CHARLOTTE WATER

VEST RESIDUALS & BACKWASH FORCE MAIN TO FRANKLIN WTP PROJECT

B&V PROJECT NO. 193725 CHARLOTTE WATER PROJECT NO. FY23-ITBCON-22

ADDENDUM NO. 3

April 13, 2023

A. <u>SCOPE</u>. This Addendum No. 3 consists of 7 pages (ADD3-1 through ADD3-7), plus the attached items listed below, and the following changes, revisions, or additions.

B. <u>ATTACHMENTS</u>.

SPECIFICATIONS

- C-410 Bid Form
- C-410 Electronic Bid Form
- Section 312333 Trenching and Backfilling
- Section 312333_F2 Protective System Design Certificate
- Section 330525 Tunnel Excavation
- Section 400586_S01 Air Valves Schedule

DRAWINGS - Available upon request through Richa Graphics

- Drawing G-001 General Sheet List & General Notes
- Drawing C-002 Civil Franklin WTP Site Plan Overview
- Drawing C-105 Civil 16-Inch DIP Force main Plan & Profile STA 41+00 to STA 49+50
- Drawing C-110 Civil 16-Inch DIP Force main Plan & Profile STA 82+50 to STA 89+50
- Drawing C-117 Civil 16-Inch DIP Force main Plan & Profile STA 137+50 to STA 145+50
- Drawing T-001 Trenchless Crossing General Notes, Specifications, & Construction Procedure for Trenchless Crossings
- Drawing T-105 Trenchless Crossing CSX Railroad Trenchless Crossing
- Drawing T-110 Trenchless Crossing NCDOT Trenchless Crossing (I-85, SR-2179, & SR-2180)

REFERENCE DOCUMENTS - Available upon request through Richa Graphics

• Geotech Data Report – Vest to Franklin Force Main Charlotte, NC

C. <u>SPECIFICATIONS</u>.

1. C-200 – Instructions to Bidders

Delete sentence of Paragraph 4.02 Bullet Point A.2.a.1, "Report dated March 7, 2023, prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 140 pages." And replace with "Report dated April 4, 2023, prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 144 pages."

2. C-205 – Information Available to Bidders

Delete sentence of Paragraph I Bullet Point A.1 under Scope 1 Bullet Point a, "Report dated March 7, 2023, prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 140 pages." And replace with "Report dated April 4, 2023, prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 144 pages."

3. C-210 – Permits and Agreements

Delete sentence of Paragraph III Bullet Point A under Scope 1 Bullet Point 1, "Geotechnical Report prepared by Terracon Consultants, Inc. dated March 7, 2023, and titled GEOTECHNICAL DATA REPORT, Vest to Franklin Force Main Charlotte, North Carolina."

And replace with "Geotechnical Report prepared by Terracon Consultants, Inc. dated April 4, 2023, and titled Geotechnical Data Report, Vest to Franklin Force Main Charlotte, North Carolina."

4. C-410 - Bid Form BID FORM

Add Bid Item after Item 1.30 as follows:

SPAR	e pa	RTS			
1.31		SPARE PARTS FOR FURNISHING AND PROVIDING TO THE OWNER PRIOR TO CONSTRUCTION AS SPECIFIED BY SECTION 40 05 19			
	А	24-INCH BELL JOINT CLAMPS	6	EA	\$ -
	В	24-INCH MECHANICAL JOINT FULL BODY LONG TRANSITION SLEEVES (DI X CI)	2	EA	\$ -

ADDENDUM NO. 3

				<u> </u>
С	24-INCH MEGALUG WITH DIP FILLER PIECE	4	EA	\$ -
D	30-INCH BELL JOINT CLAMPS	6	EA	\$ -
E	30-INCH MECHANICAL JOINT FULL BODY LONG TRANSITION SLEEVES (DI X CI)	2	EA	\$ -
F	30-INCH MEGALUG WITH DIP FILLER PIECE	4	EA	\$ -
G	36-INCH LONG PATTERN PCCP SLEEVE	12	EA	\$ -
Н	36-INCH MEGALUG	24	EA	\$ -

Delete the Bid Form in its entirety and replace with the attached Bid Form

5. C-800 – Supplementary Conditions

Delete Paragraph SC-1.01. Defined Terms in its entirety; from "SC-1.01 Defined Terms SC-1.01 Add to the list of definitions..." to "the GDR is a Contract Document."

Delete sentence of Paragraph SC-5.03 Bullet Point C.a, "Report dated March 7, 2023 prepared by Terracon Consultants, Inc. entitled "GEOTECHNICAL DATA REPORT, Vest to Franklin Force Main Charlotte, North Carolina" consisting of 140 pages, is included in the contract documents."

And replace with "Report dated April 4, 2023, prepared by Terracon Consultants, Inc. entitled "Geotechnical Data Report, Vest to Franklin Force Main Charlotte, North Carolina" consisting of 144 pages, is included in the contract documents."

6. Section 011113 – Project Requirements

Delete Paragraph 6.01 Bullet Point a, "Approximately 11,000 linear feet of 16inch restrained joint ductile iron pipe (RJ DIP). And replace with "Approximately 11,000 linear feet of 16-inch U.S. Pipe TR FLEX Restrained Joint Ductile Iron Pipe (RJ DIP) coming from Core & Main."

Delete Paragraph 6.01 Bullet b, "Approximately 6,000 linear feet of 16-inch DIP." And replace with "Approximately 6,000 linear feet of 16-inch U.S. Pipe Tyton Joint Ductile Iron Pipe (DIP) coming from Core & Main."

Add the following paragraphs in Paragraph 6.01 after bullet j. as new paragraphs, "Owner has ordered additional pipe and fittings excess of the quantity indicated to be provided to Contractor and has the ability to order additional pipe and fittings as needed, provided notification is provided to Owner by Contractor in a timely manner. Contractor shall provide Owner an update, at least monthly, of

ADDENDUM NO. 3

Owner provided pipe in length and quantity remaining to be installed and projected pipe length and quantity required to finish installation.

Additional pipe and fittings shall be provided to Contractor in order to install pipe as indicated on the drawings. The overall expectation is that the Contractor minimizes the use of fittings. Contractor shall provide justification for pipe and fittings needed beyond the quantity indicated to be provide to the Contractor in the Contract Documents. Pipe and Fittings damaged or installed recklessly shall be replaced by the Contractor and at the Contractor's expense without an adjustment in Contract Price or Contract Time. "

Add the following in Paragraph 7.01 the second paragraph after the first sentence, "If defects are identified in Owner-supplied pipe or fittings, then the Owner will assist in coordination with material supplier by upholding warranty. Contractor shall be primary coordinator with material supplier and replace defected pipe/fitting(s)."

				Approximate Delivery Dates				
			Contract					
<u>Item</u>	Description	<u>Unit</u>	Quantity	3/1/2023	5/1/2023	8/1/2023	10/1/2023	
1	Pipe for 16" Force Main							
	16" Factory Restrained							
1a	Joint DIP	LF	10930	1680	2320	3500	3430	
1b	16" Unrestrained DIP	LF	5260	2400	0	1900	960	
2	Fittings for 16" Force Main							
2a	90 Degree Bend	Each	5	5				
2b	45 Degree Bend	Each	47	42	5			
2c	22.5 Degree Bend	Each	21	16	5			
2d	11.25 Degree Bend	Each	22	10	6	6		
2e	16"x16"x16" Tee	Each	3	3				
2f	16"x6" Reducing Tee	Each	3	0	0	3		
2g	16"x14" Reducer	Each	1	1				
2h	16" Plug Valve	Each	6	0	4	2		
2i	16" Megalugs	Each	222	206	16			
2j	14" Megalugs	Each	1					

Delete scheduled delivery dates table in Paragraph 7.03 after subparagraph 5 in its entirety and replace with the following:

7. Section 012976 – Measurement & Payment

Add the following paragraph after Paragraph 1.30. CATHODIC PROTECTION SYSTEM as follows:

"Paragraph 1.31. SPARE PARTS. Additional spare parts shall be paid for at the unit price bid for each part furnished and provided to the Owner as specified in Section 40 05 19, paragraph 1-5 Spare Materials, for each size and type. The unit price shall include all costs incurred in completing the fitting procurement.

- A. Bell Joint Repair Clamps. Size and quantity as specified on the bid form and Section 40 05 19.
- B. Mechanical Joint Full Body Long Transition Sleeve. Size and quantity as specified on the bid form and Section 40 05 19.
- C. Megalug. Size and quantity as specified on the bid form and Section 40 05 19.
- D. Long Pattern PCCP Sleeve. Size and quantity as specified on the bid form and Section 40 05 19."
- 8. Section 400586_S01 Air Valves Schedule

Delete the entire section in its entirety and replace with the attached Section 400586_S01 - Air Valves Schedule.

9. Section 330525 – Jack & Bore

Delete the entire section in its entirety and replace with the attached Section 330525 – Tunnel Excavation.

10. Section 312333 – Trenching and Backfilling

Delete the entire section in its entirety and replace with the attached 312333 – Trenching and Backfilling.

11. Section 312333_F2 – Protective System Design Certificate

Delete the entire section in its entirety and replace with the attached 312333_F2 – Protective System Design Certificate.

- D. <u>DRAWINGS</u>. Modify the drawings as indicated below.
 - 1. Drawing G-001 General Sheet List & General Notes

Delete the drawing in its entirety and replace with the attached Drawing G-001 – General – Sheet List & General Notes with indicated revisions.

2. Drawing C-002 – Civil – Franklin WTP Site Plan - Overview

Delete the drawing in its entirety and replace with the attached C-002 – Civil – Franklin WTP Site Plan - Overview with indicated revisions.

3. Drawing C-105 – Civil – 16-Inch DIP Force main – Plan & Profile STA 41+00 to STA 49+50

Delete the drawing in its entirety and replace with the attached C-105 – Civil – 16-Inch DIP Force main – Plan & Profile STA 41+00 to STA 49+50 with indicated revisions.

 Drawing C-110 – Civil – 16-Inch DIP Force main – Plan & Profile STA 82+50 to STA 89+50

Delete the drawing in its entirety and replace with the attached C-105 – Civil – 16-Inch DIP Force main – Plan & Profile STA 82+50 to STA 89+50 with indicated revisions.

5. Drawing C-117 – Civil – 16-Inch DIP Force main – Plan & Profile STA 137+50 to STA 145+50

Delete the drawing in its entirety and replace with the attached C-105 – Civil – 16-Inch DIP Force main – Plan & Profile STA 137+50 to STA 145+50 with indicated revisions.

6. Drawing T-001 – Trenchless Crossing – General Notes, Specifications, & Construction Procedure for Trenchless Crossings

Delete the drawing in its entirety and replace with the attached T-001 – Trenchless Crossing – General Notes, Specifications, & Construction Procedure for Trenchless Crossings

7. Drawing T-105 – Trenchless Crossing – CSX Railroad Trenchless Crossing

Delete the drawing in its entirety and replace with the attached T-105 – Trenchless Crossing – CSX Railroad Trenchless Crossing

8. Drawing T-110 – Trenchless Crossing – NCDOT Trenchless Crossing (I-85, SR-2179, & SR-2180)

Delete the drawing in its entirety and replace with the attached T-110 – Trenchless Crossing – NCDOT Trenchless Crossing (I-85, SR-2179, & SR-2180)

9. Drawing T-900 – Trenchless Crossing – Access Pit Details

Delete the entire drawing in its entirety.

10. Drawing T-901 – Trenchless Crossing – Typical Details

Delete the drawing in its entirety and replace with the attached T-901 – Trenchless Crossing – Typical Details

11. All Drawings

Delete the total sheet number on each drawing indicated as "68." And replace with "67."

- E. <u>REPORTS</u>.
 - Delete Geotechnical Data Report dated March 7, 2023, prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 140 pages in its entirety and replace with the attached Geotechnical Data Report dated April 4, 2023 prepared by Terracon Consultants, Inc. entitled "Vest to Franklin Force Main Charlotte, North Carolina" consisting of 144 pages.
- F. <u>ACKNOWLEDGEMENT BY BIDDER</u>. Bidder shall acknowledge this Addendum No. 3 in the space provided on the Bid Form.

CHARLOTTE WATER

VEST WTP UPGRADES PROJECT

B&V PROJECT NO. 193725 CHARLOTTE WATER PROJECT NO. FY23-ITBCon-22

CLARIFICATIONS

April 13, 2023

- QUESTION: Are the fittings Restrained Joint or Mechanical Joint? If Mechanical Joint is the Owner providing megalugs for fittings?
 ANSWER: Fittings are Mechanical Joint. Megalugs to the quantity indicated in the Contract Documents will be provided by the Owner.
- 2) QUESTION: Did the Owner purchase additional pipe or fittings? ANSWER: Yes, refer to Section 011113 Project Requirements.
- QUESTION: If there are pinholes found in the Owner procured pipe or fittings, who is responsible for coordinating with manufacturer?
 ANSWER: Contractor shall refer to Section 01 11 13 Project Requirements Paragraph 7.01.
- QUESTION: What pipes are to be procured by the contractor?
 ANSWER: All items not included in Section 01113 Project Requirements,
 Paragraph 6 ITEMS FURNISHED BY OWNER and its subsequent subparagraphs shall be procured by the Contractor.
- 5) QUESTION: Quantity of pipe and fittings received to date?
 ANSWER: Refer to updated scheduled delivery date table in Section 01113 –
 Project Requirements, Paragraph 7.03 issued in Addendum No. 3.
- QUESTION: When does the second shipment of pipe arrive?
 ANSWER: Refer to updated scheduled delivery date table in Section 01113 Project Requirements, Paragraph 7.03 issued in Addendum No. 3.
- **QUESTION:** Who is the manufacturer for the plug valves? What is their anticipated delivery date?
 ANSWER: The manufacturer is DeZurik. Refer to updated scheduled delivery date table in Section 01113 Project Requirements, Paragraph 7.03 issued in Addendum No. 3.

- 8) QUESTION: Please confirm that Video Monitoring and Documentation shall be required on this project.
 ANSWER: Confirmed.
- QUESTION: Do you have the flows of the existing SS lines we are connecting to at the Franklin WTP?
 ANSWER: Flow information is not available at this time.
- 10) QUESTION: Have the fittings been ordered for instances such as STA 147+00 to STA 149+00 where bends are not labeled, but the deflection on the profile appears to be greater than the allowed amount? If they have not been ordered, would these additional fittings fall under Bid Item 1.7?
 ANSWER: Owner has ordered some pipe and fittings in excess of those indicated on the drawings; however, the overall expectation is that the Contractor minimizes the use of fittings. For instance, and specifically regarding the stations in question, it is preferable that the Contractor deflect the pipe as allowed by the pipe manufacturer to smooth vertical and horizontal changes and minimize the use of bends.
- **QUESTION:** Section 13 47 13, 4-1.03 Induced AC Voltage Testing The paragraph states "The AC potential readings shall be measured at all lead wires at each test station prior to any other testing." Does this mean I have to take AC potentials readings at all the test stations before I take any other potentials or can I take the AC potentials just prior to taking the other potentials at each test station?
 ANSWER: No need to take AC readings at all the test stations before taking any other potentials. Contractor shall take AC potentials prior to taking the other potentials at each test station.
- 12) QUESTION: Section 13 47 13, 4-1.08 Galvanic Anode Cathodic Protection System Pipe Potential Measurements – Polarized potential measurement. The paragraph states "the negative terminal of the voltmeter shall be connected to the reference electrode lead wire, and the positive terminal connected directly to a lead wire of pipe (or corrosion coupon). Temporarily disconnect the anode lead wires from the pipe leads and record potential readings within 1 second of disconnection." – By doing this individually at each test station you will not get a true polarized potential measurement since the potential will be influenced by the other connected anode test stations on the pipeline. This would require synchronously interrupting all the anodes test stations during the testing to get an accurate polarized potential. My question is do you want the testing done the way it is stated or the way I mentioned.

ANSWER: Both testing methods indicated are acceptable. Contractor shall follow the Contract Documents.

BID FORM

Vest WTP to Franklin WTP Force Main and Lee S Dukes High Density Polyethylene (HDPE) Pipeline CPM-20-15-014

Bidder Name: _____

Bid Date:

TABLE OF CONTENTS

Page

ARTICLE 1 – Bid Recipient	1
ARTICLE 2 – Bidder's Acknowledgements	1
ARTICLE 3 – Bidder's Representations	1
ARTICLE 4 – Bidder's Certification	2
ARTICLE 5 – Basis of Bid	3
ARTICLE 6 – Time of Completion	16
ARTICLE 7 – Attachments to this Bid	16
ARTICLE 8 – Defined Terms	16
ARTICLE 9 – Bid Certification	17

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of Charlotte - Charlotte Water

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum Date

- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2)

the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

- 4.01 Bidder certifies that:
 - A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
 - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
 - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
 - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

- 5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):
 - A. Scope 1 Vest WTP to Franklin WTP Force Main Prices

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices						
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price	
MOBI	LIZA	TION		•			
1.1		FOR MOBILIZATION TO THE PROJECT SITE, AS					
		SPECIFIED (THIS ITEM IS LIMITED TO 3% OF	1	15			
		THE TOTAL OF ALL UNIT PRICE BID ITEMS FOR	Ŧ	25			
		VEST WTP TO FRANKLIN WTP FORCE MAIN)					
RESTR	RAIN	IED JOINT PIPE - LABOR ONLY					
1.2		RESTRAINED JOINT DUCTILE IRON PIPE, AS					
		SPECIFIED, COMPLETE IN PLACE				1	
	А	16-INCH DUCTILE IRON PIPE (PRESSURE	10 930	IF			
		CLASS 250)	10,550	L I			
RESTR	RAIN	IED JOINT PIPE		1			
1.3		FOR ADDING RESTRAINED JOINT (MEGALUG					
		OR APPROVED EQUAL) TO DUCTILE IRON	25	EA			
		PIPE, AS SPECIFIED, COMPLETE IN PLACE					
16" D	IP C	LASS 250 - LABOR ONLY		1			
1.4		FOR INSTALLING 16-INCH DUCTILE IRON PIPE					
		(PRESSURE CLASS 250), WITH PUSH ON	5,260	LF			
		(NON-RESTRAINED) JOINTS, AS SPECIFIED,	3,200				
		COMPLETE IN PLACE					
FURN	ISH	AND INSTALL PIPE					
1.5		FOR FURNISHING AND INSTALLING PUSH-ON					
		(NON-RESTRAINED) JOINT PIPE, AS SPECIFIED,					
		COMPLETE IN PLACE		1			
	А	FOR FURNISHING AND INSTALLING 6-INCH					
		POLYVINYL CHLORIDE PIPE C900 DR 18, WITH	640	LF			
		PUSH-ON (NON-RESTRAINED) JOINTS, AS					
	_	SPECIFIED, COMPLETE IN PLACE					
	В	FOR FURNISHING AND INSTALLING 6-INCH					
		DUCTILE IRON PIPE (PRESSURE CLASS 350)	36	LF			
		WITH PUSH-ON (NON-RESTRAINED) JOINTS,					
		AS SPECIFIED, COMPLETE IN PLACE					
	C	FOR FURNISHING AND INSTALLING 16-INCH					
		PULYVINYL CHLORIDE PIPE C900 DR 18, WITH	20	LF			
		PUSH-ON (NON-RESTRAINED) JOINTS, AS					
	1	SPECIFIED, COMPLETE IN PLACE					

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices						
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price	
	D	FOR FURNISHING AND INSTALLING 16-INCH DUCTILE IRON PIPE (PRESSURE CLASS 250) WITH PUSH-ON (NON-RESTRAINED) JOINTS, AS SPECIFIED, COMPLETE IN PLACE	300	LF			
DIP FI	TTIN	IGS – LABOR ONLY					
1.6		FOR INSTALLING DIP FITTINGS AS SPECIFIED, COMPLETE IN PLACE					
	A	90 DEGREE FITTING	5	EA			
	В	45 DEGREE FITTING	47	EA			
	С	22.5 DEGREE FITTING	21	EA			
	D	11.25 DEGREE FITTING	22	EA			
	E	16X16 TEE	1	EA			
	F	16X6 TEE	3	EA			
FURN	SH /	AND INSTALL DIP FITTINGS	Γ		[
1.7		FOR FURNISHING AND INSTALLING DIP FITTINGS AS SPECIFIED, COMPLETE IN PLACE	5,000	LBS			
ЈАСК 8	& BC	DRE CROSSINGS	L				
1.8		FOR FURNISHING AND INSTALLING (DRY- BORE) STEEL ENCASEMENT, AS SPECIFIED, COMPLETE IN PLACE					
	A	48-INCH DIAMETER CASING (t=0.500") ACROSS NCDOT I-85	330	LF			
	В	48-INCH DIAMETER CASING (t=0.750") ACROSS CSX RAILROAD	117	LF			
	С	30-INCH DIAMETER CASING (t=0.500") ACROSS BOX CULVERT	25	LF			
AERIA	L PI	PE INSTALLATION					
1.9		FOR INSTALLING 16-INCH RJDIP AND FURNISHING AND INSTALLING BRACING ACROSS STEWARTS CREEK, AS SPECIFIED	194	LF			
TEMP	ORA	RY/PERMANENT STREAM CROSSINGS					
1.10		FOR CROSSING STREAMS, AS SPECIFIED ON PLANS					
	А	TEMPORARY STREAM CROSSING	2	EA			
	В	PERMANENT STREAM CROSSING	1	EA			

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices						
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price	
ABAN	DOM	MENT OF EXISITING MAINS					
1.11		FOR ABANDONMENT OF EXISTING WATER					
		MAINS, AS SPECIFIED ON PLANS AND AS					
		DIRECTED BY THE ENGINEER					
	А	CUT, FILL WITH GROUT, AND PLUG					
		(WATERTIGHT) EXISTING 2-INCH WATER	640	LF			
		MAIN					
	В	CUT, REMOVE, AND DISPOSE EXISTING 1-	315	IE			
		INCH WATER MAIN	515	LI			
CONN	ECT	ION TO EXISTING MAINS					
1.12		FOR CONNECTION OF PROPOSED MAINS TO					
		EXISTING MAINS, AS SPECIFIED ON PLANS					
		AND AS DIRECTED BY THE ENGINEER					
	А	16-INCH MAIN TO 14-INCH MAIN	1	EA			
	В	6-INCH MAIN TO 6-INCH MAIN	2	EA			
GATE	VAL	VE					
1.13		FOR FURNISHING AND INSTALLING MAIN					
		LINE GATE VALVES, AS SPECIFIED, COMPLETE					
		IN PLACE					
	А	6-INCH GATE VALVES	3	EA			
PLUG	VAL	VE - LABOR ONLY					
1.14		FOR INSTALLING MAIN LINE PLUG VALVES, AS					
		SPECIFIED, COMPLETE IN PLACE					
	Α	16-INCH PLUG VALVES	4	EA			
AIR RE	ELEA	SE VALVES					
1.15		FOR FURNISHING AND INSTALLING AIR					
		RELEASE VALVES AS SPECIFIED AND AS					
		DIRECTED BY THE ENGINEER,					
		COMPLETE IN PLACE		1 1			
	А	ON 16-INCH PIPE - 3" COMBINATION AIR	10	FΔ			
		RELEASE AND VACUUM VALVES	10				
	В	MANUAL ARV ON 16-INCH PIPE - 3" AIR	2	FA			
		RELEASE	–				
EXPLO	RA						
1.16		EXPLORATORY DIGGING, AS SPECIFIED					
	А	BOTH SIDES OF METER BOX	100	EA			
	В	PUBLIC SIDE OF METER BOX ONLY	50	EA			

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices							
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price		
WATE	R SE	RVICES						
1.17		FOR FURNISHING AND INSTALLING WATER						
		SERVICES, AS SPECIFIED, COPPER TUBING						
		(TYPE K) - OPEN CUT METHOD, COMPLETE IN						
		PLACE						
	А	3/4-INCH TUBING - SAME SIDE OF STREET	55	FA				
		(SHORT SIDE)	33	2/1				
	В	1-INCH TUBING - SAME SIDE OF STREET	5	FΔ				
		(SHORT SIDE)	5	L/1				
	С	3/4-INCH TUBING - OPPOSITE SIDE OF STREET	45	FΔ				
		(LONG SIDE)	45	2/1				
	D	1-INCH TUBING - OPPOSITE SIDE OF STREET	5	FA				
		(LONG SIDE)		2/1				
1.18		FOR CHANGEOVER OF EXISTING WATER						
		SERVICES FROM ABANDONED/REMOVED						
		WATER MAINS TO 6-INCH MAIN.						
		FURNISHING AND INSTALLING WATER						
		SERVICES, AS SPECIFIED, COPPER TUBING						
		(TYPE K) - OPEN CUT METHOD, COMPLETE IN						
		PLACE		1				
	А	3/4-INCH TUBING - SAME SIDE OF STREET	5	EA				
		(SHORT SIDE)	_					
	В	3/4-INCH TUBING - OPPOSITE SIDE OF STREET	6	EA				
		(LONG SIDE)	-					
MANH	IOLI	ES		1	[
1.19		FOR BASIC MANHOLES, 0-6 FOOT DEPTHS, AS						
		SPECIFIED, BACKFILLED COMPLETE IN PLACE,						
		WITH GROUTED ON FRAME AND COVER						
	A	FOR 4-FOOT DIAMETER MANHOLES	4	EA				
	В	FOR ADDITIONAL VERTICAL FOOT OF	15	VF				
		MANHOLE DEPTH						
1.20		FOR CONNECTIONS AT MANHOLES, AS						
		SPECIFIED, COMPLETE IN PLACE						
	A	FOR FITTINGS ADDED TO EXISTING MANHOLE	2	EA				
	_							
	В	CONNECT TO EXISTING MANHOLES WITH 6-	2	EA				
		INCH PIPE						

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices							
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price		
FENCE	AN	D/OR GATE REMOVAL AND RESETTING (OR REF	PLACEMENT)					
1.21		FOR THE REMOVAL AND RESETTING (OR						
		REPLACEMENT) OF FENCES OR GATES, AS						
		SPECIFIED, IN PLACE						
	А	FOR THE REMOVAL, STORAGE, AND	100	IF				
		RESETTING OF A PERMANENT FENCE	100					
	В	FOR THE FURNISHING AND INSTALLATION OF	2	EA				
		A PERMANENT GATE	_	_, ,				
CUTTI	NG	AND REPLACING EXISTING ASPHALT, CONCRETE	CURB AND G	UTTER				
1.22		ASPHALT CUTTING AND REPLACEMENT, FULL	6,570	SY				
4.00		SECTION WITHIN						
1.23			610	LF				
FROCI								
ERUSI		CONTROL						
1.24								
	Δ		7	FΔ				
	B	SILT FENCE	9.875	LF				
	C	STONE SILT CHECK DAM OR WATTLE	5	EA				
	D	TEMPORARY INLET PROTECTION	60	EA				
CLEAN	IUP,	SEEDING, AND SODDING						
1.25	,	FOR CLEANUP, SEEDING, AND SODDING						
		AREAS, AS SHOWN ON THE PLANS, OR AS						
		DIRECTED BY THE ENGINEER, COMPLETE AS						
		SPECIFIED, (THIS ITEM MUST BE AT LEAST 1%						
		OF THE TOTAL OF ALL UNIT PRICE BID ITEMS						
		FOR VEST WTP TO FRANKLIN WTP FORCE						
		MAIN)						
	А	FOR CLEANUP, FERTILIZING, SEEDING AND						
		MULCHING, AS SPECIFIED, COMPLETE IN	16,300	LF				
		PLACE						
CLEAR	ING	AND GRUBBING	Г					
1.26		CLEARING AND GRUBBING RIGHT-OF-WAY						
		AND/OR EASEMENTS WITHIN WOODED	1	AC				
		AREAS						

	Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices							
Bid Ite	em	Description	Quantity	Unit	Unit Price	Bid Price		
ROCK	EXC	AVATION						
1.27		FOR SOLID ROCK EXCAVATION, AS						
		SPECIFIED		-				
	А	FOR THE FIRST 100 CY ROCK EXCAVATION	100	CY				
		PER PROJECT	100	01				
	В	FOR ADDITIONAL ROCK EXCAVATION AFTER	20	CY				
		THE INITIAL 100 CY PER PROJECT	20	CI				
STONE	E ST	ABILIZATION AND/OR SELECT FILL						
1.28		FOR STONE STABILIZATION AND/OR SELECT						
		FILL MATERIAL AS SPECIFIED, COMPLETE IN	5	ΤN				
		PLACE						
TAPPI	NG	SLEEVE & VALVE						
1.29		FOR FURNISHING AND INSTALLING TAPPING						
		SLEEVE AND VALVE ASSEMBLIES, AS						
		SPECIFIED, COMPLETE IN PLACE						
	Α	6" X 6"	1	EA				
CATHO	DDI							
1.30		FOR FURNISHING AND INSTALLING THE						
		CATHODIC PROTECTION SYSTEM, AS						
		SPECIFIED AND DIRECTED BY THE ENGINEER						
	А	CATHODIC PROTECTION TEST STATION	24	EA				
	В	COATING AND ELECTRICAL BONDING OF	1	LS				
		JOINTS AND FITTINGS						
	С	COMMISSIONING AND INSTALLATION TESTS	1	LS				
SPARE	E PA	RTS						
1.31		FOR FURNISHING AND PROVIDING TO THE						
		OWNER PRIOR TO CONSTRUCTION AS						
		SPECIFIED BY SECTION 40 05 19						
	A	24-INCH BELL JOINT CLAMPS	6	ΕA				
	В	24-INCH MECHANICAL JOINT FULL BODY	2	EA				
		LONG TRANSITION SLEEVES (DI X CI)						
	C	24-INCH MEGALUG WITH DIP FILLER PIECE	4	EA				
	D	30-INCH BELL JOINT CLAMPS	6	EA				
	E	30-INCH MECHANICAL JOINT FULL BODY	2	EA				
	L	LONG TRANSITION SLEEVES (DI X CI)						
	F	30-INCH MEGALUG WITH DIP FILLER PIECE	4	EA				
	G	36-INCH LONG PATTERN PCCP SLEEVE	12	EA				
	Н	36-INCH MEGALUG	24	EA				

Scope 1 – Vest WTP to Franklin WTP Force Main – Unit Prices									
Bid Item	Description	Quantity	Unit	Unit Price	Bid Price				
Total of A Scope 1 -	II Unit Price Bid Items for Vest WTP to Franklin WTP Force Main								

B. Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices

Scope 2 - Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices						
Bid Item		Description		Unit	Unit Price	Bid Price
2.1		FOR REMOVING EXISTING CHEMICAL FEED LINES				
	А	1-1/2-INCH HDPE PIPE INSIDE 8-INCH CASING	2,000	LF		
	В	1-1/2-INCH HDPE PIPE INSIDE 12-INCH CASING	4,000	LF		
	С	3-INCH / 4-INCH HDPE PIPE INSIDE 8-INCH	6,000	LF		
		CASING				
	D	8-INCH PVC PIPE (MH NO 1 TO WTP BUILDING)	185	LF		
	Е	1-1/2-INCH HDPE PIPE AT INTAKE TOWER AND	400	LF		
		INSIDE WTP BUILDING				
	F	3-INCH / 4-INCH HDPE PIPE AT INTAKE TOWER	400	LF		
		AND INSIDE WTP BUILDING				
2.2		FOR FURNISHING AND INSTALLING 3" CPVC x				
		6" PVC DOUBLE CONTAINMENT PIPE AND				
		FITTINGS, AS SPECIFIED, COMPLETE IN PLACE				
	А	3" CPVC X 6" PVC	6,000	LF		
	В	SHIELDING FOR EXPOSED SECTIONS (INTAKE	100	LF		
		TOWER)				
	С	CONTINUOUS CABLING FOR LEAK DETECTION	6,000	LF		
	D	TESTING AND COMMISSIONING	1	LS		

	Scope 2 - Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices					
Bid It	em	Description	Quantity	Unit	Unit Price	Bid Price
2.3		FOR FURNISHING AND INSTALLING MANHOLES				
		(6-FOOT DEPTH)				
	A	4-FOOT DIAMETER MANHOLE	1	EA		
	В	8-FOOT DIAMETER MANHOLE	2	EA		
2.4		FOR FURNISHING AND INSTALLING 8' DIAMETER MANHOLES - EXTRA DEPTH	22	VF		
2.5		FOR FURNISHING AND INSTALLING 8-INCH PVC				
		CASING PIPING, AS SPECIFIED, COMPLETE IN				
		PLACE.				
	А	8-INCH PVC PIPE (OPERATIONS BUILDING TO	100	LF		
		MH NO 1)				
2.6		FOR FURNISHING AND INSTALLING 2-INCH				
		HDPE RAW WATER SAMPLING PIPE AND				
		FITTINGS INSIDE EXISTING CASINGS, AT WTP				
		AND INTAKE TOWER, AS SPECIFIED, COMPLETE				
		IN PLACE.				
	A	2-INCH HDPE PIPE INSIDE EXISTING 12-INCH	3,900	LF		
	D	CASING (MH NO 1 TO MH NO 8)	2 000			
	в	2-INCH HDPE PIPE INSIDE EXISTING 12-INCH	3,900	LF		
	6		2 000	10		
	C	CASING (MH NO 8 TO MH NO 15)	2,000	LF		
	D	2-INCH HDPE PIPE INSIDE EXISTING 8-INCH	2 000	I F		
		CASING (MH NO 8 TO MH NO 15)	2,000			
	Е	2-INCH HDPE PIPE AT INTAKE TOWER AND	500	LF		
		INSIDE WTP				
2.7		FOR FURNISHING AND INSTALLING STEEL				
		ENCASEMENT PIPE, AS SPECIFIED, COMPLETE				
		IN PLACE, WITHIN EXSITING TRANSCO AND				
		PNG RIGHTS-OF-WAY, AND AT WTP				
	А	16-INCH STEEL ENCASEMENT PIPE WITHIN	125	LF		
		WILLIAMS TRANSCO ROW				
	В	16-INCH STEEL ENCASEMENT PIPE WITHIN PNG	85	LF		
		ROW	_			
	C	12-INCH STEEL ENCASEMENT PIPE (STA 58+75	110	LF		
2.0						
2.8		FUR FURNISHING AND INSTALLING 48" STEEL				
		ENCASEIVIENT PIPE BY JACK AND BUKE, AS				
		SECTIED, COMPLETE IN PLACE WITHIN				
	Δ	48" STEEL ENCASEMENT PIPE	190	IF		
			190	-		

	Scope 2 - Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices					
Bid It	em	Description	Quantity	Unit	Unit Price	Bid Price
	В	BORE PIT 5' DEEP	2	EA		
	С	BORE PIT ADDITIONAL DEPTH	30	VF		
2.9		BORE PIT MOBILIZATION FOR UNSUCCESSFUL	1	EA		
		BORES, AS SPECIFIED				
2.10		GROUT INCOMPLETE CASING, AS SPECIFIED	1	EA		
2.11		FOR FURNISHING SELECT BACKFILL, AS				
		SPECIFIED, COMPLETE IN PLACE				
	А	SELECT BACKFILL	200	CY		
2.12		FOR SOLID ROCK EXCAVATION, AS SPECIFIED,				
	-	COMPLETE IN PLACE (\$40/CY MINIMUM)				
	A	BASE REMOVAL	100	CY		
	В	FOR ADDITIONAL REMOVAL BEYOND 100 CY	100	CY		
	С	FOR EXPLORATORY DRILLING	100	LF		
2.13		FOR STORM DRAIN REPLACEMENT, AS				
	•	SPECIFIED, COMPLETE IN PLACE	- 10			
	А	15" DIAMETER AND SMALLER DRIVEWAY	40	LF		
	<u> </u>		20			
	B	18" DIAMETER AND LADGER	20			
2 1 4	L		20	LF		
2.14						
		SDECIEIED				
	Δ		3 100	sv		
2 1 5	~	FOR CONSTRUCTING AND MAINTAINING	5,100	51		
2.15		VARIOUS FROSION CONTROL DEVICES				
		TEMPORARY TREE PROTECTION. AS SPECIFIED				
	Α		8.000	LF		
	В	SILT FENCE STONE OUTLET	40	EA		
	С	TEMPORARY CONSTRUCTION ENTRANCES	4	EA		
2.16		FOR FERTILIZING, SEEDING AND MULCHING, AS		II		
		SPECIFIED				
	Α	FERTILIZING, SEEDING AND MULCHING	24,200	SY		
2.17		SEEDING AS SPECIFIED (WETLANDS)				
	А	PERMANENT SEEDING	500	SY		
	В	TEMPORARY SEEDING	500	SY		
	С	PLANTINGS	500	SY		
2.18		FOR CUTTING AND REPLACING EXISTING				
		ASPHALT, CONCRETE CURB AND GUTTER				
	А	ASPHALT CUTTING AND REPLACEMENT, FULL	600	SY		
		SECTION WITHIN TRENCH HORIZONTAL LIMITS				

Scope 2 - Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices						
Bid It	em	Description	Quantity Unit Unit Price Bid Price			Bid Price
	В	CONCRETE CURB REMOVAL AND REPLACEMENT	150	LF		
2.19		PAVEMENT MARKING LINES AND SYMBOLS				
	Α	PAVEMENT MARKING	200	LF		
2.20		CONCRETE FLATWORK				
	А	4-INCH THICK SIDEWALK	50	SY		
2.21		TRAFFIC CONTROL				
	А	TRAFFIC CONTROL DEVICES	1	LS		
2.22		FOR FURNISHING MATERIALS, EQUIPMENT,				
		AND LABOR TO INSTALL NEW RAW WATER				
		SAMPLING PUMP, CASING, APPURTENANCES,				
		ELECTRICAL, COMPLETE AS SPECIFIED AND				
		SHOWN ON THE PLANS				
	А	RAW WATER SAMPLING PUMP, CASING, &	1	EA		
		APPURTENANCES				
	В	SAMPLE PUMP ELECTRICAL, STARTER,	1	LS		
		CONDUIT, DISCONNECT, MISC.				
2.23		FOR FURNISHING MATERIALS, EQUIPMENT,	1	LS		
		AND LABOR TO INSTALL NEW SONDE CASING,				
		APPURTENANCES, ELECTRICAL, COMPLETE, AS				
		SPECIFIED AND SHOWN ON THE PLANS				
2.24			1	LS		
2.25		INTERNAL TV INSPECTION OF PVC CHEMICAL	7,000	Lŀ		
2.20		FEED LINE CASINGS	6 5 0 0			
2.26		FIBER OPTIC CABLE COMPLETE, INCLUDING	6,500	LF		
2 27			45	Г۸		
2.27		WANHOLE COLLARS AND BOLLARDS AROUND	45	EA		
2 28						
2.20		AND LABOR TO INSTALL NEW 2-INCH DIAM				
		HDPE POTABLE WATER LINE APPLIRTENANCES				
		TAP METER VALUE BACKELOW PREVENTER				
		ENCLOSURE, ETC. COMPLETE AS SPECIFIED				
		AND SHOWN ON THE PLANS				
	А	2-INCH HDPE PIPE	1.700	LF		
	B	CONNECTION TO 24-INCH WATER MAIN.	1	LS		
	-	INCLUDING TAPPING SLEEVE				
	С	2-INCH RPPZ BACKFLOW PREVENTER AND	1	LS		
	-	HEATED ENCLOSURE				
	D	TESTING AND DISINFECTION	1	LS		
		C-410	L			

Scope 2 - Lee S Dukes High Density Polyethylene (HDPE) Pipeline – Unit Prices						
Bid Item		Description	Quantity	Unit	Unit Price	Bid Price
2.29		FOR INSTALLING NEW CHEMICAL FEED LINES				
	А	1-1/2-INCH HDPE PIPE INSIDE 8-INCH CASING	2,000	LF		
	В	1-1/2-INCH HDPE PIPE INSIDE 12-INCH CASING	4,000	LF		
	С	8-INCH PVC PIPE (MH NO 1 TO WTP BUILDING)	110	LF		
	D	1-1/2-INCH HDPE PIPE AT INTAKE TOWER AND	400	LF		
		INSIDE WTP BUILDING				
2.30		SUBTOTAL ITEMS 1 THROUGH 29				
2.31		MOBILIZATION (LIMITED TO 3% OF TOTAL OF				
		ALL ITEMS 2.1 THROUGH 2.29)				
Total	Total of All Unit Price Bid Items for					
Lee S	Duk	es High Density Polyethylene (HDPE) Pipeline				

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Total Bid Price without contingency =	
Total of All Unit Price Bid Items for Vest WTP to Franklin WTP Force Main + Total of All Unit Price Bid Items for Lee S Dukes High Density Polyethylene (HDPE) Pipeline	\$

CONTINGENCY ALLOWANCE, <u>13%</u> OF TOTAL BID PRICE	\$	
CONTINGENCY ALLOWANCE, <u>13%</u> OF TOTAL BID PRICE	Ş	

Contingency allowance shall be used only upon written approval of Owner for additional work not included in the Contract Documents. The amount paid will be negotiated as lump sum or unit price per each item of additional work. Any unused portion of the allowance remaining at the completion of the Contract shall revert to Owner as a credit. Owner reserves the right to delete the allowance from the Contract prior to award. Should an amount other than <u>13%</u> of the total Bid price be entered in the space provided, Owner reserves the right to change this amount to the correct figure.

Total Bid Price with Contingency =	ć	
Total Bid Price without contingency + Contingency Allowance	ç	

- ATTACH FLASH DRIVE OF EXCEL BID FORM TO THIS PAGE -

Reference Instructions to Bidders Paragraph 13.11 for requirement to submit electronic Bid data.

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder agrees that portions of the Work incorporated into intermediate Milestones will be completed by the associated Milestone dates included in the Agreement.
- 6.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
 - A. Required Bid security
 - B. C-433 List of Subcontractors
 - C. C-436 Equipment Questionnaire
 - D. C-444 Debarred Firms
 - E. C-445 E-Verify Certification
 - F. C-446 Non-Collusive Affidavit
 - G. C-447 Certification Regarding Debarment & Suspension
 - H. C-448 Byrd Anti-Lobbying Certification
 - I. C-449 Contractor Safety Assessment
 - J. C-450 Sensitive Document Distribution
 - K. C-451 Bidder's Qualification Statement
 - L. C-470 Corporate Authority to Execute Bid & Agreement
 - M. Charlotte Business Inclusion Forms

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID CERTIFICATION

PROJECT: VEST WTP TO FRANKLIN WTP FORCE MAIN AND LEE S DUKES HIGH DENSITY POLYETHYLENE (HDPE) PIPELINE

BIDDER: [Indicate correct legal name of bidding entity as registered with the City of Charlotte]

By: [Signature]	
[Printed name]	
Title: (If Bidder is a corporation, a limited liabili evidence of authority to sign.)	ty company, a partnership, or a joint venture, attach
Attest: [Signature]	
[Printed name]	
Title:	
Submittal Date:	
Address:	
Telephone Number:	
Fax Number:	
Email: NC General Contractor's License No.:	
Classification:	Limits:
Other Licenses (Type & No.)	
City of Charlotte Vendor Number:	
Communications concerning this Bid shall	be addressed to:
Contact Name:	
E-Mail Address:	
Phone Number: Address: (if different from above)	

Subscribed and sworn before me this _____ day of _____, 20____,

Signature

My commission expires _____

If Bid is submitted as a Joint Venture or Partnership, a second Bid Certification must be filled out for the second member of the Joint Venture or Partnership.

Section 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1-1. <u>SCOPE</u>. This section covers clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching; crossings; the handling, storage, transportation, and disposal of all excavated material; all necessary temporary earth retention systems, and other protection work; preparation of subgrades for structures; dewatering as necessary; protection of adjacent property; backfilling; pipe embedment; grading; and other appurtenant work.

1-2. <u>GENERAL</u>. With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, Contractor shall employ a competent person and, when necessary based on the regulations, a licensed professional engineer, to act upon all pertinent matters of the work of this section.

1-3. <u>SUBMITTALS</u>. Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with the Submittal Procedures section.

1-3.01. <u>Temporary Earth Retention System Design Certificate</u>. Before starting construction on temporary earth retention system(s), submit Temporary Earth Retention System Design Certificate(s), Figure 2 – 31 23 33 when required to protect existing facilities. Refer to paragraph in this specification titled, "Temporary Earth Retention."

1-3.02. <u>Independent Testing Laboratory Experience</u>. Qualifications of independent testing laboratory that will be retained by Contractor to perform the testing required by paragraph in this specification titled, "Review of Materials."

1-3.03. <u>Embedment and Backfill Materials</u>. Complete test results from tests performed by an independent commercial testing laboratory retained by the Contractor for all materials described in the paragraph titled, "Review of Materials."

1-4. <u>INSURANCE</u>. If applicable, professional liability insurance shall be provided as specified in the Supplementary Conditions.

PART 2 - PRODUCTS

2-1. MATERIALS.

2-1.01. Tunnel Materials.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 1 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Tunnel Materials shall be provided as indicated in the Tunnel Excavation section.

2-1.02. Backfill Materials.

2-1.02.01. <u>Job Excavated Material</u>. Job excavated material may be used for either uncompacted or compacted trench backfill when the job excavated material is finely divided and free from debris, organic material, cinders, corrosive material, and stones larger than 3 inches in greatest dimension. Masses of moist, stiff clay shall not be used.

2-1.02.02. Inundated Sand Backfill. Not Used.

2-1.02.03. <u>Crushed Rock Backfill</u>. Graded gravel for compacted trench backfill shall conform to the following gradation:

Percent Passing by Weight
100
85 – 100
50 - 80
35 - 60
15 – 30
5 – 10

The gravel mixture shall contain no clay lumps or organic matter. The fraction passing the No. 4 [4.75 mm] sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2-1.02.04. <u>Granular Fill</u>. Granular fill material shall be crushed rock or gravel. Granular fill shall be free from dust, clay, and trash; shall be hard, durable, and non-friable; and shall be graded 3/4 inch to No. 4 [19 to 4.75 mm] as defined in ASTM C33 for No. 67 coarse aggregate. Granular fill shall meet the quality requirements for ASTM C33 coarse aggregate.

2-1.02.05. <u>Fill and Embankment Materials</u>. To the maximum extent available, excess suitable material obtained from structure and trench excavation shall be used for the construction of site fills and embankments. Additional material shall be provided from Contractor's offsite source.

All material placed in fills and embankments shall be free from rocks or stones larger than 3 inches in their greatest dimension, brush, stumps, logs, roots, debris, and other organic or deleterious materials. No rocks or stones shall be placed in the upper 18 inches of any fill or embankment. Rocks or stones within the allowable size limit may be incorporated in the remainder of fills and embankments, provided they are distributed so that they do not interfere with proper compaction.

31 23 33 TRENCHING AND BACKFILLING Page 2 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE 2-1.02.06. <u>Structure Backfill</u>. Backfill around manholes and small concrete vaults shall meet the requirements specified herein.

Structure backfill shall be defined as the material placed around and outside of structures. For structures constructed in open excavations, structure backfill shall extend to the temporary excavation slope so that the entire excavation outside the structure shall be filled with structure backfill. For structures constructed in supported excavations, the structure backfill shall completely fill the space between structure and temporary earth retention, or between structure and excavation face, if these specifications permit removal of the system. Structure backfill shall meet the requirements of the previous paragraph entitled "Fill and Embankment Materials".

2-1.03. Controlled Low Strength Material (CLSM) Fill.

CLSM shall consist of a mixture of Portland cement, fly ash, sand, and water, and shall be placed at locations indicated on the Drawings or as directed by Engineer. The class of CLSM shall be as specified below.

The type of cement in CLSM shall be ASTM C150 Type I. The class of fly ash in CLSM shall be ASTM C618 Class C, except loss on ignition shall not exceed 4 percent. Fine aggregate in CLSM shall be clean natural sand, ASTM C33, except that clay particles shall not exceed one percent. Water in CLSM shall be potable.

Contractor shall design and test the CLSM and submit the mix design and test results to Engineer for review and acceptance. Initial set time shall be 8 hours plus or minus one hour as determined by ASTM C403. CLSM shall have an efflux time of 10 to 26 seconds through a special flow cone with a 1/2 inch discharge tube.

The batch proportions accepted by Engineer shall apply only for materials from the same source and having the same characteristics as the materials used in the mix design. Materials from any other source shall be used only with the acceptance of Engineer. If a change in sources of materials is proposed, a new mix design shall be developed by Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, Contractor shall develop a new mix design to obtain the desired results. During the progress of the work, no change shall be made in the batch proportions of the ingredients without the acceptance of Engineer.

2-1.03.01. Class B CLSM.

The initial trial mixture for Class B CLSM shall consist of the following minimum proportions per cubic yard:

Cement	100 lb
Fly Ash	100 lb
Sand (SSD)	2760 lb

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 3 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Water	386 lb
Air Entraining Agent	5 percent
Compressive strength Range at 28 days	125-250 psi

2-1.04. <u>Pipe Embedment Material</u>. Pipe embedment material shall be placed as indicated in Figure 1 – 31 23 33 – Embedments for Conduits.

2-1.04.01. <u>Granular Embedment</u>. Granular embedment shall consist of crushed rock and crushed gravel or pea gravel, meeting the quality and gradation requirements of coarse aggregate size number 7 of ASTM C33.

2-1.04.02. <u>Hand Placed Embedment</u>. Hand placed embedment shall be finely divided job excavated or imported material, free from organic materials, debris, and stones.

2-1.04.03. <u>Compacted Embedment</u>. Compacted embedment shall be finely divided job excavated material free from debris, organic material, and stones. Graded gravel may be substituted for compacted embedment. Granular embedment may be substituted for all or part of the compacted embedment at the option of the Contractor.

2-1.04.04. <u>Groundwater Barrier</u>. The material for groundwater barrier shall meet ASTM D2487 soil classification GC, SC, CL, or ML-CL. Material may be finely divided, suitable job excavated material, free from stones, organic matter, and debris.

2-2. MATERIALS TESTING.

2-2.01. <u>Review of Materials</u>. As stipulated in the Quality Control section, all tests required for preliminary review of materials and review of materials during construction shall be made by an acceptable independent testing laboratory at the expense of Contractor. Tests performed by the aggregate supplier are not acceptable. Tests shall have been performed within two (2) months of submittal. Acquisition of samples for testing shall be completed by the Contractor's independent testing laboratory.

Two initial gradation tests shall be made for each type of embedment, fill, backfill, or other material, and one additional gradation test shall be made for each additional 500 tons of each material delivered to the Site. In addition, one set of initial Atterberg Limits test shall be made for each fill materials containing more than 20 percent by weight passing the No. 200 sieve.

All material testing on CLSM shall be made by an independent testing laboratory at the expense of Contractor.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 4 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

2-2.02. <u>Field Testing Expense</u>. In-place field density tests and gradation tests will be made by an independent testing laboratory retained by Owner. Contractor shall provide access to the materials and work area and shall assist the laboratory as needed in obtaining representative samples.

2-2.03. <u>Field Tests</u>. For Contractor's planning purposes, the following general guidelines will be used for frequency of field tests performed by the Owner's independent testing laboratory. Additional tests shall be performed as necessary for job conditions and number of failed tests.

- a. Gradation tests shall be made for each type of embedment, fill, backfill, or other material, and one additional gradation test shall be made for each additional 500 tons of each material delivered to the Site. In addition, one set of Atterberg Limits test shall be made for each material containing more than 20 percent by weight passing the No. 200 sieve.
- b. In-place field density and moisture tests at intervals of 200 feet maximum along the trench.
- c. One in-place field density and moisture test for every 200 cubic yards of fill or backfill.
- d. One in-place density and moisture test whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.
- e. Gradation tests whenever the source or quality of material changes.
- f. Testing of CLSM shall be as follows:

<u>Compressive Strength</u>. For every 200 cubic yards of CLSM placed, fill four 6 by 12 inch plastic cylinder molds to overflowing and then tap sides lightly. Cure cylinders in the molds covered until time of testing, at least 14 days. Strip the cylinders carefully using a knife to cut away the plastic mold. Cap the cylinders with high strength gypsum plaster or other capping process that will not break these low strength materials. Test cylinders in accordance with ASTM C39. Two cylinders shall be tested at 7 days and the other two cylinders shall be tested at 56 days.

<u>Flow of Fill</u>. Once each day that CLSM is placed, test the fill material in accordance with ASTM C939 for the efflux time. Wet screening may be required to remove coarse particles.

<u>Unit Weight and Yield</u>. Once each day that CLSM is placed, determine unit weight and yield in accordance with ASTM C138. <u>Air Content</u>. Once each day that CLSM is placed, determine air content in accordance with ASTM C231.

<u>Penetration Resistance</u>. Once each day that CLSM is placed, determine early bearing strength in accordance with ASTM C403 penetration procedure.

PART 3 - EXECUTION

3-1. <u>CLEARING</u>. All clearing shall be performed as necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures.

All sites to be occupied by permanent construction or embankments shall be cleared of all logs, trees, roots, brush, tree trimmings, and other objectionable materials and debris. All stumps shall be grubbed. Subgrades for fills and embankments and sites to be occupied by permanent construction shall be cleaned and stripped of all surface vegetation, sod, and organic topsoil. All waste materials shall be removed from the site and disposed of by and at the expense of Contractor.

3-2. TRENCH EXCAVATION.

3-2.01. <u>General</u>. The terminology used in this specification shall be as indicated on Embedment for Conduits, Figure 1 - 31 23 33, unless indicated otherwise on the Drawings. Trench bottom when used in this specification shall refer to the bottom of trench indicated on Figure 1 - 31 23 33 - Embedment for Conduits.

Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

Except where tunneling or trenchless crossing is indicated on the Drawings, all trench excavation shall be open cut from the surface.

3-2.02. <u>Classification of Excavated Materials</u>. No classification of excavated materials will be made for payment purposes. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

Classification of excavated materials shall be made as follows:

a. <u>Rock</u>. Rock is defined as being sandstone, limestone, flint, granite, quartzite, slate, hard shale, or similar material in masses more than 1 cubic yard in volume or in ledges 4 inches or more in thickness.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 6 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Should rock be encountered in two or more ledges, each ledge being not less than 3 inches thick and with interlying strata of earth, clay, or gravel not more than 12 inches thick in each stratum, the entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

b. <u>Earth</u>. All material not classified as rock.

3-2.03. <u>Preservation of Trees</u>. No trees shall be removed outside excavated or filled areas, unless their removal is authorized by Owner. Trees left standing shall be adequately protected from damage by construction operations.

For limits of tree removal along pipeline routes, see the Temporary Facilities and Controls section under "Protection of Public and Private Property".

3-2.04. <u>Blasting</u>. Blasting or other use of explosives for excavation will not be permitted.

3-2.05. <u>Dewatering</u>. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure or tunnel to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level to the minimum depth of 24 inches beneath such excavations. The specified dewatering depth shall be maintained below the prevailing bottom of excavation at all times.

Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

Contractor shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in Contractor's operations. The permits shall be obtained prior to start of construction.

3-2.06. <u>Temporary Earth Retention</u>. Temporary excavations shall be supported with earth retention systems when excavation side slopes cannot be cut to a stable inclination or adjacent structures, utilities, or other facilities prevent cutting

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 7 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

a temporary excavation to a stable slope, or where a sloping excavation face would endanger adjacent facilities. Unless left in place, the design of the support system shall be such as to permit removal while always maintaining safety and stability.

Slide rail systems or other pre-engineered modular systems are not acceptable for temporary earth retention when the purpose of retention system is required to protect adjacent structures, utilities, and other facilities. The prohibition on use of slide rail systems and other pre-engineered modular systems, and trench shields does not prohibit their use for the sole purpose of protecting workers in an excavation, when the excavation can be made without risking damage to adjacent structures, utilities, or other infrastructure. Trench shields (i.e. trench boxes) are manufactured solely for protecting workers in trenches and shall not be used for earth retention.

The Contractor shall exercise care in placing and moving trench shields and slide rail systems, if used, to prevent movement of the pipe or disturbance of the pipe embedment and backfill. Any voids left in the trench wall or embedment material by trench shield or slide rail removal shall be carefully filled with granular embedment material compacted as specified herein.

Before starting construction on a temporary earth retention system designed by its professional engineer, the Contractor shall ensure that the temporary earth retention design engineer shall complete the Temporary Earth Retention System Design Certificate, and the Contractor shall submit the certificate along with proof of professional liability insurance for the earth retention designer, and the Contractor shall submit a separate certificate for each unique design. The submittal of a certificate is not required if the purpose of the system installed is solely for protection of workers.

Trench earth retention shall be removed unless, in the opinion of Engineer, removal of the earth retention will cause damage to the facility it is protecting or cause loss of necessary piping support from the embedment. Removal of the support system shall be performed in a manner that minimizes disturbance of pipe embedment and trench backfill. Temporary earth retention elements that are left in place shall be cut off a minimum of 24 inches below finish grade. No additional payment above the Contract Price will be made for temporary earth retention components left in place.

If the temporary earth retention is removed in stages during backfill, the retention system shall be designed and removed in such a manner that no passive earth pressure resistance is relied on from the pipe embedment materials.

3-2.07. <u>Stabilization</u>. Trench bottoms and foundation subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be sufficiently stable to remain firm and intact under the feet of the workers. Subgrades that are disturbed by Contractors improper or inadequate dewatering methods shall be

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 8 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

repaired in accordance with paragraph of this specification titled, "Artificial Foundations in Trenches," at no additional cost to Owner.

3-2.08. <u>Open Trench Limitations</u>. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One block or 400 feet, whichever is the shorter, shall be the maximum length of open trench on any line under construction. Except where tunneling is indicated on the Drawings, is specified, or is permitted by Engineer, all trench excavation shall be open cut from the surface.

3-2.09. <u>Utility Clearance</u>. Prior to excavation, Contractor shall contact local underground alert hotlines, "Dig Safe" and/or individual utility owners for marking underground utilities. Once utilities are marked, Contractor shall hand dig or pothole to expose the existing utilities. A survey shall be made of the utility size, material, location, and elevation prior to trench excavation and information shall be recorded on the record Drawings maintained by the Contractor.

3-2.10. <u>Alignment, Grade, and Minimum Cover</u>. The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

Where pipe grades or elevations are not definitely fixed by the Drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 48 inches over pipes below paved and graded streets and, of 48 inches over pipes in other locations. Greater pipe cover depths may be necessary on vertical curves or to provide adequate clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation, except where future surface elevations are indicated on the Drawings.

3-2.11. <u>Minimum Trench Widths</u>. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. Except when maximum trench width is required for certain conduits, trenches shall be excavated to the minimum trench widths indicated in the following table, unless indicated otherwise on the Drawings.

<u>Nominal Pipe Size</u>	Minimum Trench Width	<u>Clearance</u>
24-inch ID or Less	Pipe OD plus 24 in.	12 in.
Clearance = Minimun OD = Outside diamet	n sidewall clearance er (or span) of conduit	
ID = Inside diameter	(or span) of conduit.	

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 9 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Specified minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required to the trench excavation or the trench protective system.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be used only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits.

3-2.12. <u>Mechanical Excavation</u>. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, and that trench alignment is such that pipe, when accurately laid to specified alignment, will be centered in the trench with adequate sidewall clearance. Undercutting the trench sidewall to obtain sidewall clearance will not be permitted.

In locations where maximum trench widths are required for designated rigid conduits, mechanical equipment shall be operated so that uniform trench widths and vertical sidewalls are obtained at least from an elevation 12 inches above the top of the installed pipe to the bottom of the trench.

The operator of an Excavator must be a certified Excavator with the CDOT. Contractor shall, when performing any utility excavation, ensure that a CDOT excavation certified company representative is present on the Job Site. Contractor shall follow Charlotte Transportation (CDOT) regulations and procedures. Contractor shall follow:

(https://charlottenc.gov/Transportation/DivisionContacts/documents/StreetCutRe gulationsandProcedures.pdf)

3-2.13. <u>Cutting Concrete Surface Construction</u>. Cuts in concrete pavement and concrete base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least 1-1/2 inches deep along each side of the trench and along the perimeter of cuts for structures.

Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the center line of the trench.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 10 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and subsequently replaced between existing joints or between saw cuts as specified for pavement.

3-2.14. <u>Excavation Below Pipe</u>. Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe, as indicated on Embedments for Conduits, Figure $1 - 31 \ 23 \ 33$, to provide for the installation of granular embedment.

Bell holes shall provide adequate clearance for tools and methods used for installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

Unauthorized excavation below the trench bottom shall be corrected by filling with granular embedment material all at no additional cost to the Owner.

3-2.15. <u>Artificial Foundations in Trenches</u>. Whenever unsuitable or unstable soil conditions are encountered at the trench bottom, Contractor shall notify Engineer immediately. When authorized by the Engineer, the unsuitable or unstable soil shall be excavated and replaced with suitable material as instructed by the Engineer. In such cases, adjustments will be made in the Contract Price in accordance with the provisions of the General Conditions.

3-3. <u>PIPE EMBEDMENT PLACEMENT</u>. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the requirements indicated on Figure $1 - 31 \ 23 \ 33 -$ Embedments for Conduits and to the following supplementary requirements.

Embedment material shall contain no cinders, clay lumps, or other material which may cause pipe corrosion.

No pipe embedment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any embedment.

- 3-3.01. Embedment Classes.
 - a. <u>Class A Arch Encasement</u>. When arch encasement is indicated on the Drawings, Class A arch encasement shall be used at all locations so indicated.

31 23 33 TRENCHING AND BACKFILLING Page 11 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

When arch encasement is not indicated on the Drawings, Class A arch encasement is not required unless improper trenching or unexpected trench conditions require its use as determined by Engineer.

Concrete and reinforcing steel for Class A arch encasement shall conform to the requirements of the Miscellaneous Cast-in-Place Concrete section.

- b. <u>Class B Embedment</u>. Class B bedding shall be used for all steel, ductile iron, bar-wrapped concrete, and vitrified clay pipelines, and for all other pipelines not otherwise specified.
- c. <u>Class B Special Embedment</u>. Class B special embedment shall be used for HDPE, PVC, ABS, FRP, GRP, steel or stainless steel pipe where the process fluid design maximum temperature is 140° F or higher such as for pressurized air service, and when recommended by the pipe manufacturer.
- d. <u>Class C Embedment</u>. Class C embedment shall be used for all reinforced concrete and prestressed concrete pipelines.

3-3.02. <u>Embedment for Ductile Iron, Steel, FRP, and PVC Pipelines</u>. Granular embedment for PVC pipelines shall be crushed rock or crushed gravel with rounded or subrounded particles. Crushed rock or gravel with sharp edges which could cause significant scratching or abrasion of the pipe or damage to the coating or polyethylene tube protection shall not be used unless otherwise approved by Engineer and all damage is repaired to the satisfaction of Engineer.

3-3.03. <u>Placement and Compaction of Embedment</u>. Where a trench shield (trench box) is used, the trench shield shall be used in a manner that does not disturb the compacted pipe embedment, particularly when the trench shield is moved forward in the trench excavation. Before the trench shield is moved, place and compact enough embedment to ensure protection of the pipe. As the trench shield is moved, fill voids by placing and compacting embedment and complete placing and compacting the embedment at the trailing edge of the shield so that the embedment is compacted against edges of the trench.

3-3.03.01. <u>Granular Embedment</u>. Contractor shall use Compacted Embedment over Granular Embedment. Contractor shall not use Granular Embedment unless Contractor provides a written request to use Granular Embedment giving the limits and reason for using Granular Embedment in the requested area. Contractor shall not use Granular Embedment unless given written approval by Owner and only for the approved area indicated in Contractor's request.

Granular embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 12 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof by shovel slicing or other suitable methods to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Placing and compaction of embedment material shall not damage the pipe coating or polyethylene encasement. Embedment material shall not be dumped directly on the pipe or polyethylene encasement unless a suitable temporary isolation layer such as a 60 mil HDPE sheeting, is used to cover the pipe and polyethylene encasement.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement. Granular embedment shall be placed in layers not more than 6 inches deep and compacted as specified.

Each lift of granular embedment material shall be vibrated with a mechanical probe type vibrator or shovel sliced during placement to ensure that all spaces beneath the pipe are filled. Granular embedment shall be placed in maximum lift thickness of 6 inches and compacted. Each lift of embedment material shall be compacted with three passes (round trip) of a platform type vibrating compactor and to at least 70 percent relative density as determined by ASTM D4253 and D4254.

Where indicated on the Drawings or where silt, fine sand, or soft clay soils are encountered below groundwater, migration of soil into the embedment material shall be prevented by installing filter fabric Type A, or alternatively by using graded gravel in place of granular embedment. Filter fabric shall be placed on the trench surfaces so that it completely surrounds the embedment material. Joints in the filter fabric shall be lapped 12 inches.

Unless otherwise indicated on the Drawings, where pipes pass through watercontaining embankments, granular embedment material shall be omitted, and the trench bottom shall be graded to provide uniform and continuous support for the pipe. The pipe shall be embedded in embankment material containing no rocks or stones. The embedment material shall be compacted to the same density as the existing embankment or to at least 95 percent relative compaction in accordance with ASTM D698, whichever is higher.

3-3.03.02. <u>Compacted Embedment</u>. Compacted embedment shall be placed in uniform layers not more than 8 inches thick and compacted to not less than 95% maximum density as determined by ASTM D698.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 13 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

Where Class C embedment is required, compacted embedment shall be placed to the top of the pipe in all areas where compacted trench backfill is specified and around restrained pipe sections. Placing and compaction of embedment shall not damage the pipe or coating.

3-3.03.03. <u>Hand Placed Embedment</u>. Hand placed embedment shall be placed by hand shovels or using methods that prevent dropping the material for more than 24 inches above the pipe. Hand placed embedment shall be lightly tamped using hand equipment. Care shall be taken so as to not damage the pipe or coating.

3-3.04. <u>Groundwater Barrier</u>. Continuity of embedment material shall be interrupted by low permeability groundwater barriers to impede passage of water through the embedment. Materials for groundwater barriers shall be place in uniform layers not exceeding 8 inches in uncompacted thickness and shall be compacted to at least 95 percent of maximum density with moisture content within 2 percent of the optimum moisture content (as determined by ASTM D698).

Groundwater barriers for sewer lines that contain manholes with cast-in-place bases shall be compacted soil around each manhole, extending through any granular material beneath the manhole. Groundwater barriers for sewer lines that contain manholes with precast (developed) bases and for all other pipelines shall be soil plugs of 3 feet in width, extending the full depth and width of granular material, and spaced not more than 400 feet apart.

3-4. <u>TRENCH BACKFILL</u>. All trench backfill above pipe embedment shall conform to the following requirements.

A layer of backfill material not more than 8 inches deep may be placed over concrete arch encasement or concrete thrust blocking after the concrete has reached its initial set, to aid curing. No additional backfill shall be placed over arch encasement or blocking until the concrete has been in place for at least three (3) days.

No trench backfill materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any trench backfill.

3-4.01. <u>Compacted Backfill</u>. Compacted backfill will be required for the full depth of the trench above the embedment in the following locations:

Where beneath pavements, surfacings, driveways, curbs, gutters, walks, or other surface construction or structures.

Where in street, road, or highway shoulders.

In established lawn areas.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 14 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

The top portion of backfill beneath established lawn areas shall be finished with at least 12 inches of topsoil corresponding to, or better than that which is underlying adjoining lawn areas. The surface layer of topsoil in cropland and pasture land shall be restored to the original thickness.

Trench backfill material shall be suitable job excavated material and shall be as specified herein.

3-4.01.01. Job Excavated Material. Job excavated materials shall be placed in uniform layers not exceeding 8 inches in uncompacted thickness. Each layer of material shall have the best possible moisture content for satisfactory compaction. The material in each layer shall be wetted or dried as needed and thoroughly mixed to ensure uniform moisture content and adequate compaction. Increased layer thickness may be permitted for noncohesive material if Contractor demonstrates to the satisfaction of Engineer that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe. Job excavated material shall be compacted to 95 percent of maximum density at a moisture content within two (2) percent of the optimum moisture content as determined by ASTM D698when that test is appropriate, or to 70 percent relative density as determined by ASTM D4253 and D4254 when those tests are appropriate.

3-4.01.02. Inundated Sand Backfill. Not used.

3-4.01.03. <u>Crushed Rock</u>. Crushed rock shall be deposited in uniform layers not exceeding 8 inches in uncompacted thickness. Crushed rock shall be compacted to 95 percent of maximum density at a moisture content within 2 percent of the optimum water content as determined by ASTM D1557.

3-4.02. <u>Ordinary Backfill</u>. Compaction of trench backfill above pipe embedment in locations other than those specified will not be required except to the extent necessary to prevent future settlement. Contractor shall be responsible for backfill settlement as specified.

Ordinary earth backfill material to be placed above embedments shall be free of brush, roots more than 2 inches in diameter, debris, cinders, and any corrosive material, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth.

Backfill material above embedments shall be placed by methods which will not impose excessive concentrated or unbalanced loads, shock, or impact on installed pipe, and which will not result in displacement of the pipe.

Compact masses of stiff clay or other consolidated material more than 1 cubic foot in volume shall not be permitted to fall more than 5 feet into the trench, unless cushioned by at least 2 feet of loose backfill above pipe embedment.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 15 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

No trench backfill material containing rocks or rock excavation detritus shall be placed in the upper 18 inches of the trench, nor shall any stone larger than 8 inches in its greatest dimension be placed within 3 feet of the top of pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

3-4.03. <u>Water-Settled Earth Backfill</u>. Settlement or consolidation of trench backfill using water jetting or ponding shall not be performed.

3-4.04. <u>Fill and Backfill for Structures</u>. Backfill around manholes and small concrete vaults shall meet the requirements specified herein:

All fills and backfills for structures shall be constructed to the lines and grades indicated on the Drawings. Backfilling and construction of fills during freezing weather shall not be done. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

3-4.05. <u>Granular Fill</u>. Granular fills shall be provided where indicated in the Contract Documents. Granular fills shall be placed on suitably prepared subgrades in uncompacted lift thickness of 6 inches or less and compacted by vibration. Granular fills shall be compacted to not less than 70 percent relative density as determined by ASTM D4253 and D4254. If the thickness of the granular fill is less than 6 inches, the compaction shall be by a minimum four passes (round trips) of a self-propelled or walk-behind type vibratory roller operating in full vibration mode in accordance with manufacturer's instructions.

Where granular fills are to be covered with concrete, the top surface shall be graded to the required sub-grade elevation. The completed fill shall be covered by polyethylene film.

3-4.06. <u>Structure Backfill</u>. Backfill materials shall be deposited in approximately horizontal layers not to exceed 8 inches in uncompacted thickness and shall meet the following requirements:

Test method to determine maximum density and moisture.	ASTM D698.
Relative compaction.	95%.
Moisture content relative to the optimum.	-2% to +2%.

Compaction of structure backfill shall be performed in such a manner that damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

No backfill shall be deposited or compacted in water.

	31 23 33	
Charlotte Water	TRENCHING AND BACKFILLING	March 2023
Vest Residuals & Backwash	Page 16 of 19	BV PN 193725
FM to Franklin WTP	SENSITIVE DOCUMENTS – DO NOT DUPLICATE	

Care shall be taken to compact structure backfill which will be beneath pipes, drives, roads, parking areas, walks, curbs, gutters, or other surface construction or structures. In addition, wherever a pipe is to be installed within structure backfill, the structure backfill shall be placed and compacted to an elevation not less than 12 inches above the top of pipe before the trench for pipe installation is excavated. Compacted areas, in each case, shall be adequate to support the item to be constructed or placed thereon.

3-4.07. <u>Controlled Low Strength Material (CLSM)</u>. CLSM shall not be placed on frozen ground. Batching, mixing, and placing of CLSM may be started when weather conditions are favorable and when the temperature is at least 34°F and rising. At time of placement, CLSM shall have a temperature of at least 40°F. Mixing and placing shall stop when the temperature is 38°F and falling. Each filling stage shall be as continuous an operation as is practicable.

CLSM shall be discharged from the mixer by an acceptable procedure into the area to be filled. CLSM shall be placed to limits indicated on the Drawings. Mixing CLSM with in-situ soil shall be avoided.

When CLSM is placed as backfill against structures, the fill shall be placed in lifts of 2 to 3 feet and the next lift shall not be placed until the previous lift has taken initial set and at least 16 hours have elapsed from the end of placement. Lift thickness shall be reduced as necessary to prevent floatation of the structure.

When CLSM is placed over culverts or pipelines, they shall be anchored to prevent flotation during the placement of CLSM. Unless otherwise required, CLSM shall be placed to one foot below subgrade elevation if the subgrade elevation is not more than 5 feet over the top of the culvert or pipe. If the subgrade is more than 5 feet over the top of the culvert or pipe, CLSM shall be placed to an elevation 2 feet over the top of the culvert or pipe, and the remainder shall be backfilled with soil designated by Engineer.

3-5. <u>DRAINAGE MAINTENANCE</u>. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway, to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other watercourses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3-6. <u>PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES</u>. Where trenches are constructed in ditches or other watercourses, backfill shall be protected from surface erosion. Where the grade of the ditch exceeds 1 percent,

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 17 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

or as otherwise required, ditch checks shall be installed. Unless otherwise indicated on the Drawings, ditch checks shall be concrete. Ditch checks shall extend at least 2 feet below the original ditch or watercourse bottom for the full bottom width and at least 18 inches into the side slopes and shall be at least 12 inches thick.

3-7. <u>FINAL GRADING AND PLACEMENT OF TOPSOIL</u>. After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours. All cuts, fills, embankments, and other areas which have been disturbed or damaged by construction operations shall be surfaced with topsoil to a depth of at least 4 inches. Topsoil shall be of a quality at least equal to the existing topsoil in adjacent areas, free from trash, stones, and debris, and well suited to support plant growth. Topsoil required to provide the minimum thickness shall be imported and placed at no additional cost to the Owner.

Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Unless otherwise indicated, a slope of at least two (2) percent shall be provided.

Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

3-8. <u>DISPOSAL OF EXCAVATED MATERIALS</u>. Suitable excavated materials may be used in fills and embankments as needed. All excess excavated material shall be disposed of off site at the expense of Contractor.

All debris, stones, logs, stumps, roots, and other unsuitable materials shall be removed from the site and disposed of by, and at the expense of, Contractor.

Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site.

Excess earth from excavations located in unimproved property may be distributed directly over the pipe trench and within the pipeline right-of-way to a maximum depth of 6 inches above the original ground surface elevation at and across the trench and sloping uniformly each way. Material thus wasted shall be carefully finished with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the line of trench crosses or is within a railroad, public road, or highway right-of-way. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing, shall be a subsidiary obligation of Contractor and no separate payment will be made, therefore.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **31 23 33** TRENCHING AND BACKFILLING Page 18 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

3-9. <u>SETTLEMENT</u>. Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.

Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from Engineer or Owner.

End of Section

31 23 33 TRENCHING AND BACKFILLING Page 19 of 19 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

TEMPORARY EARTH RETENTION SYSTEM DESIGN CERTIFICATE – FIGURE 2-31 23 33

I, the undersigned professional engineer registered in the state where the Project is located, hereby certify that the temporary earth retention system for ______(excavation or trench location)

has been designed by me, is appropriate as represented to me, and is in compliance with the Contract Documents.

Name: _____

State of Registration: _____

Signature: _____

P.E. Number _____

Date: _____

(Seal)

SECTION 33 05 25

TUNNEL EXCAVATION

<u> PART 1 – GENERAL</u>

1-1. <u>SCOPE</u>. This section contains guidelines and specifications applicable to Tunnel Excavation installation, as indicated on the Drawings. This section includes minimum performance requirements for Tunnel Excavation installation. The Tunnel Excavation operation shall meet all requirements stipulated by the North Carolina Department of Transportation (NCDOT) and applicable railroad permits.

Geotechnical data (boring logs and test reports) are provided in a report prepared by Terracon Consultants, which is available in the Supplementary Conditions.

1-2. <u>RELATED SECTIONS.</u> The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all work required by the Contract Documents.

Section 31 23 33, Trenching and Backfilling

Section 33 14 00, Pipeline Pressure and Leakage Testing

Section 40 05 19, Ductile Iron Pipe

1-3. <u>GENERAL</u>. Any modifications, damages, or detrimental consequences to existing structures, facilities, or utilities as result of the Contractor's work shall be repaired and restored to its original condition as directed by the Engineer at no additional cost to the Owner.

1-4. DEFINITIONS.

1-4.01. <u>Jack & Bore</u>. A trenchless method of construction consisting of a horizontal jacking platform within a jacking pit. The pipe is jacked by manual control along the alignment with simultaneous excavation of the soil accomplished by rotating augers in the leading edge of the pipe's annular space. The spoil is transported to the jacking pit by helical wound auger flights rotating in the pipe.

1-4.02. Carrier Pipe. As it relates to this work, a pipe for water conveyance.

1-4.03. <u>Casing Pipe</u>. A direct-jacked pipe which provides initial ground support for the bore to be replaced by a direct-jacked carrier pipe. A casing pipe is not a carrier pipe.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **33 05 25** TUNNEL EXCAVATION Page 1 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

1-4.04. <u>Carrier Pipe Spacers/Insulators</u>. Fabricated item for placing carrier pipe inside casing pipe.

1-4.05. <u>Cobble</u>. A cobble is a clast or fragment of rock having a particle size that measures three (3) inches to twelve (12) inches in the longest dimension.

1-4.06. <u>End Closure</u>. Material placed at the interface between the shaft and tunnel to prevent inflows of ground, groundwater, slurry, and/or lubricants into the shaft during tunneling.

1-4.07. <u>Jacking Frame</u>. A structural component, fitted with hydraulic cylinders, which is used to push the cutterhead and casing pipe string into the ground. The jacking frame serves to distribute the thrust load to the casing string and the reaction load to the shaft wall or thrust block.

1-4.08. <u>Jacking Pipe</u>. Casing pipe, specially designed, to be installed using pipe jacking construction techniques.

1-4.09. <u>Obstructions</u>. Objects or portions of objects located within the area to be excavated by the auger that stops forward progress. Obstructions include rock fill, boulders, concrete, stone masonry, trees, timbers, conduits, pipes, reinforced concrete, steel sheeting, or other objects that prevent forward progress of excavation. Boulders or similar materials are considered obstructions only if the size (largest dimension) is larger than one-third of the internal diameter of the casing pipe.

1-4.10. <u>Thrust Block</u>. An engineered structure located between the jacking frame and the shaft wall intended to spread the jacking force developed by the hydraulic cylinders over a larger surface area.

1-4.11. <u>Zone of Active Excavation</u>. Area located within a radial distance about a surface point immediately above the face of excavation equal to the depth to the bottom of the excavation.

1-4.12. <u>Critical Structure</u>. Any building, structure, roadway, bridge, pier, utility, or similar construction partially or entirely located within a zone of active excavation.

1-4.13. <u>Casing Pipe Grout Backfill (Annular Backfill)</u>. The grout placed in the annular space between carrier pipe and casing pipe.

1-4.14. <u>Casing Pipe Contact Grout</u>. Grouting of overcut or voids between the casing pipe and in-situ soils. At a minimum casing pipe contact grout shall meet NCDOT standards.

1-5. QUALIFICATIONS.

1-5.01. <u>General</u>. The Contractor or Tunnel Excavation Subcontractor shall demonstrate successful completion of at least five (5) previous projects within the past five (5) years using Tunnel Excavation methods with casing pipe at least 36-inch diameter or larger and 200 feet or greater in length using the methods proposed. Qualifications of the Contractor or Tunnel Excavation Subcontractor shall be submitted to the Engineer for review and approval.

1-5.02. <u>Tunnel Excavation Operator</u>. The Tunnel Excavation Operator shall be a trenchless specialist who shall remain on the project site during the duration of the Tunnel Excavation operation. The Tunnel Excavation Operator shall have a minimum of five (5) years' experience in supervising Tunnel Excavation operations.

1-5.03. <u>Project Manager.</u> A project manager shall be provided who is a graduate civil engineer, mining engineer, or geologist from an accredited college or university and has at least three (3) years of experience with at least one (1) completed trenchless installation project with shafts as a project manager. A non-college graduate may be substituted provided the individual has five (5) years of experience as a project manager on trenchless installation projects.

1-5.04. <u>Field Superintendent.</u> A field superintendent shall be provided who has experience on at least three (3) separate projects within the last ten (10) years as a field superintendent of trenchless installation projects with shafts using the same excavation methods proposed by the Contractor. The field superintendent shall be in responsible charge and on site during the trenchless installation operations. The field superintendent shall demonstrate experience in the construction of trenchless installations as specified above.

1-5.05. Contractor shall furnish a statement of qualifications and experience to the Engineer demonstrating Subcontractor's, project manager's, field superintendent's, and trenchless equipment operators' satisfactory qualifications and experience.

1-5.06. Contractor may submit additional information that is deemed pertinent in demonstrating the required experience and qualifications.

1-6. <u>SUBMITTALS</u>. The following shall be submitted to the Engineer in accordance with the Submittal Procedures Section, prior to commencement of work:

1-6.01. <u>Detailed Work Plan</u>. A detailed work plan shall be submitted. Information shall include, but not be limited to, the following:

a. Details of the proposed method of construction, sequence of operations, number and size of construction crew(s), hours to be worked and other pertinent information relating to these items.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **33 05 25** TUNNEL EXCAVATION Page 3 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

- b. Material and equipment list including detailed information of type, manufacturer, and specifications of equipment.
- c. Capacity, number, and arrangement, of main jacks, thrust block and jacking frame details. Provide details of thrust ring, jacking controls, and pressure gages.
- d. Details of pipe lubrication and pipe lubricants used during Jack & Bore installation, including manufacturer's literature.
- e. Spoil handling, transport, and disposal procedures.
- f. A plan for monitoring surface settlement in accordance with the requirements specified on the Contract Documents and including as a minimum (for NCDOT and CDOT crossings): description of monitoring procedures, frequency of measurement and method of measurement that meet NCDOT Standard Specifications Section 1550-5 (A) (even for non-NCDOT crossings). Settlement monitoring requirements within the NCDOT right-of-way shall be at the direction of the NCDOT District Engineer. Prior to starting excavation for bore pits base line readings of the settlement points shall be performed for 5 consecutive days by a land surveyor licensed in the State of North Carolina. Settlement monitoring shall be performed by a land surveyor licensed in the State on North Carolina. Contractor shall refer to drawings for CSX crossing monitoring requirements.
- g. Temporary earth retention systems shall be designed by the Contractor's professional engineer licensed in North Carolina. The design shall meet requirements outlined in the Contract Documents, NCDOT standard specifications and NCDOT encroachment permit special provisions.
- h. Provide a Contingency Plan outlining the procedures followed if the following events occur: surface settlement, surface heave, existing utility damage and/or removal of obstructions encountered during Tunnel Excavation operations.
- i. A list of welding procedures and certifications of all welders to be used on the project. All welding procedures associated with the steel casing pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or special welds for pipe cylinders, casing joint welds, and reinforcing plates. All welding shall be performed by certified welders, welding operators, and tackers who have adequate experience in the type of materials to

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP

33 05 25 TUNNEL EXCAVATION Page 4 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent, local, approved testing agency no more than six (6) months prior to commencing work on this project. Welding machines and electrodes similar to those proposed for this project shall be used in qualification tests. The Contractor shall bear the expense for welder qualifications.

- j. Details of the steel casing pipe to be installed indicating pipe diameter, wall thickness, method of fabrication, material properties, material strength, reinforcement details, lubrication ports and fittings, joint details, and jacking station details, miscellaneous items to be furnished and/or fabricated for the pipe, and other pertinent information as applicable. Indicate the required fabrication tolerances to prevent damage to the pipe during installation and provide a certification from the pipe manufacturer indicating that the steel casing pipe is adequately designed for the project requirements. Provide details to distribute jacking forces at the ends of the pipe joints.
- k. The Contractor shall provide an as-built report within fourteen (14) days of completion of steel casing pipe installation, but prior to carrier pipe installation, and shall include the following at a minimum:
 - 1. A summary of project information, including name of Contractor or Subcontractor, date of installation, and contact information.
 - 2. As-built record drawings of the installed steel casing pipe. The plan and profile drawings shall include the theoretical alignment, actual alignment, survey benchmarks, and other adjacent structures of features, and any other information deemed necessary by the Engineer.
- I. The Contractor shall provide a grouting plan for carrier pipe grout backfill and carrier pipe contact grouting, and shall include the following at a minimum:
 - A description of materials, grout mix, equipment, and operational procedures to accomplish each grouting operation. The description shall include sketches as appropriate, indicating type and location of mixing equipment, pumps, injection points, venting method, flowlines, pressure measurement, volume measurement, grouting sequence, schedule, and stage volumes.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **33 05 25** TUNNEL EXCAVATION Page 5 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE

- 2. A grout mixture design report, including grout type and designation, grout mix constituents and proportions, including materials by weight, wet density of grout, flow of grout, initial set time of grout, shrinkage, compressive strength.
- 3. For factory premixed grouts, provide product data and safety data sheets.
- 4. Logs of grouting operation indicating data and time of placement, mix design, location and extents of placement, pressure, and actual volume for each grout placement.

1-6.02. <u>Construction Schedule</u>. A detailed construction schedule including, but not limited to the following, shall be provided:

- a. Preliminary progress schedule before construction commences
- b. Bi-weekly progress schedule updates

1-6.03. <u>Daily Report</u>. Contractor shall provide a written daily report to Engineer detailing at a minimum the following:

- a. A detailed log recording at a minimum: supervisor name, date, daily progress, jacking pressures, spoil volume and other information deemed necessary by Engineer.
- b. Instrumentation data shall be submitted to the Engineer within 24 hours of instrument readings. Data from any monitoring point exceeding the allowable settlement or heave values shall be reported to the Engineer immediately. If any monitoring point indicates settlement or heave beyond the allowable value, the Contractor shall implement the submitted contingency plan.
- c. Quantity of muck removed. Contractor to provide an assessment of the actual spoil volume removed during excavation and the theoretical volume required for the excavation.

1-6.04. <u>As-Built Report</u>. Contractor shall submit an as-built report to the Engineer within fourteen (14) days upon completion of Tunnel Excavation operations. At a minimum, the report shall include the following:

- a. A summary of project information.
- b. Name of Contractor, date of installation, and contact information.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP c. As-built record drawings of the installed casing and carrier pipes. The plan and profile drawing shall include the theoretical alignment, actual alignment, survey benchmark (northing, easting, and elevation), and other adjacent structures or features.

1-6.05. Excavated Material Disposal.

- a. Permits for any proposed off-site disposal sites if required by local, state, or federal ordinance.
- b. Written permission from the property owner of proposed off-site disposal site(s) along with a description of the property including its current and future land use/zoning designation.
- c. Written and signed release from property owner of off-site disposal site upon completion of disposal work.

1-6.06. Installation of Carrier Pipe.

- a. Pipe Design and Installation Method: A brief description of the method of transporting pipe into the casing; method of hoisting and positioning pipe; method of jointing and aligning pipe; and blocking plan. The planned method shall be in accordance with the pipe manufacturer recommendations.
- b. Joint Testing: Joint testing procedure and equipment to be used shall be submitted two weeks prior to testing.

No payment will be made for work until the as-built record drawings have been delivered and accepted by the Engineer.

PART 2 – PRODUCTS

2-1. MATERIALS.

2-1.01. STEEL CASING PIPE.

Steel casing pipe shall be a direct-jacked pipe, specifically designed for installation by jack and bore methods and shall conform to the requirements herein and be designed by the Contractor's professional engineer licensed in North Carolina. Casing pipes shall be of the diameter necessary to subsequently install carrier pipe to the specified line and grade within tolerances and clearances as described by the Contract Documents. Contractor shall be fully responsible for the sufficiency of the casing pipe provided and may select a larger diameter casing or wall thickness for their means and methods, loading characteristics, site conditions, or possible interferences at no additional cost to the Owner. Casing pipes shall be round, have smooth, even outer surfaces, and have joints that allow for easy connections between pipes. Casing pipes shall withstand the jacking forces imposed during installation and the final in-place loading

33 05 25

	00 00 20
Charlotte Water	TUNNEL EXCAVATION
Vest Residuals & Backwash	Page 7 of 13
FM to Franklin WTP	SENSITIVE DOCUMENTS – DO NOT DUPLICATE

conditions. The ends of the pipe shall be protected against damage during installation. Additionally:

- a. Pipe lengths shall not be more than twenty (20) feet long.
- b. Casing Pipe: Welded steel pipe shall be new, smooth wall, straight seam, conforming to ASTM A139, Grade B or proprietary non-welded steel pipe (Permalok Steel Casing Pipe or equal) shall be new and conforming to ASTM A1097 with connectors meeting or exceeding the requirements of ASTM A36/A36M. Minimum wall thickness shall be 0.500 inch for crossings at CDOT/NCDOT roadways and 0.75 inch at railroad crossings and 0.500 for any other locations. Minimum yield strength shall be 35,000 psi.
 - 1. Welded steel casing pipe shall be butt welded using a full-depth, single "V" groove butt weld around the entire circumference of the casing pipe.
 - 2. Non-welded steel casing pipe shall be manufactured by the rolled and welded cylinder method using the DSAW process in sections not less than eight (8) feet. Non-welded steel pipe connectors shall be full penetration butt welded square to the ends of the pipe sections or profiled directly on the finished section, at the manufacturer's option.
- c. Equip casing pipe with approximately 2-inch diameter grout holes furnished with plugs. Place holes in pattern so that each succeeding hole from top dead center is 120 degrees right, then 120 degrees left, then top dead center. Locate holes in each line no more than eight (8) feet apart.
- d. Use of other casing pipe types will require prior approval of the Engineer.
- e. Casing pipes shall also meet the requirements of the roadway or railway authority having jurisdiction, as applicable.

2-1.02. <u>Carrier Pipe</u>. Ductile iron pipe shall be as specified in the Ductile Iron Pipe section.

2-1.03. <u>Casing Pipe Grout Backfill</u>. Grout backfill shall be a NCDOT approved grout mix design. Grout backfill shall be installed in casing pipe in NCDOT right-of-way and Charlotte Department of Transportation (CDOT) right-of-way. Casing pipe installed in railroad right-of-way shall not be grout filled.

2-1.04. <u>Mechanical Casing Spacer Supports</u>. Casing spacer supports shall be manufactured by Advance Product & System, Inc., Spider Manufacturing Inc., or

33 05 25

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Charlotte Water	TUNNEL EXCAVATION	March 2023
Vest Residuals & Backwash	Page 8 of 13	BV PN 193725
FM to Franklin WTP	SENSITIVE DOCUMENTS – DO NOT DUPLICATE	

BWM Company. Minimum of three (3) Casing spacer supports shall be installed on each pipe segment. Crossing under railroads shall have 4 supports on each pipe segment. Casing spacer supports shall be designed to support rated carrier pipe(s) through specified casing. Casing Spacer Supports shall be the restrained type to hold the pipe in position and prevent movement and shall be sufficiently sturdy to carry the weight of the pipe with water and stresses during installation as recommended by the Manufacturer. Spacers shall be designed to provide electrical isolation from both the Carrier and Casing pipes. Spacers shall be designed to prevent metallic contact the Carrier and Casing pipes.

Casing spacer supports shall be provided and install in accordance with the Contact Documents and as indicated on the drawings.

2-1.05. <u>End Closure</u>. End Closures shall be provided as indicated on the drawings. Where not indicated end closures shall be brick.

Brick for end closures shall be common masonry brick unless indicated otherwise on the drawings.

PART 3 – EXECUTION

3-1. <u>GENERAL</u>. The Engineer shall be notified at least ten (10) days prior to start of construction. No Tunnel Excavation operations shall begin until Engineer or Engineer's Representative is present at the job site.

It shall be the Contractor's responsibility to carry out all Tunnel Excavation operations in strict conformance to the Contract Documents and obtain permits from all applicable agencies.

Contractor shall notify North Carolina 811 at least three (3) days prior to beginning any excavation. Contractor shall perform all responsibilities outlined in accordance with North Carolina 811 guidelines, including white-lining the proposed dig area and potholing all utilities to verify their location. North Carolina 811 can be contacted at www.nc1call.org or by dialing (800) 632-4949.

Perform work in a manner that minimizes ground loss and surface settlement. Furnish equipment, power, water, and utilities for Tunnel Excavation installation, pipe lubricant mixing, removal and disposal of spoil, and other work required for Tunnel Excavation installation.

If an obstruction is encountered which prevents completion of the installation; the pipe may be abandoned at the discretion of the Engineer. Immediately fill the casing with flowable fill. Submit a new installation procedure and revised plans to the Engineer for approval before resuming work at another location.

22 05 25

	55 05 Z5	
Charlotte Water	TUNNEL EXCAVATION	Ν
Vest Residuals & Backwash	Page 9 of 13	B١
FM to Franklin WTP	SENSITIVE DOCUMENTS – DO NOT DUPLICATE	

Any NCDOT pavement damage because of settlement of the pavement or damaged by equipment used to perform encroachment work, shall be resurfaced to the satisfaction of the NCDOT District Engineer and at the expense of the Contractor. All pavement work and pavement markings (temporary and final) are the responsibility of the Contractor.

3-2. <u>SITE CONDITIONS</u>. Conduct operations such that trucks and other construction vehicles do not create a dust nuisance in roadways and adjacent properties. Promptly clean up, remove, and dispose of any nuisance spoil or slurry spillage.

The Contractor shall continuously keep the jacking pit free from ground and surface water during operation and shall be prepared to implement groundwater control on short notice, even if observed water levels prior to construction are below the invert of the casing pipe.

Excavation for jacking pit, receiving pit, and spoil shall be contained onsite or hauled to an offsite dump site.

Upon completion of work, Contractor shall ensure the work site is restored to preconstruction conditions or as directed by the Engineer.

3-3. JACKING AND RECEIVING PITS. All jacking and receiving pits shall conform to the requirements herein and be designed by the Contractor's professional engineer licensed in North Carolina. All jacking and receiving pits shall be protected with suitable fencing or barricades to prohibit unauthorized access. Jacking and receiving pits shall be shaped with heavy timber, steel sheet piling or other suitable materials that shall be of adequate strength to support the operation. Braced steel or heavy timber shall be used to support the sides of the excavation. Jacking and receiving pits shoring shall meet requirements outlined in the Trenching and Backfilling section, NCDOT standard specifications and NCDOT encroachment permit special provisions.

Steel rails or beams shall be used in the pit for placement and alignment of each pipe during installation operations.

The Contractor shall be fully responsible for the removal of pits, including the break-up, removal, and disposal of concrete or cutting-off of sheeting and furnishing backfill to the normal subgrade as may be required following installation.

The jacking and receiving pits shall be backfilled and compacted in accordance with the Trenching and Backfilling section. Excavated material may be used as backfill upon completion of casing and carrier pipe installation.

Charlotte Water Vest Residuals & Backwash FM to Franklin WTP **33 05 25** TUNNEL EXCAVATION Page 10 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE 3-4. <u>EQUIPMENT REQUIREMENTS</u>. Tunnel Excavation equipment shall be manufactured by a company that specializes in design and fabrication of this type of equipment and has at least five (5) years of experience.

The equipment shall be:

- a. Capable of installing steel casing pipe the length of the crossing as shown on the drawings.
- b. Provide a means for controlling line and grade in accordance with specified criteria, centering cutting head inside borehole, and preventing excessive settlement, heave or voids.

Tunnel Excavation equipment shall be hydraulically operated and capable of pushing the pipe in a controlled manner and compatible with the anticipated jacking loads and pipe capacity. Contractor shall monitor the jacking force applied to the pipe and ensure the jacking force does not exceed pipe manufacturer's recommendations.

3-5. INSTALLATION.

3-5.01. <u>Procedures for Installation</u>. Follow the procedures for pipe installation set forth herein.

- a. Pipe shall be jacked on properly braced and supported guide rails.
- b. Welding of the pipe shall be performed prior to installation. Field welds shall be complete penetration, full-depth, single "V" groove butt weld type joints that are air tight and continuous over the circumference of the pipe.
- c. Do not exceed force recommended by the manufacturer for jointing or pushing pipe.
- d. Provide a means of tracking the leading edge of the pipe using an electronic transmitting and receiving device.
- e. In the event a section of pipe is damaged during the jacking operation, jack through to the receiving pit and remove the damaged pipe accordingly. Other methods of repair may be used, subject to the approval of the Engineer.
- f. Monitor volume of material excavated and adjust auger rate to avoid loss of ground, over-excavation, settlement, and surface heave.

- g. Mechanically bore through soil by a continuous auger mounted inside the pipe. The Tunnel Excavation operations shall be performed simultaneously, with continuous installation of casing pipe. In case unsuitable conditions are encountered the cutting head shall be retracted into the casing. Bore hole diameter shall not be more than 1" greater than the outside diameter of the casing pipe.
- h. Once the casing pipe is in place, any voids between the casing pipe and surrounding soil shall be filled with NCDOT Type I grout forced in under pressure. Enough water shall be used to produce, when well mixed, a grout having a consistency of thick cream. As the pumping through any hole is stopped, it shall be plugged to prevent backflow. The contact grout injection pressures shall be adequate to displace the hydrostatic head while not damaging casing pipe.
- i. Once the casing pipe is in place and grouted, the carrier pipe shall be installed inside the casing. All carrier pipe joints in the casing shall be restrained including the first joints outside the casing pipe. The carrier pipe shall be centered within the casing using stainless steel spacers. The spacers shall be equally spaced along the length of the pipe and shall be as shown on the Drawings.
- j. Once the carrier pipe is in place, end closures shall be installed and the annular space between the carrier pipe and casing shall be backfilled with casing pipe grout backfill. Casing pipes located in a railroad right-of-way shall not be backfilled with casing pipe grout.

3-6. <u>SPOIL TRANSPORT AND DISPOSAL</u>. Spoil from Tunnel Excavation operations shall be removed by the helical wound flights to the jacking pit and stored onsite or disposed of properly at an offsite facility.

3-7. <u>CONTROL OF LINE AND GRADE</u>. Benchmarks and other survey control shall be established by the Contractor. Accuracy of the benchmarks shall be verified at the beginning of construction by the Surveyor.

If the pipe installation line and grade exceeds specified tolerances, perform corrective work as approved by the Engineer and at no additional cost to the Owner.

3-7.01. <u>Tolerances</u>. Install casing pipe to meet the following tolerances along the alignment:

Horizontal Tolerance: maximum of plus-or-minus 1-inch from the design horizontal (line) alignment as shown on the Drawings from the theoretical at any point.

33 05 25 TUNNEL EXCAVATION Page 12 of 13 SENSITIVE DOCUMENTS – DO NOT DUPLICATE Grade Tolerance: maximum of plus-or-minus 1-inch from the design vertical (grade) alignment as shown on the Drawings from the theoretical at any point.

3-8. <u>GROUNDWATER CONTROL</u>. Control of groundwater shall be in accordance with the requirements of the Trenching and Backfilling section.

3-9. <u>VENTILATION</u>. Contractor shall provide adequate ventilation complying with all relevant OSHA regulations and shall design the ventilating system to include such factors as the volume required to furnish fresh air and the volume to remove dust and vapor that may impact the laser guidance system. The ventilation system shall be designed considering all internal combustion equipment that may be used in and near the shaft. When personnel entry is required, gas testing shall be carried out in accordance with OSHA requirements.

All work areas, including shaft access, ladders, and Tunnel Excavations operation activities (above and below the surface), shall be lighted to ensure proper workspace safety and visibility complying with all relevant OSHA regulations. The lights shall be on a separate circuit from other equipment. Underground spaces, whether completed or under construction, shall be kept clear of water, slurry, lubricant, hydraulic oil, and excavated material to the extent practical, and shall comply with all relevant OSHA regulations.

3-10. <u>CARRIER PIPE INSTALLATION</u>. The carrier pipe shall be installed within the casing pipe by Contractor in the presence of Engineer. Installation shall be in accordance with the Ductile Iron Pipe section and in accordance with the recommendations of the pipe manufacturer.

End of Section

1.010			1.020	1.030	1.040	1.050	1.060	2.010	3.010	3.020
Tag Number	Station	Drawing Sheet	Type(1)	Location(2)	Inlet size	Outlet Size	Orifice Size	Inlet Type(3)	Outlet Type(4)	Working Pressure
					(in)	(in)	(in)			(psi)
CAV-105A	43+37.11	C-105	CAV	IV	(in) 3	(in) 3	(in) 5/64	250F	F	(psi) 3-150
CAV-105A CAV-105B	43+37.11 47+14.04	C-105 C-105	CAV CAV	IV IV	(in) 3 3	(in) 3 3	(in) 5/64 5/64	250F 250F	F	(psi) 3-150 3-150
CAV-105A CAV-105B CAV-107	43+37.11 47+14.04 57+78.05	C-105 C-105 C-107	CAV CAV CAV	IV IV IV	(in) 3 3 3	(in) 3 3 3	(in) 5/64 5/64 5/64	250F 250F 250F	F F F	(psi) 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108	43+37.11 47+14.04 57+78.05 67+70.95	C-105 C-105 C-107 C-108	CAV CAV CAV CAV	IV IV IV IV	(in) 3 3 3 3	(in) 3 3 3 3	(in) 5/64 5/64 5/64 5/64	250F 250F 250F 250F	F F F	(psi) 3-150 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108 CAV-110A	43+37.11 47+14.04 57+78.05 67+70.95 83+65.27	C-105 C-105 C-107 C-108 C-110	CAV CAV CAV CAV CAV	IV IV IV IV	(in) 3 3 3 3 3 3	(in) 3 3 3 3 3 3	(in) 5/64 5/64 5/64 5/64	250F 250F 250F 250F 250F	F F F F	(psi) 3-150 3-150 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108 CAV-110A CAV-110B	43+37.11 47+14.04 57+78.05 67+70.95 83+65.27 88+25.00	C-105 C-105 C-107 C-108 C-110 C-110	CAV CAV CAV CAV CAV CAV	IV IV IV IV IV	(in) 3 3 3 3 3 3 3	(in) 3 3 3 3 3 3 3	(in) 5/64 5/64 5/64 5/64 5/64	250F 250F 250F 250F 250F 250F	F F F F	(psi) 3-150 3-150 3-150 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108 CAV-1108 CAV-110B CAV-114	43+37.11 47+14.04 57+78.05 67+70.95 83+65.27 88+25.00 120+00.00	C-105 C-105 C-107 C-108 C-110 C-110 C-114	CAV CAV CAV CAV CAV CAV CAV	IV IV IV IV IV	(in) 3 3 3 3 3 3 3 3 3	(in) 3 3 3 3 3 3 3 3 3	(in) 5/64 5/64 5/64 5/64 5/64 5/64	250F 250F 250F 250F 250F 250F 250F	F F F F	(psi) 3-150 3-150 3-150 3-150 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108 CAV-110A CAV-110B CAV-110B CAV-114 CAV-116	43+37.11 47+14.04 57+78.05 67+70.95 83+65.27 88+25.00 120+00.00 136+75.85	C-105 C-105 C-107 C-108 C-110 C-110 C-114 C-116	CAV CAV CAV CAV CAV CAV CAV CAV	IV IV IV IV IV IV	(in) 3 3 3 3 3 3 3 3 3 3	(in) 3 3 3 3 3 3 3 3 3 3 3	(in) 5/64 5/64 5/64 5/64 5/64 5/64 5/64	250F 250F 250F 250F 250F 250F 250F 250F	F F F F F	(psi) 3-150 3-150 3-150 3-150 3-150 3-150 3-150 3-150
CAV-105A CAV-105B CAV-107 CAV-108 CAV-110A CAV-110B CAV-110B CAV-114 CAV-116 CAV-118A	43+37.11 47+14.04 57+78.05 67+70.95 83+65.27 88+25.00 120+00.00 136+75.85 148+00.00	C-105 C-105 C-107 C-108 C-110 C-110 C-110 C-114 C-116 C-118	CAV CAV CAV CAV CAV CAV CAV CAV CAV	IV IV IV IV IV IV IV	(in) 3 3 3 3 3 3 3 3 3 3 3 3	(in) 3 3 3 3 3 3 3 3 3 3 3 3 3	(in) 5/64 5/64 5/64 5/64 5/64 5/64 5/64	250F 250F 250F 250F 250F 250F 250F 250F	F F F F F F	(psi) 3-150 3-150 3-150 3-150 3-150 3-150 3-150 3-150