide an inside drop assembly on manholes for sewer pipes entering with two and a half (2.5) feet or more vertical drop. Inside drop assemblies shall be used for connections to existing manholes when the drop exceeds two and a half (2.5) feet and the manhole diameter is five (5) feet or larger. Provide a pipe slide where vertical separation between inverts is less than two and a half (2.5) feet.

Replace the fourth paragraph with:

In all sewer manholes, provide steps spaced 16 inches on center. Install steps in line with the effluent opening unless otherwise specified.

Replace the fifth paragraph with:

The invert channel shall be constructed of brick and mortar, in accordance with the manhole details in the plans. Precast inverts are not allowed. The invert channel shall be smooth and semicircular in shape conforming to the inside of the connecting sewer section. Changes in direction of flow shall be made with a smooth curve as large as a radius as the size of the manhole will permit without a decrease in flow velocity. Changes in size and grade of the channel shall be made gradually and evenly. The invert channel walls shall be constructed to three quarters (3/4) of the height of the crown of the outlet sewer and in such a manner not to obstruct maintenance, inspection or flow in the sewers. The inverts shall have a minimum slope of one (1) percent across the bottom of the manhole. A shelf shall be provided on each side of any manhole invert channel. Inverts in manholes with standing water will not be acceptable. The shelf shall be sloped not less than 1:12 (min) and no more than 2:12 (max). The bottom of the boot for the new sewer main or lateral shall be set one (1) inch above existing shelf unless otherwise indicated.

Page 15-15, Article 1525-3 Construction Methods:

Replace Table 1525-1 with:

| |
|--|
| TABLE 1525-1 MANHOLE CONSTRUCTION |
|--|

| Location | Top height above finished grade | Ring and Cover Type |
|--|---|---|
| Roadway pavement, Driveways, Sidewalks, Parking lots | Flush \pm 1/4" with concrete collar | Standard Traffic Area Manhole Ring and Cover (H-20 Rated) |
| Vehicle Recovery Area | Flush \pm 3" | Standard Traffic Area Manhole Ring and Cover with Wiper Gasket and Cam Lock |
| Manicured Areas | Flush to +2" | Standard non-Traffic Area Manhole Ring and Cover with Wiper Gasket and Cam Lock |
| Flood Zones less than 3 ft above finished grade | Minimum 18" Above Ground with Vent Extending to 2 feet above 100-year Flood Elevation | Standard non-Traffic Area Manhole Ring and Cover with Wiper Gasket and Cam Lock |
| Flood Zones greater than 3 ft above finished grade | Minimum 18" Above Ground with Vent Extending to 2 feet above 100-year Flood Elevation | Standard non-Traffic Area Manhole Ring and Cover with Wiper Gasket and Cam Lock |
| Outfall Areas outside of Flood Zones | Minimum 18" Above Ground | Standard non-Traffic Area Manhole Ring and Cover with Wiper Gasket and Cam Lock |

Add additional provisions:

The manhole size shall be in accordance with the following table, unless otherwise specified:

| <u>Pipe Size (inches)</u> | <u>Manhole Diameter (inches) **</u> |
|---------------------------|-------------------------------------|
| 24 and less | 48 |
| 27 to 36 | 60* |
| 42 | 72 |

* Where interior drop structures are required, use 60-inch diameter as required in the Utility Owner's standard details.

** Where multiple connections or acute angles are required, larger diameter manhole may be required as indicated on the Drawings.

Page 15-15, Article 1525-3 (B) Construction Methods, Precast Units:

Add the following paragraph:

All exterior manhole riser joints, including the joint at the cone, shall be sealed with an external rubber sleeve. The sleeve shall be made of stretchable, self-shrinking rubber, with a minimum thickness of 30 mils. The back side of each wrap shall be coated with a cross-linked reinforced butyl adhesive. The butyl adhesive shall be a non-hardening sealant, with a minimum thickness of 30 mils.

Page 15-15, Sub-article 1525-3 (D) Testing:

Add the following sentence:

(1) Vacuum Testing Sewer Manholes:

All precast sanitary sewer manholes installed by the Contractor shall be vacuum tested for leakage. This test shall be done in accordance with ASTM C-1244 and in the presence of the Utility Owner. Provide all the necessary labor, materials, equipment, testing apparatus, and all other incidentals necessary to complete the vacuum test. All testing equipment used shall be approved for use in vacuum testing manholes.

Each manhole shall be tested after assembly. All lift holes shall be plugged with an approved non-shrink grout. All lines, including laterals, entering the manhole shall be temporarily plugged. Ensure that the pipes and plugs are secure in place to prevent them being drawn into the manhole. The test head shall be placed directly on top of the concrete surface of the manhole following the manufacturer's recommendations, rather than to the cast iron seating ring.

Manholes may be tested either prior to backfill or post backfill at the contractor's option. For pre-backfill testing, a vacuum of 10 inches of Mercury (inches Hg) shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to nine (9) inches of Mercury (inches Hg). The manhole is acceptable if the time for the vacuum reading to drop from 10 inches of Mercury to nine (9) inches of Mercury meets or exceeds the values indicated below:

| Manhole Depth | Diameter of Manhole | | |
|---------------|---------------------|-------------|-------------|
| | 4' Diameter | 5' Diameter | 6' Diameter |
| 10' or less | 25 sec | 33 sec | 41 sec |
| 11' to 15' | 38 sec | 49 sec | 62 sec |
| 16' to 20' | 50 sec | 65 sec | 81 sec |
| 21' to 25' | 62 sec | 82 sec | 101 sec |
| 25' to 30' | 74 sec | 98 sec | 121 sec |

Vacuum testing backfilled manholes is not recommended in the presence of groundwater. Vacuum testing a backfilled manhole that is subjected to hydrostatic pressure may exceed the design limits

of the flexible connectors and could lead to failure of the structure, joints, and/or connectors. Where groundwater is present a reduction in the vacuum pressure applied to the manhole will be required. The vacuum shall be reduced by one (1) inch of Mercury for every one (1) foot of hydrostatic head between 12 feet and 21 feet. A vacuum test should not be performed when the hydrostatic head exceeds 22 feet. See the chart below:

| | | | | | | | | | | | |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Hydrostatic Head (ft)* | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| Vacuum Pressure (in Hg) | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ** |

*Hydrostatic head above the critical connector (critical connector is bottom most flexible connector)

**Do not perform vacuum test

If the manhole fails the initial test, the manhole shall be repaired by an approved method until a satisfactory test is obtained. All repair methods shall be approved by the Utility Owner prior to being used. Retesting shall be performed until a satisfactory test is accomplished.

Section 1530-Abandon or Remove Utilities

Page 15-16, Sub-article 1530-3(A) Abandoning Pipe:

Add the following paragraphs:

Perform kill-outs of existing mains to be abandoned as designated on the Drawings. Kill-outs shall consist of the following requirements:

1. Kill out shall be done a minimum of five (5) feet from any fitting on the existing water main that is to remain in service.
2. Ductile iron pipe stiff knee shall be four (4) inch diameter for mains 12-inches or less. Utilize eight (8) inch ductile iron pipe or larger for mains larger than 12-inches. Minimum length of five (5) feet of stiff knee shall be provided. Stiff knee shall be encased in concrete. Concrete shall cover the abandoned pipe but it shall not come in contact with the active water main or any fittings on the active water main. Place blocks rated as the same compressive strength as the concrete under the stiff knee to provide support during concrete placement.
3. On the active water main side of the stiff knee, provide full body mechanical joint sleeve with restraining gland and restraining plug or cap.
4. On the abandoned water main side, provide minimum one-quarter (1/4) inch steel plate or ductile iron cap or plug.
5. Coordinate outages with Utility Owner and other work to minimize number of planned outages.
6. Abandoned pipe shall be grout filled or removed in accordance with Section 1530.

Remove valves, or close valves and remove the top of the valve box to an elevation two (2) feet below the roadway subgrade or finished grade, and backfill.

Page 15-17, Sub-article 1530-4 Measurement and Payment:

Add the following sentence to the first paragraph:

Kill out of existing water mains to be abandoned shall be incidental to the other work and will not be measured and paid.

Section 1540-Encasement**Page 15-18, Sub-article 1540-2, Materials:**

Add the following paragraphs:

Encasement wall thickness for the railroad crossing shall comply with the following chart unless indicated otherwise on the Drawings or defined by the Department or Railroad.

| CARRIER PIPE (dia, in inches) | MIN CASING SIZE (inches) | WALL THICKNESS (inches) | RAILROAD WALL THICKNESS (inches) |
|----------------------------------|-----------------------------|-------------------------------|-------------------------------------|
| 4 | 10 | 0.188 | 0.188 |
| 6 | 12 | 0.250 | 0.281 |
| 8 | 16 | 0.250 | 0.281 |
| 12 | 24 | 0.250 | 0.375 |
| 16 | 30 | 0.312 | 0.469 |
| 18 | 30 | 0.312 | 0.469 |
| 24 | 36 | 0.375 | 0.532 |
| 30 | 42 | 0.500 | 0.625 |
| 36 | 48 | 0.500 | 0.688 |

The Contractor may substitute larger size casing pipe (particularly for sewer mains where grade and alignment are critical) with the proper wall thickness. All additional costs shall be included in the cost of the encasement. Furthermore, the Contractor will be responsible for all engineering costs to update the 100-year design service life for the larger encasement at their expense.

Page 15-18, Sub-article 1540-2, Materials:

Add the following paragraphs for specifying carrier pipe:

The carrier pipe installed for water or force main applications, within the casing pipe shall be CL 50 ductile iron restrained joint pipe. Use of pressure class ductile iron pipe for water mains is acceptable, in accordance with these Special Provisions for Section 1036. Mechanical joint restraint systems are not an acceptable means of restraint within the casing pipe for water mains or force mains.

The material for the gravity sanitary sewer carrier pipe shall be C900 PVC (DR 18) unless noted on the Drawings to be ductile iron. Where ductile iron is called out, gravity sewer pipe shall be CL 50 ductile iron restrained joint pipe. All ductile iron carrier pipes in sewer service shall have the appropriate lining and coating. Use of restraining gaskets (i.e., field-lock gaskets) is an acceptable means of restraint for gravity sewer mains. Use of iron MJ restraint retaining glands are not approved for restraint within casings.

Add the following paragraphs for specifying the carrier pipe brace or spider assembly:

Provide carbon steel carrier pipe brace with the band being made from 12-gauge minimum thickness and riser being made from eight (8) gauge minimum thickness. Runners shall be minimum two (2) inches wide.

Page 15-18, Sub-article 1540-3 (C), Construction Methods:

Add the following paragraph for Encasements for Future Use:

Mark encasements for future use with a manufactured three (3) sided fiberglass utility marker (color green for sewer and blue for water). Marker shall be anchored in the ground using U-channel Post minimum of two (2) feet in depth. Place marker at the right of way or at the ends of the encasements if encasements extend beyond the right of way. One (1) inch locating rod shall be buried just above ends of encasement and extended into valve box located above ends of encasement for additional means of locating. Install minimum length of three (3) feet of ductile iron main plugged on both ends and supported with one pipe brace. Extend minimum of six (6) inches from encasement and center one (1) inch locating rod above pipe end. Seal annular space with water-tight end seal.

Page 15-18, Sub-article 1540-3 (D), Construction Methods:

Add the following sentences to the first paragraph:

Minimum spacing for carrier pipe brace or spider assemblies shall be at three (3) feet prior to and three (3) feet after each joint of ductile iron carrier pipe. Fasten brace or spider to pipe with heavy duty studs, nuts and washers.

Section 1550-Trenchless Installation of Utilities

Page 15-20, Sub-article 1550-3 (B), Construction Methods:

Add the following sentences to the last paragraph:

For boring and tunneling operations, the certified calculations shall include a geotechnical analysis to confirm the selected method will not result in road settlement or upheaval, a road movement monitoring plan and remediation plan should the work result in settlement or upheaval. For drilling operations, appropriate calculations shall be provided to evaluate hydraulic fracturing and to develop a Fraction Mitigation Contingency Plan.

Page 15-20, Sub-article 1550-4 (A), Trenchless Methods:

Add the following paragraphs for Guided Auger Bore and Jack:

The Contractor shall locate all existing utilities in the proposed location of the jack and bore.

Pilot Tube Guided Auger Bore and Jack

The Pilot Tube Guided Auger Bore and Jack system shall utilize a two or three phase system as described below:

1. Three Pass System

- A. Phase 1 – A rigid steel pilot tube in approximately one-meter lengths shall be installed through the ground from the drive shaft to the receiver shaft by earth displacement with the jacking frame. The alignment of the pilot tube shall be established with a theodolite mounted at the rear of the drive shaft and accurately set to the desired line and grade. The theodolite shall view a lighted target in the lead or steering pilot tube. A camera shall be fitted to the theodolite and shall transmit the image of the crosshair and the target onto a monitor screen to be viewed in the drive shaft by the operator. As the operator advances the pilot tube through the earth the center of the target will drift from the crosshair as a result of the biased or slanted leading tip of the pilot tube. The operator shall rotate the pilot tube as required to orient the slanted steering tip toward the crosshair and continue to advance the pilot tube until it reaches the receiver shaft.
- B. Phase 2 – An enlargement casing with an outside diameter up to one and a half (1 ½) inches larger than the product pipe shall be rigidly connected to the final pilot tube and advanced into the earth behind the pilot tube. An auger shall be used inside the enlargement casing to remove the material being excavated. The auger shall be contained inside the limits of the enlargement casing as it progresses along the proposed alignment. A train of temporary steel casings with an outside diameter very similar to the enlargement casing and used to move the enlargement casing from the drive shaft to the receiver shaft. The enlargement casing will cut a bore hole from the drive shaft to the receiver shaft and the temporary casings will case the hole as it is cut. Each temporary casing shall be fitted with an internal auger to transport the excavated material to the drive shaft where it shall be removed from the shaft and disposed of at an approved location. The pilot tubes shall be recovered in the receiver shaft as the temporary casings are installed.

- C. Phase 3 – The product pipe shall then be installed directly behind the final temporary casing pipe with the jacking frame. The casing pipes and augers shall be recovered in the receiver shaft as the product pipe is installed.

2. Two Pass System

- A. Phase 1 – The pilot tube shall be installed in the same manner described Phase 1 of the Three Pass System.
- B. Phase 2 – The enlargement casing shall be installed in the same manner described in Phase 2 of the Three-Phase System. Each product pipe shall be fitted with an internal protective-casing pipe to house the auger and prevent damage to product pipe. The product pipe shall be installed directly behind the enlargement casing with the internal casing rigidly connected to the auger chamber of the enlargement casing. The internal casing shall be manufactured such that the excavated material does not leak excessively into the product pipe. The internal casing shall be fitted with a protective shoe to protect the product pipe from damage and to support the casing and auger at the centerline of the pipe.

The product pipe shall be advanced along the proposed alignment with the jacking frame thus progressing the enlargement casing from the drive shaft to the receiver shaft with the pilot tubes being recovered in the receiver shaft. The excavated material shall be funneled into and conveyed through the internal casing to the drive shaft where it shall be removed from the shaft and disposed of at an approved location. Upon reaching the receiver shaft the enlargement casing shall be removed and the internal casings and augers retracted and recovered at the drive shaft.

Page 15-20, Sub-article 1550-4 (C), Trenchless Methods:

Add the following paragraph:

The Contractor shall locate all existing utilities in the proposed location of the jack and bore.

Page 15-20, Sub-article 1550-4 (D), Trenchless Methods:

Add the following paragraph:

The Contractor shall locate all existing utilities in the proposed location of the jack and bore.

13.3. CONSTRUCTION METHODS 103
 13.4. MEASUREMENT AND PAYMENT 103
14. BACK PULL FIBER OPTIC CABLE 104
 14.1. DESCRIPTION 104
 14.1. CONSTRUCTION 104
 14.2. MEASUREMENT AND PAYMENT 104

1. 2018 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES

The 2018 Standard Specifications are revised as follows:

1.1. GENERAL REQUIREMENTS – Construction Methods (1700-3(K))

Page 17-4, revise sentence starting on line 14 to read “Modify existing electrical services, as necessary, to meet the grounding requirements of the NEC, these *Standard Specifications*, *Standard Drawings*, and the project plans.”

Page 17-4, revise sentence beginning on line 21 to read “Furnish and install additional ground rods to grounding electrode system as necessary to meet the *Standard Specifications*, *Standard Drawings*, and test requirements.”

1.2. 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.”

1.3. REQUIREMENTS FOR CABLES CROSSING RAILROADS

Copies of all executed railroad agreements and related correspondence may be obtained from the Engineer upon request.

1. Railroad Crossings

Application has been made with Aberdeen & Rockfish herein called the Railroad Company, for the encroachment agreements necessary under this Contract. Do not commence cable routing work over or under railroad-owned facilities until notification and coordination with Engineer and the appropriate Railroad Company has occurred. Install fiber-optic communications cable as shown on the Plans. All work associated with the crossing is to conform to the Railroad Company’s specifications.

For work within Aberdeen & Rockfish’s rights of way, comply with the latest approved edition of Railroad Specification CE-4, “Specifications for Wire, Conduit and Cable Occupations of Railroad Property” and Railroad Specification CE-8 “Specifications for Pipeline Occupancy of Railroad Property.”

Cable crossings include the following location(s):

| Plan Sheet | Location | Railroad Company |
|------------|--|---------------------|
| SCP-17 | At-Grade Crossing across US 401 (Raeford Road) at Twin Acres Drive near Owen Drive/ Crossing AAR# 847-200B | Aberdeen & Rockfish |

2. Insurance Requirements

The Department has provided Railroad Protective Liability Insurance to the railroad company as part of the Department's encroachment agreements with the railroad companies for each of location listed in the table above.

If required by the railroad, pay for railroad personnel to be present when work is performed.

In addition to any other forms of insurance or bonds required under the terms of the Contract and the *Standard Specifications*, take out and keep in force from the commencement of all construction on railroad right-of-way until the final inspection and acceptance of the project by the Engineer, insurance of the following kinds and amount. It is understood that the amounts specified are minimum amounts and that larger amounts may be carried if so desired. Any insurance taken out due to these requirements shall be subject to the approval of the Engineer, and the Railroad Company as to form and amount. Furnish satisfactory policies for approval prior to beginning of any work on railroad right-of-way.

Refer to the below verbiage for more specific insurance requirements and requirements for working on the rights-of-way of the railroad company. In the event of a conflict between the requirements of the railroad company and the requirements contained in the Plans or these Project Special Provisions, the requirements of the railroad company shall govern.

- (a) Statutory Workers' Compensation and Employer's Liability insurance.
- (b) An Occurrence Form Railroad Protective Policy with limits of not less than Two Million (\$2,000,000.00) Dollars per occurrence for Bodily Injury Liability, Property Damage Liability and Physical Damage to Property, with Six Million (\$6,000,000.00) Dollars aggregate for the term of the policy with respect to Bodily Injury, Liability, Property Damage Liability and Physical Damage to Property. The Policy must name

**ABERDEEN & ROCKFISH RAILROAD COMPANY
101 E. MAIN ST.
P.O. BOX 917
ABERDEEN, NC 28315**

as the insured, and shall provide for not less than ten (10) days' prior written notice to Railroad of cancellation of, or any material change, in the policy.

Keep such insurance in force until final inspection of the project, or that portion or portions within the railroad right-of-way, by the Engineer or, in the case of Subcontractors, until the Contractor furnishes a letter to the Engineer stating that the Subcontractor has completed his/her subcontracted work within the railroad right-of-way to Contractor's satisfaction, and that the Contractor will accomplish any additional work necessary on the railroad right-of-way with the Contractor's own forces.

Termination of Insurance and Policies to be Submitted

Any insurance policies given hereunder shall cover all Contractor-performed work within railroad right-of-way, but shall not be liable for accidents occurring after acceptance of the completed project by the Department. Such policies shall contain a clause requiring 30 days written notice be given to the Engineer and to the appropriate Railroad Company, prior to cancellation or change.

Submit to the Engineer the original and one copy of the Commercial General Liability Policy, one certified duplicate copy of all other policies, and certificates of insurance in an original and two copies as required by these Project Special Provisions.

No extra allowance will be made for the insurance required hereunder. The entire cost shall be included in the contract unit price bids for other pay items.

The named insured under the commercial General Liability Insurance Policy is the respective Railroad Company, and the designation of the job site description of work is as follows: All construction on the Aberdeen & Rockfish right-of-way on NCDOT Project No. U-4405 in the City of Fayetteville, Cumberland County, North Carolina.

3. Flagging Protection or Watchman Service

Provide a minimum of 7 days advance notice to Aberdeen & Rockfish in order that flagging service can be arranged and provided. Do not undertake any work within the Aberdeen & Rockfish right-of-way until the flagman is at the job site.

4. Delays Caused by Operations of Others

Neither the Department nor the Railroad Company assumes any responsibility for any work performed by others in connection with the construction of the project, and the Contractor shall have no claim whatsoever against the Department or the Railroad Company for any inconvenience, delay, or additional cost incurred by the Contractor on account of such operations by others.

5. Time Extensions

No time extensions related to railroad encroachments will be allowed until the related work becomes the controlling factor relative to overall project completion.

6. Cooperation with Others

Cooperate with others participating in the construction of the project to the end that all work may be carried on to the best advantage.

7. Authority of Railroad Engineer

The authorized representative of the Railroad Company, hereinafter referred to as the Railroad Engineer, will have the final authority in all matters affecting the safe maintenance of railroad traffic of his company.

8. Interference with Railroad Operations

Arrange and conduct work so that there will be no interference with railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to the poles, wire, and other facilities of tenants on the rights-of-way of the Railroad Company. Wherever work is liable to affect the operations or safety of trains, first submit the method of doing such work to the Railroad Engineer for approval. However, such approval will not relieve the Contractor from liability.

Should conditions arising from or in connection with the work, require that immediate and unusual provisions be made to protect train operations and property of the Railroad Company, it shall be a part of the required services by the Contractor to make such provisions and if, in the judgment of the Railroad Engineer such provisions are insufficient, the Railroad Engineer or the Department may, at the expense of the Contractor, require or provide such provisions as may be deemed necessary.

9. Storage of Materials

Do not store materials and equipment where they will interfere with railroad operations, nor on the rights-of-way of the Railroad Company without first having obtained permission from the Railroad Engineer. Such permission will be with the understanding that the Railroad Company will not be liable or damage to such material and equipment from any cause, and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

10. Completion and Acceptance of Work

Upon completion of the work, remove from within the limits of the railroad right-of-way all machinery, equipment, surplus materials, or rubbish and leave said rights-of-way in a neat and orderly condition. Acceptance of the work will be contingent upon final inspection by the Department and by the Railroad Company (if required by the Railroad Company) to determine if the work was completed satisfactorily in a manner acceptable to the Department and the Railroad Company.

1.4. MEASUREMENT AND PAYMENT

There will be no direct payment for work covered in this section. Include the costs for obtaining and furnishing Railroad insurance whose measurement and payment is not specifically stated under any of the contract pay items, into the unit cost(s) for the various contract pay items associated with performing this work.

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings, 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 pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
 - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
 - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
 - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

(Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,

3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and

5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.
6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 8 inches in length for 8-inch vehicle signal head sections. Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate, and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate messenger cable hanger components, wire outlet bodies and balance adjuster components from stainless steel or malleable iron galvanized in accordance with ASTM A153 (Class A) or ASTM A123. Provide serrated rings made of aluminum. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, hex-head bolts and associated nuts, clevis pins, cotter pins, U-bolt clamps and nuts from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra-bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow, and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections, and 8-inch circular sections. All makes, and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

| Module Type | Max. Wattage at 165° F | Nominal Wattage at 77° F |
|------------------------|------------------------|--------------------------|
| 12-inch red circular | 17 | 11 |
| 8-inch red circular | 13 | 8 |
| 12-inch green circular | 15 | 15 |
| 8-inch green circular | 12 | 12 |

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes, and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the

ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

| Module Type | Max. Wattage at 165° F | Nominal Wattage at 77° F |
|---------------------|------------------------|--------------------------|
| 12-inch red arrow | 12 | 9 |
| 12-inch green arrow | 11 | 11 |

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

3. LED U-Turn Arrow Signal Modules:

Provide modules in the following configurations: 12-inch left u-turn arrow signal modules and 12-inch right u-turn arrow signal modules.

Modules are not required to be listed on the ITS and Signals Qualified Products List. Provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that have minimum maintained luminous intensity values that are not less than 16% of the values calculated using the method described in section 4.1 of the VTCSH Circular Supplement.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

| Module Type | Max. Wattage at 165° F | Nominal Wattage at 77° F |
|----------------------------|------------------------|--------------------------|
| 12-inch red u-turn arrow | 17 | 11 |
| 12-inch green u-turn arrow | 15 | 15 |

For yellow u-turn arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to ensure power required at 77° F is 22 Watts or less.

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for “Pedestrian Traffic Control Signal Indications” and the following sections of the ITE standard for “Vehicle Traffic Control Signal Heads” in effect on the date of advertisement:

- Section 3.00 - “Physical and Mechanical Requirements”
- Section 4.01 - “Housing, Door, and Visor: General”
- Section 4.04 - “Housing, Door, and Visor: Materials and Fabrication”
- Section 7.00 - “Exterior Finish”

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long. Where required by the plans, provide 12-inch pedestrian signal heads with traditional three-sided, rectangular visors, 8 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

Provide standard R10-3 signs with mounting hardware that comply with the MUTCD in effect on the date of advertisement. Provide R10-3E signs for countdown pedestrian heads and R10-3B for non-countdown pedestrian heads.

Design the LED pedestrian traffic signal modules (hereafter referred to as modules) for installation into standard pedestrian traffic signal sections that do not contain the incandescent signal section reflector, lens, eggcrate visor, gasket, or socket. Provide modules that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp. Use LEDs that are of the latest aluminum indium gallium phosphorus (AlInGaP) technology for the Portland Orange hand and countdown displays. Use LEDs that are of the latest indium gallium nitride (InGaN) technology for the Lunar White walking man displays. Install the ultra-bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

Design all modules to operate using a standard 3 - wire field installation. Provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard pedestrian signal housing. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Provide modules in the following configuration: 16-inch displays which have the solid hand/walking man overlay on the left and the countdown on the right, and 12-inch displays which have the solid hand/walking man module as an overlay. All makes, and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2018 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

| Module Type | Max. Wattage at 165° F | Nominal Wattage at 77° F |
|------------------------|------------------------|--------------------------|
| Hand Indication | 16 | 13 |
| Walking Man Indication | 12 | 9 |
| Countdown Indication | 16 | 13 |

Note: Use a wattmeter having an accuracy of $\pm 1\%$ to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

D. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

3. CONTROLLERS WITH CABINETS

3.1. MATERIALS – GENERAL CABINETS

Install an Ethernet edge switch in all new cabinets and furnish an Ethernet edge switch for each spare cabinet. See Section 9 - ETHERNET EDGE SWITCH.

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:

Digital CCTV Camera AssemblyEach

9. DYNAMIC MESSAGE SIGN (DMS)

9.1. DESCRIPTION

For this project furnish two (2) DMS’s mounted back to back on a single support structure.

DMSs used on the State Highway System shall be preapproved on the current NCDOT ITS & Signals 2012 Qualified Products List (QPL) by the date of installation. DMSs not reapproved will not be allowed for use on the project. 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 Version 4 software (also referred to hereinafter as the “Control Software”). 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>

Furnish and install DMSs compliant with UL standards 48, 50, and 879.

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the plans.

Contact the Engineer to confirm all DMS locations prior to beginning construction. Furnish operating DMS systems consisting of, but not limited to, the following:

- Front Access DMS
 - Full Matrix, Full Color 20mm, 96 pixels high by 208 pixels wide front access LED DMS
 - Pedestal type DMS support structures and mounting hardware
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- Branch circuit conductors and related equipment
- All other equipment and incidentals required for furnishing, installing, and testing the DMS system and system components

Use only UL listed and approved electronic and electrical components in the DMS system.

9.2. MATERIALS

C. Environmental Requirements

Construct the DMS and DMS controller-cabinet so the equipment within shall be 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.

D. Full Matrix Led Dynamic Message Sign (DMS)

Construct the DMS to display at least three lines of text that, when installed, are 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.

When displaying three lines, each line must display at least 8 equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height and composed from a luminous dot matrix. Provide an entire LED matrix that is a minimum of 98 pixels high and 208 pixels wide.

3. DMS Enclosure

Comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005 as it applies to Walk-in enclosures. The following requirements complement TS 4-2005:

- Construct the DMS with a metal front-access enclosure excluding the face. Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8-inch thick. 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).
- Provide all exterior and interior DMS enclosure surfaces with natural, mill-finish aluminum. Remove all grind marks and discoloration from the surfaces.
- Provide corrosion resistant nuts, bolts, washers, and other mounting and bonding parts and components used on the exterior of the DMS enclosure and ensure they are sealed against water intrusion.
- Provide one access door for each 10 to 15 pixel wide section of the sign enclosure. 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.
- 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 shall be in addition to reporting power failure at the controller cabinet.

- Do not paint the stainless-steel bolts on the Z-bar assembly used for mounting the enclosure.

4. DMS Interior Environment Control

Design the local field controller to monitor and control the interior DMS environment. Design environmental control to maintain the internal DMS temperature within +/- 10° F of the outdoor ambient temperature. Provide the DMS environmental control system with four primary subsystems as follows:

a. Internal Temperature Sensors – Provide the DMS with two internally mounted temperature sensors that are equipped with external thermocouples and which the Field Controller continuously monitors. Design the Field Controller to use this temperature information to determine when to activate and deactivate the environmental control systems described herein. Locate sensors on opposite ends of the upper 1/3 of the LED display matrix with their external thermocouples attached to and making contact with an LED pixel circuit board. Design the thermocouple and LED board to be easily detachable, in the event that one of the units requires removal and replacement. Provide sensors capable of measuring temperatures from -40° F to +185° F. Design the Field Controller to automatically shut down the LED display whenever one or both sensors indicates that LED board temperature has exceeded +140° F, and to automatically restart the LED display whenever the suspect temperature falls below +130° F. Design both shutdown and re-start temperature thresholds to be user-programmable. Design the field controller to report sensor temperatures and DMS shutdown/re-start events to the DMS Control Software.

b. Housing Cooling System – Provide the DMS housing with a cooling system that circulates outside air into the DMS housing whenever the LED board temperature exceeds a user-programmable threshold. Provide this system with enough ventilation fans to exchange the internal DMS housing air volume at a minimum rate of two times per minute. Provide steel ball bearing type fans. Mount fans in a line across the upper rear wall of the DMS housing to direct air out of the cabinet. Provide one filtered air intake port for each exhaust fan. Locate intake ports in a line across the lower rear wall of the DMS housing. Provide intake ports with a removable filter that will remove airborne particles measuring 500 microns in diameter and larger. Provide a filter that is of a size and style that is commercially readily available. Program the field controller to activate the DMS housing cooling system whenever the LED board temperature exceeds +90° F and to turn the cooling system off whenever LED board temperature falls below +85° F. On the DMS housing rear exterior wall, cover all air intake and exhaust ports on their top, front, and sides by an aluminum shroud fabricated from 0.090-inch aluminum sheeting. Taper the shrouds at the top. Securely fasten shrouds to the DMS housing, and provide gaskets at the interface to prevent water from entering the DMS. Design all air filters and fans to be removable from inside the DMS housing. Provide the DMS housing cooling system with an adjustable timer that will turn fans off after the set time has expired. Provide a timer that is adjustable to at least 4 hours, and locate it just inside the DMS housing door, within easy reach of a maintenance technician standing outside the DMS doorway.

c. LED Display Cooling System – Provide the DMS with an LED display cooling system which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. Direct fan-forced air vertically across the backside of the entire LED display matrix using multiple ball-bearing fans. Program the field controller to activate the LED cooling fan system whenever LED board temperature exceeds +90° F and to

deactivate the system whenever LED board temperature falls to +85° F. Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

d. Front Face Panel Defog / Defrost System – Provide the DMS with a defog / defrost system which circulates warm, fan-forced air across the inside of the polycarbonate front face whenever LED board temperature falls below a user-programmable threshold. Provide multiple steel ball-bearing fans that provide uniform airflow across the face panel. Program the field controller to activate the defog / defrost system whenever LED board temperature falls below +40° F and to deactivate the defog / defrost system whenever LED board temperature exceeds +106° F. Mount a 100-watt pencil-style heating element in front of each defog / defrost fan to warm the air directed across the DMS face. Design heating elements to be on only when the defog /defrost fans are on.

Install additional fans and / or heaters as needed to maintain the temperature inside the DMS enclosure within the operating temperature range of the equipment within the DMS enclosure as recommended by the equipment manufacturer(s).

5. Front Panel

Protect the DMS face with contiguous, weather-tight, removable panels. These panels shall be a polycarbonate material that are ultraviolet protected, have an antireflection coating, and are a minimum of 1/8- inch thick.

Furnish polycarbonate panels with the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270° F and 66 PSI at 288° F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

For substitutes, submit one 12" x 12" sample of the proposed material together with a description of the material attributes to the Engineer for review and approval. Install a .09" aluminum mask on the front of the panel (facing the motorists) that contains a circular opening for each LED pixel. Prime and coat the front side of the aluminum mask, which faces the viewing

motorists, with automotive-grade flat 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.

6. Display Modules

Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5, 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. Construct each display module as a rectangular array of 5 horizontal pixels by 7 to 9 vertical pixels. Provide the module with an equal vertical and horizontal pitch between pixels, and columns that are perpendicular to the rows (i.e., no slant).

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.

7. 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. Viewing cone tolerances shall be as specified in the LED manufacturer's product specifications and shall not exceed +/- 3 degrees half-power viewing angle of 30 degrees.

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology. Provide T1 ¾, 0.2-inch size LEDs that emit a true amber color at a wavelength of 590 ± 5 nm.

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. Document the procedure to be used to comply with this requirement as part of the material submittal.

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 $+14^{\circ}$ F at 95% relative humidity, non-condensing.

Supply the LED manufacturer's technical specification sheet with the material submittals.

8. 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 48 volts DC or less. Wire the supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the 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. 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.

9. 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 to be a maximum of two inches in diameter.

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.

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. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed. Submit a complete schematic of the LED power and driver circuits with the material submittals.

10. Character Display

Design display modules to be easily removable without the use of tools. Position cooling fans so they do not prevent removal of an LED pixel board or driver board.

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.

Design the controller to automatically detect failed LED strings or drivers and initiate a report of the event to the Control Software. Design the controller to be able to read the internal temperature of the DMS enclosure and the ambient temperature outside the DMS enclosure and report these to the Control Software.

11. Display Capabilities

Design the DMS with at least the following message displays:

- Static display
- Flashing display with Dynamic flash rates
- At least two alternating Static and / or Flashing sequences (multi-page messages)

12. DMS Mini Controller

Furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber optic cable, CAT-5 cable, or an approved alternate. 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.

Alternatively, install an EIA/TIA-232E port inside the DMS enclosure to enable a maintenance technician to communicate with the DMS main controller and obtain access to and perform all functions of the main controller using a laptop computer.

E. DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the support structures. Design the DMS enclosure supports to allow full access to the DMS enclosure inspection door.

Furnish and install U-bolt connections of hanger beams to overhead assembly 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, 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 2013 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals*, 6th Edition, and the 2013 and 2015 Interim Revisions, and the section titled *DMS Pedestal Structure* of this Project Special Provision.

F. DMS / DMS Controller Interconnect

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the DMS controller. Use approved manufacturer's specifications and the plans developed by the Design-Build Team 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.

G. DMS Controller and Cabinet

Furnish and install one DMS controller with accessories per DMS in a new equipment cabinet. Mount the controller cabinet on the DMS support structure. Install cabinet so that the height from the ground to the middle of the cabinet is four feet. Ensure a minimum of three-foot 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 assembly
- 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)
- Serial 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, such as screwdrivers. 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 ten keys to the Engineer. In addition, design the handle to permit pad-locking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 75% of the useable space in the cabinet. 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 so as 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 three-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 shall utilize the GFCI receptacle. Furnish one spare non-GFCI 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 six 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).

13. Wiring

The requirements stated herein apply wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards etc.

Neatly arrange and secure the wiring inside the cabinet. Where cable wires are clamped to the walls of the control cabinet, provide clamps made of nylon, metal, plastic with rubber or neoprene protectors, or similar. Lace and jacket all harnesses, or tie them with nylon tie wraps spaced at six 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.

14. 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.

15. Power Supply and Circuit Protections

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 and accessories and for servicing DMS equipment and cabinet utilities.

16. 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 two 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 wave-shape | 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

17. Radio Interference Suppressor

Provide each controller cabinet with sufficient electrical and electronic noise suppression to enable all equipment in it to function properly. Provide one or more radio interference suppressors (RIS) connected between the stages of the power line surge suppressor that minimize interference generated in the cabinet in both the broadcast and the aircraft frequencies. Each RIS must provide a minimum attenuation of 50 decibels over a frequency range of 200 KHz to 75 MHz. Clearly label

the suppressor(s) and size them at least at the rated current of the main circuit breaker but not less than 50 amperes.

Provide RIS that are hermetically sealed in a substantial metal case which is filled with a suitable insulating compound and have nickel-plated 10/24 brass stud terminals of sufficient external length to provide space to connect #8 AWG wires. Mount them so that the studs cannot be turned in the case. Properly insulate ungrounded terminals from each other, and maintain a surface linkage distance of not less than ¼" between any exposed current conductor and any other metallic parts. The terminals must have an insulation factor of 100-200 MΩ, dependent on external circuit conditions. Use RIS designed for 120 VAC + 10%, 60Hz, and which meet the standards of UL and the Radio Manufacturers Association.

18. Communications Surge Protector

Equip the cabinet with properly labeled hybrid data line surge protectors that meet the following general requirements:

| | |
|--|-----------------------------------|
| Surge current occurrences at 2000 ampere, 8 x 20 microsecond | > 80 |
| Surge current occurrences at 400 ampere, 10x700 microsecond | > 80 |
| Peak surge current for 8 x 20 microsecond waveform | 10,000 A (2500 A/line) |
| Peak surge current for 10x700 microsecond | 500 A/line |
| Response time | < 1 nanosecond |
| Series resistance | < 15 W |
| Average capacitance | 1500 pF |
| Temperature range | -10°F to 150°F |
| Clamp Voltage | As required to match equipment in |

19. Lightning Arrester

Protect the system with an UL-approved lightning arrester installed at the main service disconnect. It shall meet 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 |

20. 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 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 Ration: @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, IEEE 587

Provide the UPS unit capable of supplying 30 minutes of continuous backup power to the equipment connected to it when this equipment is operating at full load.

21. 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

22. Controller Local User Interface

Provide the controller with a Local User Interface (LUI) for at least the following functions:

- On / Off Switch: controls power to the controller.
- Control Mode Switch: for setting the controller operation mode to either remote or local mode.

- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc.) running diagnostics, viewing peripherals status, message creation, message preview, message activation, etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

23. 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.

24. 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.

25. 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.

H. Photo-Electric 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 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 elements in each Light Level Mode.
- The ambient light level at which each Light Level Mode is activated.

I. 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 an itemized list of equipment costs.

Include a table itemizing the estimated average and maximum power consumption for each major piece of equipment.

J. 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.

K. 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.

L. Character Set Submittal

Submit an engineering drawing of the DMS character set including 26 upper case and lower-case letters, 10 numerals, an asterisk (*), a dash, a plus sign (+), a designated lane diamond, a slash, an ampersand, and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

M. 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, 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.

N. 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.

O. 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.

P. 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 sections titled *Wiring Diagrams* and *Routine 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.

Q. Field Trial

At the request of the Engineer, supply a three-character demonstration module with characters of the size and type specified for the project, an appropriate control device and power supply to allow character display within 30 working days of the request. Perform a field trial on this module at a time and location selected by the Engineer.

This trial will allow the Engineer or his selected representatives to test the readability of the DMS at the maximum distance required for specified character size. Test the module with the sun directly above the DMS, and near the horizon in front of and behind the DMS (washout and back-lit conditions).

9.3. CONSTRUCTION METHODS**R. 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 controllers and electric utilities that conform to NEC standards.

Express wire sizes according to the American Wire Gauge (AWG).

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.

S. Layout

The Engineer will establish the actual location of each Dynamic Message Sign assembly. It is the Contractor's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the project plans, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

T. 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 shall 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.

U. Conduit

Install the conduit system in accordance with Section 1715 of the 2012 *Standard Specifications for Roads and Structures* 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 DMS structure assemblies with beam clamps or stainless-steel strapping. Install strapping according to the strapping manufacturer's recommendations. 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.

Locate underground conduit as shown in the plans in a manner consistent with these Project Special Provisions.

Do not exceed the appropriate fill ratio on all cable installed in conduit as specified in the NEC.

V. Wiring Methods

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.

Bury underground circuits at the depth shown in the plans and surround it with at least three inches of sand or earth back-fill free of rocks and debris. Compact backfill in six-inch layers. Do not splice underground circuits unless specifically noted in the project plans and approved by the Department.

W. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the plans and, 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 one key-operated, pin tumbler, dead bolt padlock, with brass or bronze shackle and case, conforming to Military Specification MIL-P-17802E (Grade I, Class 2, Size 2, Style A) for each electrical panel and switch on the project. Key all padlocks alike, and provide ten keys to the Engineer.

Provide cabinets with all mounting plates, anchor bolts, and any other necessary mounting hardware in accordance with these Project Special Provisions.

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, 24 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.

X. 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.

9.4. MEASUREMENT AND PAYMENT

Dual DMS Mounted Back to Back will be measured and paid as the actual number of DMS's furnished, installed, and accepted. The Dual DMS setup will consist of both LED Dynamic Message Signs, spare display modules, communications equipment, 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:

Dual DMS Mounted Back to Back.....Each

10. NTCIP Requirements

This section defines the detailed NTCIP requirements for the DMSs covered by these Project Special Provisions and Plans.

10.1. REFERENCES

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.

Table 1: NTCIP Standards

| Abbreviated Number | Full Number | Title |
|---------------------------|------------------------|---|
| NTCIP 1101 | NTCIP 1101:1997 | <i>Simple Transportation Management Framework</i> |
| NTCIP 1201 | NTCIP 1201:1997 | <i>Global Object Definitions</i> |
| NTCIP 1203 | NTCIP 1203:1997 | <i>Object Definitions for Dynamic Message Signs</i> |
| NTCIP 2001 | NTCIP 2001:1997 | <i>Class B Profile</i> |
| NTCIP 2101 | NTCIP 2101 | <i>SP-PMPP/232 Subnet Profile for PMPP over RS-232</i> |
| NTCIP 2102 | NTCIP 2102 | <i>SP-PMPP/FSK Subnet Profile for PMPP over FSK Modem</i> |
| NTCIP 2103 | NTCIP 2103 | <i>SP-PPP/232 Subnetwork Profile for PPP over RS232 (Dial Up)</i> |
| NTCIP 2104 | NTCIP 2104 | <i>SP-Ethernet Subnet Profile for Ethernet</i> |
| NTCIP 2201 | NTCIP 2201 | <i>TP-Null Transport Profile</i> |
| NTCIP 2202 | NTCIP 2202 | <i>TP-Internet Internet Transport Profile (TCP/IP and UDP/IP)</i> |
| NTCIP 2301 | NTCIP 2301 | <i>AP-STMF</i> |

| Abbreviated Number | Full Number | Title |
|--------------------|-------------|---|
| | | AP for Simple Transportation Management Framework |

A. General Requirements

1. Subnet Level

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a dial-up connection with a contractor provided external modem with data rates of 28.8 kbps, 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. Enable the NTCIP Component to make outgoing and receive incoming calls as necessary and support the following modem command sets:

- Hayes AT - Command Set
- MNP5
- MNP10
- V.42bis

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a null-modem connection with data rates of 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure each serial port on each NTCIP Component supports NTCIP 2101 with data rates of 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

NTCIP Components may support additional Subnet Profiles at the manufacturer's option. At any one time, make certain only one Subnet Profile is active on a given serial port of the NTCIP Component. Ensure the NTCIP Component can be configured to allow the field technician to activate the desired Subnet Profile and provide a visual indication of the currently selected Subnet Profile.

2. Transport Level

Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

NTCIP Components may support additional Transport Profiles at the manufacturer's option. Ensure Response datagrams use the same Transport Profile used in the request. Ensure each NTCIP Component supports the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

3. Application Level

Ensure each NTCIP Component complies with NTCIP 1101 and 2301 and meets the requirements for Conformance Level 1 (NOTE - See Amendment to standard).

Ensure each NTCIP Component supports SNMP traps. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Ensure Responses use the same

Application Profile used by the request. Ensure each NTCIP Component supports the receipt of Application data packets at any time allowed by the subject standards.

4. Information Level

Guarantee each NTCIP Component provides Full, Standardized Object Range Support of all objects required by these Special Provisions unless otherwise indicated below. Make certain the maximum Response Time for any object or group of objects is 200 milliseconds.

Design the DMS to support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203. Table 2 indicates the modified object requirements for these mandatory objects.

Table 2: Modified Object Ranges for Mandatory Objects

| Object | Reference | Project Requirement |
|-------------------------|---------------------------------|--|
| ModuleTableEntry | NTCIP 1201 Clause 2.2.3 | Contains 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 modelVersion indicates the model version number of the component. |
| MaxGroupAddresses | NTCIP 1201 Clause 2.7.1 | At least 1 |
| CommunityNamesMax | NTCIP 1201 Clause 2.8.2 | At least 3 |
| DmsNumPermanentMsg | NTCIP 1203 Clause 2.6.1.1.1.1 | At least 1* |
| DmsMaxChangeableMsg | NTCIP 1203 Clause 2.6.1.1.1.3 | At least 21 |
| DmsFreeChangeableMemory | NTCIP 1203 Clause 2.6.1.1.1.4 | At least 20 when no messages are stored. |
| DmsMessageMultiString | NTCIP 1203 Clause 2.6.1.1.1.8.3 | The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4 |
| DmsControlMode | NTCIP 1203 Clause 2.7.1.1.1.1 | Support at least the following modes: Local |

| Object | Reference | Project Requirement |
|--------|-----------|--|
| | | External central CentralOverride |

* Ensure the Permanent Messages display the content shown in Table 3.

Ensure the sign blanks if a command to display a message contains an invalid Message CRC value for the desired message.

Table 3: Content of Permanent Messages

| Perm. Msg. Num. | Description |
|-----------------|---|
| 1 | Permanent Message #1 blanks the display (i.e., consist of and empty MULTI string). It has a run-time priority of one (1). |

Table 4: Required 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 |
| j12 | Justification – line – left |
| j13 | Justification – line – center |
| j14 | Justification – line – right |
| j15 | Justification – line – full |
| jp2 | Justification – page – top |

| Code | Feature |
|------|--|
| 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. |

The NTCIP Component implements all mandatory and optional objects of the following optional conformance groups with FSORS.

5. Test Heading

Time Management

As defined in NTCIP 1201

Timebase Event Schedule

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 5: Modified Object Ranges for the Timebase Event Schedule Conformance Group

| Object | Reference | Project Requirement |
|----------------------------|---------------------------|---------------------|
| MaxTimeBaseScheduleEntries | NTCIP 1201 Clause 2.4.3.1 | At least 28 |
| maxDayPlans | NTCIP 1201 Clause 2.4.4.1 | At least 14 |
| maxDayPlanEvents | NTCIP 1201 Clause 2.4.4.2 | At least 10 |

Report

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 6: Modified Object Ranges for the Report Conformance Group

| Object | Reference | Project Requirement |
|------------------------|---------------------------|--|
| maxEventLogConfigs | NTCIP 1201 Clause 2.5.1 | At least 50 |
| eventConfigurationMode | NTCIP 1201 Clause 2.4.3.1 | The NTCIP Component supports the following Event |

| | | |
|-----------------|-------------------------|--|
| | | Configuration Modes: onChange greaterThanValue smallerThanValue |
| MaxEventLogSize | NTCIP 1201 Clause 2.5.3 | At least 200 |
| MaxEventClasses | NTCIP 1201 Clause 2.5.5 | At least 16 |

PMPP

Font Configuration

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 7: Modified Object Ranges for the Font Configuration Conformance Group

| Object | Reference | Project Requirement |
|-------------------|-------------------------------|---------------------|
| NumFonts | NTCIP 1203 Clause 2.4.1.1.1.1 | At least 4* |
| MaxFontCharacters | NTCIP 1203 Clause 2.4.1.1.1.3 | At least 127** |

*Upon delivery, the first font is a standard 18” font. The second font is a double-stroke 18” font. The third font is a 28” font. The fourth font is empty.

**Upon delivery, the first three font sets are configured in accordance with the ASCII character set for the following characters:

- “A” thru “Z”- All upper case letters.
- “0” thru “9”- All decimal digits.
- Space (i.e., ASCII code 0x20).
- Punctuation marks shown in brackets [. , ! ? - ‘ ’ “ ” / ()]
- Special characters shown in brackets [# & * +<>]

DMS Configuration

As defined in NTCIP 1203.

MULTI Configuration

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 8: Modified Object Ranges for the MULTI Configuration Conformance Group

| Object | Reference | Project Requirement |
|--------|-----------|---------------------|
|--------|-----------|---------------------|

| | | |
|--------------------------|-----------------------------------|--|
| DefaultBackgroundColor | NTCIP 1203 Clause 2.5.1.1.1.1 | The DMS supports the following background colors: black |
| DefaultForegroundColor | NTCIP 1203 Clause 2.5.1.1.1.2 | The DMS supports the following foreground colors: amber |
| DefaultJustificationLine | NTCIP 1203 Clause 2.5.1.1.1.6 | The DMS supports the following forms of line justification: left center right full |
| defaultJustificationPage | NTCIP 1203 Clause 2.5.1.1.1.7 | The DMS supports the following forms of page justification: top middle bottom |
| defaultPageOnTime | NTCIP 1203 Clause 2.5.1.1.1.8 | The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds |
| defaultPageOffTime | NTCIP 1203 Clause 2.5.1.1.1.9 | The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds |
| defaultCharacterSet | NTCIP 1203 Clause 2.5.1.1.1.10 | The DMS supports the following character sets: eightBit |

Default Message Control as defined in NTCIP 1203

Pixel Service Control as defined in NTCIP 1203

MULTI Error Control as defined in NTCIP 1203

Illumination/Brightness Control

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 9: Modified Object Ranges for the Illumination/Brightness Control Conformance Group

| Object | Reference | Project Requirement |
|--------|-----------|---------------------|
|--------|-----------|---------------------|

| | | |
|-------------------------|----------------------------------|--|
| dmsIllumControl | NTCIP 1203 Clause 2.8.1.1.1.1 | The DMS supports the following illumination control modes: photocell timer manual |
| dmsIllumNumBrightLevels | NTCIP 1203 Clause 2.8.1.1.1.4 | At least 16 |

Auxiliary I/O

Scheduling

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 10: Modified Object Ranges for the Scheduling Conformance Group

| Object | Reference | Project Requirement |
|-----------------------|----------------------------------|----------------------------|
| NumActionTableEntries | NTCIP 1203 Clause 2.9.1.1.1.1 | At least 21 |

Sign Status as defined in NTCIP 1203

Status Error as defined in NTCIP 1203

Pixel Error Status as defined in NTCIP 1203

Fan Error Status as defined in NTCIP 1203

Power Status as defined in NTCIP 1203

Temperature Status as defined in NTCIP 1203

Install necessary hardware for the support of items q, r, and s above.

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.

10.2. 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 "Dual DMS Mounted Back to Back" and will be full compensation for all work listed above.

11. DMS ASSEMBLIES

11.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS assemblies, and attachment of the DMS enclosures to the structures in accordance with the requirements of these Project Special Provisions and the Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Plans. Cantilevered and monotube (horizontal truss) DMS structures will not be allowed.

For the two (2) DMS's mounted back to back on a single support structure, provide pedestal structures with a minimum of 18 feet clearance from the high point of the road to the bottom of the DMS enclosure. DMS assemblies must allow for field adjustment with shims (horizontal & vertical tilting) +/- 3 degrees of the DMS enclosure to ensure optimum legibility from all travel lanes.

Design the new DMS assemblies (including footings) and submit shop drawings for approval. A Professional Engineer that is registered in the state of North Carolina will prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 of the Standard Specifications apply to all work covered by this section.

It is the Contractor's responsibility to provide DMS S-dimension elevation drawings for the DMS locations to the Engineer for approval.

11.2. MATERIAL

Use materials that meet the following requirements of the Standard Specifications:

| | |
|---------------------------|-----------------------|
| Structural Steel | Section 1072 |
| Overhead Sign Structures | Section 1096 |
| Signing Materials | Section 1092 |
| Organic-Zinc Repair Paint | Article 1080-9 |
| Reinforcing Steel | Sub-article 1070 |
| Direct Tension Indicators | Sections 440 and 1072 |

DMS foundation will be full compensation for providing labor, tools, equipment, and foundation materials, stabilizing, or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the 2018 Standard Specifications.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------|-----------------|
| DMS Foundation | Cubic Yards |

14. BACK PULL FIBER OPTIC CABLE

14.1. DESCRIPTION

Back pull and store or back pull and reinstall existing communications cable.

14.1. 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.

14.2. 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:

| | |
|-----------------------------------|-------------|
| Back Pull Fiber Optic Cable | Linear Feet |
|-----------------------------------|-------------|

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|----------------------|--------------|-------|--|--------------|-----------|--------|
| ROADWAY ITEMS | | | | | | |
| 0001 | 0000100000-N | 800 | MOBILIZATION | Lump Sum | L.S. | |
| 0002 | 0000400000-N | 801 | CONSTRUCTION SURVEYING | Lump Sum | L.S. | |
| 0003 | 0001000000-E | 200 | CLEARING & GRUBBING .. ACRE(S) | Lump Sum | L.S. | |
| 0004 | 0008000000-E | 200 | SUPPLEMENTARY CLEARING & GRUB-BING | 1 ACR | | |
| 0005 | 0022000000-E | 225 | UNCLASSIFIED EXCAVATION | 3,300 CY | | |
| 0006 | 0036000000-E | 225 | UNDERCUT EXCAVATION | 1,100 CY | | |
| 0007 | 0106000000-E | 230 | BORROW EXCAVATION | 53,300 CY | | |
| 0008 | 0134000000-E | 240 | DRAINAGE DITCH EXCAVATION | 890 CY | | |
| 0009 | 0156000000-E | 250 | REMOVAL OF EXISTING ASPHALT PAVEMENT | 2,730 SY | | |
| 0010 | 0195000000-E | 265 | SELECT GRANULAR MATERIAL | 1,200 CY | | |
| 0011 | 0196000000-E | 270 | GEOTEXTILE FOR SOIL STABILIZA-TION | 8,700 SY | | |
| 0012 | 0199000000-E | SP | TEMPORARY SHORING | 1,272 SF | | |
| 0013 | 0255000000-E | SP | GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETRO-LEUM CONTAMINATED SOIL | 100 TON | | |
| 0014 | 0318000000-E | 300 | FOUNDATION CONDITIONING MATE-RIAL, MINOR STRUCTURES | 3,822 TON | | |
| 0015 | 0320000000-E | 300 | FOUNDATION CONDITIONING GEO-TEXTILE | 13,382 SY | | |
| 0016 | 0335000000-E | 305 | *** DRAINAGE PIPE (54") | 268 LF | | |
| 0017 | 0335000000-E | 305 | **" DRAINAGE PIPE (66") | 52 LF | | |
| 0018 | 0335100000-E | 305 | 12" DRAINAGE PIPE | 52 LF | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|-------------|-----------|--------|
| 0019 | 0335200000-E | 305 | 15" DRAINAGE PIPE | 1,076 LF | | |
| 0020 | 0335300000-E | 305 | 18" DRAINAGE PIPE | 636 LF | | |
| 0021 | 0335400000-E | 305 | 24" DRAINAGE PIPE | 140 LF | | |
| 0022 | 0335500000-E | 305 | 30" DRAINAGE PIPE | 604 LF | | |
| 0023 | 0335600000-E | 305 | 36" DRAINAGE PIPE | 60 LF | | |
| 0024 | 0335700000-E | 305 | 42" DRAINAGE PIPE | 768 LF | | |
| 0025 | 0335800000-E | 305 | 48" DRAINAGE PIPE | 572 LF | | |
| 0026 | 0335850000-E | 305 | *** DRAINAGE PIPE ELBOWS (12") | 2 EA | | |
| 0027 | 0335850000-E | 305 | *** DRAINAGE PIPE ELBOWS (30") | 4 EA | | |
| 0028 | 0343000000-E | 310 | 15" SIDE DRAIN PIPE | 60 LF | | |
| 0029 | 0354000000-E | 310 | **** RC PIPE CULVERTS, CLASS ***** (66", V) | 100 LF | | |
| 0030 | 0402000000-E | 310 | 48" RC PIPE CULVERTS, CLASS III | 20 LF | | |
| 0031 | 0414000000-E | 310 | 60" RC PIPE CULVERTS, CLASS III | 44 LF | | |
| 0032 | 0420000000-E | 310 | 66" RC PIPE CULVERTS, CLASS III | 48 LF | | |
| 0033 | 0426000000-E | 310 | 72" RC PIPE CULVERTS, CLASS III | 40 LF | | |
| 0034 | 0448000000-E | 310 | **** RC PIPE CULVERTS, CLASS IV (48") | 652 LF | | |
| 0035 | 0448000000-E | 310 | **** RC PIPE CULVERTS, CLASS IV (54") | 1,024 LF | | |
| 0036 | 0448200000-E | 310 | 15" RC PIPE CULVERTS, CLASS IV | 7,384 LF | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|---------------|-----------|--------|
| 0037 | 0448300000-E | 310 | 18" RC PIPE CULVERTS, CLASS IV | 1,416 LF | | |
| 0038 | 0448400000-E | 310 | 24" RC PIPE CULVERTS, CLASS IV | 1,964 LF | | |
| 0039 | 0448500000-E | 310 | 30" RC PIPE CULVERTS, CLASS IV | 1,132 LF | | |
| 0040 | 0448600000-E | 310 | 36" RC PIPE CULVERTS, CLASS IV | 1,648 LF | | |
| 0041 | 0448700000-E | 310 | 42" RC PIPE CULVERTS, CLASS IV | 1,240 LF | | |
| 0042 | 0973100000-E | 330 | *** WELDED STEEL PIPE, ***** THICK, GRADE B IN SOIL (72", 1.000") | 84 LF | | |
| 0043 | 0973300000-E | 330 | *** WELDED STEEL PIPE, ***** THICK, GRADE B NOT IN SOIL (72", 1.000") | 84 LF | | |
| 0044 | 0986000000-E | SP | GENERIC PIPE ITEM 4" PVC SLEEVE | 950 LF | | |
| 0045 | 0995000000-E | 340 | PIPE REMOVAL | 8,542 LF | | |
| 0046 | 1011000000-N | 500 | FINE GRADING | Lump Sum | L.S. | |
| 0047 | 1099500000-E | 505 | SHALLOW UNDERCUT | 1,300 CY | | |
| 0048 | 1099700000-E | 505 | CLASS IV SUBGRADE STABILIZA- TION | 3,850 TON | | |
| 0049 | 1220000000-E | 545 | INCIDENTAL STONE BASE | 1,500 TON | | |
| 0050 | 1297000000-E | 607 | MILLING ASPHALT PAVEMENT, ***** DEPTH (1-1/2") | 16,490 SY | | |
| 0051 | 1330000000-E | 607 | INCIDENTAL MILLING | 5,000 SY | | |
| 0052 | 1491000000-E | 610 | ASPHALT CONC BASE COURSE, TYPE B25.0C | 17,990 TON | | |
| 0053 | 1503000000-E | 610 | ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C | 18,360 TON | | |
| 0054 | 1519000000-E | 610 | ASPHALT CONC SURFACE COURSE, TYPE S9.5B | 2,140 TON | | |

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| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|---------------|-----------|--------|
| 0055 | 1523000000-E | 610 | ASPHALT CONC SURFACE COURSE, TYPE S9.5C | 17,590 TON | | |
| 0056 | 1575000000-E | 620 | ASPHALT BINDER FOR PLANT MIX | 2,895 TON | | |
| 0057 | 1693000000-E | 654 | ASPHALT PLANT MIX, PAVEMENT REPAIR | 1,242 TON | | |
| 0058 | 2022000000-E | 815 | SUBDRAIN EXCAVATION | 45 CY | | |
| 0059 | 2026000000-E | 815 | GEOTEXTILE FOR SUBSURFACE DRAINS | 200 SY | | |
| 0060 | 2036000000-E | 815 | SUBDRAIN COARSE AGGREGATE | 34 CY | | |
| 0061 | 2044000000-E | 815 | 6" PERFORATED SUBDRAIN PIPE | 200 LF | | |
| 0062 | 2070000000-N | 815 | SUBDRAIN PIPE OUTLET | 1 EA | | |
| 0063 | 2077000000-E | 815 | 6" OUTLET PIPE | 6 LF | | |
| 0064 | 2209000000-E | 838 | ENDWALLS | 11.7 CY | | |
| 0065 | 2220000000-E | 838 | REINFORCED ENDWALLS | 207.5 CY | | |
| 0066 | 2253000000-E | 840 | PIPE COLLARS | 24.72 CY | | |
| 0067 | 2264000000-E | 840 | PIPE PLUGS | 3.75 CY | | |
| 0068 | 2275000000-E | SP | FLOWABLE FILL | 64 CY | | |
| 0069 | 2286000000-N | 840 | MASONRY DRAINAGE STRUCTURES | 213 EA | | |
| 0070 | 2297000000-E | 840 | MASONRY DRAINAGE STRUCTURES | 57.233 CY | | |
| 0071 | 2308000000-E | 840 | MASONRY DRAINAGE STRUCTURES | 155.6 LF | | |
| 0072 | 2352000000-N | 840 | FRAME WITH GRATE, STD 840.**** (840.16) | 81 EA | | |
| 0073 | 2366000000-N | 840 | FRAME WITH TWO GRATES, STD 840.24 | 5 EA | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|--------------|-----------|--------|
| 0074 | 2367000000-N | 840 | FRAME WITH TWO GRATES, STD 840.29 | 8 EA | | |
| 0075 | 2374000000-N | 840 | FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E) | 14 EA | | |
| 0076 | 2374000000-N | 840 | FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F) | 53 EA | | |
| 0077 | 2374000000-N | 840 | FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G) | 47 EA | | |
| 0078 | 2396000000-N | 840 | FRAME WITH COVER, STD 840.54 | 16 EA | | |
| 0079 | 2451000000-N | 852 | CONCRETE TRANSITIONAL SECTION FOR DROP INLET | 36 EA | | |
| 0080 | 2535000000-E | 846 | ***X *** CONCRETE CURB (8" X 12") | 110 LF | | |
| 0081 | 2542000000-E | 846 | 1'-6" CONCRETE CURB & GUTTER | 9,270 LF | | |
| 0082 | 2549000000-E | 846 | 2'-6" CONCRETE CURB & GUTTER | 22,690 LF | | |
| 0083 | 2591000000-E | 848 | 4" CONCRETE SIDEWALK | 10,505 SY | | |
| 0084 | 2605000000-N | 848 | CONCRETE CURB RAMPS | 89 EA | | |
| 0085 | 2612000000-E | 848 | 6" CONCRETE DRIVEWAY | 1,209 SY | | |
| 0086 | 2655000000-E | 852 | 5" MONOLITHIC CONCRETE ISLANDS (KEYED IN) | 2,500 SY | | |
| 0087 | 2800000000-N | 858 | ADJUSTMENT OF CATCH BASINS | 3 EA | | |
| 0088 | 2815000000-N | 858 | ADJUSTMENT OF DROP INLETS | 1 EA | | |
| 0089 | 2845000000-N | 858 | ADJUSTMENT OF METER BOXES OR VALVE BOXES | 30 EA | | |
| 0090 | 2860000000-N | 859 | CONVERT EXISTING CATCH BASIN TO JUNCTION BOX | 1 EA | | |
| 0091 | 3030000000-E | 862 | STEEL BEAM GUARDRAIL | 1,125 LF | | |

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| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|-------------|-----------|--------|
| 0092 | 3150000000-N | 862 | ADDITIONAL GUARDRAIL POSTS | 5 EA | | |
| 0093 | 3210000000-N | 862 | GUARDRAIL END UNITS, TYPE CAT-1 | 4 EA | | |
| 0094 | 3287000000-N | SP | GUARDRAIL END UNITS, TYPE TL-3 | 4 EA | | |
| 0095 | 3628000000-E | 876 | RIP RAP, CLASS I | 300 TON | | |
| 0096 | 3635000000-E | 876 | RIP RAP, CLASS II | 620 TON | | |
| 0097 | 3649000000-E | 876 | RIP RAP, CLASS B | 60 TON | | |
| 0098 | 3656000000-E | 876 | GEOTEXTILE FOR DRAINAGE | 1,850 SY | | |
| 0099 | 4072000000-E | 903 | SUPPORTS, 3-LB STEEL U-CHANNEL | 2,746 LF | | |
| 0100 | 4096000000-N | 904 | SIGN ERECTION, TYPE D | 4 EA | | |
| 0101 | 4102000000-N | 904 | SIGN ERECTION, TYPE E | 171 EA | | |
| 0102 | 4108000000-N | 904 | SIGN ERECTION, TYPE F | 11 EA | | |
| 0103 | 4116100000-N | 904 | SIGN ERECTION, RELOCATE TYPE **** (GROUND MOUNTED) (D) | 24 EA | | |
| 0104 | 4155000000-N | 907 | DISPOSAL OF SIGN SYSTEM, U-CHANNEL | 139 EA | | |
| 0105 | 4192000000-N | 907 | DISPOSAL OF SUPPORT, U-CHANNEL | 24 EA | | |
| 0106 | 4400000000-E | 1110 | WORK ZONE SIGNS (STATIONARY) | 480 SF | | |
| 0107 | 4405000000-E | 1110 | WORK ZONE SIGNS (PORTABLE) | 480 SF | | |
| 0108 | 4410000000-E | 1110 | WORK ZONE SIGNS (BARRICADE MOUNTED) | 36 SF | | |
| 0109 | 4415000000-N | 1115 | FLASHING ARROW BOARD | 2 EA | | |
| 0110 | 4420000000-N | 1120 | PORTABLE CHANGEABLE MESSAGE SIGN | 4 EA | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|--------------|-----------|--------|
| 0111 | 4430000000-N | 1130 | DRUMS | 175 EA | | |
| 0112 | 4435000000-N | 1135 | CONES | 100 EA | | |
| 0113 | 4445000000-E | 1145 | BARRICADES (TYPE III) | 32 LF | | |
| 0114 | 4447000000-E | SP | PEDESTRIAN CHANNELIZING DEVICES | 64 LF | | |
| 0115 | 4455000000-N | 1150 | FLAGGER | 100 DAY | | |
| 0116 | 4480000000-N | 1165 | TMA | 2 EA | | |
| 0117 | 4510000000-N | 1190 | LAW ENFORCEMENT | 500 HR | | |
| 0118 | 4516000000-N | 1180 | SKINNY DRUM | 75 EA | | |
| 0119 | 4685000000-E | 1205 | THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS) | 37,899 LF | | |
| 0120 | 4695000000-E | 1205 | THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS) | 10,250 LF | | |
| 0121 | 4720000000-E | 1205 | THERMOPLASTIC PAVEMENT MARKING CHARACTER (90 MILS) | 90 EA | | |
| 0122 | 4725000000-E | 1205 | THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS) | 179 EA | | |
| 0123 | 4810000000-E | 1205 | PAINT PAVEMENT MARKING LINES (4") | 625 LF | | |
| 0124 | 4891000000-E | 1205 | GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC PAVEMENT MARKING LINES (24", 90 MILS) | 2,140 LF | | |
| 0125 | 4900000000-N | 1251 | PERMANENT RAISED PAVEMENT MARKERS | 1,691 EA | | |
| 0126 | 5255000000-N | 1413 | PORTABLE LIGHTING | Lump Sum | L.S. | |
| 0128 | 5325600000-E | 1510 | 6" WATER LINE | 858 LF | | |
| 0129 | 5325800000-E | 1510 | 8" WATER LINE | 292 LF | | |

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| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|--------------|-----------|--------|
| 0130 | 5326200000-E | 1510 | 12" WATER LINE | 4,094 LF | | |
| 0131 | 5326600000-E | 1510 | 16" WATER LINE | 880 LF | | |
| 0132 | 5327400000-E | 1510 | 24" WATER LINE | 6,416 LF | | |
| 0133 | 5329000000-E | 1510 | DUCTILE IRON WATER PIPE FITTINGS | 98,466 LB | | |
| 0134 | 5540000000-E | 1515 | 6" VALVE | 21 EA | | |
| 0135 | 5546000000-E | 1515 | 8" VALVE | 4 EA | | |
| 0136 | 5558000000-E | 1515 | 12" VALVE | 8 EA | | |
| 0137 | 5558600000-E | 1515 | 16" VALVE | 2 EA | | |
| 0138 | 5559400000-E | 1515 | 24" VALVE | 11 EA | | |
| 0139 | 5571800000-E | 1515 | 8" TAPPING SLEEVE & VALVE | 1 EA | | |
| 0140 | 5572200000-E | 1515 | 12" TAPPING SLEEVE & VALVE | 2 EA | | |
| 0141 | 5573400000-E | 1515 | 24" TAPPING SLEEVE & VALVE | 5 EA | | |
| 0143 | 5643150000-E | 1515 | 1-1/2" WATER METER | 6 EA | | |
| 0144 | 5648000000-N | 1515 | RELOCATE WATER METER | 9 EA | | |
| 0145 | 5649000000-N | 1515 | RECONNECT WATER METER | 1 EA | | |
| 0146 | 5656000000-E | 1515 | **" RPZ BACKFLOW PREVENTION ASSEMBLY (1-1/2") | 6 EA | | |
| 0147 | 5666000000-N | 1515 | FIRE HYDRANT | 20 EA | | |
| 0148 | 5672000000-N | 1515 | RELOCATE FIRE HYDRANT | 1 EA | | |
| 0149 | 5673000000-E | 1515 | FIRE HYDRANT LEG | 280 LF | | |
| 0150 | 5686000000-E | 1515 | **" WATER SERVICE LINE (2") | 627 LF | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|-------------|-----------|--------|
| 0151 | 5686500000-E | 1515 | WATER SERVICE LINE | 157 LF | | |
| 0152 | 5691300000-E | 1520 | 8" SANITARY GRAVITY SEWER | 179 LF | | |
| 0153 | 5768000000-N | 1520 | SANITARY SEWER CLEAN-OUT | 1 EA | | |
| 0154 | 5768500000-E | 1520 | SEWER SERVICE LINE | 26 LF | | |
| 0155 | 5775000000-E | 1525 | 4' DIA UTILITY MANHOLE | 2 EA | | |
| 0156 | 5781000000-E | 1525 | UTILITY MANHOLE WALL 4' DIA | 8 LF | | |
| 0157 | 5801000000-E | 1530 | ABANDON 8" UTILITY PIPE | 119 LF | | |
| 0158 | 5813000000-E | 1530 | ABANDON 24" UTILITY PIPE | 5,798 LF | | |
| 0159 | 5815500000-N | 1530 | REMOVE FIRE HYDRANT | 4 EA | | |
| 0160 | 5816000000-N | 1530 | ABANDON UTILITY MANHOLE | 1 EA | | |
| 0161 | 5828000000-N | 1530 | REMOVE UTILITY MANHOLE | 1 EA | | |
| 0162 | 5836000000-E | 1540 | 24" ENCASEMENT PIPE | 325 LF | | |
| 0163 | 5836400000-E | 1540 | 36" ENCASEMENT PIPE | 321 LF | | |
| 0164 | 5872500000-E | 1550 | BORE AND JACK OF *** (24") | 325 LF | | |
| 0165 | 5872500000-E | 1550 | BORE AND JACK OF *** (36") | 321 LF | | |
| 0166 | 5872600000-E | 1550 | DIRECTIONAL DRILLING OF *** (16") | 368 LF | | |
| 0167 | 5882000000-N | SP | GENERIC UTILITY ITEM 16" NITRILE PIPE GASKET | 3 EA | | |
| 0168 | 5882000000-N | SP | GENERIC UTILITY ITEM 2" COMBINATION AIR RELEASE VALVE | 1 EA | | |
| 0169 | 5882000000-N | SP | GENERIC UTILITY ITEM 24" NITRILE PIPE GASKET | 20 EA | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|--------------|-----------|--------|
| 0170 | 5882000000-N | SP | GENERIC UTILITY ITEM ADJUSTMENT OF BRICK AND MORTAR MANHOLES | 2 EA | | |
| 0171 | 5882000000-N | SP | GENERIC UTILITY ITEM ADJUSTMENT OF PRECAST MANHOLES | 5 EA | | |
| 0172 | 5888000000-E | SP | GENERIC UTILITY ITEM MAJOR DRAINAGE STRUCTURES AND BRICK AND MORTAR MANHOLES | 3.5 LF | | |
| 0173 | 5888000000-E | SP | GENERIC UTILITY ITEM MAJOR DRAINAGE STRUCTURES AND PRECAST MANHOLES | 2 LF | | |
| 0174 | 5888000000-E | SP | GENERIC UTILITY ITEM POLYETHYLENE ENCASEMENT ON 16" DIA MAIN | 101 LF | | |
| 0175 | 5888000000-E | SP | GENERIC UTILITY ITEM POLYETHYLENE ENCASEMENT ON 24" DIA MAIN | 340 LF | | |
| 0176 | 6000000000-E | 1605 | TEMPORARY SILT FENCE | 14,000 LF | | |
| 0177 | 6006000000-E | 1610 | STONE FOR EROSION CONTROL, CLASS A | 630 TON | | |
| 0178 | 6009000000-E | 1610 | STONE FOR EROSION CONTROL, CLASS B | 905 TON | | |
| 0179 | 6012000000-E | 1610 | SEDIMENT CONTROL STONE | 2,520 TON | | |
| 0180 | 6015000000-E | 1615 | TEMPORARY MULCHING | 60 ACR | | |
| 0181 | 6018000000-E | 1620 | SEED FOR TEMPORARY SEEDING | 1,100 LB | | |
| 0182 | 6021000000-E | 1620 | FERTILIZER FOR TEMPORARY SEED- ING | 6.5 TON | | |
| 0183 | 6024000000-E | 1622 | TEMPORARY SLOPE DRAINS | 885 LF | | |
| 0184 | 6029000000-E | SP | SAFETY FENCE | 800 LF | | |
| 0185 | 6030000000-E | 1630 | SILT EXCAVATION | 1,500 CY | | |
| 0186 | 6036000000-E | 1631 | MATTING FOR EROSION CONTROL | 60,000 SY | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|----------------------------------|-------------|-----------|--------|
| 0187 | 603700000-E | SP | COIR FIBER MAT | 100 SY | | |
| 0188 | 603800000-E | SP | PERMANENT SOIL REINFORCEMENT MAT | 125 SY | | |
| 0189 | 604200000-E | 1632 | 1/4" HARDWARE CLOTH | 8,750 LF | | |
| 0190 | 604300000-E | SP | LOW PERMEABILITY GEOTEXTILE | 20 SY | | |
| 0191 | 607000000-N | 1639 | SPECIAL STILLING BASINS | 6 EA | | |
| 0192 | 6071012000-E | SP | COIR FIBER WATTLE | 4,100 LF | | |
| 0193 | 6071020000-E | SP | POLYACRYLAMIDE (PAM) | 1,100 LB | | |
| 0194 | 6071030000-E | 1640 | COIR FIBER BAFFLE | 450 LF | | |
| 0195 | 6071050000-E | SP | *** SKIMMER (1-1/2") | 1 EA | | |
| 0196 | 6084000000-E | 1660 | SEEDING & MULCHING | 18 ACR | | |
| 0197 | 6087000000-E | 1660 | MOWING | 9 ACR | | |
| 0198 | 6090000000-E | 1661 | SEED FOR REPAIR SEEDING | 200 LB | | |
| 0199 | 6093000000-E | 1661 | FERTILIZER FOR REPAIR SEEDING | 0.75 TON | | |
| 0200 | 6096000000-E | 1662 | SEED FOR SUPPLEMENTAL SEEDING | 450 LB | | |
| 0201 | 6108000000-E | 1665 | FERTILIZER TOPDRESSING | 13 TON | | |
| 0202 | 6111000000-E | SP | IMPERVIOUS DIKE | 455 LF | | |
| 0203 | 6114500000-N | 1667 | SPECIALIZED HAND MOWING | 10 MHR | | |
| 0204 | 6117000000-N | SP | RESPONSE FOR EROSION CONTROL | 25 EA | | |
| 0205 | 6117500000-N | SP | CONCRETE WASHOUT STRUCTURE | 4 EA | | |
| 0206 | 6120000000-E | SP | CULVERT DIVERSION CHANNEL | 61 CY | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|--------------|-----------|--------|
| 0207 | 6132000000-N | SP | GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT | 75 EA | | |
| 0208 | 6132000000-N | SP | GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE | 25 EA | | |
| 0209 | 6147000000-E | SP | GENERIC EROSION CONTROL ITEM TREE PROTECTION FENCE | 1,700 LF | | |
| 0210 | 7048500000-E | 1705 | PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN) | 32 EA | | |
| 0211 | 7060000000-E | 1705 | SIGNAL CABLE | 39,760 LF | | |
| 0212 | 7120000000-E | 1705 | VEHICLE SIGNAL HEAD (12", 3 SECTION) | 104 EA | | |
| 0213 | 7132000000-E | 1705 | VEHICLE SIGNAL HEAD (12", 4 SECTION) | 12 EA | | |
| 0214 | 7144000000-E | 1705 | VEHICLE SIGNAL HEAD (12", 5 SECTION) | 21 EA | | |
| 0215 | 7180000000-N | 1706 | BACKPLATE | 133 EA | | |
| 0216 | 7252000000-E | 1710 | MESSENGER CABLE (1/4") | 40 LF | | |
| 0217 | 7264000000-E | 1710 | MESSENGER CABLE (3/8") | 6,010 LF | | |
| 0218 | 7288000000-E | 1715 | PAVED TRENCHING (***** (1, 2") | 50 LF | | |
| 0219 | 7300000000-E | 1715 | UNPAVED TRENCHING (***** (1, 2") | 4,000 LF | | |
| 0220 | 7300000000-E | 1715 | UNPAVED TRENCHING (***** (2, 2") | 2,340 LF | | |
| 0221 | 7300000000-E | 1715 | UNPAVED TRENCHING (***** (3, 2") | 120 LF | | |
| 0222 | 7300000000-E | 1715 | UNPAVED TRENCHING (***** (4, 2") | 70 LF | | |
| 0223 | 7300100000-E | 1715 | UNPAVED TRENCHING FOR TEMP- ORARY LEAD-IN | 370 LF | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|--------------|-----------|--------|
| 0224 | 7301000000-E | 1715 | DIRECTIONAL DRILL (***** (1, 2") | 110 LF | | |
| 0225 | 7301000000-E | 1715 | DIRECTIONAL DRILL (***** (2, 2") | 170 LF | | |
| 0226 | 7324000000-N | 1716 | JUNCTION BOX (STANDARD SIZE) | 59 EA | | |
| 0227 | 7348000000-N | 1716 | JUNCTION BOX (OVER-SIZED, HEAVY DUTY) | 5 EA | | |
| 0228 | 7360000000-N | 1720 | WOOD POLE | 17 EA | | |
| 0229 | 7372000000-N | 1721 | GUY ASSEMBLY | 34 EA | | |
| 0230 | 7396000000-E | 1722 | 1/2" RISER WITH WEATHERHEAD | 13 EA | | |
| 0231 | 7408000000-E | 1722 | 1" RISER WITH WEATHERHEAD | 8 EA | | |
| 0232 | 7420000000-E | 1722 | 2" RISER WITH WEATHERHEAD | 18 EA | | |
| 0233 | 7444000000-E | 1725 | INDUCTIVE LOOP SAWCUT | 10,040 LF | | |
| 0234 | 7456000000-E | 1726 | LEAD-IN CABLE (***** (14-2) | 43,800 LF | | |
| 0235 | 7481000000-N | SP | SITE SURVEY | 5 EA | | |
| 0236 | 7481200000-N | SP | LUMINAIRE ARM FOR VIDEO SYSTEM | 18 EA | | |
| 0237 | 7481240000-N | SP | CAMERA WITHOUT INTERNAL LOOP EMULATOR PROCESSING UNIT | 18 EA | | |
| 0238 | 7481260000-N | SP | EXTERNAL LOOP EMULATOR PROCESSING UNIT | 5 EA | | |
| 0239 | 7481280000-N | SP | RELOCATE CAMERA SENSOR UNIT | 21 EA | | |
| 0241 | 7528000000-E | 1730 | DROP CABLE | 100 LF | | |
| 0242 | 7540000000-N | 1731 | SPLICE ENCLOSURE | 1 EA | | |
| 0243 | 7552000000-N | 1731 | INTERCONNECT CENTER | 1 EA | | |

County : Cumberland

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|-----------|-----------|--------|
| 0244 | 7566000000-N | 1733 | DELINEATOR MARKER | 1 EA | | |
| 0245 | 7575160000-E | 1734 | REMOVE EXISTING COMMUNICATIONS CABLE | 100 LF | | |
| 0246 | 7576000000-N | SP | METAL STRAIN SIGNAL POLE | 10 EA | | |
| 0247 | 7613000000-N | SP | SOIL TEST | 18 EA | | |
| 0248 | 7614100000-E | SP | DRILLED PIER FOUNDATION | 108 CY | | |
| 0249 | 7636000000-N | 1745 | SIGN FOR SIGNALS | 23 EA | | |
| 0250 | 7642200000-N | 1743 | TYPE II PEDESTAL WITH FOUNDATION | 28 EA | | |
| 0251 | 7684000000-N | 1750 | SIGNAL CABINET FOUNDATION | 5 EA | | |
| 0252 | 7696000000-N | 1751 | CONTROLLERS WITH CABINET (*****) (TYPE 2070LX, BASE MOUNTED) | 1 EA | | |
| 0253 | 7696000000-N | 1751 | CONTROLLERS WITH CABINET (*****) (TYPE 2070LX, POLE MOUNTED) | 1 EA | | |
| 0254 | 7744000000-N | 1751 | DETECTOR CARD (TYPE 170) | 61 EA | | |
| 0255 | 7901000000-N | 1753 | CABINET BASE EXTENDER | 1 EA | | |
| 0256 | 7960000000-N | SP | METAL POLE FOUNDATION REMOVAL | 5 EA | | |
| 0257 | 7972000000-N | SP | METAL POLE REMOVAL | 5 EA | | |
| 0258 | 7980000000-N | SP | GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY | 1 EA | | |
| 0259 | 7980000000-N | SP | GENERIC SIGNAL ITEM DMS ELECTRICAL SERVICE | 2 EA | | |
| 0260 | 7980000000-N | SP | GENERIC SIGNAL ITEM DMS STRUCTURE | 1 EA | | |
| 0261 | 7980000000-N | SP | GENERIC SIGNAL ITEM DUAL DMS MOUNTED BACK TO BACK | 1 EA | | |

County : Cumberland

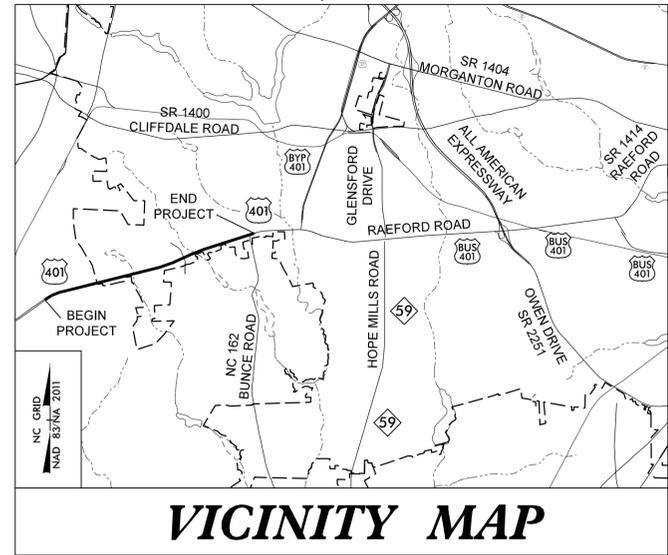
| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--|--------------|-------|---|-------------|-----------|--------|
| 0262 | 7980000000-N | SP | GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT | 1 EA | | |
| 0263 | 7980000000-N | SP | GENERIC SIGNAL ITEM ETHERNET EDGE SWITCH | 1 EA | | |
| 0264 | 7980000000-N | SP | GENERIC SIGNAL ITEM SOIL TEST FOR DMS FOUNDATION | 1 EA | | |
| 0265 | 7992000000-E | SP | GENERIC SIGNAL ITEM DMS FOUNDATION | 15 CY | | |
| 0268 | 5571600000-E | 1515 | 6" TAPPING SLEEVE & VALVE | 11 EA | | |
| 0269 | 5804000000-E | 1530 | ABANDON 12" UTILITY PIPE | 434 LF | | |
| 0270 | 7430000000-N | 1722 | HEAT SHRINK TUBING RETROFIT KIT | 5 EA | | |
| 0271 | 7432000000-E | 1722 | 2" RISER WITH HEAT SHRINK TUBING | 1 EA | | |
| 0272 | 7541000000-N | 1731 | MODIFY SPLICE ENCLOSURE | 5 EA | | |
| 0273 | 7990000000-E | SP | GENERIC SIGNAL ITEM BACK PULL FIBER OPTIC CABLE | 500 LF | | |
| WALL ITEMS | | | | | | |
| 0266 | 8203000000-E | 420 | CLASS A CONCRETE (RETAINING WALL) | 28 CY | | |
| 0267 | 8252000000-E | 425 | REINFORCING STEEL (RETAINING WALL) | 3,002 LB | | |
| 1532/Oct26/Q651156.253/D1209478902000/E270 | | | Total Amount Of Bid For Entire Project : | | | |

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

| | | | |
|-----------------|-----------------------------|-------------|--------------|
| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
| N.C. | U-4405A | 1 | |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |
| 39049.1.FR2 | STPDA-0401(300) | PE | |
| 39049.2.2 | STPDA-0401(300) | RW | |
| 39049.2.4 | STPDA-0401(300) | UTIL | |
| 39049.3.2 | STPDA-0401(300) | CONST | |

TIP PROJECT: U-4405A

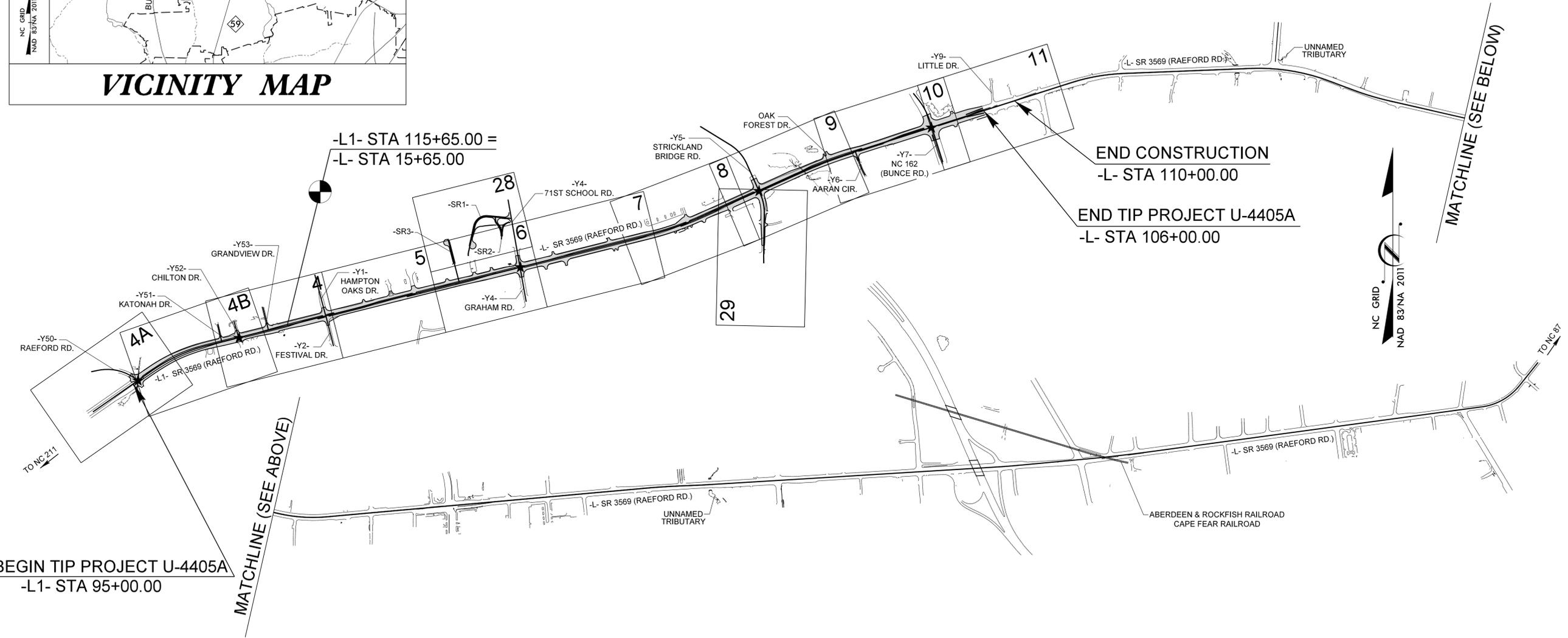


CUMBERLAND COUNTY

LOCATION: US 401 FROM OLD RAEFORD ROAD TO EAST OF NC 162 (BUNCE RD) IN FAYETTEVILLE

TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNALS, AND CULVERT

CONTRACT: C204404



BEGIN TIP PROJECT U-4405A
-L1- STA 95+00.00

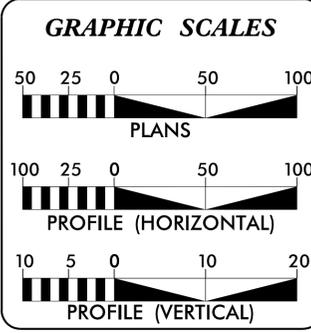
-L1- STA 115+65.00 =
-L- STA 15+65.00

END CONSTRUCTION
-L- STA 110+00.00

END TIP PROJECT U-4405A
-L- STA 106+00.00

★ PROPOSED SIGNAL

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DESIGN DATA

| | |
|--------------------------|------------------------------|
| ADT 2021 = | 64,325 |
| ADT 2041 = | 72,150 |
| K = | 10 % |
| D = | 60 % |
| T = | 3 %* |
| V = | 50 MPH |
| *(TTST = 1% & DUAL = 2%) | |
| FUNC CLASS = | URBAN ARTERIAL REGIONAL TIER |

PROJECT LENGTH

| | |
|--------------------------------------|-------------|
| LENGTH ROADWAY TIP PROJECT U-4405A = | 2.102 MILES |
| TOTAL LENGTH TIP PROJECT U-4405A = | 2.102 MILES |
| NCDOT CONTACT: KHALED ALAKHDAR | |

Prepared In the Office of:

ATKINS 1616 EAST MILLBROOK ROAD, SUITE 160
RALEIGH, NORTH CAROLINA 27609
(919) 876-6888 NCBEES #F-0326

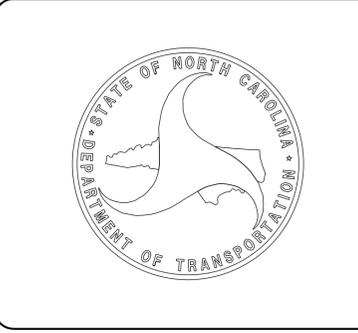
| | |
|------------------------------|---|
| 2018 STANDARD SPECIFICATIONS | |
| RIGHT OF WAY DATE: | CLINTON J. MORGAN, PE PROJECT ENGINEER |
| JULY 29, 2016 | |
| LETTING DATE: | VIRGINIA T. SCHAAR, PE PROJECT DESIGN ENGINEER |
| NOVEMBER 16, 2021 | |

HYDRAULICS ENGINEER

Seal: Frank Fleming, 20147, 10/18/2021, P.E.

ROADWAY DESIGN ENGINEER

Seal: Virginia T. Schaar, 024929, 10/18/2021, P.E.



| | |
|--|------------------------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-3 |
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

UTILITY CONSTRUCTION

GENERAL NOTES:

1. 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 SPECIAL PROVISIONS TO NCDOT SPECIFICATION DIVISION 15.
2. FAYETTEVILLE PWC OWNS AND OPERATES THE EXISTING WATER AND SEWER UTILITIES EXCEPT FOR THE WATER UTILITIES IDENTIFIED AS AQUA AMERICA.
3. ALL WATER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES, PUBLIC WATER SUPPLY SECTION. ALL SEWER LINES TO BE INSTALLED WITHIN COMPLIANCE OF THE RULES AND REGULATIONS OF THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES, WATER QUALITY SECTION. PERFORM ALL WORK IN ACCORDANCE WITH THE APPLICABLE PLUMBING CODES.
4. FAYETTEVILLE PWC OWNS THE EXISTING UTILITY FACILITIES AND WILL OWN THE NEW UTILITY FACILITIES AFTER ACCEPTANCE BY THE DEPARTMENT. THE DEPARTMENT OWNS THE CONSTRUCTION CONTRACT AND HAS ADMINISTRATIVE AUTHORITY. COMMUNICATIONS AND DECISIONS BETWEEN THE CONTRACTOR AND UTILITY OWNER ARE NOT BINDING UPON THE DEPARTMENT OR THIS CONTRACT UNLESS AUTHORIZED BY THE ENGINEER. AGREEMENTS BETWEEN THE UTILITY OWNER AND CONTRACTOR FOR THE WORK THAT IS NOT PART OF THIS CONTRACT OR IS SECONDARY TO THIS CONTRACT ARE ALLOWED, BUT ARE NOT BINDING UPON THE DEPARTMENT.
5. THE CONTRACTOR SHALL PROVIDE ACCESS FOR THE DEPARTMENT PERSONNEL AND THE OWNER'S REPRESENTATIVES TO ALL PHASES OF CONSTRUCTION. NOTIFY DEPARTMENT PERSONNEL AND THE UTILITY OWNER TWO WEEKS PRIOR TO COMMENCEMENT OF ANY WORK AND ONE WEEK PRIOR TO SERVICE INTERRUPTION. KEEP UTILITY OWNERS' REPRESENTATIVES INFORMED OF WORK PROGRESS AND PROVIDE OPPORTUNITY FOR INSPECTION OF CONSTRUCTION AND TESTING.
6. MAKE FINAL CONNECTIONS OF THE NEW WORK TO THE EXISTING SYSTEM WHERE INDICATED ON THE PLANS, AS REQUIRED TO FIT THE ACTUAL CONDITIONS, OR AS DIRECTED.

7. THE PLANS DEPICT THE BEST AVAILABLE INFORMATION FOR THE LOCATION, SIZE, AND TYPE OF MATERIAL FOR ALL EXISTING UTILITIES. MAKE INVESTIGATIONS FOR DETERMINING THE EXACT LOCATION, SIZE, AND TYPE MATERIAL OF THE EXISTING FACILITIES AS NECESSARY FOR THE CONSTRUCTION OF THE PROPOSED UTILITIES AND FOR AVOIDING DAMAGE TO EXISTING FACILITIES. REPAIR ANY DAMAGE INCURRED TO EXISTING FACILITIES TO THE ORIGINAL OR BETTER CONDITION AT NO ADDITIONAL COST TO THE DEPARTMENT.
8. MAKE CONNECTIONS BETWEEN EXISTING AND PROPOSED UTILITIES AT TIMES MOST CONVENIENT TO THE PUBLIC, WITHOUT ENDANGERING THE UTILITY SERVICE, AND IN ACCORDANCE WITH THE UTILITY OWNER'S REQUIREMENTS. MAKE CONNECTIONS ON WEEKENDS, AT NIGHT, AND ON HOLIDAYS IF NECESSARY.
9. ALL UTILITY MATERIALS SHALL BE APPROVED PRIOR TO DELIVERY TO THE PROJECT. SEE 1500-7, " SUBMITTALS AND RECORDS" IN SECTION 1500 OF THE STANDARD SPECIFICATIONS.
10. PRIOR TO PLACEMENT OF PROPOSED SANITARY GRAVITY SEWER THE CONTRACTOR SHALL LOCATE ALL EXISTING SEWER SERVICE LATERALS (DEPTH AND PIPE DIAMETER) AND NOTIFY THE RESIDENT ENGINEER IF THERE ARE COMPLICATIONS WITH CONNECTING TO THE PROPOSED SANITARY GRAVITY SEWER. THE CONTRACTOR'S COST FOR ALL WORK ASSOCIATED WITH SEWER SERVICES, IS INCIDENTAL TO SEWER SERVICE PAYMENT ITEM.
11. PRIOR TO PLACEMENT OF PROPOSED WATERLINE THE CONTRACTOR SHALL LOCATE ALL EXISTING WATER SERVICE LATERALS (DEPTH AND PIPE DIAMETER) AND NOTIFY THE RESIDENT ENGINEER IF THERE ARE COMPLICATIONS WITH CONNECTING TO THE PROPOSED WATERLINE. THE CONTRACTOR'S COST FOR ALL WORK ASSOCIATED WITH WATER SERVICES, IS INCIDENTAL TO WATER SERVICE PAYMENT ITEM.
12. THE CONTRACTOR SHALL REFER TO THE "UTILITIES BY OTHERS" PLANS FOR PROPOSED GAS, TELECOMMUNICATIONS, AQUA AMERICA WATER, AND POWER UTILITY RELOCATIONS.

PROJECT SPECIFIC NOTES:

1. ALL PROPOSED WATER LINE 2" IN DIAMETER SHALL BE SDR21, PRESSURE CLASS 200 IN ACCORDANCE WITH ASTM D 2241 OR SDR-17 WITH A PRESSURE RATING OF 250 PSI, IN ACCORDANCE WITH ASTM D-224. ALL PROPOSED WATER LINE 4"-12" IN DIAMETER SHALL BE DI (DUCTILE IRON PUSH-ON) PC 350 PIPE, UNLESS SPECIFIED TO BE RESTRAINED JOINT PIPE AND/OR SPECIAL THICKNESS CLASS AS SHOWN ON THE PLAN/PROFILE. ALL PROPOSED WATERLINE LINE 16" IN DIAMETER AND LARGER SHALL BE DI (DUCTILE IRON PUSH-ON) PC 250 PIPE, UNLESS SPECIFIED TO BE RESTRAINED JOINT PIPE AND/OR SPECIAL THICKNESS CLASS AS SHOWN ON THE PLAN/PROFILE.
2. ALL PROPOSED GRAVITY SEWER LINES 12" IN DIAMETER AND SMALLER SHALL BE CERAMIC EPOXY LINED DI (DUCTILE IRON PUSH ON) PC 350 PIPE UNLESS OTHERWISE SPECIFIED. ALL PROPOSED GRAVITY SEWER LINES 16" IN DIAMETER AND GREATER SHALL BE CERAMIC EPOXY LINED DI (DUCTILE IRON PUSH ON) PC 250, UNLESS OTHERWISE SPECIFIED.
3. CONTRACTOR'S ATTENTION IS DIRECTED TO SECTIONS 102, 107, AND 1550 OF THE STANDARD SPECIFICATIONS CONCERNING TRENCHLESS INSTALLATION. IT IS CONTRACTOR'S RESPONSIBILITY TO HAVE BORE DESIGNED AND SEALED BY A LICENSED NORTH CAROLINA PROFESSIONAL ENGINEER. NO DAMAGE IS ALLOWED TO RIVER, WETLANDS, OR BUFFER ZONES.
4. IF HDPE PIPE IS INSTALLED BY DIRECTIONAL DRILL. IT SHALL BE FILLED WITH WATER AND NOT BE CONNECTED TO ANY OTHER PIPE OR FITTINGS FOR ONE WEEK FROM THE TIME OF INSTALLATION.
5. ALL CONSTRUCTION TO BE IN ACCORDANCE WITH ALL FAYETTEVILLE PWC AND/OR NCDOT STANDARDS AND SPECIFICATIONS.
6. TEMPORARY SHORING IF REQUIRED FOR BUILDING FOUNDATION PROTECTION OR MAINTENANCE OF TRAFFIC WILL BE PAID AS TEMPORARY SHORING IN SQUARE FEET BELOW GROUND SURFACE. THIS REQUIREMENT IS APPLICABLE TO ALL UTILITY CONSTRUCTION SHEETS.

7. UTILITY CONSTRUCTION NOTE SHEETS PROVIDE SEQUENCE OPTIONS FOR THE CRITICAL INSTALLATIONS AND KILL OUTS OF THE PROPOSED WATER AND SEWER LINES. CONTRACTOR SHALL PROVIDE A CONSTRUCTION SEQUENCE FOR ALL WATER LINE AND SEWER LINE SEGMENTS AND KILLOUTS PRIOR TO INSTALLATION FOR REVIEW AND APPROVAL BY ENGINEER. CONTRACTOR SHALL UPDATE CONSTRUCTION SEQUENCES WHERE ACTUAL CONDITIONS REQUIRE AJDUSTMENTS OR ALTERATIONS TO THE PLANNED WORK. CONSTRUCTION SEQUENCE OPTIONS THAT ARE PROVIDED ARE INTENDED TO MINIMIZE IMPACTS TO WATER AND SEWER OPERATIONS. INSTALLATION SHALL NOT BEGIN UNTIL AN APPROVED SEQUENCE PLAN IS IN PLACE.
8. ALL EXISTING VALVES, AIR RELEASE VALVES, FIRE HYDRANTS AND MANHOLE RING AND COVERS TO BE REMOVED SHALL BE RETURNED TO PWC
9. SEE PROFILE SHEETS FOR REFERENCE TO PIPE MATERIALS AND VALVE TYPES.

UTILITY CONSTRUCTION

*DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED*

REVISIONS
 UTILITY REV.- JULY 23,2008 - REVISED GENERAL NOTES
 9:\c-2021\019 Environmental\Fayetteville Public Works Commission\20150117\008A Reeford Road NCDOT U 4405\CADD\NCDOT PLANS\Utilities\Engineering\UC\ProJ\U4405A_ut_notes_UC03_psh.dgn
 7/14/99

UTILITY CONSTRUCTION

DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED

| PROJECT REFERENCE NO. | SHEET NO. |
|--|------------------------------------|
| U-4405 | UC-3A |
| DESIGNED BY: AMH | |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4751 | UTILITY CONSTRUCTION PLANS ONLY |

UTILITY CONSTRUCTION

UC-6 UTILITY NOTES:

CONSTRUCTION SEQUENCING ON INDIVIDUAL SHEETS IS IMPACTED BY SEQUENCING REQUIREMENTS ON OTHER SHEETS. REVIEW THEM ACCORDINGLY.

UC-4 UTILITY NOTES:

1. INSTALL AND MAKE OPERATIONAL:
 - WL-1 BETWEEN TAP AT -WL-1- STA 0+00 AND VALVE AT APPROX -WL-1- STA. 8+95
 - WL-2
 - WL-3BEFORE INSTALLING ANY OTHER PORTION OF WL-1.
2. PURSUANT TO TRAFFIC CONTROL REQUIREMENTS, CONTRACTOR MUST BE COMPLETE WITH THE PORTION OF WL-1 AND WL-2 AS DEFINED IN NOTE 3 BEFORE BEGINNING INSTALLATION OF WL-3. CONTRACTOR SHALL NOT BE PERFORMING WATER MAIN INSTALLATION LONGITUDINALLY TO THE ROAD ON BOTH SIDES.

FULLY GROUT MIN. 60LF OF 24" EXIST MAIN. PLUG EACH END OF ABANDONED MAIN PER UTILITY OWNER KILLOUT DETAIL W-22.

3. KILL OUT OF PORTION OF 24" EXIST MAIN EAST OF TAPPING SLEEVE SHALL BE COORDINATED WITH 24" MAIN SHUTDOWN FOR LAYING BACK NEW 24" MAIN INTO EXIST ALIGNMENT ON SHEET UC-5.
4. WL-2, WL-3 AND WL-1 BETWEEN TAP AT -WL-1- STA 0+00 AND VALVE AT APPROX -WL-1- STA. 8+95 SHALL BE INSTALLED AND OPERATIONAL BEFORE INSTALLING ANY OTHER PORTION OF WL-1
5. WL-3 TO BE CONNECTED TO EXISTING MAIN UNDER SERVICE INTERRUPTION. ADHERE TO UTILITY OWNER'S PROCEDURES FOR SHUTDOWN. EXISTING VALVES EV-2A AND EV-2B SHALL BE CRITICAL IN ISOLATING CONNECTING POINTS.
6. KILL-OUT OF 24" SIDES OF 24"x24"x8"x8" CROSS TO BE FACILITATED BY SHUTDOWN WHEN KILLING OUT 24" MAIN AT TAPPING SLEEVE FOR WL-1. VALVES TO ISOLATE KILL OUT INCLUDE EV-1, EV-2A, EV-2B, EV-2C, EV-4 AND TAPPING VALVE FOR WL-1.

UC-5 UTILITY NOTES:

1. INSTALL AND MAKE OPERATIONAL:
 - WL-1 BETWEEN TAP AT -WL-1- STA 0+00 AND VALVE AT APPROX -WL-1- STA. 8+95
 - WL-2
 - WL-3BEFORE INSTALLING ANY OTHER PORTION OF WL-1.
2. CONTRACTOR SHALL LAY BACK INTO EXISTING 24" WATER MAIN WITH A MINIMUM OF 20 LF OF RESTRAINED JOINT UNDER PLANNED SERVICE INTERRUPTION.
3. CONTRACTOR SHALL PROVIDE A TEMPORARY RESTRAINED PLUG AND TEMPORARY BLOW OFF ASSEMBLY FOR TESTING AND FLUSHING BEFORE RECONNECTING TO EXISTING 24" MAIN. NO SEPARATE PAYMENT SHALL BE MADE FOR TEMPORARY BLOW-OFF ASSEMBLIES.
4. CONTRACTOR SHALL REMOVE TEMPORARY 24" PLUG AND SLEEVE TO EXISTING 24" WATER MAIN USING MJ x MJ FULL BODY SLEEVE AND RESTRAIN WITH RESTRAINING GLANDS.
5. AFTER SLEEVING OF PROPOSED 24" MAIN TO EXISTING 24" MAIN, CONTRACTOR SHALL ADHERE TO CUT IN CONSTRUCTION REQUIREMENTS WHEN REINSTATING THE 24" MAIN.
6. PURSUANT TO TRAFFIC CONTROL REQUIREMENTS, CONTRACTOR MUST BE COMPLETE WITH THE PORTION OF WL-1 AND WL-2 BEFORE BEGINNING INSTALLATION OF WL-3. CONTRACTOR SHALL NOT BE PERFORMING WATER MAIN INSTALLATION LONGITUDINALLY TO THE ROAD ON BOTH SIDES.
7. WHEN MAKING CONNECTION OF WL-1 TO EXISTING 24" MAIN AND PERFORMING KILL-OUT OF EXISTING 24" MAIN AT TAPPING LOCATION, MAIN SHUTDOWN SHALL BE FACILITATED THROUGH EV-1, EV-2A, EV-2C, EV-4 AND 24" TAPPING VALVE AND NEW IN-LINE VALVE AT STA. 8+95. WL-2 AND WL-3 SHALL BE INSTALLED AND OPERATIONAL PRIOR TO SHUTDOWN FOR WL-1 TO BACKFEED EXISTING SERVICES ON SKATEWAY DRIVE.
8. TRANSFER EXISTING METERS FROM EXISTING 24" MAIN TO WL-5 BEFORE PERFORMING DOWN AND UNDERS ON EXISTING MAIN AND HYDRANT LEG ADJUSTMENTS BETWEEN EV-4 AND EV-8.
9. UTILITY OWNER'S SAMPLING STATION SHALL NOT BE DISTURBED. PROVIDE NEW TAP AND LATERAL TO SAMPLING STATION IF SAMPLING STATION'S 1" SERVICE LATERAL IS IN CONFLICT WITH PROPOSED DRAINAGE. SAMPLING STATION SHALL NOT BE INTERRUPTED DURING ANNUAL BURN OUT, WHICH OCCURS EVERY MARCH. OTHERWISE, SERVICE TO SAMPLING STATION MAY BE INTERRUPTED SHOULD PLANNED SHUTDOWNS IMPACT THIS SERVICE LATERAL.
10. CITY OF FAYETTEVILLE HAS A 1" SERVICE FOR MEDIAN IRRIGATION. PROVIDE NEW TAP AND LATERAL TO RECONNECT 1" IRRIGATION SERVICE IF IT IS IN CONFLICT WITH PROPOSED DRAINAGE. CONTRACTOR SHALL REPLACE ALL DAMAGED IRRIGATION PIPING (INCIDENTAL AND THAT IS IN CONFLICT WITH WORK) AT NO ADDITIONAL COST. EXISTING IRRIGATION PIPING HAS NOT BEEN LOCATED AND IS NOT SHOWN ON SHEET.
11. ALL DOWN AND UNDERS BETWEEN WL-1 AND WL-5 SHALL BE PERFORMED DURING PLANNED OUTAGES. CONTRACTOR SHALL CONFORM TO CUT IN CONSTRUCTION REQUIREMENTS WHEN PERFORMING THIS WORK.
12. TRANSFER EXISTING METERS FROM EXISTING 24" MAIN TO WL-5 BEFORE PERFORMING DOWN AND UNDERS ON EXISTING MAIN AND HYDRANT LEG ADJUSTMENTS BETWEEN EV-4 AND EV-8.

1. INSTALL AND HAVE OPERATIONAL
 - WL-5 BETWEEN TAPPING VALVE AT WL-5 STA 0+00 AND 24"x24"x24" TEE AT WL-5 STA 8+37.33
 - WL-6 BETWEEN WL-5 AND 24" TAPPING VALVE FOR WL-6
 - STUB OUT WL-5 FOR CONNECTION TO EXISTING 24" MAIN
 - STUB OUT WL-7
2. EXISTING METER AND SERVICE WAS NOT LOCATED FOR PARCELS 46, 47, AND 48. CONTRACTOR TO PROVIDE 1" METER SERVICE FOR THOSE PARCELS THAT CURRENTLY ARE SERVED BY UTILITY OWNER. COORDINATE LOCATION WITH UTILITY OWNER'S PROJECT COORDINATOR.

3. PURSUANT TO TRAFFIC CONTROL REQUIREMENTS, CONTRACTOR MUST BE COMPLETED WITH WORK ON WL-5 AS DEFINED IN NOTE 1 (ABOVE) BEFORE BEGINNING INSTALLATION ON WL-6. CONTRACTOR SHALL NOT BE PERFORMING WATER MAIN INSTALLATION LONGITUDINALLY TO THE ROAD ON BOTH SIDES.
4. TRANSFER EXISTING METERS FROM EXISTING 24" MAIN TO WL-5 BEFORE PERFORMING DOWN AND UNDERS ON EXISTING MAIN AND HYDRANT LEG ADJUSTMENTS BETWEEN EV-4 AND EV-8.

5. COORDINATE SHUTDOWN TO PERFORM EXISTING MAIN AND HYDRANT LEG ADJUSTMENTS BETWEEN EV-4 AND EV-8 WITH UTILITY OWNER'S PROJECT COORDINATOR AND KILLING OUT EXISTING MAIN AT TAPPING SLEEVE FOR WL-5 STA 0+00. EXISTING VALVES EV-4, EV-5, EV-8, AND TAPPING SLEEVE FOR WL-5 AT STA 0+00 SHALL FACILITATE SHUTDOWN AND MAINTAIN UNINTERRUPTED SERVICE TO CUSTOMERS.

6. AFTER COMPLETING ALTERATIONS IN NOTE 5 (ABOVE), COMPLETE CONNECTION OF WL-5 TO EXISTING 24" MAIN BY CUTTING IN AND KILLING OUT EXISTING MAIN AT TAPPING SLEEVE FOR WL-6 UNDER PLANNED SHUTDOWN. CONSTRUCTION TIME FOR THIS WORK SHALL BE LIMITED TO WEEKEND AND SHALL NOT BEGIN UNTIL 6:00 P.M. ON FRIDAY. ALL WORK MUST BE COMPLETED AND WATER MAIN BACK IN OPERATION BEFORE 6:00 A.M. MONDAY. EXISTING VALVES EV-4, EV-5, EV-8A AND EV-9 SHALL FACILITATE SHUTDOWN TO MINIMIZE SERVICE INTERRUPTIONS.

7. INSTALL NEW FIRE HYDRANT WITH TAPPING SLEEVE AND VALVE CONNECTION TO THE EXISTING 24" MAIN IN FRONT OF THE PIZZA HUT AND WEST OF THE NEW IN-LINE VALVE PV-1 TO BE INSTALLED.

8. INSTALL NEW IN-LINE VALVE PV-1. UTILIZE VALVES EV-8A AND EV-10 TO FACILITATE SHUTDOWN OF EXISTING 24" MAIN.

9. DURING INSTALLATION OF WL-5, CONTRACTOR SHALL REMOVE AND REPLACE 48 LF OF RCP AS SHOWN ON PLANS UNLESS ACTUAL CONDITIONS DIFFER. OR WORK CAN BE PERFORMED SO AS NOT TO INTERFERE WITH EXISTING DRAINAGE.

10. COMPLETE CONNECTION OF WL-5 TO EXISTING 24" MAIN FROM STUB OUT TO MAIN UTILIZING VALVE PV-1.

UC-7 UTILITY NOTES

1. WL-8 SHALL BE BUILT OUT FROM TAPPING SLEEVE AND VALVE (SEE SHEET UC-8) TO TIE INTO EXISTING 24" MAIN ON THIS SHEET.
2. SEE UTILITY NOTES ON SHEET UC-8 FOR SPECIAL SEQUENCING OF INSTALLATION AND CUT IN REQUIREMENTS FOR WL-8, WL-10, AND 24" MAIN ABANDONMENT.
3. LAY BACK MINIMUM OF ONE FULL RESTRAINED JOINT WHEN SLEEVING INTO EXISTING MAIN.

UC-8 UTILITY NOTES:

1. INSTALL AND HAVE OPERATIONAL
 - WL-8 BETWEEN TAPPING SLEEVE AND VALVE AT APPROX. WL-8 STA 17+00 AND NEW 24" VALVE AT APPROX WL-8 STA 1+10
 - WL-10 BETWEEN TAPPING SLEEVE AND VALVE AT APPROX STA 25+50 ND VALVE AT APPROX WL-10 STA 1+00
 - WL-12
 - TEMPORARY LOOP FROM WL-12 TO EXISTING 12" MAIN
 - WL-11 TO VALVE AT APPROX STA 0+30
 - BURY TEMPORARY MAIN PARALLEL TO WL-8
2. THE PORTION OF WL-8 WITHIN RAEFORD ROAD (BETWEEN APPROX. WL-8- STA 12+00 AND APPROX. WL-8- STA 17+00) SHALL BE INSTALLED DURING WEEKNIGHT TIMES TO FACILITATE MAXIMUM OF TWO LANES OF CLOSURE. WORK EACH NIGHT SHALL NOT BEGIN BEFORE 7:00 P.M. ALL WORK UTILIZING THE SECOND LANE OF CLOSURE SHALL BE COMPLETED BEFORE 6:00 A.M.
3. INSTALL TEMPORARY WATER LINE FROM FIRE HYDRANT AT PIZZA HUT TO LAFAYETTE PARK APTS.
4. FULLY GROUT MIN. 60 LF OF 24" EXIST. MAIN. PLUG EACH END OF ABANDONED MAIN PER KILLOUT DETAIL W-22.
5. KILL OUT OF LINE SIDE OF TAPPING SLEEVE SHALL BE COORDINATED WITH 24" MAIN SHUTDOWN FOR LAYING BACK NEW 24" MAIN INTO EXISTING ALIGNMENT (SEE SHEET UC-7 FOR WL-8 AND UC-8 FOR WL-10).
6. INSTALL WL-8 AND WL-10 AND HAVE EACH SEGMENT OPERATIONAL TO LAST IN LINE VALVE ON EACH SEGMENT (BETWEEN WL-8- STA 1+10 AND APPROX. WL-8- STA 17+10 AND BETWEEN APPROX. WL-10- STA 1+00 AND WL-10- STA 25+50). ALL EXISTING METERS THAT OVERLAP THESE RELOCATION SEGMENTS SHALL BE TRANSFERRED TO THESE NEW SEGMENTS. ALL CROSS-LINES FOR WL-10 SHALL BE FULLY RESTRAINED THROUGH BRANCH VALVES. ARRAN CIRCLE AND STRICKLAND BRIDGE ROAD (WL-11 AND WL-12) RECONNECTION SHALL BE COMPLETED AND OPERATIONAL CONCURRENT WITH WL-10 INSTALLATION. EXISTING BRANCH VALVES FOR ARRAN CIRCLE AND STRICKLAND BRIDGE ROAD SHALL BE PERMANENTLY CLOSED AND PROPERLY ABANDONED. SEE UC-9 UTILITY NOTES FOR ADDITIONAL SEQUENCING PROVISIONS FOR UC-12 THAT SHALL BE PERFORMED BEFORE SHUTDOWN FOR WL-8 AND WL-

UC-8 UTILITY NOTES:

7. PRIOR TO TAPPING THE EXISTING 24" WATER MAIN, CONTRACTOR SHALL INSTALL SPLIT RING BELL HARNESSES ON EXISTING PIPE EQUIVALENT TO 3 FULL JOINT LENGTHS. MJ x MJ FULL BODY SOLID TAPPING SLEEVE WITH RESTRAINING GLANDS SHALL BE PLUGGED AND RESTRAINED ON LINE SIDE. NO SEPARATE PAYMENT SHALL BE MADE FOR PIPE HARNESSSES.

| Shoring Location No. | Begin Station & Offset | End Station & Offset | Estimated Average Height (ft) | Estimated Maximum Height (ft) | Shoring Location Type | Square Footage (ft ²) | Trench Length (ft) |
|----------------------|---------------------------|---------------------------|-------------------------------|-------------------------------|---|-----------------------------------|--------------------|
| No. 1 | 67+17.82 -L, 43.94' Right | 67+66.02 -L, 37.17' Right | 6.5 | 10.81 | Roadway (Longitudinal Trench) | 715 | 50 |
| No. 2 | 76+01.08 -L, 182.28' Left | 76+10.56 -L, 181.02' Left | 9.55 | 9.71 | Roadway Shoulder (Perpendicular Box (Receiving) Within Roadway) | 286.5 | 10 |
| No. 3 | 98.92.49 -L, 221.06' Left | 99+11.68 -L, 226.64' Left | 6.75 | 6.75 | | 270 | 10 |

8. BURY TEMPORARY MAINS AT ALL DRIVEWAY CROSSINGS TO MAINTAIN INGRESS/EGRESS FOR THESE PARCELS.

9. RECONNECT WL-8 AND WL-10 TO EXISTING MAIN UNDER SERVICE INTERRUPTION. ADHERE TO UTILITY OWNER'S PROCEDURES FOR SHUTDOWN. UTILIZE VALVES PV-1 AND EV-10 FOR RECONNECTION OF WL-8. UTILIZE VALVES EV-12A, EV-13, EV-12, EV-10 AND THE WL-8 TSV TO COMPLETE THE RECONNECT OF WL-10. INSTALL PERMANENT SERVICE CONNECTION TO LAFAYETTE PARK APTS WATER LINE WHEN WL-8 IS RECONNECTED.

10. KILL-OUT OF 24" TAPPING SLEEVE (LINE SIDE OF 24"x24"x24") FOR WL-8 AND WL-10 TO BE FACILITATED UNDER SAME SHUTDOWN. AFTER COMPLETION OF KILLOUTS AND CUT IN CONSTRUCTION, RESUME OPERATION OF EXISTING 24" WATER MAIN BY OPENING PV-1, EV-20, EV-20A AND EV-22 AND COMPLETE ABANDONMENT OF 24" ADJACENT TO WL-8 AND WL-10

11. EXISTING 24" WATER MAIN IS RESTRAINED AT DESIGNATED LOCATION OF CUT IN FOR WL-10. WL-10 CAN BE SLEEVED IN WITH FULL BODY SLEEVE AND RESTRAINING GLANDS WITHOUT LAYING BACK ONE FULL JOINT INTO EXISTING SYSTEM UNLESS ACTUAL CONDITIONS DIFFER.

12. ABNDON/REMOVE TEMPORARY WATER LINE TO LAFAYETTE PARK APTS.

UC-9 UTILITY NOTES:

1. ADHERE TO SPECIAL PROVISIONS OF OPEN CUTTING EXISTING PAVEMENT.
2. EXISTING IN LINE VALVE TO FACILITATE SHUTDOWN FOR RECONENCTION OF THE EXISTING WATER MAIN IN OAK FOREST DR IS APPROXIMATELY 325 LF FROM PROPOSED RECONNECTION POINT.
3. FULLY GROUT MIN. 60 LF OF 12" EXIST. MAIN. PLUG EACH END OF ABANDONED MAIN PER KILLOUT DETAIL W-22.
4. KILL OUT OF LINE SIDE OF TAPPING SLEEVE FOR WL-13 SHALL BE COORDINATED WITH 12" MAIN SHUTDOWN.
5. INSTALL WL-12 AND HAVE OPERATIONAL PRIOR TO PLANNED SHUTDOWN FOR CONNECTION OF WL-10 BACK TO EXISTING 24" MAIN. WL-12 SHALL BE CONNECTED AS SHOWN TO EXISTING 12" MAIN TO MAINTAIN OPERATION AND TO FACILITATE KILL OUT OF EXISTING 12" MAIN CROSSING OF RAEFORD ROAD.
6. UTILIZE EV-12 AND NEXT EXSITING IN-LINE VALVE TO THE SOUTH TO CONNECT WL-11 TO EXISTING 16" MAIN.
7. 12"x12"x12" TAPPING SLEEVE AND VALVE AND SHORT LOOP BETWEEN EXISTING 12" MAIN AND WL-13 SHALL BE INSTALLED TO MAINTAIN OPERATION UNTIL WL-13 IS INSTALLED AND OPERATIONAL. THIS SHORT LOOP SHALL BE ABANDONED AFTER WL-13 IS IN OPERATION.
8. KILL OUT OF PORTION OF EXISTING 12" MAIN THAT FEEDS STRICKLAND BRIDGE ROAD (NORTH) AND NORTH SIDE OF RAEFORD ROAD SHALL BE FACILITATED BY EV-13, EV-14 AND EV-15.
9. PURSUANT TO TRAFFIC CONTROL REQUIREMENTS, NO WORK ON THE SOUTH SIDE SHALL BE IN PROGRESS WHILE INSTALLING WL-12 AND CONNECTING IT TO THE EXISTING 12" MAIN ON STRICKLAND BRIDGE ROAD. CONTRACTOR SHALL NOT BE PERFORMING WATER MAIN INSTALLATION LONGITUDINALLY TO THE ROAD ON BOTH SIDES.

UC-9A UTILITY NOTES

1. CONTRACTOR SHALL VERIFY EXISTING SEWER SERVICE LOCATION AND DEPTH PRIOR TO ORDERING MATERIALS.
2. CONTRACTOR SHALL COORDINATE WITH UTILITY OWNER'S PROJECT COORDINATOR TO DETERMINE IF PARCEL 87 IS CONNECTED TO EXISTING SEWER. IF CONNECTED, CONTRACTOR SHALL DETERMINE LOCATION AND DEPTH PRIOR TO ORDERING MATERIALS.

REVISIONS

UTILITY REV. - JULY 23, 2008 - REVISED ALL CONSTRUCTION NOTES

9:\00T-2021\049 - Municipal\Fayetteville Public Works Commission\20150117\00RA - Raeford Road NCDOT U 4405\CADD\NCDOT PLANS\Utilities\Engineering\UC\Proc\U4405A_ut_noties_UC03a_psh.dgn 7/14/09

| | |
|--|---------------------------------|
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL UNTIL ALL SIGNATURES ARE COMPLETED

- CONTRACTOR SHALL REPAIR ALL WATER LATERALS AND MAINS DAMAGED DURING CONSTRUCTION. THE CONTRACTOR SHALL REPORT IMMEDIATELY ALL WATER MAIN AND LATERAL BREAKS TO THE FAYETTEVILLE PROJECT COORDINATOR. THE CONTRACTOR SHALL INITIATE IMMEDIATE REPAIRS IN ACCORDANCE WITH FAYPWC STANDARDS. CONTRACTOR SHALL NOT OPERATE FAYPWC WATER MAIN VALVES WITHOUT FAYPWC APPROVAL AND SHALL COORDINATE ALL VALVE CLOSINGS WITH FAYPWC.
- THE CONTRACTOR SHALL NOT USE HOUSE HOSE BIBBS OR ANY OTHER METHOD OF BLOW OFF WHICH ALLOWS DOMESTIC WATER CONTAINING SEDIMENTS OR HIGH LEVELS OF CHLORINE TO PASS THRU RESIDENT'S METERS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGES RESULTING FROM ALLOWING "DIRTY" WATER TO ENTER RESIDENT'S PLUMBING SYSTEM, SUCH AS WATER HEATERS, STAINED CLOTHING, CLOGGED SCREENS, ETC.
- WATER MAINS AND LATERALS SHALL BE INSTALLED UTILIZING A FAYPWC APPROVED CUT-SHEET INDICATING INSTALLATION DEPTH.
- TRANSFER OF WATER SERVICES SHALL BE ACCOMPLISHED AS FOLLOWS:
 - INSTALL, TEST AND STERILIZE NEW MAIN AND LATERALS. LATERALS SHALL BE INSTALLED 18" INSIDE RIGHT-OF-WAY UNLESS OTHERWISE DIRECTED BY FAYPWC.
 - TRANSFER EXISTING METER TO NEW WATER LATERAL. THE EXISTING METER SHALL BE INSTALLED ON SAME ADDRESS AND/OR CUSTOMER. BLOW OFF SERVICE AT HOSE BIBB ON HOUSE ONLY AFTER METER HAS BEEN TRANSFERRED.
 - AFTER ALL SERVICES ARE TRANSFERRED TO THE NEW SYSTEM, SHUT OFF VALVE ON EXISTING SYSTEM AND ABANDON EXISTING MAINS IN ACCORDANCE WITH FAYPWC DETAILS.
 - CONTRACTOR SHALL SUPPLY NEW METER BOXES AND DISPOSE OF EXISTING METER BOXES.
- WHEN MAIN IS NOT TO BE ABANDONED, CONTRACTOR SHALL UNCOVER OLD CORPORATION AT MAIN, CLOSE AND PLUG CORPORATION TO ABANDON OLD SERVICE.
- CONTRACTOR SHALL ABANDON ("KILL-OUT") ANY EXISTING WATER SERVICES THAT WILL NOT BE UTILIZED BY CUTTING THE SERVICE AT THE MAIN, PLUGGING THE CORPORATION, AND TURNING OFF THE CORPORATION. AT THE METER BOX, THE ABANDONED SERVICE IS TO BE CUT OR CRIMPED, AND BURIED A MINIMUM OF 3 FEET BELOW GRADE.
- ALL EXISTING UTILITIES IMPACTED BY CONSTRUCTION SHALL BE ADJUSTED TO FINISHED GRADE, IN ACCORDANCE WITH FAYPWC REQUIREMENTS.
- ALL WORK ON FAYPWC WATER UTILITIES (MAINS, LATERALS, ETC.) SHALL BE PERFORMED BY A LICENSED UTILITY CONTRACTOR. THE FAYETTEVILLE PUBLIC WORKS COMMISSION SHALL OBSERVE AND APPROVE ALL WORK ON FAYPWC WATER UTILITIES. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH FAYPWC REQUIREMENTS.
- SEPARATION REQUIREMENTS:
 - LATERAL SEPARATION OF SEWERS AND WATER MAINS:** WATER MAINS SHALL BE LAID AT LEAST 10 FEET LATERALLY FROM EXISTING OR PROPOSED SEWER MAINLATERAL, UNLESS LOCAL CONDITIONS OR BARRIERS PREVENT A 10-FOOT LATERAL SEPARATION - IN WHICH CASE:
 - THE WATER MAIN IS LAID IN A SEPARATE TRENCH, WITH THE ELEVATION OF THE BOTTOM OF THE WATER MAIN AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER MAINLATERAL; OR
 - THE WATER MAIN IS LAID IN THE SAME TRENCH AS THE SEWER MAINLATERAL WITH THE WATER MAIN LOCATED AT ONE SIDE ON A BENCH OF UNDISTURBED EARTH AND WITH THE ELEVATION OF THE BOTTOM OF THE WATER MAIN AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER MAINLATERAL.
 - CROSSING A WATER MAIN OVER A SEWER:** WHENEVER IT IS NECESSARY FOR A WATER MAIN TO CROSS OVER A SEWER MAINLATERAL, THE WATER MAIN SHALL BE LAID AT SUCH AN ELEVATION THAT THE BOTTOM OF THE WATER MAIN IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER MAINLATERAL, UNLESS LOCAL CONDITIONS OR BARRIERS PREVENT AN 18 INCH VERTICAL SEPARATION - IN WHICH CASE BOTH THE WATER MAIN AND SEWER MAINLATERAL SHALL BE DUCTILE IRON IN ACCORDANCE WITH FAYPWC REQUIREMENTS.
 - CROSSING WATER MAIN UNDER A SEWER:** WHENEVER IT IS NECESSARY FOR A WATER MAIN TO CROSS UNDER A SEWER MAINLATERAL, BOTH THE WATER MAIN AND THE SEWER MAINLATERAL SHALL BE DUCTILE IRON IN ACCORDANCE WITH FAYPWC REQUIREMENTS. A FULL JOINT OF DUCTILE IRON PIPE SHALL BE INSTALLED ON THE WATER MAIN CENTERED AT THE POINT OF CROSSING.
 - CROSSING STORM DRAINAGE LINES:** A MINIMUM OF 12 INCHES OF VERTICAL CLEARANCE SHALL BE MAINTAINED BETWEEN A WATER LINE CROSSING OVER A STORM DRAINAGE LINE UNLESS DUCTILE IRON PIPE IS USED. IN ADDITION, THREE AND A HALF (3.5) FEET OF COVER MUST BE MAINTAINED OVER THE WATER MAIN OR IT SHALL BE DUCTILE IRON. IF DUCTILE IRON PIPE IS USED THEN TWO AND A HALF (2.5) FEET OF COVER MUST BE MAINTAINED OVER THE WATER MAIN AND A MINIMUM OF 4 INCHES OF VERTICAL CLEARANCE SHALL BE MAINTAINED BETWEEN THE WATER MAIN AND THE STORM DRAINAGE LINE. WHERE A WATER MAIN CROSSES UNDER A STORM DRAINAGE LINE THE MINIMUM OF TWELVE (12) INCHES OF VERTICAL SEPARATION SHALL BE MAINTAINED AND THE WATER MAIN SHALL BE DUCTILE IRON FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE CROSSING.

- WATER OUTAGES:** THE CONTRACTOR SHALL SCHEDULE A COORDINATION MEETING WITH THE FAYPWC PROJECT COORDINATOR AND PROJECT ENGINEER A MINIMUM OF THREE (3) WORKING DAYS PRIOR TO ANY PLANNED WATER OUTAGE. THE COORDINATION MEETING SHALL BE CONDUCTED PRIOR TO ANY NOTICES BEING ISSUED. ADDITIONALLY, THE CONTRACTOR SHALL LOCATE (VERTICALLY AND HORIZONTALLY) ANY UTILITIES WITHIN THE WORK AREA, IN ACCORDANCE WITH THESE CONTRACT DOCUMENTS. THE LOCATIONS OF ALL UTILITIES WITHIN THE WORK AREA SHALL BE DETERMINED PRIOR TO THE COORDINATION MEETING. ANY CONFLICTS WITH THE PENDING WORK AND THE EXISTING UTILITIES SHALL BE IDENTIFIED AND A PLAN FOR RESOLVING ANY CONFLICTS SHALL BE PRESENTED. THE PURPOSE OF THIS COORDINATION MEETING IS TO ENSURE THAT THE CONTRACTOR HAS A GOOD UNDERSTANDING OF THE REQUIREMENTS RELATED TO THE PENDING OUTAGE, VERIFY THAT THERE ARE NO UTILITY CONFLICTS THAT WILL PREVENT THE WORK FROM BEING COMPLETED, ALL EQUIPMENT IS IN GOOD WORKING ORDER, ALL EQUIPMENT IS FUNCTIONAL, ALL MATERIALS ARE ON SITE, ALL NECESSARY TOOLS ARE ON SITE, DISCUSS ANY NECESSARY CONTINGENCY PLANS, AND ANY OTHER ITEMS NECESSARY TO ENSURE THAT THE FAYETTEVILLE PUBLIC WORKS COMMISSION HAS CONFIDENCE THAT THE WORK CAN BE ACCOMPLISHED WITHIN THE GIVEN TIME PERIOD. SHOULD, FOR ANY REASON, THE FAYETTEVILLE PUBLIC WORKS COMMISSION DEEM THAT THE CONTRACTOR IS NOT PREPARED FOR THE PROPOSED OUTAGE, THE OUTAGE NOTIFICATIONS WILL NOT BE DISTRIBUTED AND THE OUTAGE SHALL BE POSTPONED A MINIMUM OF TWO (2) WEEKS. THE FAYETTEVILLE PUBLIC WORKS COMMISSION WILL PROVIDE WRITTEN NOTIFICATION TO THE CONTRACTOR OF THIS DECISION. NO ADDITIONAL CONTRACT TIME WILL BE GRANTED FOR THIS DELAY.

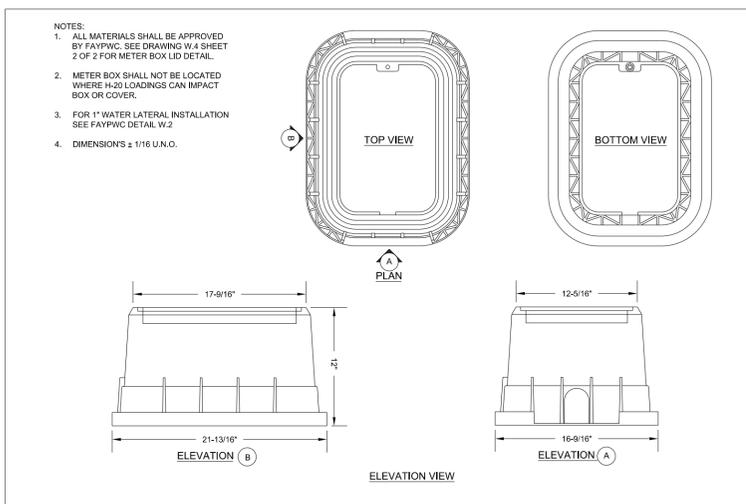
ONCE THE WATER OUTAGE NOTIFICATIONS HAVE BEEN ISSUED, A FOLLOW-UP COORDINATION MEETING WITH THE FAYPWC PROJECT COORDINATOR AND PROJECT ENGINEER SHALL BE HELD A MINIMUM OF 24 HOURS PRIOR TO THE SCHEDULED OUTAGE. THE PURPOSE OF THIS MEETING IS TO VERIFY THAT THE CONTRACTOR IS PREPARED TO PROCEED WITH THE OUTAGE, AND THAT ALL EQUIPMENT, MATERIALS, TOOLS, AND ALL OTHER INCIDENTALS ARE ON THE PROJECT SITE AND FUNCTIONING. IF FOR ANY REASON THE FAYETTEVILLE PUBLIC WORKS COMMISSION DEEMS THAT THE CONTRACTOR IS NOT PREPARED TO PROCEED AND ALL CUSTOMERS IMMEDIATELY NOTIFIED OF THE CANCELLATION, THE OUTAGE SHALL BE POSTPONED A MINIMUM OF TWO (2) WEEKS. NO ADDITIONAL CONTRACT TIME WILL BE GRANTED FOR THIS DELAY.

THE CONTRACTOR SHALL COMPLETE THE REQUIRED WORK AND RESTORE WATER SERVICE WITHIN THE GIVEN TIME PERIOD FOR THE OUTAGE. IF THE FAYPWC PROJECT COORDINATOR DETERMINES THAT THE CONTRACTOR WILL NOT RESTORE WATER SERVICE WITHIN THE APPROVED TIMEFRAME, THE FAYPWC PROJECT COORDINATOR WILL DIRECT THE CONTRACTOR ON HOW TO RESTORE WATER SERVICE. THE CONTRACTOR SHALL ADHERE TO ALL INSTRUCTIONS GIVEN BY THE FAYPWC PROJECT COORDINATOR.

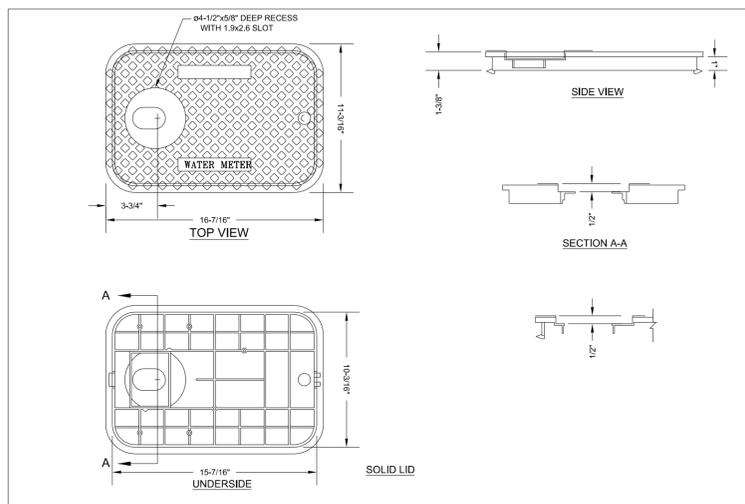
SHOULD THE CONTRACTOR FAIL TO COMPLETE THE WORK WITHIN THE ALLOTTED TIME, THE FAYETTEVILLE PUBLIC WORKS COMMISSION SHALL ASSESS A PENALTY OF \$500 PER 15-MINUTE INTERVAL OR ANY PORTION THEREOF UNTIL WATER SERVICE IS RESTORED. THIS PENALTY WILL BE DEDUCTED FROM THE CONTRACTOR'S PAY APPLICATION OR BILLED DIRECTLY TO THE CONTRACTOR. THE PENALTY MAY BE WAIVED FOR CIRCUMSTANCES BEYOND THE CONTRACTOR'S CONTROL, AS DEEMED BY THE FAYETTEVILLE PUBLIC WORKS COMMISSION. THE FAYPWC PROJECT COORDINATOR AND/OR PROJECT ENGINEER RESERVE THE RIGHT TO CANCEL OR POSTPONE THE OUTAGE AT ANY GIVEN TIME, IF DEEMED NECESSARY.

| WATER UTILITY NOTES | | | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | | | | | | | | | | |
|--|--------------|--------------------------------|---------------------|---|--|-----|------|----------|---|-------|--------------------------------|---|----------|--------------|---|----------|------------------|
| SHEET NO. 1 OF 2 | DWG. NO. W.1 | DWG. BY: FAYPWC | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | WATER RESOURCES ENGINEERING DEPARTMENT | | | | | | | | | | | | |
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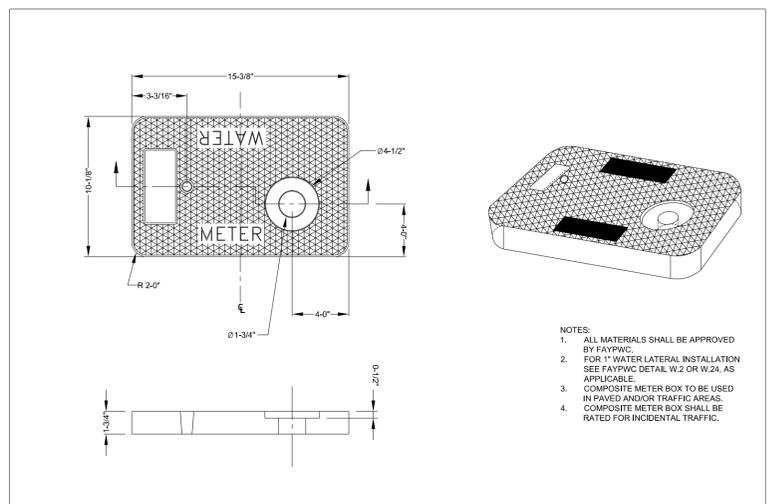
| WATER UTILITY NOTES | | | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | | | | | | | | | | |
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| SHEET NO. 2 OF 2 | DWG. NO. W.1 | DWG. BY: FAYPWC | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | WATER RESOURCES ENGINEERING DEPARTMENT | | | | | | | | | | | | |
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| 2 | 07/01/16 | ADDED NOTE 6 | | | | | | | | | | | | | | | |
| 3 | 01/01/18 | ADDED NOTES 6, 8 | | | | | | | | | | | | | | | |



| 1-INCH METER BOX DETAILS | | | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | | | | |
|--|--------------|------------------------|---------------------|---|--|-----|------|----------|---|-------|------------------------|
| N.T.S. | | | | | | | | | | | |
| SHEET NO. 1 OF 2 | DWG. NO. W.4 | DWG. BY: FAYPWC | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | WATER RESOURCES ENGINEERING DEPARTMENT | | | | | | |
| <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>03/10</td> <td>CHANGED BOX DIMENSIONS</td> </tr> </tbody> </table> | | | | | | NO. | DATE | REVISION | 1 | 03/10 | CHANGED BOX DIMENSIONS |
| NO. | DATE | REVISION | | | | | | | | | |
| 1 | 03/10 | CHANGED BOX DIMENSIONS | | | | | | | | | |



| 1-INCH METER BOX LID | | | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | | | | | | | | | | |
|--|--------------|--------------------------------|---------------------|---|--|-----|------|----------|---|-------|-------------|---|-------|--------------------------------|---|-------|-------------|
| N.T.S. | | | | | | | | | | | | | | | | | |
| SHEET NO. 2 OF 2 | DWG. NO. W.4 | DWG. BY: FAYPWC | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | WATER RESOURCES ENGINEERING DEPARTMENT | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>07/07</td> <td>REVISED LID</td> </tr> <tr> <td>1</td> <td>03/10</td> <td>CHANGED BOX AND LID DIMENSIONS</td> </tr> <tr> <td>2</td> <td>01/15</td> <td>REVISED LID</td> </tr> </tbody> </table> | | | | | | NO. | DATE | REVISION | 1 | 07/07 | REVISED LID | 1 | 03/10 | CHANGED BOX AND LID DIMENSIONS | 2 | 01/15 | REVISED LID |
| NO. | DATE | REVISION | | | | | | | | | | | | | | | |
| 1 | 07/07 | REVISED LID | | | | | | | | | | | | | | | |
| 1 | 03/10 | CHANGED BOX AND LID DIMENSIONS | | | | | | | | | | | | | | | |
| 2 | 01/15 | REVISED LID | | | | | | | | | | | | | | | |

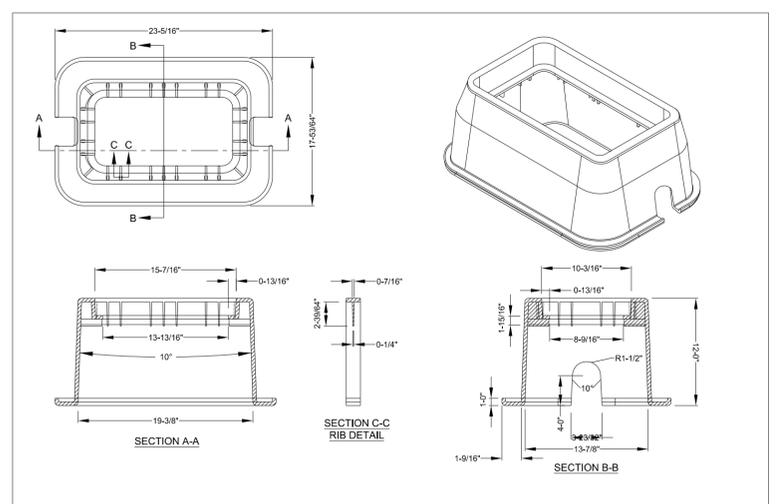


| 1-INCH COMPOSITE METER BOX & COVER | | | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | | | | | | | |
|--|---------------|---------------------------------|---------------------|---|----------------------------|-----|------|----------|---|-------|------------------------------|---|-------|---------------------------------|
| N.T.S. | | | | | | | | | | | | | | |
| SHEET NO. 1 OF 2 | DWG. NO. W.4B | DWG. BY: FAYPWC | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | WATER RESOURCES DEPARTMENT | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>NO.</th> <th>DATE</th> <th>REVISION</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>03/10</td> <td>CHANGED BOX & LID DIMENSIONS</td> </tr> <tr> <td>2</td> <td>12/15</td> <td>REPLACED CI BOX w/COMPOSITE BOX</td> </tr> </tbody> </table> | | | | | | NO. | DATE | REVISION | 1 | 03/10 | CHANGED BOX & LID DIMENSIONS | 2 | 12/15 | REPLACED CI BOX w/COMPOSITE BOX |
| NO. | DATE | REVISION | | | | | | | | | | | | |
| 1 | 03/10 | CHANGED BOX & LID DIMENSIONS | | | | | | | | | | | | |
| 2 | 12/15 | REPLACED CI BOX w/COMPOSITE BOX | | | | | | | | | | | | |

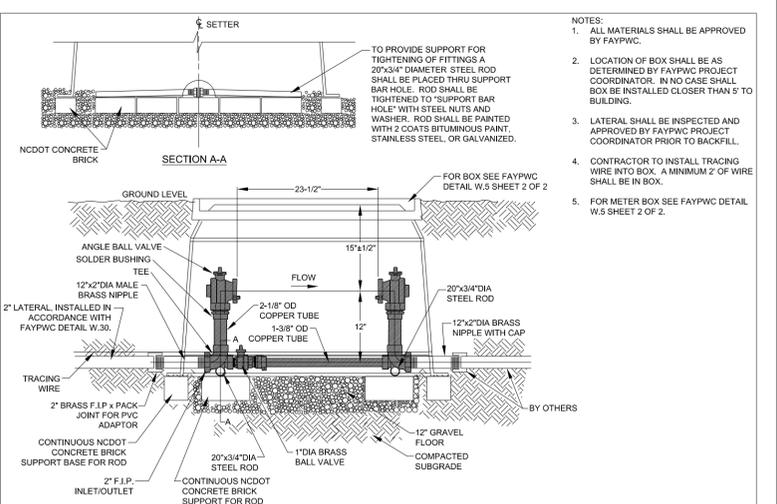
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 UTILITY REV. - JULY 24, 2018 - REVISIONS TO DETAIL SHEETS

| | | | |
|--|--------|---------------------------------|--------|
| PROJECT REFERENCE NO. | U-4405 | SHEET NO. | UC-03D |
| DESIGNED BY: | AMH | DRAWN BY: | AMH/AB |
| CHECKED BY: | AMH | APPROVED BY: | BRO |
| REVISED: | | | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | | UTILITY CONSTRUCTION PLANS ONLY | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | | | |

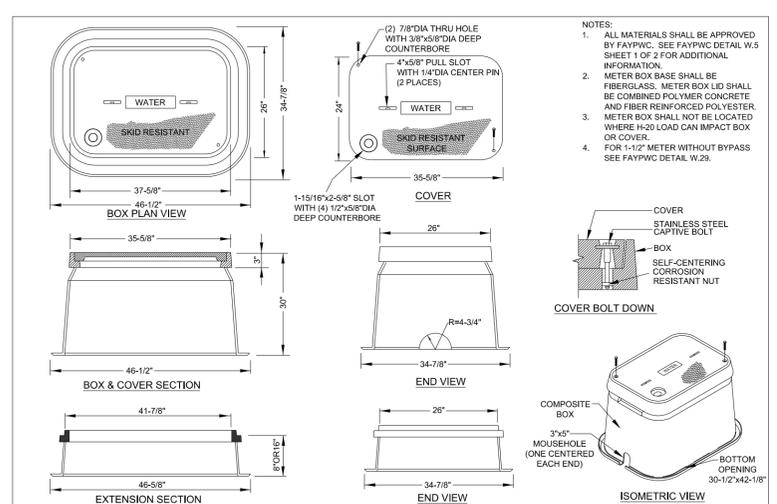
UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED



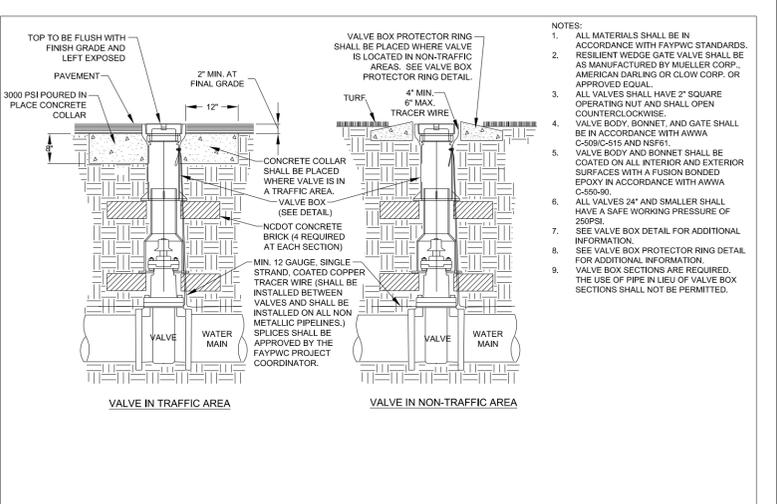
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|---|---------------|---|----------|------------|--|
| 1-INCH COMPOSITE METER BOX & COVER N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 12/15 | REPLACED CI BOX WITH COMPOSITE BOX | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 2 OF 2 | W.4B | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



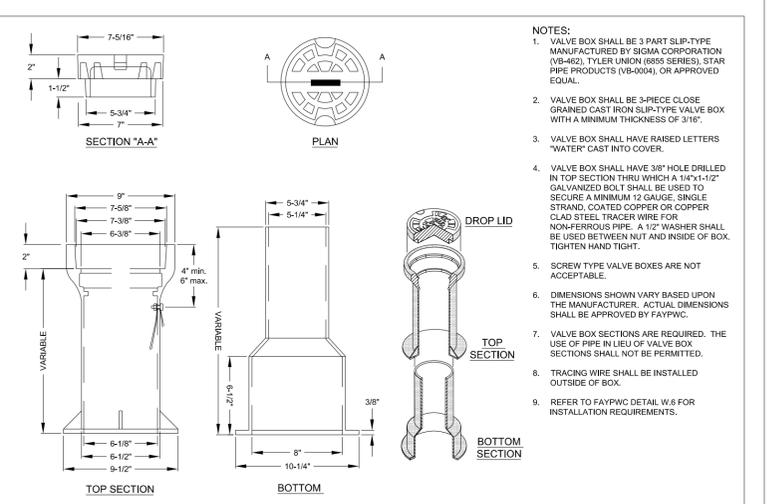
| | | | | | |
|---|---------------|---|----------|------------|--|
| 2" COPPER SETTER WITH BY-PASS 23-1/2" METER SPACING | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 07/13 | REVISED, UPDATED NOTES | | | |
| 2 | 07/17 | UPDATED NOTES | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 2 | W.5 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



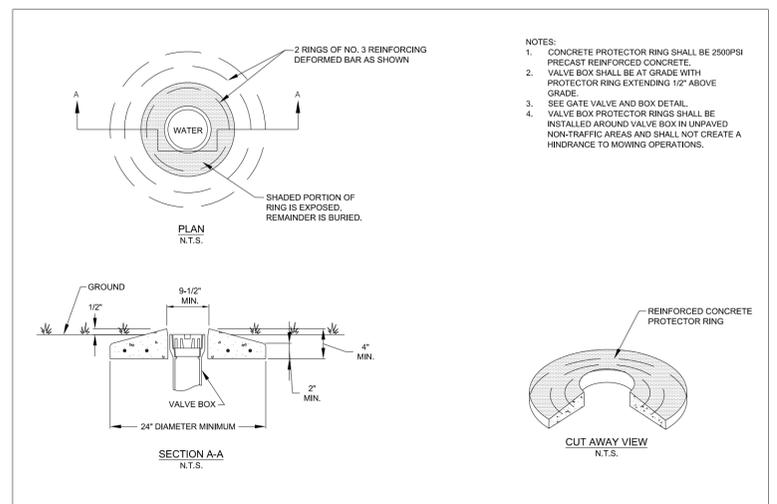
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|--|---------------|---|----------|------------|--|
| 1-1/2" AND 2" BY-PASS METER BOX N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 12/15 | REVISED LID | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 2 OF 2 | W.5 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



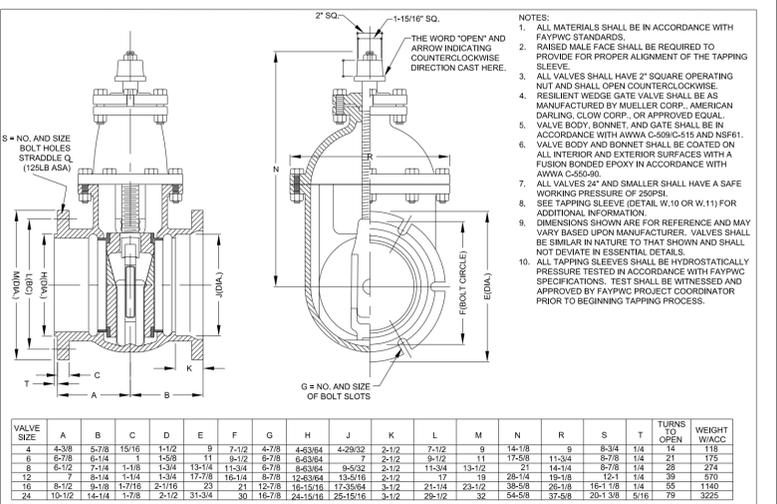
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|-----------------------------|---------------|---|----------|------------|--|
| GATE VALVE N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 6/06 | ADDED NOTE NO. 9 | | | |
| 2 | 7/09 | CLARIFIED NOTES | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 1 | W.6 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



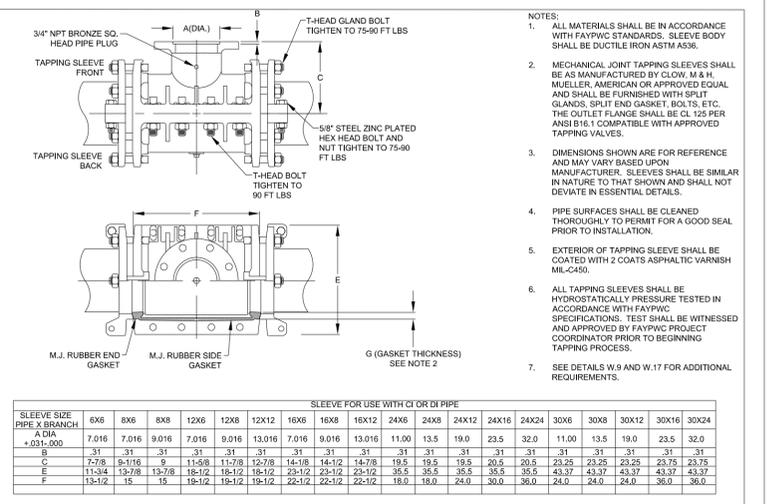
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|----------------------------|---------------|---|----------|------------|--|
| VALVE BOX N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 07/09 | ADDED NOTES 7, 8, AND CLARIFIED NOTES | | | |
| 2 | 01/14 | REVISED NOTES 1, 4, 6 | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 1 | W.7 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



| | | | | | |
|---|---------------|---|----------|------------|--|
| VALVE BOX PROTECTOR RING N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 1 | W.8 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



| | | | | | |
|--------------------------------|---------------|---|----------|------------|--|
| TAPPING VALVE N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 07/09 | ADDED NOTE 10, REVISED 4 AND 5 | | | |
| 2 | 07/13 | REVISED NOTES 4, 8, 10 | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 1 | W.9 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |



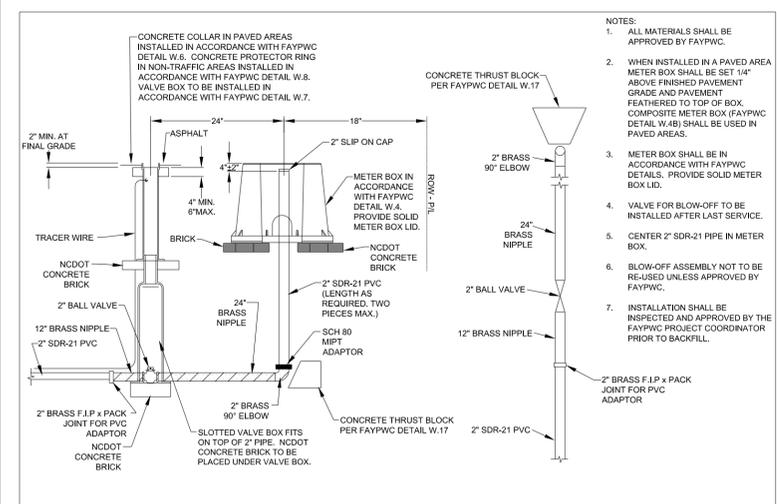
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|--|---------------|---|----------|------------|--|
| DUCTILE IRON TAPPING SLEEVE N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | FWC | |
| NO. | DATE | REVISION | | | |
| 1 | 07/09 | REVISION NOTE G REMOVED NOTE 8 | | | |
| 2 | 07/13 | REVISED NOTES 6, 7 | | | |
| SHEET NO. | DWG. NO. | DWG. BY: | REVISION | | |
| 1 OF 1 | W.10 | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | |

| SLEEVE SIZE PIPE X BRANCH | 6X6 | 8X8 | 8X8 | 12X8 | 12X8 | 12X12 | 16X8 | 16X8 | 16X12 | 24X8 | 24X8 | 24X12 | 24X16 | 24X24 | 30X8 | 30X8 | 30X12 | 30X16 | 30X24 |
|------------------------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|-------|-------|-------|--------|-------|-------|-------|-------|
| A DIA. +0.011-0.000 | 7.016 | 7.016 | 9.016 | 7.016 | 9.016 | 13.016 | 7.016 | 9.016 | 13.016 | 11.000 | 13.5 | 19.0 | 23.5 | 32.0 | 11.000 | 13.5 | 19.0 | 23.5 | 32.0 |
| B DIA. | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| C | 7.78 | 9.116 | 9 | 11.508 | 11.778 | 12.778 | 14.178 | 14.178 | 14.178 | 19.5 | 19.5 | 19.5 | 20.5 | 20.5 | 23.25 | 23.25 | 23.25 | 23.75 | 23.75 |
| E | 11.24 | 13.778 | 13.778 | 18.12 | 18.12 | 18.12 | 23.12 | 23.12 | 23.12 | 35.5 | 35.5 | 35.5 | 35.5 | 35.5 | 43.37 | 43.37 | 43.37 | 43.37 | 43.37 |
| F | 13.12 | 15 | 15 | 19.12 | 19.12 | 19.12 | 26.12 | 26.12 | 26.12 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 |

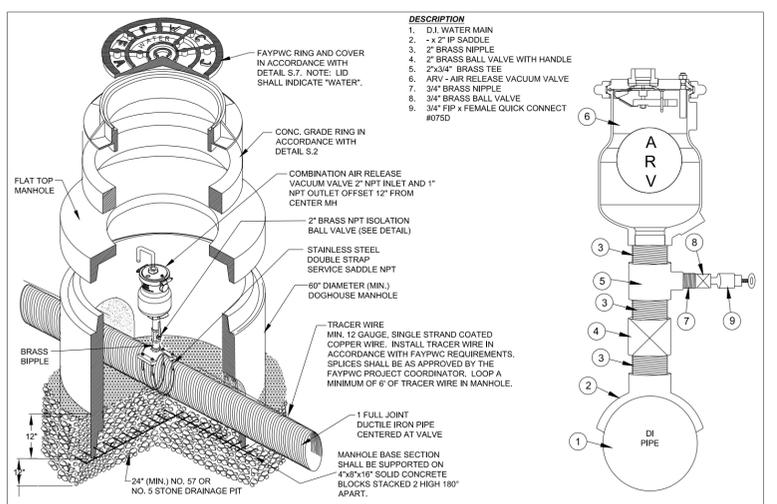
5/14/99
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 UTILITY REV. - JULY 24, 2008 - REVISIONS TO DETAIL SHEETS

| | |
|--|---------------------------------|
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

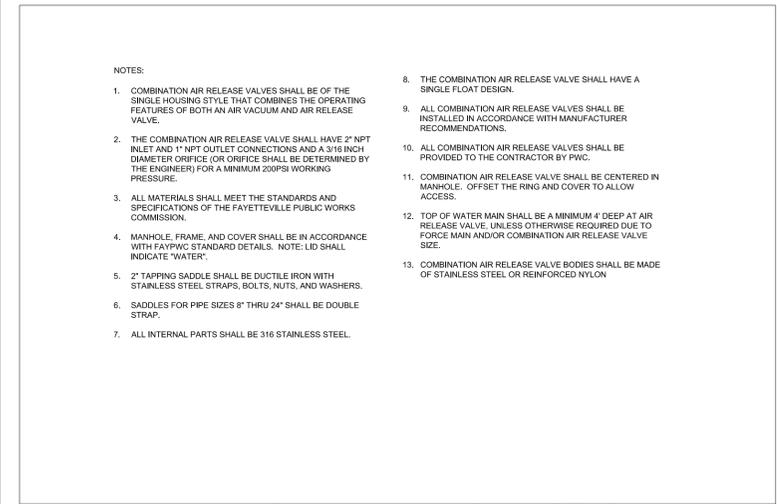
UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED



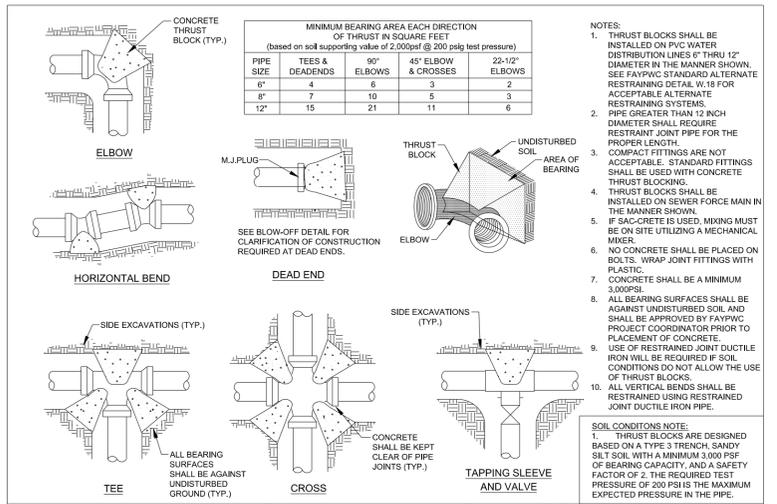
| | | | |
|------------------------------|---------------------|---|-------------------|
| 2" BLOW OFF ON 2" WATER MAIN | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 07/17 | REVISED NOTES | |
| DWG. NO. W.15C | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



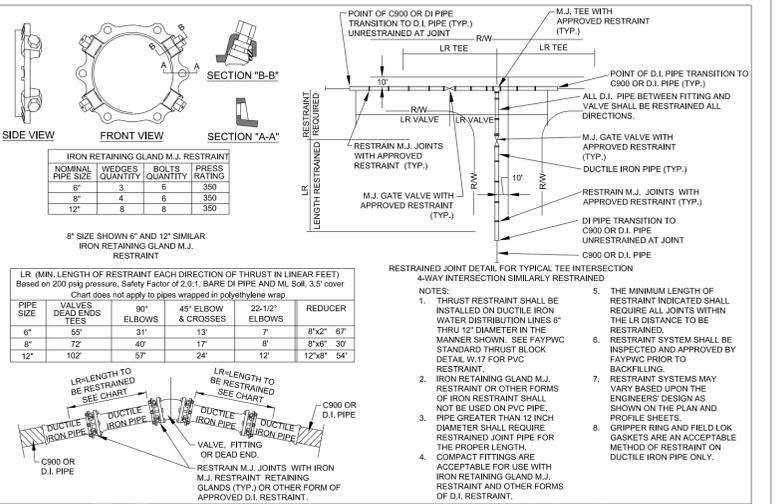
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|--|---------------------|---|-------------------|
| COMBINATION AIR RELEASE VACUUM VALVE (WATER SERVICE) | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 07/09 | REVISED NOTES 3 AND 5, ADD NOTE 7 | |
| 2 | 01/13 | UPDATED NOTES, ADDED TRACER WIRE | |
| DWG. NO. W.16 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



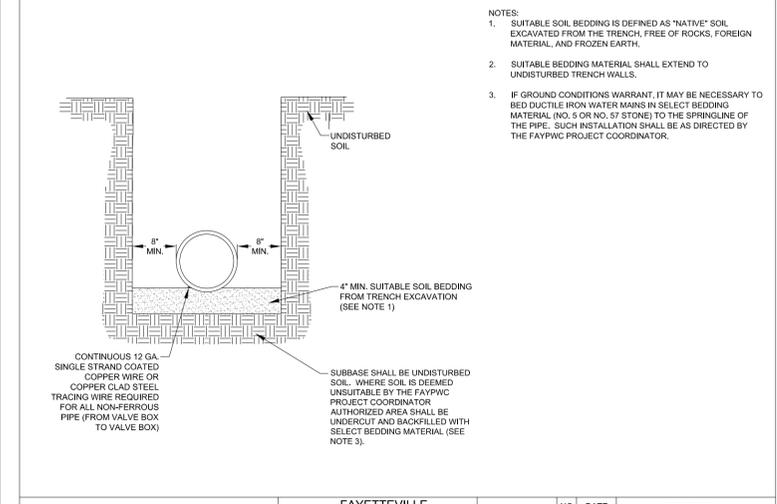
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|--|---------------------|---|-------------------|
| COMBINATION AIR RELEASE VACUUM VALVE (WATER SERVICE) | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 01/13 | ADDED NOTE 16, REVISED NOTES | |
| 2 | 07/16 | DELETED NOTES 3, 16 | |
| DWG. NO. W.16 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



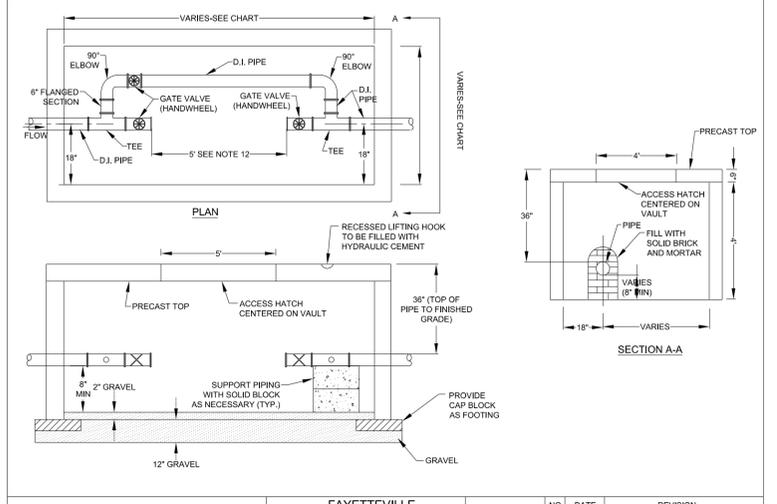
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|------------------------------|---------------------|---|-------------------|
| CONCRETE THRUST BLOCK DETAIL | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 09/05 | REVISED TABLE | |
| 2 | 02/07 | ADDED NOTES 9 AND 10 | |
| 3 | 07/13 | ADDED TAPPING SLEEVE AND VALVE DETAIL | |
| DWG. NO. W.17 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



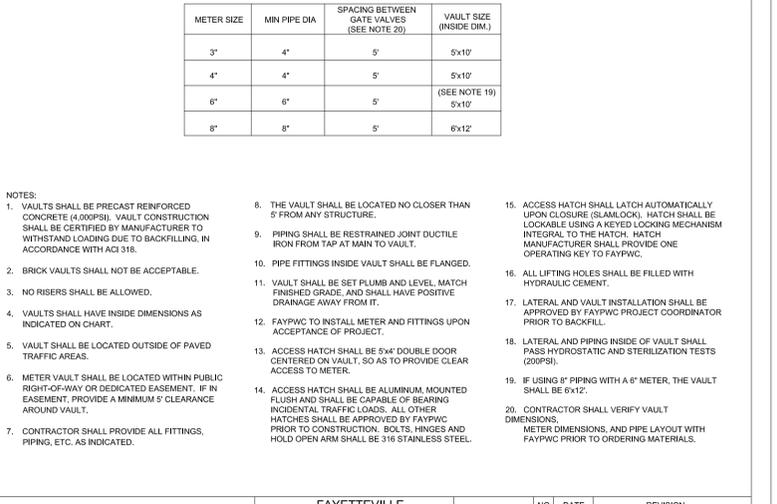
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|---|---------------------|---|-------------------|
| ALTERNATE RESTRAINT DETAIL (DUCTILE IRON PIPE ONLY) | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 11/16/07 | REVISED TABLE, ADDED NOTE 8 | |
| DWG. NO. W.18 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



| | | | |
|---------------------------|---------------------|---|-------------------|
| WATER MAIN BEDDING DETAIL | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 01/01/17 | REVISED NOTES | |
| 2 | 07/01/13 | REVISED NOTE RE: TRACER WIRE | |
| DWG. NO. W.19 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



| | | | |
|---------------------|---------------------|---|-------------------|
| METER VAULT | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 09/10 | REVISED PIPE BURY DEPTH | |
| 2 | | | |
| 3 | | | |
| DWG. NO. W.20 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |



| | | | |
|---------------------|---------------------|---|-------------------|
| METER VAULT | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | NO. DATE REVISION |
| 1 | 09/10 | REVISED NOTES | |
| 2 | | | |
| 3 | | | |
| DWG. NO. W.20 | DWG. BY: FAYPWC | WATER RESOURCES ENGINEERING DEPARTMENT | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | |

5/14/99
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 UTILITY REV. - JULY 24, 2018 - REVISIONS TO DETAIL SHEETS

| | |
|--|---------------------------------|
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

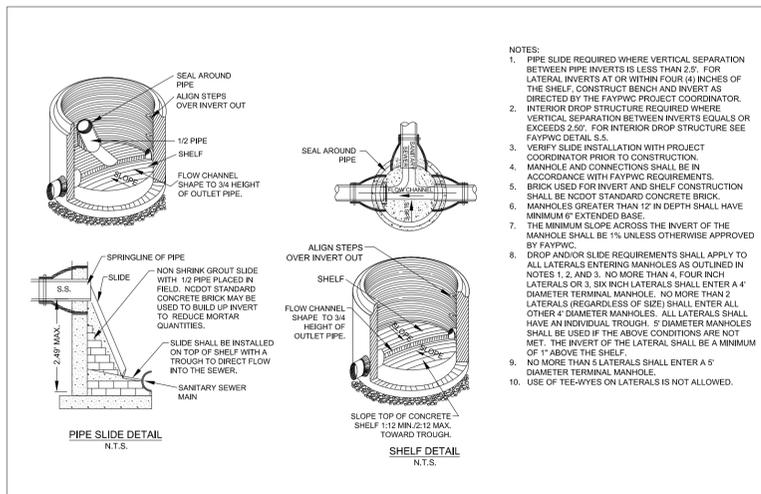
UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED

- CONTRACTOR SHALL REPAIR ALL SEWER LATERALS AND MAINS DAMAGED DURING CONSTRUCTION. THE CONTRACTOR SHALL IMMEDIATELY REPORT ALL SEWER MAIN AND LATERAL BREAKS TO THE FAYFWPC PROJECT COORDINATOR. THE CONTRACTOR SHALL INITIATE IMMEDIATE REPAIRS IN ACCORDANCE WITH FAYFWPC STANDARDS.
- SEWER MAINS, LATERALS, AND MANHOLES SHALL BE INSTALLED UTILIZING A FAYFWPC APPROVED OUT-SHEET, INDICATING INSTALLATION DEPTH.
- TRANSFER OF SEWER SERVICES SHALL BE ACCOMPLISHED AS FOLLOWS:
 - INSTALL AND TEST NEW MAINS, MANHOLES, AND LATERALS. CLEANOUTS SHALL BE INSTALLED 18" INSIDE R/W UNLESS OTHERWISE DIRECTED BY FAYFWPC.
 - CONNECT EXISTING PLUMBING TO NEW LATERAL UTILIZING THE NECESSARY FITTINGS AS DIRECTED BY FAYFWPC.
 - AFTER ALL SERVICES HAVE BEEN TRANSFERRED TO THE NEW MAIN, THE EXISTING SEWER SYSTEM SHALL BE ABANDONED IN ACCORDANCE WITH FAYFWPC REQUIREMENTS.
- WHEN THE EXISTING MAIN IS NOT TO BE ABANDONED, THE CONTRACTOR SHALL UNCOVER THE EXISTING LATERAL AT THE MAIN, CUT AND PLUG BOTH ENDS, REMOVE THE EXISTING CLEANOUT AND COMBINATION, AND PLUG THE LATERAL TO ABANDON THE OLD SERVICE.
- CONTRACTOR SHALL ABANDON ("KILL-OUT") ANY EXISTING SEWER SERVICES THAT WILL NOT BE UTILIZED BY UNCOVERING THE EXISTING LATERAL AT THE MAIN, CUT AND PLUG AT BOTH ENDS, REMOVE THE EXISTING CLEANOUT AND COMBINATION, AND PLUG THE TAP OR TEE AT THE MAIN. FOR LATERALS THAT CONNECT TO A MANHOLE AND ARE TO BE ABANDONED ("KILL-OUT"), THE LATERAL SHALL BE REMOVED FROM THE MANHOLE AND THE REMAINING VOID IN THE MANHOLE SHALL BE FILLED WITH BLOCK AND MORTAR.
- SEWER PLUGS SHALL BE INSTALLED TO ELIMINATE ANY DEBRIS OR OTHER MATERIAL FROM ENTERING THE ACTIVE SEWER SYSTEM. UPON ACCEPTANCE OF THE NEW SEWER SYSTEM, THE CONTRACTOR SHALL CLEAN THE NEW MAINS, REMOVE ALL DEBRIS, AND THEN REMOVE THE PLUG.
- ALL EXISTING UTILITIES IMPACTED BY CONSTRUCTION SHALL BE ADJUSTED TO FINISHED GRADE, IN ACCORDANCE WITH FAYFWPC REQUIREMENTS.
- ALL WORK ON FAYFWPC SEWER UTILITIES (MAINS, LATERALS, ETC) SHALL BE PERFORMED BY A LICENSED SEWER CONTRACTOR. THE FAYFWPC PUBLIC WORKS COMMISSION SHALL OBSERVE AND APPROVE ALL WORK ON FAYFWPC SEWER UTILITIES. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH FAYFWPC REQUIREMENTS.

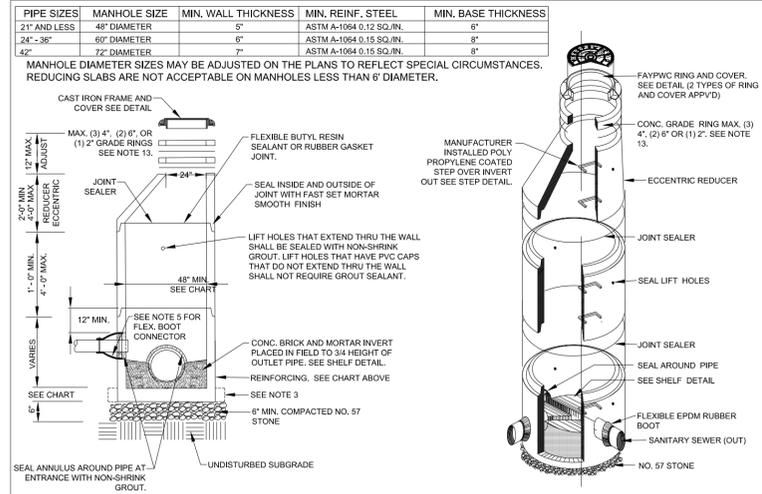
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|---|---------------------|--|--|-----|-------|------------------|
| GENERAL NOTES SANITARY SEWER UTILITY | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | DWG. NO. S.1 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 07/16 | ADDED NOTE 6 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 01/18 | ADDED NOTES 5, 8 |

- NOTES:
- PRECAST REINFORCED CONCRETE MANHOLES SHALL BE IN ACCORDANCE WITH ASTM C478.
 - MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE 4,000PSI.
 - MANHOLES GREATER THAN 12" DEPTH SHALL HAVE MINIMUM 6" EXTENDED BASE.
 - FLEXIBLE BUTYL RESIN JOINT SEALANT SHALL BE IN ACCORDANCE WITH ASTM C990. RUBBER GASKET JOINTS SHALL BE IN ACCORDANCE WITH ASTM C443.
 - FLEXIBLE EPDM RUBBER BOOT CONNECTORS SHALL BE IN ACCORDANCE WITH ASTM C923. INSTALLED BY MANUFACTURER WITH STAINLESS STEEL COMPRESSION RING AND TAKE-UP CLAMP. CONNECTION TO MAIN SHALL BE BY CONTRACTOR WITH STAINLESS STEEL PIPE CLAMP.
 - CONNECTIONS TO EXISTING MANHOLES SHALL BE BY CORING MANHOLE AND FIELD INSTALLING A FLEXIBLE EPDM RUBBER BOOT CONNECTOR. DO NOT ALLOW DEBRIS TO ENTER SYSTEM.
 - MORTAR SHALL BE QUICK SETTING, NON-SHRINK GROUT MIXED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
 - MANHOLE STEPS SHALL BE IN ACCORDANCE WITH ASTM C478 AND OSHA REGULATIONS. ALIGN STEPS WITH INVERT OUT.
 - PRECAST INVERTS ARE NOT ALLOWED.
 - VERTICAL DROPS BETWEEN THE INFLOW PIPES AND OUTFLOW PIPES SHALL REQUIRE THE FOLLOWING:
 - GREATER THAN 2' SEE DROP STRUCTURE DETAIL.
 - LESS THAN 2' SEE PIPE SLIDE DETAIL.
 - AN ECCENTRIC CONE SHALL BE UTILIZED ON ALL MANHOLES, UNLESS OTHERWISE APPROVED BY FAYFWPC.
 - CONCRETE GRADE RINGS SHALL NOT BE USED FOR ABOVE GRADE ADJUSTMENTS (IE: OUTFALL AREAS). USE OF GRADE RINGS ARE ALLOWABLE IN YARD AREAS AND PAVEMENT, WHERE THE RING AND COVER ARE AT GROUND LEVEL.
 - THE MINIMUM SLOPE ACROSS THE INVERT OF THE MANHOLE SHALL BE 1%, UNLESS OTHERWISE APPROVED BY FAYFWPC. STANDING WATER IN INVERT OF MANHOLE IS NOT ACCEPTABLE.
 - THE EXTERIOR MANHOLE RISER JOINTS, INCLUDING THE JOINT AT THE CONE, SHALL BE SEALED ON THE OUTSIDE BY AN APPROVED JOINT WRAP. THE WRAP SHALL BE IN ACCORDANCE WITH FAYFWPC SPECIFICATIONS.
 - MANHOLE BOOT FOR 4-INCH LATERALS, SHOULD IT BE NECESSARY TO INSTALL A 4-INCH LATERAL INTO A MANHOLE, THE RUBBER BOOT THAT THE LATERAL IS INSERTED INTO SHALL BE SECURELY FASTENED TO THE CORE HOLE BY UTILIZING A STAINLESS STEEL BAND THAT IS TIGHTENED USING A JACK OR A TORQUE WRENCH (DIRECT DRIVE). BOTH STANDARD SIZE AND STEP DOWN BOOTS ARE ALLOWED. THE TORQUE WRENCH SHALL BE SUPPORTED BY THE MANUFACTURER. NO OTHER TIE BANDS OR METHOD OF SECURING THE BOOT TO THE MANHOLE SHALL BE ACCEPTED.
 - FOR FOUR (4) INCH SDR 26 LATERALS, THE PIPE OUTSIDE DIAMETER RANGE OF THE BOOT SHALL BE 3.5 INCHES TO 4.25 INCHES.
 - FOR FOUR (4) INCH DUCTILE IRON LATERALS, THE PIPE OUTSIDE DIAMETER RANGE OF THE BOOT SHALL EITHER BE AS FOR VC OR 4.25 INCHES TO 4.81 INCHES.
 - IN ALL CASES, THE BOOT SHALL BE TIGHTENED ON THE LATERAL BY MEANS OF A SINGLE STAINLESS STEEL STRAP.
 - THE LATERAL INVERT SHALL BE AT THE TOP OF THE SHELF.
 - NO MORE THAN 4, FOUR INCH LATERALS OR 3, SIX INCH LATERALS SHALL ENTER A 4" DIAMETER TERMINAL MANHOLE. NO MORE THAN 2 LATERALS (REGARDLESS OF SIZE) SHALL ENTER ALL OTHER 4" DIAMETER MANHOLES. ALL LATERALS SHALL HAVE AN INDIVIDUAL TROUGH. 5" DIAMETER MANHOLES SHALL BE USED IF THE ABOVE CONDITIONS ARE NOT MET.
 - NO MORE THAN 5 LATERALS SHALL ENTER A 5" DIAMETER MANHOLE.
 - USE OF TEE-WYES ON LATERALS IS NOT ALLOWED.
 - ALL MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH FAYFWPC STANDARDS.

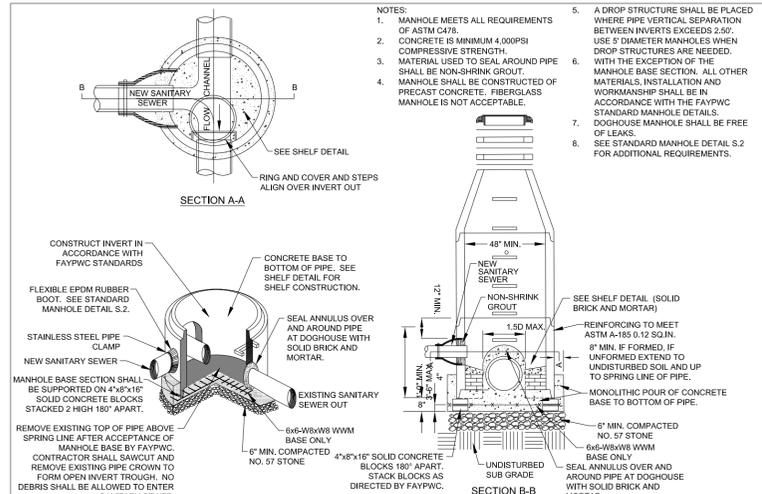
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|------------------|---------------------|--|--|-----|-------|---|
| STANDARD MANHOLE | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 2 OF 2 | DWG. NO. S.2 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 01/08 | CREATED DETAIL, ADDED NOTES 14-20 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 07/13 | REVISED NOTES 9, 11, 15 CONVERTED TO S.2 SHEET 2 OF 2 |



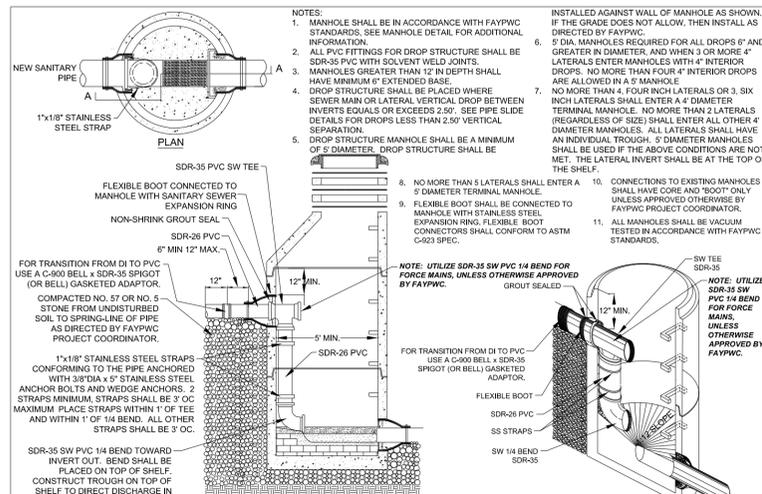
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| PIPE SLIDE AND SHELF DETAILS | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | DWG. NO. S.4 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 01/05 | ADDED NOTE 8 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 02/07 | REVISED NOTE 8, SLIDE DETAIL, ADDED NOTES 10, 11, 12 |



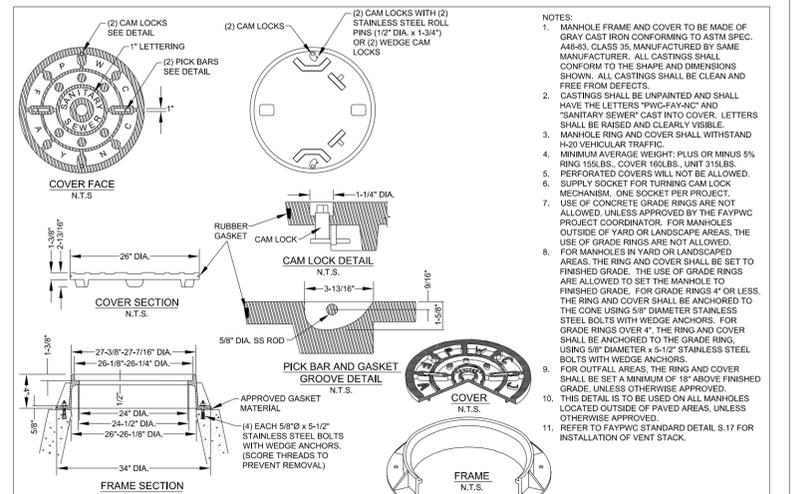
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| STANDARD MANHOLE | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 2 | DWG. NO. S.2 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 02/07 | CREATED S.2A ADDED NOTES 13-17 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 07/13 | ADDED SHEET 2 OF 2 |



| | | | | | | |
|------------------|---------------------|--|--|-----|----------|-----------------------|
| DOGHOUSE MANHOLE | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 2 | DWG. NO. S.3 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 07/16 | ADDED SHEET 2 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 11/25/08 | MADE CHANGES TO NOTES |



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|-------------------------|---------------------|--|--|-----|-------|---------------------------------------|
| INTERIOR DROP STRUCTURE | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | DWG. NO. S.5 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 4 | 11/08 | REVISED FITTING MATERIAL |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 5 | 07/12 | REVISED NOTES 5, 6, AND HUB ON INVERT |

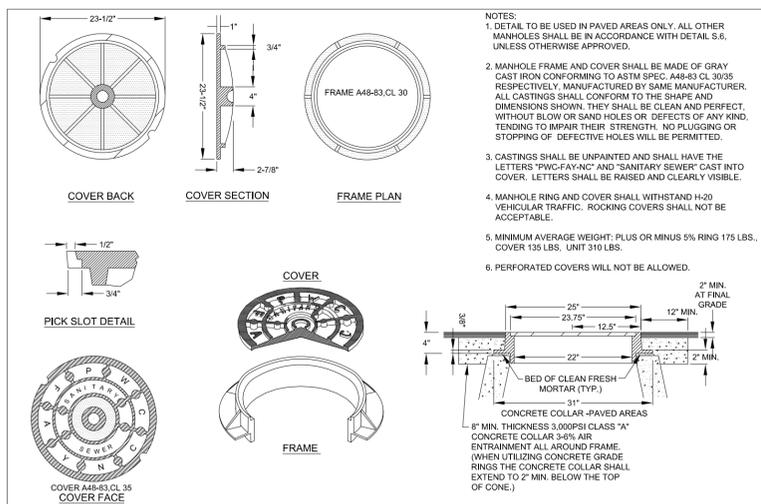


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|---------------------------|---------------------|--|--|-----|-------|--|
| STANDARD NON-TRAFFIC AREA | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | DWG. NO. S.6 | DWG. BY: FAYFWPC | WATER RESOURCES ENGINEERING DEPARTMENT | 1 | 07/09 | REVISED NOTES ON FRAME SECTION, REVISED NOTE 3 |
| | DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | | 2 | 07/17 | ADDED NOTE ON WEDGE CAM LOCKS |

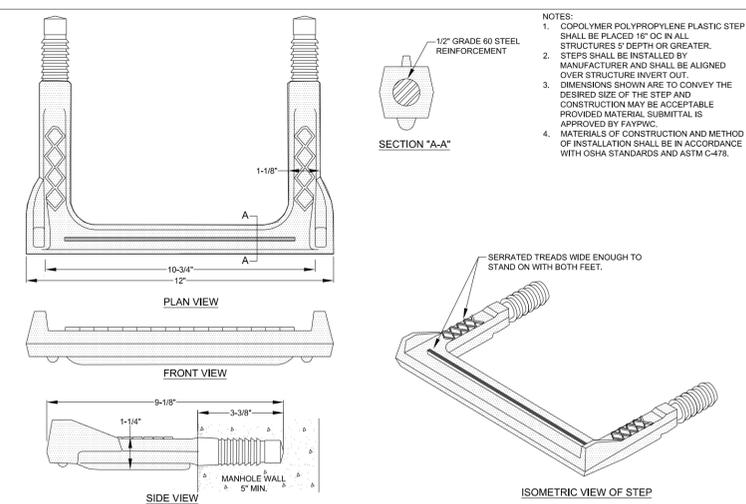
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 01-OCT-2021 (01-20)
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|--|--------|---|--------|
| PROJECT REFERENCE NO. | U-4405 | SHEET NO. | UC-03J |
| DESIGNED BY: | AMH | UTILITY CONSTRUCTION PLANS ONLY | |
| DRAWN BY: | AMH/AB | | |
| CHECKED BY: | AMH | | |
| APPROVED BY: | BRO | | |
| REVISED: | | NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | | | |

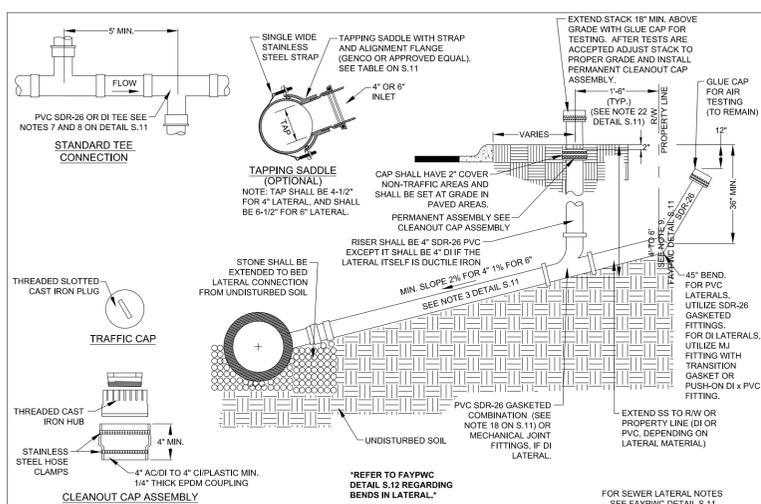
UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED



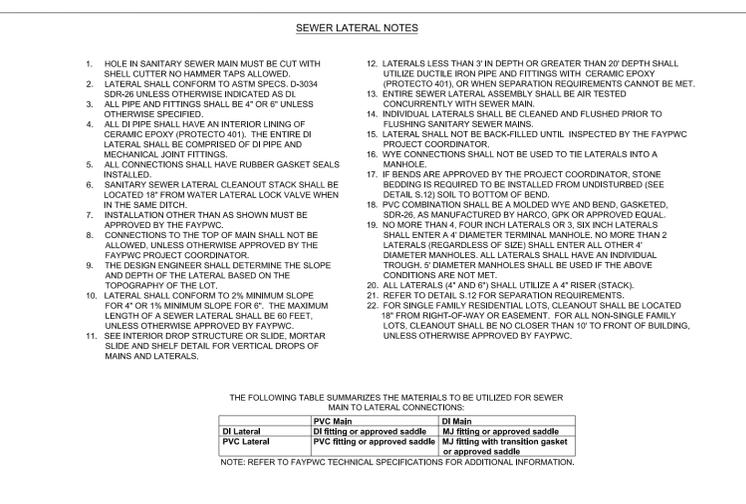
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| STANDARD TRAFFIC AREA MANHOLE RING AND COVER | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.7 | DWG. BY: | FAYPWC | 1 | 01/05 | CHANGED NON TRAFFIC DETAIL |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 2 | 07/06 | ADDED NOTE ON CONCRETE COLLAR |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | 3 | 02/07 | REMOVED NON TRAFFIC AREA AND REVISED NOTES |
| | | | | 4 | 07/08 | REVISED ASPHALT THICKNESS |



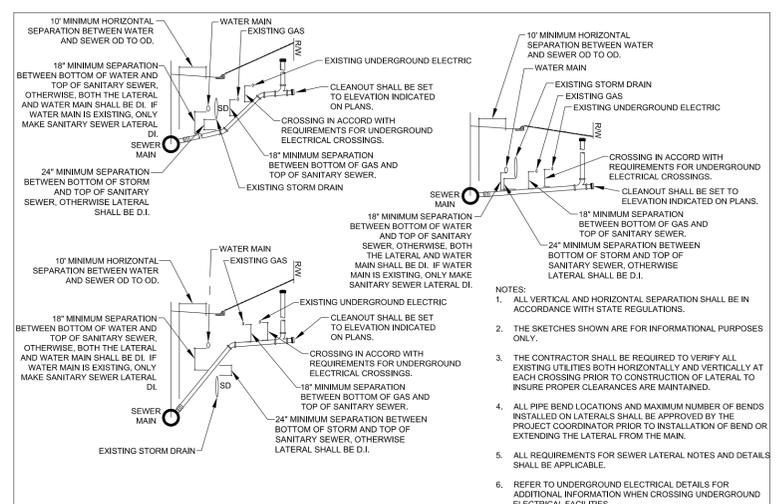
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| STRUCTURE STEP | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.8 | DWG. BY: | FAYPWC | | | |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | | | |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |



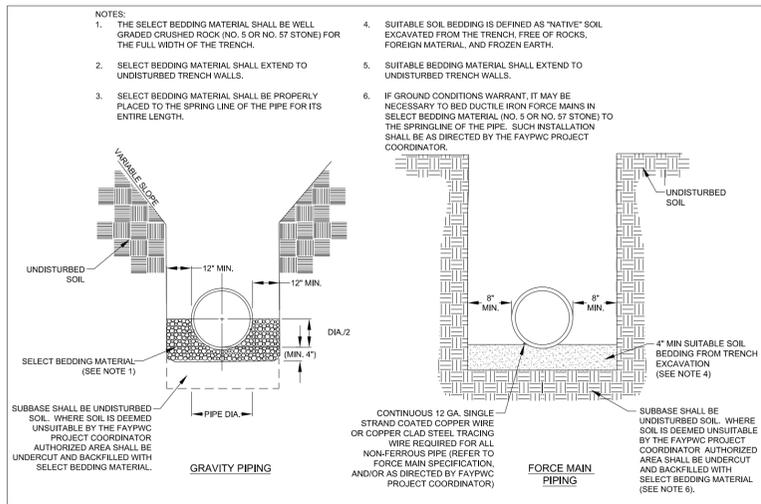
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| SEWER LATERAL (4-INCH AND 6-INCH) | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.10 | DWG. BY: | FAYPWC | 2 | 01/14 | ADDED TAILPIECE, NOTES |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 3 | 01/15 | REVISED NOTES RE: TAILPIECE |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | 4 | 07/18 | REVISED NOTE RE: LATERAL DEPTH |



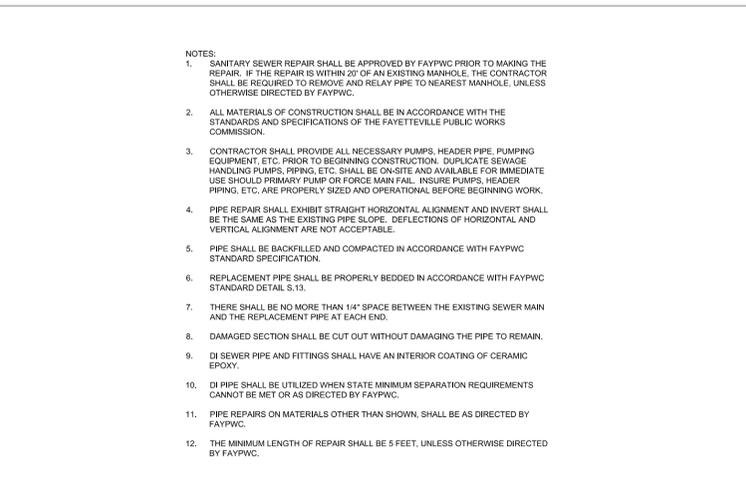
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| SEWER LATERAL NOTES (4-INCH AND 6-INCH) | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.11 | DWG. BY: | FAYPWC | 3 | 01/13 | REVISED NOTES AND ADDED TABLE |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 4 | 01/15 | REVISED NOTE 22, TABLE |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | 5 | 07/18 | REVISED NOTES 6, 9 |



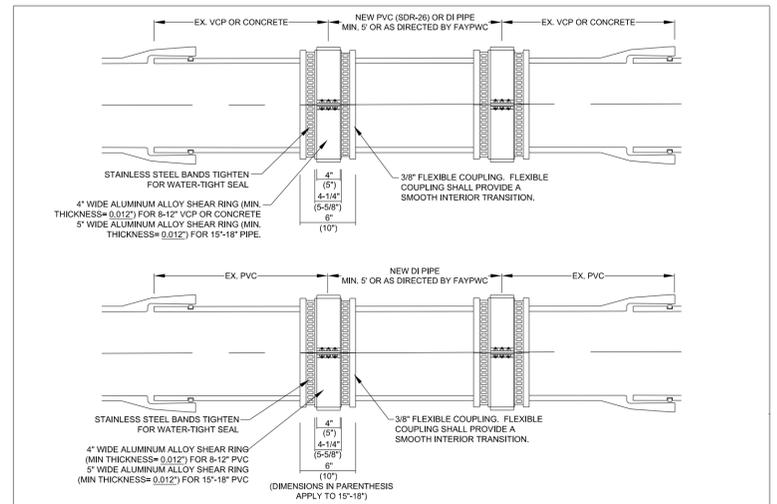
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| SEWER LATERAL SEPARATION REQUIREMENTS | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.12 | DWG. BY: | FAYPWC | 1 | 01/05 | REVISED NOTES 1 AND 6 |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 2 | 11/06 | ADDED NOTE ON DI LATERALS |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | 3 | 03/10 | ADDED LATERAL AND MIN SEPARATION |



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|------------------------------------|---------------|---|--------|-----|----------|---------------|
| GRAVITY SANITARY SEWER PIPE REPAIR | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.13 | DWG. BY: | FAYPWC | 1 | 01/05 | REVISED NOTES |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 2 | 01/01/16 | REVISED NOTES |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |



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| GRAVITY SANITARY SEWER PIPE REPAIR | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.15 | DWG. BY: | FAYPWC | 1 | 01/05 | REVISED REPLACEMENT PIPE |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 2 | 07/11 | REVISED NOTES |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |



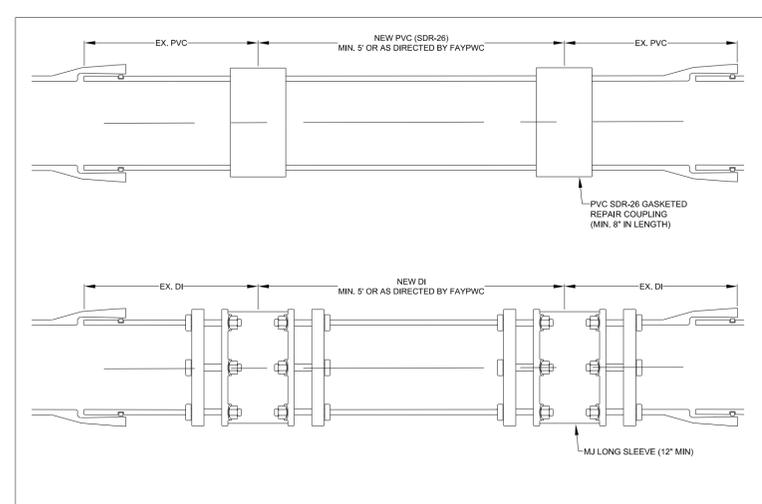
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| GRAVITY SANITARY SEWER PIPE REPAIR | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| DWG. NO. | S.15 | DWG. BY: | FAYPWC | 1 | 01/05 | REVISED REPLACEMENT PIPE |
| DATE: | JAN. 01, 2021 | APPROVED BY: | J.E.G. | 2 | 07/11 | REVISED NOTES |
| | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |

REVISIONS
UTILITY REV. - JULY 24, 2018 - REVISIONS TO DETAIL SHEETS

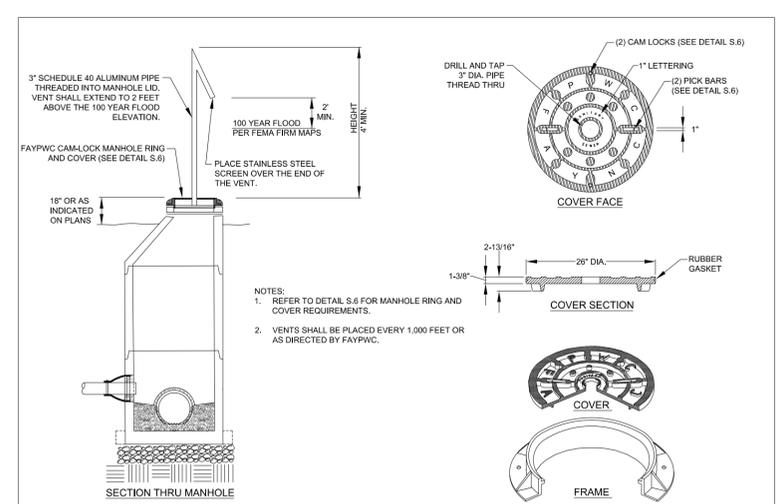
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| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-03K |
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

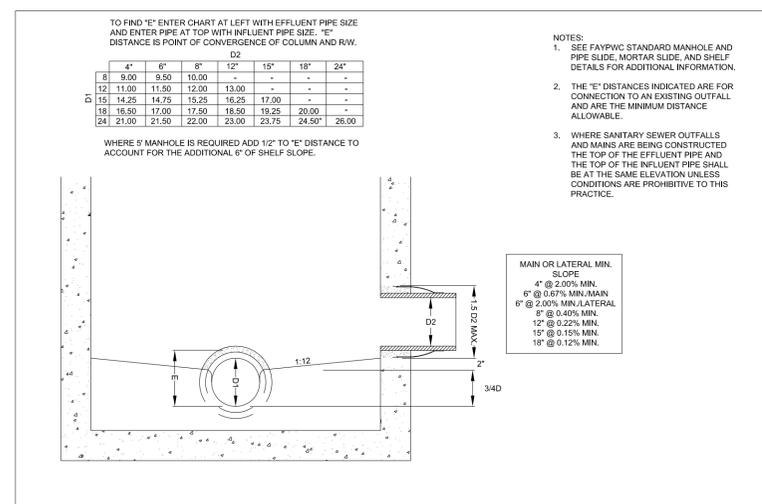
UTILITY CONSTRUCTION
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| GRAVITY SANITARY SEWER PIPE REPAIR N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 3 OF 3 | | WATER RESOURCES ENGINEERING DEPARTMENT | | 1 | 01/05 | REVISED REPLACEMENT PIPE |
| DWG. NO. S.15 | DWG. BY: FAYPWC | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | 2 | 07/11 | REVISED NOTES, REPAIRS |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | |



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|------------------------|---------------------|---|--|-----|------|----------|
| MANHOLE VENT N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |
| DWG. NO. S.17 | DWG. BY: FAYPWC | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | |

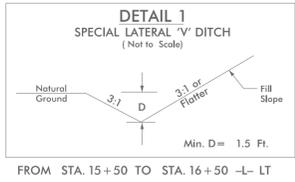


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| MH CONNECTION DESIGN GUIDE N.T.S. | | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | NO. | DATE | REVISION |
| SHEET NO. 1 OF 1 | | WATER RESOURCES ENGINEERING DEPARTMENT | | | | |
| DWG. NO. S.18 | DWG. BY: FAYPWC | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | |
| DATE: JAN. 01, 2021 | APPROVED BY: J.E.G. | FAYETTEVILLE PUBLIC WORKS COMMISSION FAYETTEVILLE, N.C. | | | | |

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 UTILITY REV. - JULY 24, 2008 - REVISIONS TO DETAIL SHEETS

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| PROJECT REFERENCE NO. | U-4405 |
| SHEET NO. | UC-4 |
| DESIGNED BY: | AMH |
| DRAWN BY: | AMH/AB |
| CHECKED BY: | AMH |
| APPROVED BY: | BRO |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |
| UTILITY CONSTRUCTION PLANS ONLY | |

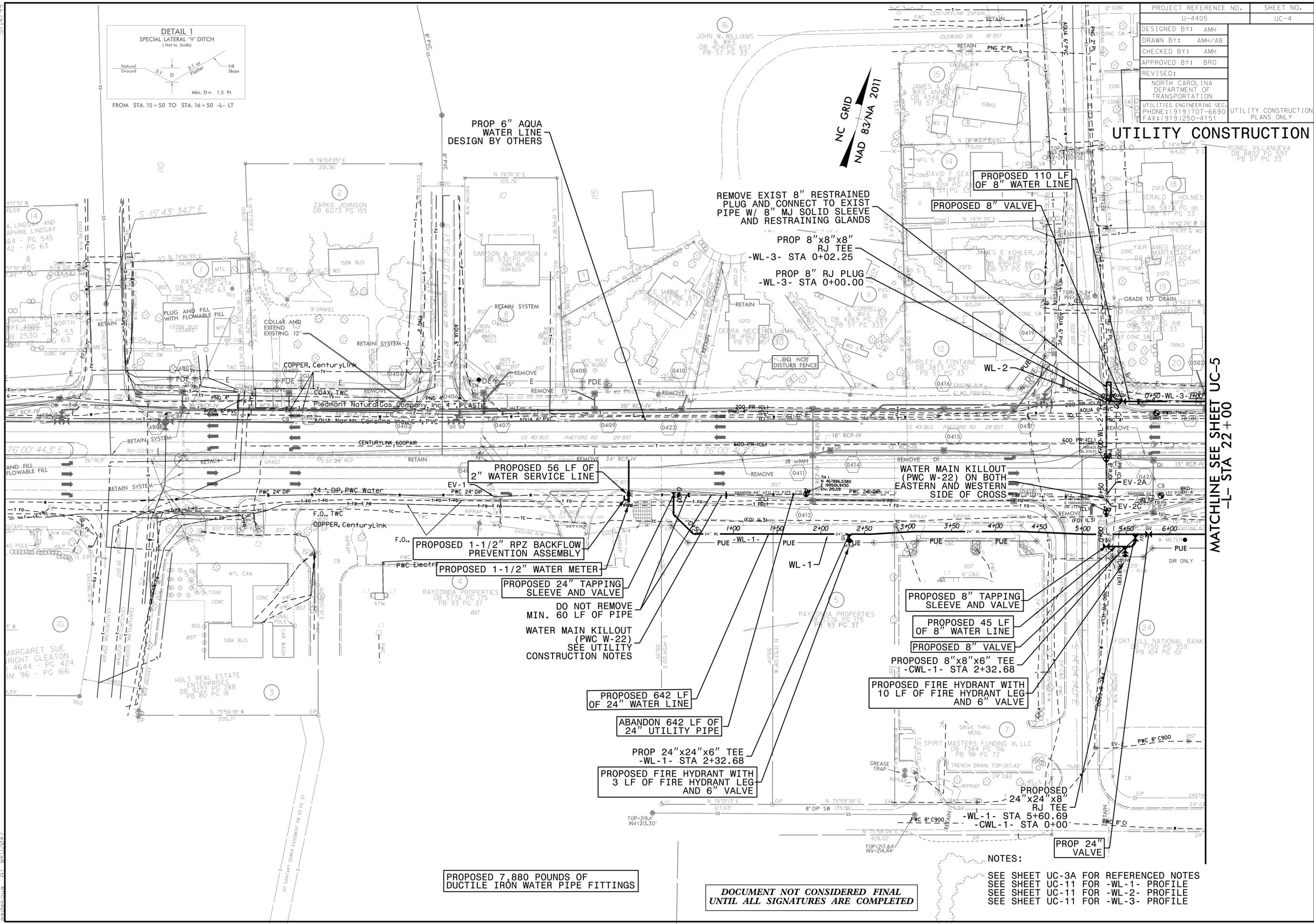
UTILITY CONSTRUCTION



FROM STA. 15+50 TO STA. 16+50 -L- LT

NC GRID
NAD 83/NA 2011

MATCHLINE SEE SHEET UC-5
-L- STA 22+00



PROP 6" AQUA WATER LINE DESIGN BY OTHERS

REMOVE EXIST 8" RESTRAINED PLUG AND CONNECT TO EXIST PIPE W/ 8" MJ SOLID SLEEVE AND RESTRAINING GLANDS

PROP 8"x8"x8" RJ TEE -WL-3- STA 0+02.25

PROP 8" RJ PLUG -WL-3- STA 0+00.00

PROPOSED 110 LF OF 8" WATER LINE

PROPOSED 8" VALVE

PROPOSED 56 LF OF 2" WATER SERVICE LINE

PROPOSED 1-1/2" RPZ BACKFLOW PREVENTION ASSEMBLY

PROPOSED 1-1/2" WATER METER

PROPOSED 24" TAPPING SLEEVE AND VALVE

DO NOT REMOVE MIN. 60 LF OF PIPE WATER MAIN KILLOUT (PWC W-22) SEE UTILITY CONSTRUCTION NOTES

WATER MAIN KILLOUT (PWC W-22) ON BOTH EASTERN AND WESTERN SIDE OF CROSS

PROPOSED 8" TAPPING SLEEVE AND VALVE

PROPOSED 45 LF OF 8" WATER LINE

PROPOSED 8" VALVE

PROPOSED 8"x8"x6" TEE -CWL-1- STA 2+32.68

PROPOSED FIRE HYDRANT WITH 10 LF OF FIRE HYDRANT LEG AND 6" VALVE

PROPOSED 642 LF OF 24" WATER LINE

ABANDON 642 LF OF 24" UTILITY PIPE

PROP 24"x24"x6" TEE -WL-1- STA 2+32.68

PROPOSED FIRE HYDRANT WITH 3 LF OF FIRE HYDRANT LEG AND 6" VALVE

PROPOSED 24"x24"x8" RJ TEE -WL-1- STA 5+60.69 -CWL-1- STA 0+00

PROP 24" VALVE

PROPOSED 7,880 POUNDS OF DUCTILE IRON WATER PIPE FITTINGS

DOCUMENT NOT CONSIDERED FINAL UNTIL ALL SIGNATURES ARE COMPLETED

NOTES:

- SEE SHEET UC-3A FOR REFERENCED NOTES
- SEE SHEET UC-11 FOR -WL-1- PROFILE
- SEE SHEET UC-11 FOR -WL-2- PROFILE
- SEE SHEET UC-11 FOR -WL-3- PROFILE

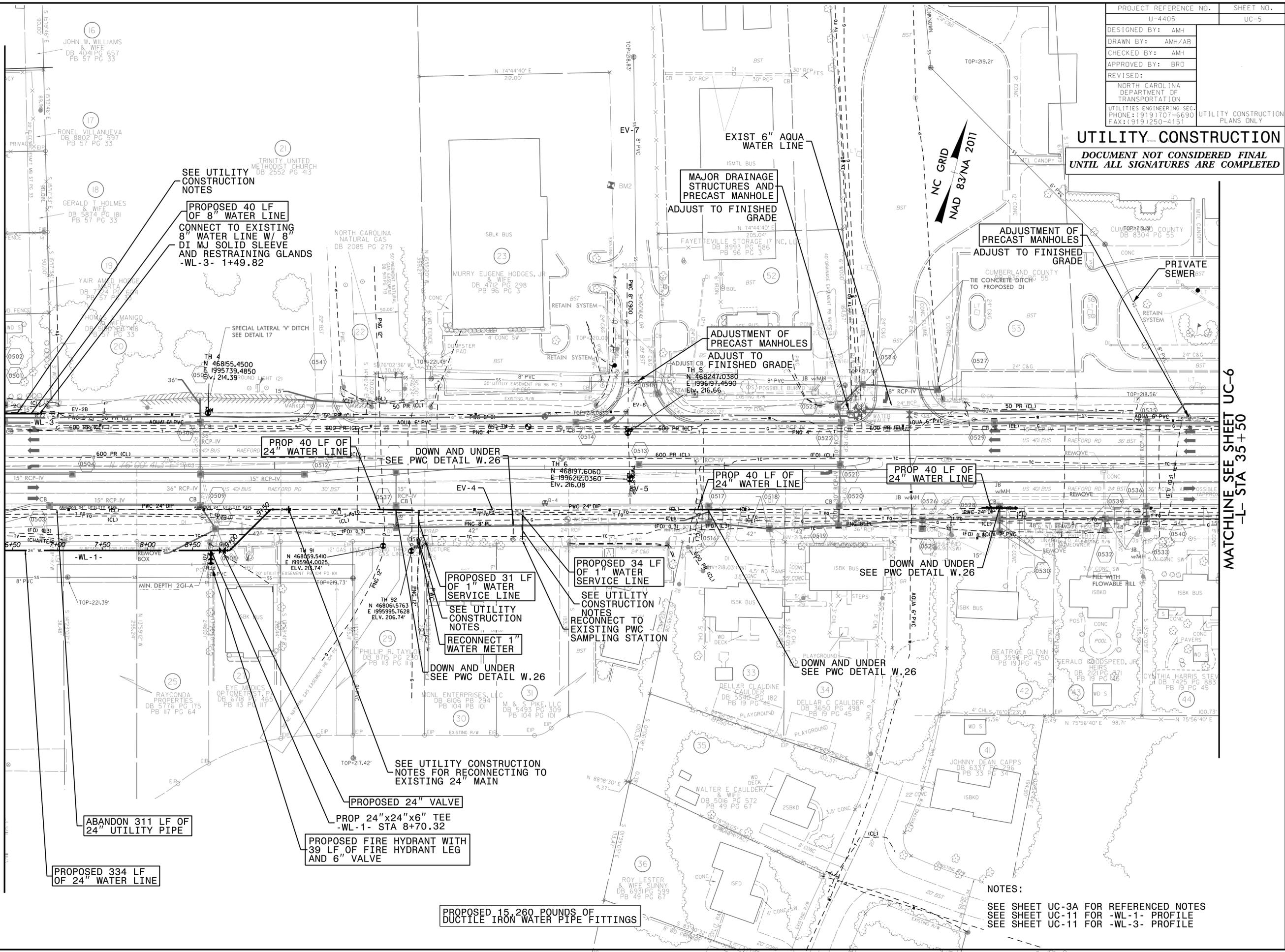
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|--|---------------------------------|
| PROJECT REFERENCE NO. | U-4405 |
| SHEET NO. | UC-5 |
| DESIGNED BY: | AMH |
| DRAWN BY: | AMH/AB |
| CHECKED BY: | AMH |
| APPROVED BY: | BRO |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
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UTILITY CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED

MATCHLINE SEE SHEET UC-4
 -L- STA 22+00

MATCHLINE SEE SHEET UC-6
 -L- STA 35+50



SEE UTILITY CONSTRUCTION NOTES
PROPOSED 40 LF OF 8" WATER LINE
 CONNECT TO EXISTING 8" WATER LINE W/ 8" DI MJ SOLID SLEEVE AND RESTRAINING GLANDS
 -WL-3- 1+49.82

EXIST 6" AQUA LINE
MAJOR DRAINAGE STRUCTURES AND PRECAST MANHOLE
 ADJUST TO FINISHED GRADE

ADJUSTMENT OF PRECAST MANHOLES
 ADJUST TO FINISHED GRADE

ADJUSTMENT OF PRECAST MANHOLES
 ADJUST TO FINISHED GRADE

PROP 40 LF OF 24" WATER LINE
 DOWN AND UNDER SEE PWC DETAIL W.26

PROP 40 LF OF 24" WATER LINE
 DOWN AND UNDER SEE PWC DETAIL W.26

PROP 40 LF OF 24" WATER LINE
 DOWN AND UNDER SEE PWC DETAIL W.26

PROPOSED 31 LF OF 1" WATER SERVICE LINE
 SEE UTILITY CONSTRUCTION NOTES
 RECONNECT TO EXISTING PWC SAMPLING STATION

RECONNECT 1" WATER METER
 DOWN AND UNDER SEE PWC DETAIL W.26

ABANDON 311 LF OF 24" UTILITY PIPE

PROPOSED 24" VALVE
 PROP 24"x24"x6" TEE
 -WL-1- STA 8+70.32

PROPOSED 334 LF OF 24" WATER LINE

PROPOSED 15,260 POUNDS OF DUCTILE IRON WATER PIPE FITTINGS

NOTES:
 SEE SHEET UC-3A FOR REFERENCED NOTES
 SEE SHEET UC-11 FOR -WL-1- PROFILE
 SEE SHEET UC-11 FOR -WL-3- PROFILE

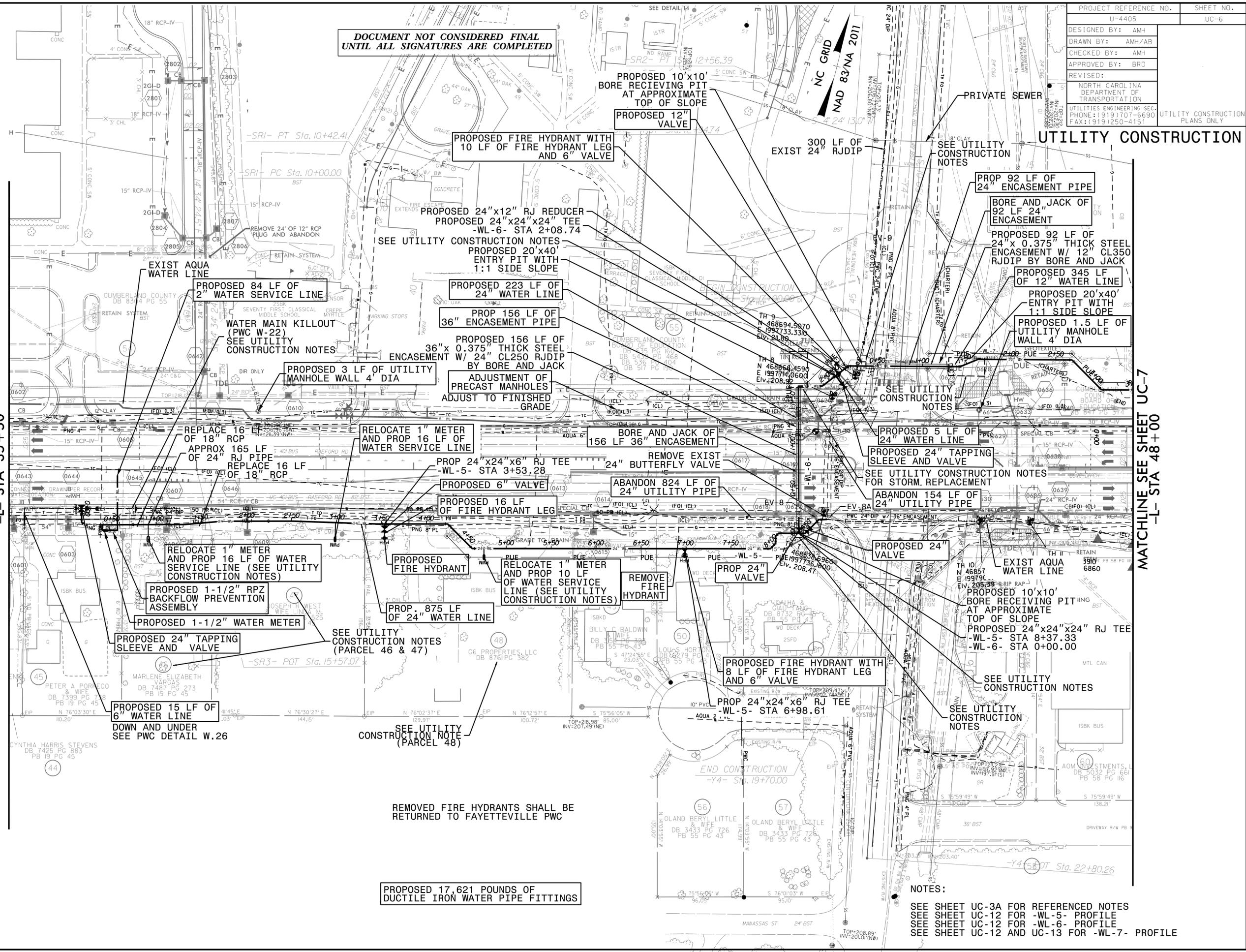
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 5/14/20

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| PROJECT REFERENCE NO. | U-4405 |
| SHEET NO. | UC-6 |
| DESIGNED BY: | AMH |
| DRAWN BY: | AMH/AB |
| CHECKED BY: | AMH |
| APPROVED BY: | BRO |
| REVISED: | |
| NORTH CAROLINA DEPARTMENT OF TRANSPORTATION | |
| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |
| UTILITY CONSTRUCTION PLANS ONLY | |

**DOCUMENT NOT CONSIDERED FINAL
UNTIL ALL SIGNATURES ARE COMPLETED**

MATCHLINE SEE SHEET UC-5
-L- STA 35+50

MATCHLINE SEE SHEET UC-7
-L- STA 48+00



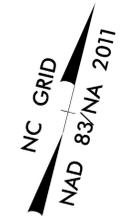
NOTES:
 SEE SHEET UC-3A FOR REFERENCED NOTES
 SEE SHEET UC-12 FOR -WL-5- PROFILE
 SEE SHEET UC-12 FOR -WL-6- PROFILE
 SEE SHEET UC-12 AND UC-13 FOR -WL-7- PROFILE

PROPOSED 17,621 POUNDS OF
DUCTILE IRON WATER PIPE FITTINGS

REMOVED FIRE HYDRANTS SHALL BE
RETURNED TO FAYETTEVILLE PWC

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 5/14/2019

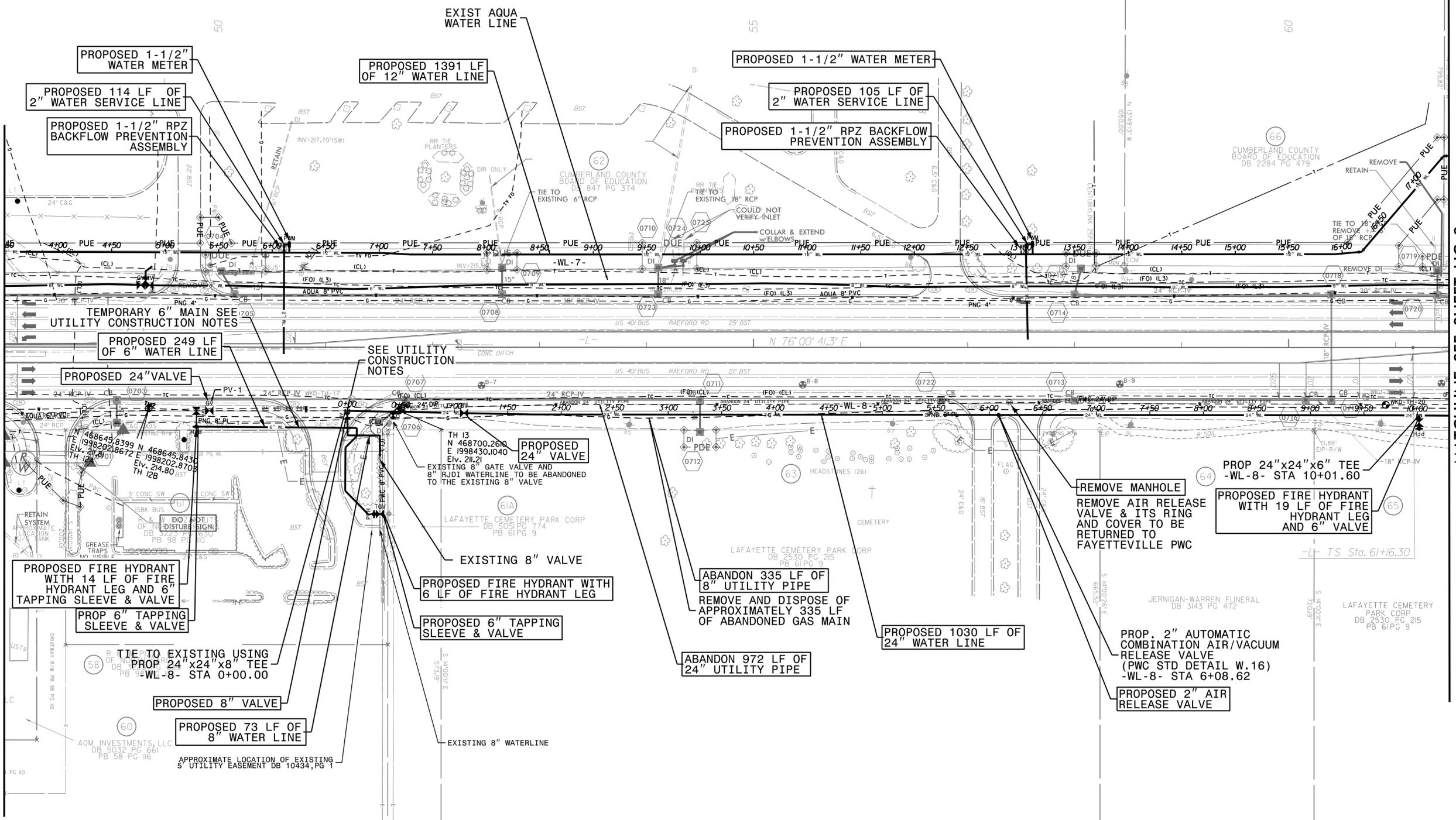
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|--|---------------------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-7 |
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
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UTILITY CONSTRUCTION
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MATCHLINE SEE SHEET UC-6
-L- STA 48+00

MATCHLINE SEE SHEET UC-8
-L- STA 61+50



PROPOSED 2,840 POUNDS OF
DUCTILE IRON WATER PIPE FITTINGS

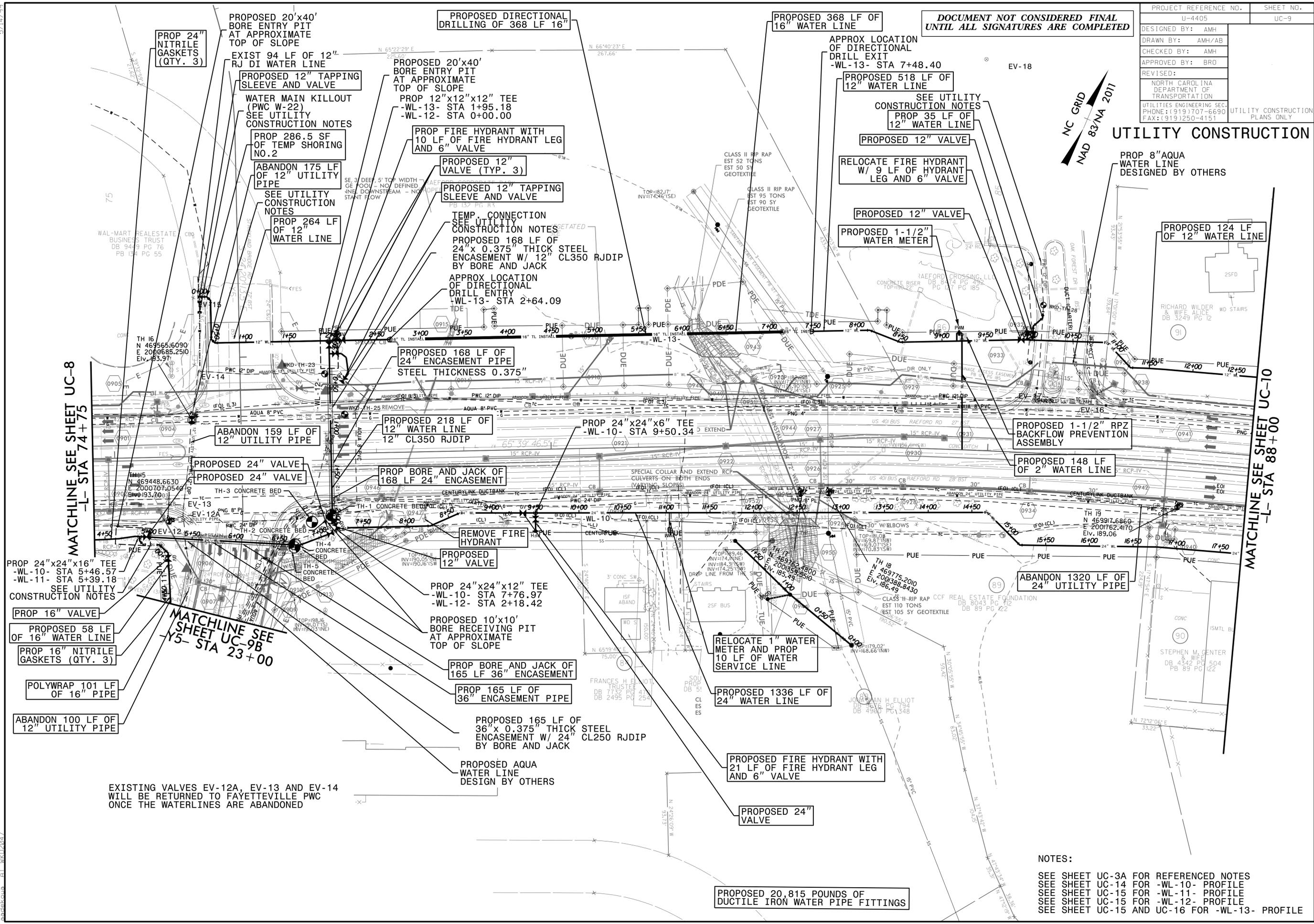
NOTES:
 SEE SHEET UC-3A FOR REFERENCED NOTES
 SEE SHEET UC-12 AND UC-13 FOR -WL-7- PROFILE
 SEE SHEET UC-13 FOR -WL-8- PROFILE

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| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-9 |
| DESIGNED BY: AMH | |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
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UTILITY CONSTRUCTION



MATCHLINE SEE SHEET UC-8
-L- STA 74+75

MATCHLINE SEE SHEET UC-10
-L- STA 88+00

PROP 24"x24"x16" TEE
-WL-10- STA 5+46.57
-WL-11- STA 5+39.18
SEE UTILITY CONSTRUCTION NOTES

PROP 16" VALVE

PROP 58 LF OF 16" WATER LINE

PROP 16" NITRILE GASKETS (QTY. 3)

POLYWRAP 101 LF OF 16" PIPE

ABANDON 100 LF OF 12" UTILITY PIPE

MATCHLINE SEE SHEET UC-9B
-Y5- STA 23+00

NOTES:

SEE SHEET UC-3A FOR REFERENCED NOTES
SEE SHEET UC-14 FOR -WL-10- PROFILE
SEE SHEET UC-15 FOR -WL-11- PROFILE
SEE SHEET UC-15 FOR -WL-12- PROFILE
SEE SHEET UC-15 AND UC-16 FOR -WL-13- PROFILE

EXISTING VALVES EV-12A, EV-13 AND EV-14 WILL BE RETURNED TO FAYETTEVILLE PWC ONCE THE WATERLINES ARE ABANDONED

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|--|--------|---------------------------------|-------|
| PROJECT REFERENCE NO. | U-4405 | SHEET NO. | UC-9A |
| DESIGNED BY: | AMH | | |
| DRAWN BY: | AMH/AB | | |
| CHECKED BY: | AMH | | |
| APPROVED BY: | BRO | | |
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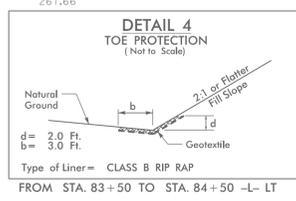
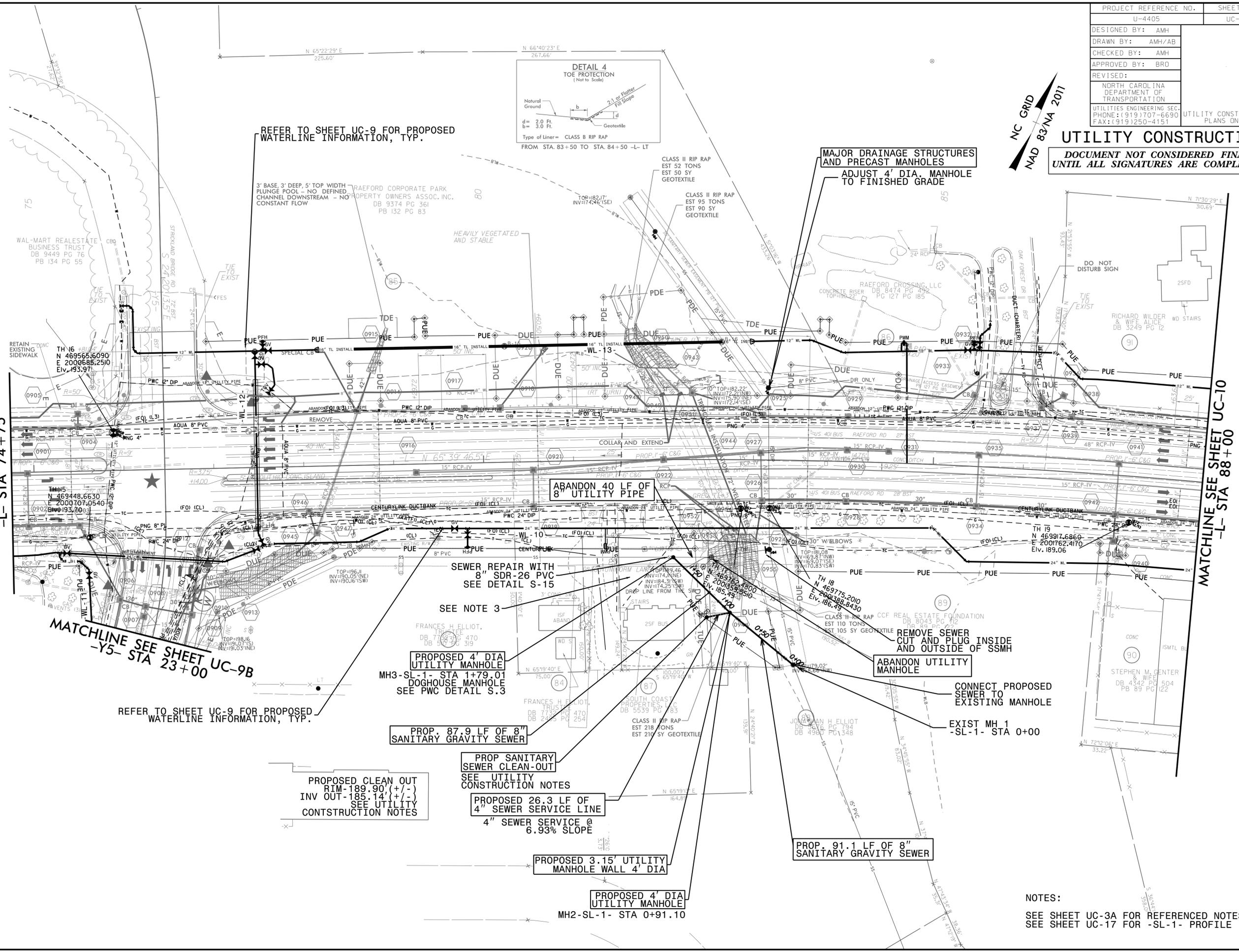


UTILITY CONSTRUCTION
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 5/14/2015

MATCHLINE SEE SHEET UC-8
-L- STA 74+75

MATCHLINE SEE SHEET UC-10
-L- STA 88+00



REFER TO SHEET UC-9 FOR PROPOSED WATERLINE INFORMATION, TYP.

MAJOR DRAINAGE STRUCTURES AND PRECAST MANHOLES
 ADJUST 4' DIA. MANHOLE TO FINISHED GRADE

MATCHLINE SEE SHEET UC-9B
 -Y5- STA 23+00

REFER TO SHEET UC-9 FOR PROPOSED WATERLINE INFORMATION, TYP.

ABANDON 40 LF OF 8" UTILITY PIPE

SEWER REPAIR WITH 8" SDR-26 PVC SEE DETAIL S-15

SEE NOTE 3

PROPOSED 4' DIA UTILITY MANHOLE
 MH3-SL-1- STA 1+79.01 DOGHOUSE MANHOLE SEE PWC DETAIL S.3

PROP. 87.9 LF OF 8" SANITARY GRAVITY SEWER

PROP SANITARY SEWER CLEAN-OUT SEE UTILITY CONSTRUCTION NOTES

PROPOSED 26.3 LF OF 4" SEWER SERVICE LINE
 4" SEWER SERVICE @ 6.93% SLOPE

PROPOSED 3.15' UTILITY MANHOLE WALL 4' DIA

PROPOSED 4' DIA UTILITY MANHOLE
 MH2-SL-1- STA 0+91.10

REMOVE SEWER CUT AND PLUG INSIDE AND OUTSIDE OF SSMH
 ABANDON UTILITY MANHOLE

CONNECT PROPOSED SEWER TO EXISTING MANHOLE

EXIST MH 1 -SL-1- STA 0+00

PROP. 91.1 LF OF 8" SANITARY GRAVITY SEWER

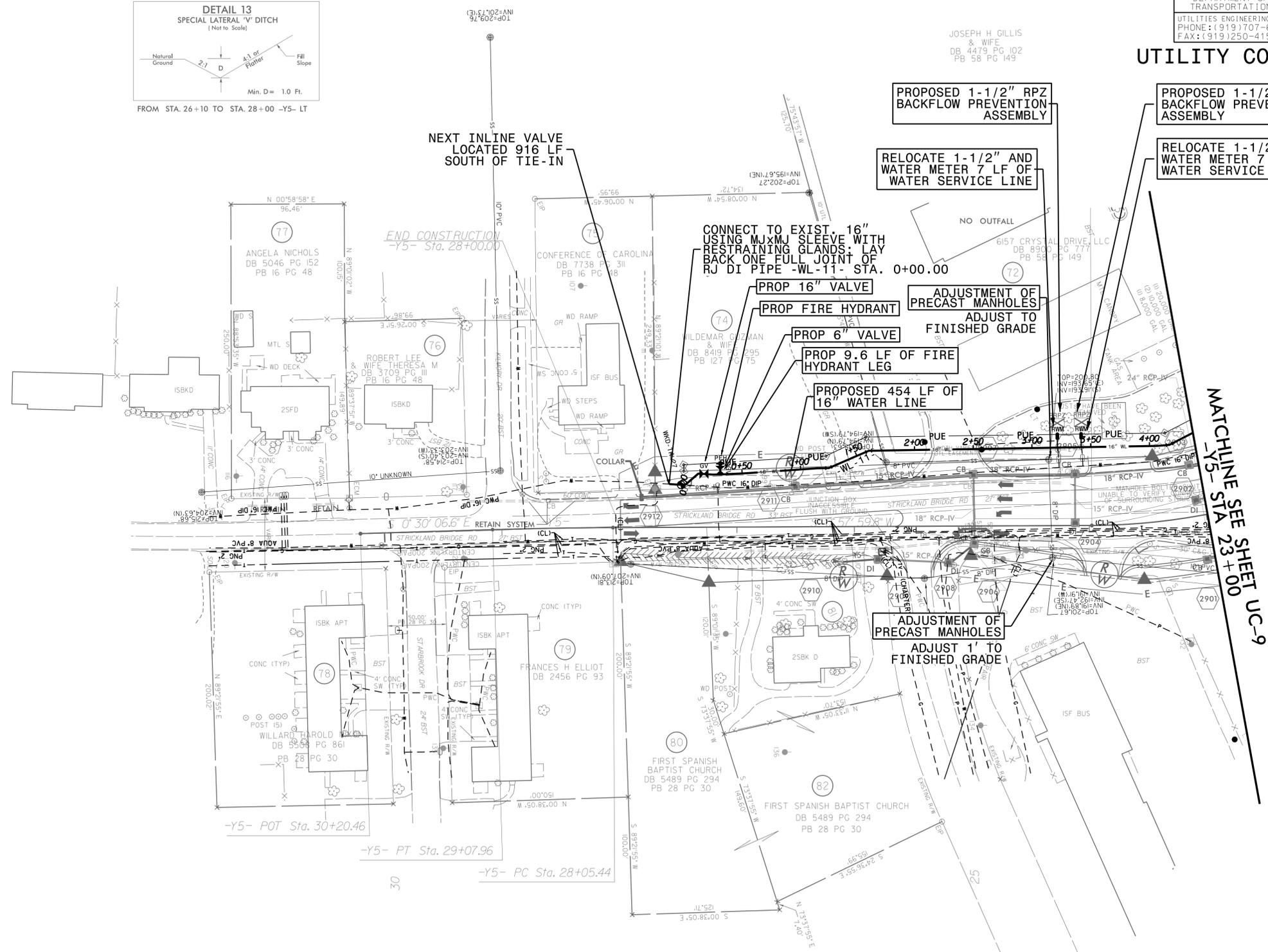
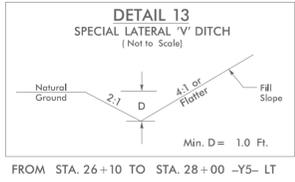
NOTES:
 SEE SHEET UC-3A FOR REFERENCED NOTES
 SEE SHEET UC-17 FOR -SL-1- PROFILE

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|--|------------------------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-98 |
| DESIGNED BY: AMH | UTILITY CONSTRUCTION PLANS ONLY |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
| APPROVED BY: BRO | |
| REVISED: | |
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| UTILITIES ENGINEERING SEC. PHONE: (919) 707-6690 FAX: (919) 250-4151 | |

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NC GRID
NAD 83/NA 2011

JOSEPH H. GILLIS
& WIFE
DB 4479 PG 102
PB 58 PG 149



PROPOSED 2,490 POUNDS OF
DUCTILE IRON WATER PIPE FITTINGS

| | |
|--------------------------------------|---------------------------------------|
| -Y5- | |
| PI Sta 28+56.71 | PI Sta 22+82.12 |
| $\Delta = 1^{\circ} 28' 06.4\"$ (LT) | $\Delta = 25^{\circ} 18' 13.3\"$ (RT) |
| $D = 1^{\circ} 25' 56.6\"$ | $D = 10^{\circ} 44' 58.8\"$ |
| $L = 102.52'$ | $L = 235.39'$ |
| $T = 51.26'$ | $T = 119.65'$ |
| $R = 4,000.00'$ | $R = 533.00'$ |
| | $SE = 0.02$ |

MATCHLINE SEE SHEET UC-9
-Y5- STA 23+00

NOTE:
SEE SHEET UC-3A FOR CONSTRUCTION NOTES
SEE SHEET UC-3B FOR -WL-11 PROFILE

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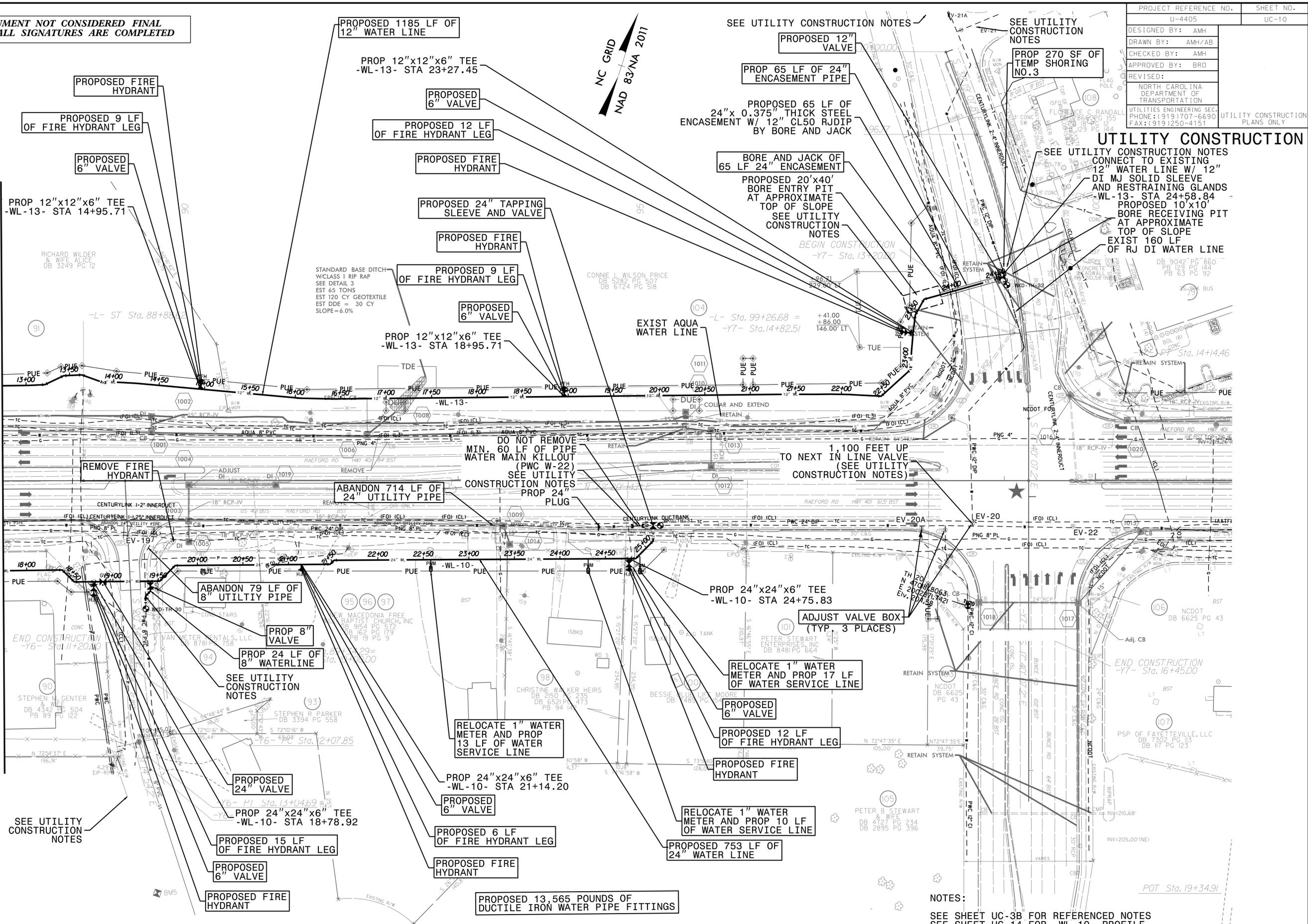
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| PROJECT REFERENCE NO. | SHEET NO. |
| U-4405 | UC-10 |
| DESIGNED BY: AMH | |
| DRAWN BY: AMH/AB | |
| CHECKED BY: AMH | |
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| UTILITY CONSTRUCTION PLANS ONLY | |

UTILITY CONSTRUCTION

SEE UTILITY CONSTRUCTION NOTES
CONNECT TO EXISTING 12" WATER LINE W/ 12" DI MJ SOLID SLEEVE AND RESTRAINING GLANDS -WL-13- STA 24+58.84
PROPOSED 10'x10' BORE RECEIVING PIT AT APPROXIMATE TOP OF SLOPE
EXIST 160 LF OF RJ DI WATER LINE



MATCHLINE SEE SHEET UC-9
-L- STA 88+00



NOTES:
SEE SHEET UC-3B FOR REFERENCED NOTES
SEE SHEET UC-14 FOR -WL-10- PROFILE
SEE SHEET UC-15 AND UC-13 FOR -WL-13- PROFILE

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 5/14/2021

