

February 11, 2022

Subject: Invitation to Bid #1993-B: SR 54 Water Main Crossing at Veterans Parkway

Gentlemen/Ladies:

Fayette County, Georgia invites you to submit a bid for horizontal directional drilling under SR54 at Veterans Parkway to install a water main. You are invited to submit a bid in accordance with the information contained herein.

Questions concerning this invitation to bid should be addressed to Natasha M. Duggan in writing via email to <u>nduggan@fayettecountyga.gov</u> or fax to (770) 719-5534. Questions will be accepted until **3:00 p.m., Tuesday, March 1, 2022**.

Purchasing Department office hours are Monday through Friday 8:00 a.m. to 5:00 p.m. The office telephone number is (770) 305-5420.

Please return your response to the following address:

Fayette County Purchasing Department 140 Stonewall Avenue West, Suite 204 Fayetteville, Georgia 30214

Bid Number: **1993-B** Bid Name: **SR 54 Water Main Crossing at Veterans Parkway**

Your envelope *must* be sealed and should show your company's name and address.

Bids will be received at the above address until **3:00 p.m., Friday, March 11, 2022,** in the Purchasing Department, Suite 204. Bids will be opened at that time.

Bids must be signed to be considered. Late bids cannot be considered. Faxed bids or emailed bids cannot be considered.

If you download this invitation to bid from the county's web site, it will be your responsibility to check the web site for any addenda that might be issued for this solicitation. The county cannot not be responsible for a vendor not receiving information provided in any addendum.

Thank you for participating in the solicitation process.

Sincerely, 10 Ted L. Burgess

Director of Purchasing

GENERAL TERMS AND CONDITIONS ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

- 1. **Definitions**: The term "contractor" as used herein and elsewhere in these Terms and Conditions shall be used synonymously with the term "successful bidder." The term "County" shall mean Fayette County, Georgia.
- 2. Bid is Offer to Contract: Each bid constitutes an offer to become legally bound to a contract with the County, incorporating the invitation to bid and the bidder's bid. The binding offer includes compliance with all terms, conditions, special conditions, specifications, and requirements stated in the invitation to bid, except to the extent that a bidder takes written exception to such provisions. All such terms, conditions, special conditions, specifications, and requirements will form the basis of the contract. The bidder should take care to answer all questions and provide all requested information, and to note any exceptions in the bid submission. Failure to observe any of the instructions or conditions in this invitation to bid may result in rejection of the bid.
- 3. **Binding Offer**: To allow sufficient time for a contract to be awarded, each bid shall constitute a firm offer that is binding for sixty (60) days from the date of the bid opening until the date of contract award, unless the bidder takes exception to this provision in writing.
- 4. **Bidder's Questions**: -As appropriate, the County will post answers to questions and/or other information concerning the invitation to bid in the form of an addendum on the County's website at <u>www.fayettecountyga.gov</u>. It is the responsibility of the prospective bidder to check the website for any addenda issued for this invitation to bid.
- 5. **References**: Include with your bid a list of three (3) jobs that your company has done that are of the same or similar nature to the work described in this invitation to bid on the form provided. Include all information as requested on the form.
- 6. **Bid Submission:** Submit your bid, along with any addenda issued by the county, in a sealed opaque envelope with the following information written on the outside of the envelope:
 - a. The bidder's company name,
 - b. The bid number, which is **#1993-B**, and
 - c. The bid name, which is SR 54 Water Main Crossing at Veterans Parkway

Mail or deliver one (1) original, **unbound** bid, signed in ink by a company official authorized to make a legal and binding offer, and one (1) copy on a flash drive, to:

Fayette County Purchasing Department 140 Stonewall Avenue West, Suite 204 Fayetteville, Georgia 30214

Bid Number: <u>1993-B</u> Bid Name: <u>SR 54 Water Main Crossing at Veterans Parkway</u> Georgia Utility Contractor's License Number: _____ You may submit bids in person, by U.S. mail, or by a commercial carrier. Do not submit bids by facsimile, e-mail, or other electronic means. Once submitted, all bids become the property of Fayette County.

- 7. Bid Preparation Costs: The bidder shall bear all costs associated with preparing the bid.
- 8. Late Bids: Bids not received by the time and date of the scheduled bid opening will not be considered, unless the delay is a result of action or inaction by the county.
- 9. More than One Bid: Do not submit alternate bids or options, unless requested or authorized by the county in the Invitation to Bid. If a responder submits more than one bid without being requested or authorized to do so, the county may disqualify the bids from that responder, at the county's option.
- Bid Corrections or Withdrawals: The bidder may correct a mistake, or withdraw a bid, before the bid opening by sending written notification to the Director of Purchasing. Bids may be withdrawn after the bid opening only with written authorization from the Director of Purchasing.
- 11. **Defects or Irregularities in Bids:** The county reserves the right to waive any defect or irregularity in any bid received. In case of an error in extension of prices or totals in the bid, the unit prices shall govern.
- 12. **Prices Held Firm**: Prices quoted shall be firm for the period of the contract, unless otherwise specified in the bid. All prices for commodities, supplies, equipment, or other products shall be quoted FOB Destination, Fayette County or job site.
- 13. **Brand Name:** If items in this invitation for bid have been identified, described or referenced by a brand name or trade name description, such identification is intended to be descriptive, but not restrictive and is to indicate the quality and characteristics of products that may be offered. Alternative products may be considered for award if clearly identified in the bid. Items offered must meet required specifications and must be of a quality which will adequately serve the use and purpose for which intended.
- 14. **Bidder Substitutions:** Bidders offering substitutions or deviations from specifications stated in the invitation to bid, shall list such substitutions or deviations on the "Exceptions to Specifications" sheet provided, or on a separate sheet to be submitted with the bid. The absence of such list shall indicate that the bidder has taken no exception to the specifications. The evaluation of bids and the determination as to equality and acceptability of products or services offered shall be the responsibility of the county.
- 15. **Samples**: When the county requires samples as part of the bid and vendor selection process, bidders must provide requested samples within the time allotted, and at no cost to the county unless otherwise specified. Any goods provided under contract shall conform to the sample submitted. The county will return samples only at the bidder's request, and at the bidder's expense, if they are not destroyed by testing.

- 16. **Non-Collusion**: By responding to this invitation to bid, the bidder represents that the bid is not made in connection with any competing bidder, supplier, or service provider submitting a separate response to this invitation to bid and is in all respects fair and without collusion or fraud.
- 17. **Bid Evaluation**: Award will be made to the lowest responsive, responsible bidder, taking into consideration total bid, payment terms, vendor qualifications and experience, quality, references, any exceptions listed, and/or other factors deemed relevant in making the award. The county may make such investigation as it deems necessary to determine the ability of the bidder to perform, and the bidder shall furnish to the county all information and data for this purpose as the county may request. The county reserves the right to reject any bid item, any bid, or all bids, and to re-advertise for bids.
- 18. Payment Terms and Discounts: The County's standard payment terms are Net 30. Any deviation from standard payment terms must be specified in the resulting contract, and both parties must agree on such deviation. Cash discounts offered will be a consideration in awarding the bid, but only if they give the county at least 15 days from receipt of invoice to pay. For taking discounts, time will be computed from the date of invoice acceptance by the County, or the date a correct invoice is received, whichever is the later date. Payment is deemed made, for the purpose of earning the discount, on the date of the check.
- 19. Trade Secrets Confidentiality: If any person or entity submits a bid or proposal that contains trade secrets, an affidavit shall be included with the bid or proposal. The affidavit shall declare the specific included information which constitutes trade secrets. Any trade secrets must be either (1) placed in a separate envelope, clearly identified and marked as such, or (2) at a minimum, marked in the affidavit or an attached document explaining exactly where such information is, and otherwise marked, highlighted, or made plainly visible. See O.C.G.A. § 50-18-72 (A)(34).
- 20. **Trade Secrets Internal Use:** In submitting a bid, the bidder agrees that the county may reveal any trade secret materials contained in the bid to all county staff and officials involved in the selection process, and to any outside consultant or other third parties who may assist in the selection process. The bidder agrees to hold harmless the county and each of its officers, employees, and agents from all costs, damages, and expenses incurred in connection with refusing to disclose any material which the bidder has designated as a trade secret.
- 21. Ethics Disclosure of Relationships: Before a proposed contract in excess of \$10,000.00 is recommended for award to the Board of Commissioners or the County Administrator, or before the County renews, extends, or otherwise modifies a contract after it has been awarded, the contractor must disclose certain relationships with any County Commissioner or County Official, or their spouse, mother, father, grandparent, brother, sister, son or daughter related by blood, adoption, or marriage (including in-laws). A relationship that must be reported exists if any of these individuals is a director, officer, partner, or employee, or has a substantial financial interest the business, as described in Fayette County Ordinance Chapter 2, Article IV, Division 3 (Code of Ethics).

If such relationship exists between your company and any individual mentioned above, relevant information must be presented in the form of a written letter to the Director of Purchasing. You must include the letter with any bid, proposal, or price quote you submit to the Purchasing Department.

In the event that a contractor fails to comply with this requirement, the County will take action as appropriate to the situation, which may include actions up to and including rejection of the bid or offer, cancellation of the contract in question, or debarment or suspension from award of a County contract for a period of up to three years.

- 22. **Contract Execution & Notice to Proceed**: After the Board of Commissioners makes an award, all required documents are received by the county, and the contract is fully executed with signature of both parties, the county will issue a written Notice to Proceed. The county shall not be liable for payment of any work done or any costs incurred by any bidder prior to the county issuing the Notice to Proceed.
- 23. **Unavailability of Funds**: This contract will terminate immediately and absolutely at such time as appropriated and otherwise unobligated funds are no longer available to satisfy the obligations of the county under the contract.
- 24. **Insurance**: The successful bidder shall procure and maintain the following insurance, to be in effect throughout the term of the contract, in at least the amounts and limits as follows:
 - a. **General Liability Insurance**: \$1,000,000 combined single limit per occurrence, including bodily and personal injury, destruction of property, and contractual liability.
 - b. Automobile Liability Insurance: \$1,000,000 combined single limit each occurrence, including bodily injury and property damage liability.
 - c. Worker's Compensation & Employer's Liability Insurance: Workers Compensation as required by Georgia statute.

Before a contract with the successful bidder is executed, the successful bidder shall provide Certificates of Insurance for all required coverage. The successful offeror can provide the Certificate of Insurance after award of the contract but must be provided prior to execution of the contract document by both parties. The certificate shall list an additional insured as follows:

Fayette County, Georgia 140 Stonewall Avenue West Fayetteville, GA 30214

25. **Bid Bond**: You must include a bid bond with your bid, equal to five percent (5%) of the total amount bid. Bid bonds shall be provided by a surety which appears on Georgia's list of approved sureties administered by the State Insurance Commissioner, or the U.S. Treasury's list of approved bond sureties (Circular 570).

- 26. **Performance and Payment Bonds**: Prior to execution of a contract, the successful bidder shall submit performance and payment bonds each equal to 100 percent of the contract value, provided by a surety which appears on Georgia's list of approved sureties administered by the State Insurance Commissioner, or the U.S. Treasury's list of approved bond sureties (Circular 570).
- 27. **Substitution of Contracted Items**: The contractor shall be obligated to deliver products awarded in this contract in accordance with terms and conditions specified herein. If a contractor is unable to deliver the products under the contract, it shall be the contractor's responsibility to obtain prior approval of the ordering agency to deliver an acceptable substitute at the same price quoted in the contractor's original bid. In the event any contractor consistently needs to substitute or refuses to substitute products, the County reserves the right to terminate the contract or invoke the "Delivery Failures" clause stated herein.
- 28. **Building Permits:** Work performed for the county requiring building permits by licensed contractors will not have permit fees assessed, although any re-inspection fees for disapproved inspections will be the responsibility of the contractor prior to final inspections and the Certificate of Occupancy or Certificate of Completion being issued.
- 29. **Unauthorized Performance**: The county will not compensate the contractor for work performed unless the work is authorized under the contract, as initially executed or as amended.
- 30. **Assignment of Contract:** Assignment of any contract resulting from this invitation to bid will not be authorized, except with express written authorization from the county.
- 31. Indemnification: The contractor shall indemnify and save the county and all its officers, agents and employees harmless from all suits, actions, or other claims of any character, name and description brought for or on account of any damages, losses, or expenses to the extent caused by or resulting from the negligence, recklessness, or intentionally wrongful conduct of the contractor or other persons employed or utilized by the contractor in the performance of the contract. The contractor shall pay any judgment with cost which may be obtained against the county growing out of such damages, losses, or expenses.
- 32. **Severability**: The invalidity of one or more of the phrases, sentences, clauses or sections contained in the contract shall not affect the validity of the remaining portion of the contract. If any provision of the contract is held to be unenforceable, then both parties shall be relieved of all obligations arising under such provision to the extent that the provision is unenforceable. In such case, the contract shall be deemed amended to the extent necessary to make it enforceable while preserving its intent.

- 33. Delivery Failures: If the contractor fails to deliver contracted goods or services within the time specified in the contract or fails to replace rejected items in a timely manner, the county shall have authority to make open-market purchases of comparable goods or services. The county shall have the right to invoice the contractor for any excess expenses incurred or deduct such amount from monies owed the contractor. Such purchases shall be deducted from contracted quantities.
- 34. **Substitution of Contracted Items**: The contractor shall be obligated to deliver products awarded in this contract in accordance with terms and conditions specified herein. If a contractor is unable to deliver the products under the contract, it shall be the contractor's responsibility to obtain prior approval of the ordering agency to deliver an acceptable substitute at the same price quoted in the contractor's original bid. In the event any contractor consistently needs to substitute or refuses to substitute products, the County reserves the right to terminate the contract or invoke the "Delivery Failures" clause stated herein.
- 35. **Termination for Cause**: The county may terminate the contract for cause by sending written notice to the contractor of the contractor's default in the performance of any term of this agreement. As appropriate, the county will compensate the contractor for completed performance, and for any partially completed performance as determined by the county to be adequately performed. Termination shall be without prejudice to any of the county's rights or remedies by law.
- 36. Termination for Convenience: The county may terminate the contract for its convenience at any time with 10 days' written notice to the contractor. In the event of termination for convenience, the county will pay the contractor for services performed. The county will compensate partially completed performance based upon a signed statement of completion submitted by the contractor, which shall itemize each element of performance completed.
- 37. Force Majeure: Neither party shall be deemed to be in breach of the contract to the extent that performance of its obligations is delayed, restricted, or prevented by reason of any act of God, natural disaster, act of government, or any other act or condition beyond the reasonable control of the party in question.
- 38. **Governing Law**: This agreement shall be governed in accordance with the laws of the State of Georgia. The parties agree to submit to the jurisdiction in Georgia, and further agree that any cause of action arising under this agreement shall be required to be brought in the appropriate venue in Fayette County, Georgia.

Checklist of Required Documents

(Be Sure to Return This Checklist and the Required Documents in the order listed below)

#ITB 1993-B: SR 54 Water Main Crossing at Veterans Parkway

Company information – on the form provided Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

Pricing sheet*

Bid Bond*

List of exceptions, if any – on the form provided

References - on form provided

Copy of Georgia Utility Contractor's License

Addenda, if Any

*FAILURE TO INCLUDE THIS ITEM WILL RESULT IN DISQUALIFICATION

COMPANY NAME: _____

COMPANY INFORMATION ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

Company Name:	
Physical Address:	
Mailing Address (if different):	
AUTHORIZED REPRESENTATIVE	
Signature:	
Printed or Typed Name:	
Title:	
Email Address:	
Phone Number:	Fax Number:
PROJECT CONTACT PERSON	
Name:	
Title:	
Office Number:	_ Cellular Number:
Email Address:	

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(l)

The undersigned contractor ("Contractor") executes this Affidavit to comply with O.C.G.A § 13-10-91 related to any contract to which Contractor is a party that is subject to O.C.G.A. § 13-10-91 and hereby verifies its compliance with O.C.G.A. § 13-10-91, attesting as follows:

- a) The Contractor has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program;
- b) The Contractor will continue to use the federal work authorization program throughout the contract period, including any renewal or extension thereof;
- c) The Contractor will notify the public employer in the event the Contractor ceases to utilize the federal work authorization program during the contract period, including renewals or extensions thereof;
- d) The Contractor understands that ceasing to utilize the federal work authorization program constitutes a material breach of Contract;
- e) The Contractor will contract for the performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the Contractor with the information required by O.C.G.A. § 13-10-91(a), (b), and (c);
- f) The Contractor acknowledges and agrees that this Affidavit shall be incorporated into any contract(s) subject to the provisions of O.C.G.A. § 13-10- 91 for the project listed below to which Contractor is a party after the date hereof without further action or consent by Contractor; and
- g) Contractor acknowledges its responsibility to submit copies of any affidavits, drivers' licenses, and identification cards required pursuant to O.C.G.A. § 13-10-91 to the public employer within five business days of receipt.

Federal Work Authorization User Identification Number

Date of Authorization

Name of Contractor

#1993-B SR54 Water Main Crossing at Veterans Parkway Name of Project

Fayette County, Georgia

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ___, 2022 in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE _____ DAY OF _____, 2022.

NOTARY PUBLIC

My Commission Expires:

PRICING SHEET

ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

	Number of Linear Feet	Price per Linear Foot	Extended Price
Install water main crossing, per			
specification			\$
Rock Removal, estimated	50	\$	\$
Allowance*			\$ 10,000.00
Total Bid, including allowance			\$

*Allowance shall only be used with prior written approval of the County Administrator.

<u>Notes</u>: <u>All</u> applicable charges shall be included in your prices, e.g., mobilization, freight, materials, equipment, fuel for equipment, labor, and any other charges or fess. No additional Charges will be allowed to be added after the bid received date.

State number of days to start after notice to proceed is issued: _____Days.

State the number of days to complete the project: _____ Days.

EXCEPTIONS TO SPECIFICATIONS ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

Please list below any exceptions or clarifications to the specifications of this bid. Explain any exceptions in full.

COMPANY NAME______

REFERENCES

ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

Please list three (3) references for current or recent customers who can verify the quality of service your company provides. Projects of similar size and scope are preferable.

1. Government/Company Name	
City & State	
Work or Service Provided	
Approximate Completion Date	
Contact Person and Title	
Phone	Email
2. Government/Company Name	
City & State	
Work or Service Provided	s
Approximate Completion Date	
Contact Person and Title	
Phone	Email
3. Government/Company Name	
City & State	
Work or Service Provided	
Approximate Completion Date	
Contact Person and Title	
Phone	Email
COMPANY NAME	

SCOPE AND SPECIFICATION ITB #1993-B: SR 54 Water Main Crossing at Veterans Parkway

Fayette County Water System is seeking a qualified contractor to provide a water main crossing in casing under SR54 using fusible PVC C900/C905 casing and water main.

SCOPE OF WORK:

The scope of work includes horizontal directional drilling (HDD) under SR 54 at Veterans Parkway of a 20" fusible polyvinyl chloride (FPVC) to serve as casing pipe. 16" FPVC water main shall be installed in the casing pipe. Fayette County Water System will obtain the Georgia Department of Transportation (GDOT) permit for this work.

SPECIFICATIONS:

- 1. Install a 16" FPVC water main installed in casing pipe.
- 2. The awarded contractor is not responsible for tapping and connecting the water main.
- 3. The end seals shall be GPT Model W Wrap Around End Seals or approved equal. If an alternative product is included in the submitted bid, the Fayette County Engineer will determine if the alternative product is acceptable.
- 4. All bidders shall include in a price for rock removal for 50 Linear Feet, as provided for on the Pricing Sheet. Attachment 1 provides the report of subsurface exploration and geotechnical engineering evaluation.
- 5. This work shall be performed per the GDOT drawings and stipulations (Attachment 2). This is the design portion of the GDOT permit. GDOT will add in its requirements about notifying the GDOT Inspector, GDOT traffic signal department, and other departments once the contract is awarded and the GDOT permit is approved.
- 6. The following sections from Underground Solutions contain the specifications for "Fusible Polyvinyl Chloride Pipe for Installation by Sliplining" and "Fusible Polyvinyl Chloride Pipe for Installation by Horizontal Directional Drilling
- 7. Informational Bore Calculations are included:
 - a. Bore Calc 1 Attachment 3
 - b. Bore Calc 2 Attachment 4
- 8. An allowance for unforeseen expenses has been included on the pricing sheet. The allowance shall only be used with prior written approval of the County Administrator. Any unused allowance shall be reduced from the final payment by a written change order.

SECTION 02600

FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE FOR INSTALLATION BY HORIZONTAL DIRECTIONAL DRILLING (HDD)

PART 1 - GENERAL

- 1.01 DESCRIPTION
 - A SCOPE
 - 1. This section specifies fusible polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by horizontal directional drilling, directional boring, or guided boring.

B REQUIREMENTS:

- 1. Contractor shall provide fusible polyvinyl chloride (PVC) pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification for installation by horizontal directional drilling, directional boring, or guided boring.
- 2. Contractor shall be responsible for all installation processes and procedures associated with the installation by horizontal directional drilling, directional boring, or guided boring in accordance with this specification.

C PIPE DESCRIPTION

- 1. Pipe Supplier shall furnish fusible polyvinyl chloride (PVC) pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.
- 2. Pipe shall conform to the following table of dimensions and designations:

<u>Pipe Name</u> <u>& Reference</u> <u>Standard</u>	<u>Nominal Diameter</u> (in.) & Convention (e.g., CIOD, IPS, or <u>other)</u>	<u>Dimension</u> <u>Ratio (DR)</u>	Pressure Class or Rating (psi)	<u>Required</u> <u>Inside</u> Diameter (in.)
Fusible PVC C-900	20 DIP OD (Min Bend Radius = 450 ft)	21	200	19.42

1.02 QUALITY ASSURANCE

A REFERENCES:

- 1. This section contains references to the following documents. They are a part of this section as specified and modified. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- 2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design.

Reference	Title
ANSI/AWWA C110/A21.10	Standard for Ductile-Iron and Gray-Iron Fittings
ANSI/AWWA C111/A21.11	Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C605	Standard for Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
AWWA C651	Standard for Disinfecting Water Mains
AWWA C900 ¹	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. (100mm Through 1,500mm)
AWWA C907	Standard for Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water, Wastewater, and Reclaimed Water Service
AWWA M23	AWWA Manual of Practices for PVC Pipe—Design and Installation
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2665	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

¹ Prior to 2017, AWWA C905 was the standard for PVC pipe and fabricated fittings larger than 12 in. (300 mm). "AWWA C905" marking on pipe larger than 12 in. is acceptable.

Reference	Title
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F1417	Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
UNI-PUB-08	PVC Pressure Pipe Tapping Guide
NSF/ANSI – 61-G	Drinking Water System ComponentsHealth Effects
PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

B MANUFACTURER REQUIREMENTS

1. All piping shall be made from PVC compound having a minimum cell classification of 12454 per ASTM D1784.

C FUSION TECHNICIAN REQUIREMENTS

1. Fusion technician shall be qualified by the pipe supplier to install fusible polyvinyl chloride (PVC) pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

D SPECIFIED FUSION PROCESS AND PIPE SUPPLIERS

- 1. The pipe fusion joining process shall be that of Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051.
- The pipe manufacturers shall be fully experienced, reputable, and qualified in the manufacture of fusible polyvinyl chloride (PVC) products for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusible polyvinyl chloride (PVC) pipe marking shall include either Fusible PVC[®], Fusible C-900[®], or FPVC[®].

E WARRANTY

- 1. The pipe shall be warranted for one year per the pipe supplier's standard terms.
- 2. In addition to the standard pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.

F PRE-CONSTRUCTION SUBMITTALS

- 1. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:
 - 1) Pipe Size
 - 2) Dimensionality
 - 3) Pressure Class or Pressure Rating per applicable standard
 - 4) Color

- 5) Recommended Minimum Bending Radius
- 6) Recommended Maximum Safe Pull Force
- 7) Fusion technician qualification indicating conformance with this specification
- 2. The following WORK PLAN AND INFORMATION is required from the contractor and/or horizontal directional drilling Contractor. This WORK PLAN AND INFORMATION shall also be supplied to the pipe supplier upon request:
 - 1) Work plan shall include for each HDD installation any excavation locations and dimensions, interfering utilities, bore dimensions and locations including bend radii used, and traffic control schematics.
 - 2) A project safety and contingency plan which shall include but shall not be limited to drilling fluid containment and cleanup procedures, equipment and plan for compromised utility installations including electrical and power lines, water, wastewater and any other subsurface utility in the area.
 - 3) An HDD schedule identifying daily work hours and working dates for each installation.

G POST-CONSTRUCTION SUBMITTALS

- 1. The following is required from the contractor and/or fusion provider to the owner or pipe supplier upon request:
 - 1) Approved datalogger device reports
 - 2) Fusion joint documentation containing the following information:
 - a) Pipe Size (Diameter) and Wall Thickness
 - b) Fusion Machine Size (Make & Model Number)
 - c) Fusion Technician Identification
 - d) Job Identification (Name, location & project number)
 - e) Fusion Joint Number
 - f) Fusion, Heating, Cool Down and Drag Pressure Settings
 - g) Heat Plate Temperature
 - h) Time Stamp
 - i) Fusion Heating and Cool Down Time
 - j) Ambient Temperature and Weather Conditions
 - 3) As-recorded Information
 - a) The as-recorded plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.
 - b) All fittings, valves, or other appurtenances will also be referenced and shown.

c) A daily project log, along with tracking log sheets, should they be used, shall be provided. Tracking log sheet data, should it be employed, shall include all that apply, including inclination, depth, azimuth, and hydraulic pull-back and rotational force measured.

PART 2 - PRODUCTS

- 2.01 FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE FOR POTABLE WATER, RECLAIMED WATER, AND WASTEWATER
 - A Fusible polyvinyl chloride (PVC) pipe shall conform to AWWA C900, ASTM D2241 or ASTM D1785, as applicable. Testing shall be in accordance with the test methods provided or referenced in the applicable pipe standard.
 - B Fusible polyvinyl chloride (PVC) pipe shall be extruded with plain ends. The ends shall be square to the pipe and without any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe unless specified for connections with appurtenances or for connections at the fusible pipeline termination locations.
 - C Fusible polyvinyl chloride (PVC) pipe shall be manufactured in a standard 40'or 45' nominal length, or custom lengths as specified.
 - D Fusible polyvinyl chloride (PVC) pipe for potable water use shall be blue in color.
 - E Marking on the pipe shall include:
 - 1. Pipe size (nominal diameter)
 - 2. PVC
 - 3. Pipe Dimension Ratio (DR), Standard Dimension Ratio (SDR), or Schedule (SCH)
 - 4. AWWA pressure class, or ASTM pressure rating, as applicable,
 - 5. Designation of the applicable AWWA or ASTM standard, (e.g., "AWWA C900")
 - 6. Extrusion production-record code
 - 7. Trademark or trade name
 - 8. Cell Classification 12454 and/or PVC material designation code 1120 may also be included
 - 9. NSF-61-G (designating suitability for potable water service, including the lead-free requirements of the Safe Drinking Water Act) on all potable water pipe.
 - F Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

2.02 FUSION JOINTS

A Unless otherwise specified, fusible polyvinyl chloride (PVC) pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.

2.03 CONNECTIONS AND FITTINGS

A DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

Acceptable fittings for use with fusible polyvinyl chloride (PVC) pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.

- 1. Connections to fusible polyvinyl chloride (PVC) pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
- 2. Ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
- 3. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

B PVC GASKETED, PUSH-ON FITTINGS

Fittings for use with fusible polyvinyl chloride (PVC) pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C907.

- 1. Fittings for use joining fusible polyvinyl chloride (PVC) pipe with other sections of fusible polyvinyl chloride (PVC) pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the construction documents.
- 2. PVC gasketed, push-on fittings and mechanical restraints, if used, shall be installed per the manufacturer's guidelines.
- C FUSIBLE POLYVINYL CHLORIDE (PVC) SWEEPS OR BENDS
 - 1. Fusible polyvinyl chloride (PVC) sweeps or bends shall be manufactured from the same fusible polyvinyl chloride (PVC) pipe being used for the installation and be of the same sizing convention, diameter, wall thickness and pressure class of the pipe being joined using the sweep or bend.
 - 2. Fusible polyvinyl chloride (PVC) sweeps or bends shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation. Unless otherwise specified, there shall be no gasketed connections utilized with a fusible polyvinyl chloride (PVC) sweep.
 - 3. Standard fusible polyvinyl chloride (PVC) sweep or bend angles shall not be greater than 22.5 degrees, and unless otherwise specified, shall be used in nominal diameters ranging from 4-inch through 16-inch.

D SLEEVE-TYPE COUPLINGS

- 1. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe.
- 2. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

E EXPANSION AND FLEXIBLE COUPLINGS

- 1. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.
- 2. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

F CONNECTION HARDWARE

Bolts and nuts for buried service shall be made of non-corrosive, high-strength, lowalloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

G CONNECTION TO SANITARY SEWER MANHOLES AND STRUCTURES

- 1. Fusible polyvinyl chloride (PVC) pipe shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out of the manhole or structure.
- 2. Connections to existing manholes and structures shall be as indicated in the construction documents.
 - 1) For a cored or drilled opening provide a flexible, watertight connection that meets and/or exceeds ASTM C923.
 - 2) For a knock-out opening, provide a watertight connection (waterstop or other method) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means.
 - 3) Grout opening in manhole wall with non-shrink grout. Pour concrete collar around pipe and outside manhole opening. Provide flexible pipe joint or flexible connector within 2 feet of the collar.
- 3. Connections to a new manhole or structure shall be as indicated in the construction documents.
 - 1) A flexible, watertight gasket per ASTM C 923 shall be cast integrally with riser section(s) for all precast manhole and structures.
 - 2) Drop connections shall be required where shown on drawings.
 - 3) Grout internal joint space with non-shrink grout.

2.04 DRILLING SYSTEM EQUIPMENT

- A GENERAL
 - 1. The directional drilling equipment, as a minimum, shall consist of a directional drilling rig of sufficient capacity to perform the bore(s) and pull-back of the pipe(s), a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project. All required equipment shall be included in the emergency and contingency plan as submitted per these specifications.

B DRILLING RIG

- 1. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull drill pipe while delivering a pressurized fluid mixture to a drill head. The machine shall be anchored to withstand the pulling, pushing and rotating forces required to complete the project.
- 2. The drilling rig hydraulic system shall be of sufficient pressure and volume to power drilling operations. The hydraulic system shall be free from leaks.
- 3. The drilling rig shall have a system to monitor pull-back hydraulic pressure during pull-back operations.
- C DRILL HEAD
 - 1. The horizontal directional drilling equipment shall produce a stable fluid lined tunnel with the use of a steer-able drill head and any subsequent pre-reaming heads.
 - 2. The system must be able to control the depth and direction of the drilling operation.
 - 3. Drill head shall contain all necessary cutters and fluid jets for the operation, and shall be of the appropriate design for the ground medium being drilled.

D DRILLING FLUID SYSTEM

- 1. DRILLING FLUID (DRILLING MUD)
 - a) Drilling fluid shall be composed of clean water and the appropriate additive(s) for the fluid to be used. Water shall be from a clean source and shall meet the mixing requirements of the mixture manufacturer(s).
 - b) The water and additives shall be mixed thoroughly to assure the absence of any clumps or clods. No hazardous additives may be used.
 - c) Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall(s).
 - d) Drilling fluid shall be disposed of off-site in accordance with local, state and federal requirements and/or permit conditions.
 - e) No additional chemicals or polymer surfactants shall be allowed to be added to the drilling fluid unless they have been submitted per this specification.

2. MIXING SYSTEM

- a) A drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid for the project.
- b) The mixing system shall be able to ensure thorough mixing of the drilling fluid. The drilling fluid reservoir tank shall be sized for adequate storage of the fluid.
- c) The mixing system shall continually agitate the drilling fluid during drilling operations.

3. DRILLING FLUID DELIVERY AND RECOVERY SYSTEM

- a) The drilling fluid pumping system shall have a minimum capacity to supply drilling fluid in accordance with the drilling equipment pull-back rating at a constant required pressure.
- b) The delivery system shall have filters or other appropriate in-line equipment to prevent solids from being pumped into the drill pipe.
- c) Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. The use of spill containment measures shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps, vacuum truck(s), and/or storage of sufficient size shall be in place to contain excess drilling fluid.
- d) A closed-loop drilling fluid system and a drilling fluid cleaning system should be used to whatever extent practical, depending upon project size and conditions. Under no circumstances shall drilling fluid that has escaped containment be reused in the drilling system.

E DRILLING CONTROL SYSTEM

- 1. Calibration of the electronic detection and control system shall be verified prior to the start of the bore.
- 2. The drilling head shall be remotely steer-able by means of an electronic or magnetic detection system. The drilling head location shall be monitored in three dimensions:
 - a) Offset from the baseline,
 - b) Distance along the baseline, and
 - c) Depth of cover.
- 3. Point of rotation of the head shall also be monitored.
- 4. For gravity application and on-grade drilling, sonde/beacon or approved equipment applicable for grade increments of 1/10th of one percent shall be used.

2.05 PIPE PULL HEADS

- A Pipe pull heads shall be utilized that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section at all times.
- B Pipe pull heads shall be specifically designed for use with fusible polyvinyl chloride (PVC) pipe, and shall be as recommended by the pipe supplier.

2.06 PIPE ROLLERS

- A Pipe rollers, if used, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.
- B A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and excessive sagging of the product pipe.

PART 3 – EXECUTION

- 3.01 DELIVERY AND OFF-LOADING
 - A All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
 - B Each pipe shipment shall be inspected for damage and to determine if the load has shifted prior to unloading. The owner or engineer shall be notified immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, and type.
 - C Pipe shall be loaded, off-loaded, and otherwise handled following all of the pipe supplier's guidelines.
 - D Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
 - E During off-loading and handling, care shall be taken to avoid the pipe striking hard objects. Significant impact could cause damage, particularly during cold weather.
 - F If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

3.02 HANDLING AND STORAGE

- A Visibly damaged pipe sections, or sections with suspected damage shall be cut out and removed. Cutting shall be performed per the pipe supplier's recommendations.
- B Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.
- C Pipe lengths shall be stored and placed on level ground. Pipe shall be stored at the job site in the unit packaging provided by the manufacturer. Caution shall be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, shall be kept free from dirt and foreign matter.
- D Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
- E If pipe is to be stored for periods of 1 year or longer, the pipe shall be shielded from direct sunlight. The pipe cover shall be opaque and provide for adequate air circulation above and around the pipe to prevent excess heat accumulation.
- F Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.03 FUSION PROCESS

- A GENERAL
 - 1. Fusible polyvinyl chloride (PVC) pipe shall be handled in a safe manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
 - 2. Fusible polyvinyl chloride (PVC) pipe shall be fused by qualified fusion technicians, as documented by the pipe supplier.
 - 3. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.
 - 4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
 - a) HEAT PLATE Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
 - b) CARRIAGE Carriage shall travel smoothly with no binding at low pressure. Jaws shall be in good condition with proper and clean inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
 - c) GENERAL MACHINE Overview of machine body shall yield no obvious defects, missing parts, hydraulic leaks or potential safety issues prior to fusion.
 - d) DATA LOGGING DEVICE An approved, fully functional datalogging device, with the current version of the pipe supplier's software shall be used. Datalogging device operations and maintenance manual shall be kept with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.
 - 5. Other equipment specifically required for the fusion process shall include the following:
 - a) Pipe rollers shall be used for support of pipe to either side of the machine
 - b) An infrared (IR) pyrometer, with an accuracy of 1% or better, for checking pipe and heat plate temperatures.
 - c) Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
 - d) Facing blades specifically designed for cutting fusible polyvinyl chloride (PVC) pipe shall be used.

e) For fusion in inclement weather, and/or windy conditions; a weather protection canopy with sides that allow full machine motion of the heat plate, fusion assembly and carriage shall be provided per the pipe supplier's recommendations. When the pipe temperature is below 40°F, the pipe supplier's cold weather operating procedures shall be followed.

B JOINT RECORDING

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine hydraulic system. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride (PVC) pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Required data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.04 DRILLING OPERATIONS

- A GENERAL
 - 1. Bore path and alignment are as indicated in the contract documents. The path of the bore may be modified based on field and equipment conditions. Entry and exit locations and control-point elevations shall be maintained as indicated in the contract documents.
 - 2. Bend radii shown in the contract documents are minimum allowable radii and shall not be reduced.

B LOCATION AND PROTECTION OF UNDERGROUND UTILITIES

- 1. Correct location of all underground utilities that may impact the HDD installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
- 2. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
- 3. All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact of HDD installation as determined for the project specific site conditions. It is the Contractor and HDD system operator's responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, HDD system and equipment, and foreign subsurface material.

C SITE LOCATION PREPARATION

- 1. Work site as indicated on drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made
- 2. Contractor shall confine all activities to designated work areas.

D DRILLING LAYOUT AND TOLERANCES

- 1. The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
- 2. Instrumentation shall be provided and maintained at all times that accurately locates the pilot hole, measures drill-string axial and torsional loads and measures drilling fluid discharge rate and pressure.
- 3. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

E PILOT HOLE BORE

- 1. Pilot hole shall be drilled along bore path. In the event that the pilot bore does deviate from the bore path, it may require contractor to pull-back and re-drill from the location along bore path before the deviation.
- 2. The Contractor shall limit curvature in any direction to reduce force on the pipe during pull-back. The minimum radius of curvature shall be no less than that specified by the pipe supplier and as indicated on the drawings.

F REAMING

1. After successfully completing the pilot hole, the bore hole shall be reamed to a diameter which meets the requirements of the pipe being installed. The following table is offered as an estimated guide:

Nominal Pipe Diameter	Bore Hole Diameter
< 8 inches	Pipe Dia. + 4 inches
8 inches to 24 inches	Pipe Dia. X 1.5
> 24 inches	Pipe Dia. + 12 inches

- 2. Multiple reaming passes shall be used at the discretion of the Contractor and shall conform to this specification.
- 3. In the event of a drilling fluid fracture, returns loss or other loss of drilling fluid, the Contractor shall be responsible for restoring any damaged property to original condition and cleaning up the area in the vicinity of the damage or loss.

3.05 PIPE PULL-BACK AND INSERTION

A Pipe shall be fused prior to insertion, if the site and conditions allow, into one continuous length.

- B Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past the pipe supplier's minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.
- C The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
 - 1. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
 - 2. The fusible polyvinyl chloride (PVC) pipe may be continuously or partially supported on rollers or other Owner and Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.
 - 3. A swivel shall be used between the reaming head and the fusible polyvinyl chloride (PVC) pipe to minimize torsion stress on the pipe assembly.
- D Buoyancy modification shall be at the sole discretion of the Contractor, and shall not exceed the pipe supplier's guidelines in regards to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the responsibility of the Contractor.
- E Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the bore hole.
- F The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Any damages caused by the Contractor's operations shall be corrected by the Contractor.
- G Pneumatic hammer shall not be used to dislodge a stuck pipe.

3.06 INSTALLATION CLEANUP

- A Following the installation, the project site shall be returned to a condition as required in the construction documents. All excavations shall be backfilled and compacted per the construction documents and jurisdictional standards. All pavement and hardscape shall be repaired per applicable jurisdictional standards. All drilling fluid shall be properly disposed of per these specifications and all applicable jurisdictional laws.
- B Contractor shall verify that all utilities, structures, and surface features in the immediate project area are sound.

3.07 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

- A Prior to making connections into existing piping systems, the contractor shall:
 - 1. Field verify location, size, piping material, and piping system of the existing pipe.
 - 2. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, mechanical restraints, tees, or others as shown in the construction documents.
 - 3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.

B Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.08 PIPE SYSTEM CONNECTIONS

- A Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.
- B If possible, pipe installed via HDD shall be filled with water prior to making any connections to the existing system or other portions of the project.

3.09 TAPPING FOR POTABLE AND NON-POTABLE PRESSURE WATER APPLICATIONS

- A Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per UNI-PUB-08, "PVC Pressure Pipe Tapping Guide".
- B All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.
- C Equipment used for tapping shall be made specifically for tapping PVC pipe:
 - Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' and drill bits made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
 - 2. Manually operated or power operated drilling machines may be used.
- D Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.10 TESTING

- A Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.
- B HYDROSTATIC TESTING AND LEAKAGE TESTING FOR FUSIBLE POLYVINYL CHLORIDE (PVC) PRESSURE PIPING
 - 1. Hydrostatic and leakage testing shall be conducted in accordance with the requirements of AWWA C605.
 - 2. Unless agreed to or otherwise designated by the owner or engineer, for a simultaneous hydrostatic and leakage test following installation, a pressure equal to 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation shall be applied. Unless otherwise agreed to, the duration of the pressure test shall be for two (2) hours.
 - 3. If hydrostatic testing and leakage testing are performed at separate times, follow procedures as outlined in AWWA C605.

- 4. In preparation for pressure testing the following parameters must be followed:
 - 1) All air shall be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.
 - 2) The pipeline shall be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.
 - 3) Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to provide for the removal of trapped air in the pipeline.
- C LEAKAGE TESTING FOR NON-PRESSURE FUSIBLE POLYVINYL CHLORIDE (PVC) PIPING
 - 1. Gravity sanitary sewers that contain mechanical jointing in addition to fused PVC joints may need to be tested for excessive leakage.
 - 2. Gravity sanitary sewer leakage testing may include appropriate water or low-pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of two feet. The air test, if used, shall be conducted in accordance with one of the following Standards:
 - 1) ASTM F1417
 - 2) UNI-B-6
 - 3. The testing method selected shall properly consider the existing groundwater elevations during the test.
- D DEFLECTION TESTING FOR NON-PRESSURE PIPING
 - 1. After completion of the backfill, the engineer or owner may require that a deflection test be performed.
 - 2. Deflection tests can be conducted using a go/no-go mandrel. The mandrel's outside dimension shall be sized to permit passage through no more than 7.5 percent deflection. The percent deflection shall be established from the base inside diameter of the pipe. When the internal fusion beads are not removed, the base inside diameter shall include the height of the internal bead. The mandrel shall be approved by the owner or engineer prior to use. Other deflection test options, such as direct measurements, can be used for lines large enough for safe entry.

E INTERMEDIATE TESTING

1. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the owner and engineer. Testing of each HDD installation prior to connection to the system or other piping is preferred.

3.11 DISINFECTION OF POTABLE WATER PIPING

Chlorine granules shall not be used or present near the pipe ends while the pipe sections are being joined. After installation, the pipeline, having passed all required testing, shall be disinfected prior to being put into service. Unless otherwise directed by the owner or engineer, the pipeline will be disinfected per AWWA C651.

END OF SECTION

SECTION 02600

FUSIBLE POLYVINYL CHLORIDE PIPE FOR INSTALLATION BY SLIPLINING

PART 1 -GENERAL

1.01 DESCRIPTION

A Scope

This section specifies fusible polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by sliplining.

- B Pipe Description
 - 1. Pipe Supplier shall furnish fusible polyvinylchloride (PVC) pipe conforming to all identified standards and meeting all testing and material properties called out in this specification.
 - 2. Pipe shall conform to the following table of nominal size(s), dimensions and pressure designation(s):

Pipe Description & Reference Standard	Nominal Diameter (in.) & Convention (e.g., CIOD, IPS, or other)	Dimension Ratio (DR)	Pressure Class or Rating (psi)	Required Inside Diameter (in.)
Fusible PVC C-900	16 DIP OD	18	235	15.35

1.02 QUALITY ASSURANCE

- A References:
 - 1. This section contains references to the following documents. They are a part of this section as specified and modified. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
 - 2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design.

REFERENCE	TITLE
ANSI/AWWA C110/A21.10	Standard for Ductile-Iron and Gray-Iron Fittings
ANSI/AWWA C111/A21.11	Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	Standard for Ductile-Iron Compact Fittings
AWWA C605	Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
AWWA C651	Standard for Disinfecting Water Mains
AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. (100mm Through 1500mm) ¹
AWWA C907	Standard for Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 Mm Through 300 Mm), For Water, Wastewater, And Reclaimed Water Service
AWWA M23	AWWA Manual of Supply Practices for PVC Pipe—Design and Installation, Third Edition
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2152	Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion
ASTM D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F1057	Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique

¹ Prior to 2017, AWWA C905 was the standard for PVC pipe and fabricated fittings larger than 12 in. (300 mm). "AWWA C905" marking on pipe larger than 12 in. is acceptable.

REFERENCE	TITLE
ASTM F1336	Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
NSF-14	Plastics Piping System Components and Related Materials
NSF/ANSI-61-G	Drinking Water System ComponentsHealth Effects
PPI TR-2	PVC Range Composition Listing of Qualified Ingredients

B Manufacturer Requirements

All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

C Fusion Technician Requirements

Fusion technician(s) shall be qualified by the pipe supplier to install fusible polyvinylchloride (PVC) pipe of the type(s) and size(s) specified. Qualification shall be current as of the actual date of fusion performance on the project.

- D Specified Fusion Process and Pipe Suppliers
 - 1. The pipe fusion joining process shall be that of Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051.
 - The pipe manufacturers shall be fully experienced, reputable, and qualified in the manufacture of fusible polyvinyl chloride (PVC) products for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Fusible polyvinyl chloride (PVC) pipe marking shall include either Fusible PVC[°], Fusible C-900[°], or FPVC[°].

E Warranty

- 1. The pipe shall be warranted for one year per the pipe supplier's standard terms.
- 2. In addition to the standard pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.
- F Pre-Construction Submittals
 - 1. The following product data shall be required from the pipe supplier and fusion provider:
 - a) Pipe Size
 - b) Dimensions
 - c) Pressure Class or Pressure Rating per applicable standard
 - d) Color

- e) Recommended Minimum Bending Radius
- f) Recommended Maximum Safe Pull Force
- g) Fusion technician qualification indicating conformance with this specification.
- 2. The following work plan and information is required from the contractor and/or slipline installer. This work plan and information shall also be supplied to the pipe supplier, upon request:
 - a) The work plan for each sliplining installation shall include all excavation locations, excavation dimensions, the locations of interfering utilities, and flow bypass and traffic control schematics.
 - b) At least 2 weeks prior to the start of work, the pipe installation Contractor shall submit its sliplining schedule identifying daily work hours and working dates for each installation.
 - c) If grout is to be used for filling the annular space, the pipe installation Contractor shall provide information detailing the grout design mixes, installation plan and contingency plan for all grouting.
- G Post-Construction Submittals

The contractor and fusion provider shall present the following information to the owner or pipe supplier upon request:

- 1. The joint fusion datalogger reports.
- 2. Fusion joint documentation containing the following information:
 - a) Pipe size (Diameter) and Thickness
 - b) Fusion Machine Make, Model and Serial Number
 - c) Fusion Technician Identification and Qualification Level
 - d) Job Identification (Name, Location and/or Project Number)
 - e) Fusion Joint Number
 - f) Fusion, Heating, and Drag Pressure Settings
 - g) Heat Plate Temperature
 - h) Time Stamp
 - i) Fusion Heating Time and Cool Down Time
 - j) Ambient Temperature and Weather Conditions
- 3. If grout is used in the annular space, the contractor and/or slipline installer shall present the as-recorded grout testing reports to the owner or pipe supplier upon request.

PART 2 – PRODUCTS

- 2.01 FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE FOR WATER, RECLAIMED WATER, AND WASTEWATER
 - A Fusible polyvinyl chloride (PVC) pipe shall conform to AWWA C900, ASTM D2241, ASTM D1785, ASTM D3034 (non-pressure), or ASTM D679 (non-pressure), as specified in the project contract documents. Pipe QA/QC testing shall be in accordance with the test methods provided or referenced in the specified pipe standard.
 - B Fusible polyvinylchloride (PVC) pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe unless specified for connections with appurtenances or for connections at the sliplining termination locations.
 - C Fusible polyvinyl chloride (PVC) pipe shall be manufactured in a standard 40' or 45' nominal length, or specified custom lengths.
 - D Marking on the pipe exterior shall include:
 - 1. Pipe size (nominal diameter)
 - 2. PVC
 - 3. Dimension Ratio (DR) or Standard Dimension Ratio (SDR) or Schedule (SCH)
 - 4. Pressure Class (PC) or Pressure Rating (PR) for pressure pipe applications
 - 5. Pipe stiffness (PS) may be required for non-pressure pipe applications
 - 6. AWWA or ASTM standard designation
 - 7. NSF-61-G mark verifying suitability, when required for potable water applications
 - 8. Extrusion production-record code
 - 9. Trademark or trade name
 - 10. Cell Classification 12454 or PVC material designation code 1120
 - 11. If color coding is required, the pipe exterior shall be the required color or include exterior stripes of the required color.

2.02 FUSION JOINT ASSEMBLY

Unless otherwise specified, fusible polyvinyl chloride (PVC) pipe shall be assembled via thermal butt-fusion in the field. The Contractor shall follow the pipe supplier's written guidelines and comply with Sections 1.02 C and 1.02 D1 of this specification.

2.03 DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

- A Acceptable fittings for use with fusible polyvinyl chloride (PVC) pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.
- B Connections to fusible polyvinyl chloride (PVC) pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.

C Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

2.04 PVC GASKETED, PUSH-ON FITTINGS

- A PVC pressure fittings for use with fusible polyvinyl chloride pipe shall conform to AWWA C900 or C907. PVC non-pressure fittings for use with fusible polyvinyl chloride (PVC) pipe shall conform to ASTM D3034, F679 or F1336.
- B PVC fittings for joining fusible polyvinyl chloride (PVC) pipe to other sections of fused or gasket-joint PVC pipe shall include gasketed, push-on type couplings and fittings, including bends, tees, and couplings as shown in the drawings.
- C Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as indicated in the project contract documents.
- D PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guidelines.

2.05 FUSIBLE POLYVINYL CHLORIDE PIPE SWEEPS OR BENDS

- A Fusible polyvinyl chloride (PVC) pipe sweeps or bends shall conform to the same sizing convention, diameter, dimensional tolerances, and pressure class of the pipe being joined using the sweep or bend.
- B Fusible polyvinyl chloride (PVC) pipe sweeps or bends shall be manufactured from the same fusible polyvinyl chloride pipe being used for the installation, and shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation.
- C Standard fusible polyvinyl chloride pipe sweep or bend angles shall not be greater than 22.5 degrees and shall only be allowed for nominal diameters ranging from 4-inch through 16-inch.

2.06 SLEEVE-TYPE COUPLINGS

- A Sleeve-type, mechanical couplings shall be manufactured for use with PVC pipe and may be restrained or unrestrained as indicated in the project contract documents.
- B Sleeve-type couplings shall be rated at the same, or greater, pressure as the pipe.

2.07 EXPANSION AND FLEXIBLE COUPLINGS

- A Only expansion-type mechanical couplings manufactured for use with PVC pipe shall be permitted and may be restrained or unrestrained as indicated in the project contract documents.
- B Expansion-type mechanical couplings shall be rated at the same, or greater, pressure as the pipe.

2.08 CONNECTION HARDWARE

Unless otherwise specified, bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

2.09 CONNECTION TO SANITARY SEWER MANHOLES AND STRUCTURES

- A Fusible polyvinyl chloride (PVC) pipe shall be connected to manholes and other structures to provide a leak-free, properly graded flow into or out of the manhole or structure.
- B Unless otherwise indicated in the project contract documents, connections to existing manholes and structures shall be the following:
 - 1. For cored or drilled openings a flexible, watertight connection that meets and/or exceeds ASTM C923 shall be installed.
 - 2. For knock-out openings, a watertight connection (waterstop or other method) meeting the material requirements of ASTM C923 that is securely attached to the pipe with stainless steel bands or other means provided in the project contract documents shall be installed.
 - 3. Grout Openings in manhole walls shall be filled with non-shrink grout. Concrete collars shall be poured around pipe and outside manhole openings. Flexible pipe joints or flexible connectors shall be installed within 2 feet of the collar.
- C Unless otherwise indicated in the project contract documents, connections to a new manhole or structure shall be the following.
 - 1. A flexible, watertight gasket per ASTM C 923 shall be cast integrally with riser section(s) for all precast manholes and structures.
 - 2. Drop connections shall be installed where shown on drawings.
 - **3**. Joint gaps and openings around the connection shall be grouted with non-shrink grout.

2.10 GROUT

- A Grout used to fill the annular space between the fusible polyvinyl chloride (PVC) pipe and the host pipe shall be a low-density, highly flowable mix. Grout shall meet the compressive strength requirements for the installation per the project contract documents.
- B Testing requirements shall be in accordance with the contract documents. Grout additives to improve its flow properties shall be permitted, provided that the grout strength property requirements are met.

2.11 PIPE PULL HEADS

- A When used, pipe pull heads shall employ a positive through-bolt design that provides a smooth pull head exterior against the host pipe interior throughout the pipe insertion.
- B Pipe pull heads shall be specifically designed for use with fusible polyvinyl chloride (PVC) pipe and shall be as recommended by the pipe supplier.

2.12 PIPE ROLLERS

A Pipe rollers shall be sized to fully support the weight of the pipe during handling and pullback operations.

B To assure adequate support and resist excessive sagging of the pipe, the quantity and spacing of pipe rollers shall be per the pipe supplier's guidelines.

PART 3 -- EXECUTION

3.01 DELIVERY AND OFF-LOADING

- A All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- B Each pipe shipment shall be inspected prior to unloading to see if the load has shifted or otherwise been damaged. The owner or engineer shall be notified immediately if more than immaterial damage is found. Each pipe shipment shall also be checked for quantity and proper pipe size and type.
- C Pipe shall be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all the pipe supplier's guidelines shall be followed.
- D Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
- E During off-loading and handling, care shall be taken to avoid the pipe striking hard objects. Substantial impact could cause damage, particularly during freezing weather.
- F If appropriate unloading equipment is not available, pipe shall be unloaded by removing pieces individually. Care should be taken to ensure that pipe is not dropped or damaged. Pipe shall be carefully lowered, not dropped, from trucks.

3.02 HANDLING AND STORAGE

- A Visibly damaged pipe sections and sections with suspected damage, shall be segregated and set aside for thorough evaluation.
- B Any damage, scratch or gouge that is deeper than 10% of the wall thickness shall be significant and is basis for rejection unless determined acceptable by the owner or engineer. Significantly damaged pipe sections shall be rejected or cut out. Cutting shall be performed according to the pipe supplier's recommendations.
- C Pipe lengths should be stored and placed on level ground. Pipe shall be stored at the job site in the unit packaging provided by the manufacturer. Caution shall be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, shall be kept free from dirt and foreign matter.
- D Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut into, gouge, scratch or otherwise abrade the pipe.
- E If pipe is to be stored for a period in excess of 1 year, the pipe shall be shaded or otherwise shielded from direct sunlight. If pipe is shielded with a cover, adequate air circulation above and around the pipe shall be provided to prevent excess heat from accumulating.
- F Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.03 FUSION PROCESS

- A General Requirements
 - 1. Fusible polyvinylchloride (PVC) pipe shall be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
 - 2. Fusible polyvinylchloride pipe shall be fused by qualified fusion technicians, as documented by the pipe supplier.
 - 3. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) properly connected to the fusion machine.
 - 4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
 - a) Heat Plate Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly. The cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
 - b) Carriage The carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
 - c) Fusion Machine Overview The entire fusion machine shall be examined for defects, missing parts, or potential safety issues. All issues shall be rectified prior to use.
 - d) Data Logging Device An approved electronic datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. The operations and maintenance manual shall be kept with the datalogging device at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.
 - 5. Other equipment specifically required for the fusion process shall include the following:
 - a) Pipe rollers shall be used to adequately support the pipe on both sides of the machine
 - b) A weather protection canopy or like protection that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and/or windy weather conditions, per the pipe supplier's recommendations. When the pipe temperature is below 40°F, the pipe supplier's cold weather operating procedures shall be followed.
 - c) An infrared (IR) pyrometer with an accuracy of ±1% or better, shall be used to check pipe and heat plate temperatures.

- d) The fusion machine operations and maintenance manual shall always be kept with the fusion machine.
- e) Facing blades specifically designed for use on fusible polyvinyl chloride (PVC) pipe shall be used.
- B Fusion Joint Report Requirements

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride (PVC) pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Pertinent data not logged by the data logger shall be logged manually and be included in the Fusion Technician's report.

3.04 HOST PIPE PREPARATION

- A The host pipe shall be cleaned in accordance with all applicable standards and guidelines. Unless otherwise specified, all interior pipe surfaces shall be cleaned per AWWA M28. The number of cleaning passes will depend on the method used and what is needed to create a uniform interior host pipe surface that is free of all loose material and sharp edges. Any potentially deleterious areas of the host pipe shall be removed or secured in place, prior to the insertion of fusible polyvinyl chloride (PVC) pipe.
- B Hazardous materials shall be removed and disposed of per all applicable requirements and regulations.

3.05 VIDEO INSPECTION

- A The host pipe shall be inspected by video camera after or during the cleaning process in accordance with these specifications.
- B Video camera inspection after host pipe cleaning shall indicate condition of host pipe and the suitability of host pipe for fusible polyvinyl chloride (PVC) pipe insertion.
- C Obstructions such as corporation taps, valves and valve bodies, and collapsed piping shall be remedied prior to pipe insertion. Spot repairs shall be made in accordance with the project contract drawings and these specifications.

3.06 FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE INSTALLATION

- A. Access pit excavations shall be performed at all points where the fusible polyvinyl chloride (PVC) pipe will be inserted into the existing pipeline. When possible, access pit excavations shall coincide with host pipe lateral connection points or other appurtenance locations.
- B Access pit length shall be such that the minimum bending radius, per the pipe supplier, for the fusible polyvinyl chloride (PVC) pipe is maintained. Sheeting, shoring and bracing requirements shall be in accordance with these specifications and applicable worker safety requirements.
- C The pulling mechanism shall be properly connected to the end of the fusible polyvinyl chloride (PVC) pipe via a pulling head or arrangement approved by the pipe supplier.

- D The maximum pulling tension on the pipe shall not exceed the pipe supplier's safe pulling force as submitted for this project.
- E Immediately following the completion of an installation by sliplining, if possible, the pipe shall be pushed back into the host pipe, at the pulling head, until a small amount of polyvinyl chloride (PVC) pipe movement is observed at the insertion pit, i.e., on the other end of the installation from the pulling equipment.
- F The fusible polyvinyl chloride (PVC) pipe shall be handled with care to minimize the possibility of it being cut, kinked, gouged, or otherwise damaged. Metal cables or hooks shall not be permitted.
- G Damaged, cut, or gouged fusible polyvinyl chloride (PVC) pipe shall be removed by cutting out the damaged section(s) of pipe. Cutting shall be performed according to the pipe supplier's recommendations.

3.07 ANNULAR SPACE GROUTING

- A If required in the project contract documents, the annular space between the outside of the fusible polyvinylchloride (PVC) pipe and the inside of the existing host pipe can be filled with a flowable grout in accordance with the contract documents.
- B Samples of grout shall be obtained in accordance with ASTM C495. One set of four standard cylinders shall be cast for each batch. Special handling and sampling procedures shall be followed if indicated by the grout manufacturer. The samples must meet the design compressive strength of the grout as outlined in the project contract documents and per the grout manufacturer. Samples shall be tested in accordance with ASTM C495.
- C Grouting of the annular space shall be done in such a manner as to prevent damage or collapse of the fusible polyvinyl chloride (PVC) pipe. Grouting operations shall be properly vented. If the distance between grout points exceeds the Contractor's pumping capability additional grouting points shall be excavated. Grouting shall be limited to no higher than the springline of the existing host pipe at access pits, service connections, and other grouting points.
- D The fusible polyvinyl chloride (PVC) pipe shall be filled with water prior to grouting. This shall aid in keeping the pipe from excessive floating or collapsing during grouting and also aid in dissipating the grout's heat of hydration as the grout cures. The water filling can be done in conjunction with the post-installation pipe pressure testing.

3.08 CONNECTIONS TO ADJOINING PIPE SYSTEMS

- A Unless otherwise specified in the project contract documents, the new sliplining pipeline shall be completely assembled and successfully tested prior to making connections into existing pipe systems.
- B The sizes, type and locations of adjoining piping systems, as shown in the project construction documents, shall be verified in the field prior to making connections.
- C All required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents shall be delivered to their respective connection location(s) as shown on the project construction drawings.

- D All temporary pumps and/or pipes shall be in place and operational in accordance with established connection plans prior to making connections.
- E Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the project contract documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.
- 3.09 HYDROSTATIC TESTING AND LEAKAGE TESTING FOR FUSIBLE POLYVINYL CHLORIDE (PVC) PRESSURE PIPING
 - A Prior to pressure testing the following preparations shall be completed:
 - 1. All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.
 - 2. The pipeline shall be fully restrained prior to pressurization. This includes complete installation of approved mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.
 - 3. Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially trapped air in the pipeline.
 - B Hydrostatic pressure and leakage testing shall be conducted according to and comply with AWWA C605, unless otherwise required in the project contract documents.
 - C Leakage testing shall comply with all applicable local, State and national codes, statutes, standards, regulations, and laws.
- 3.10 LEAKAGE TESTING FOR FUSIBLE POLYVINYL CHLORIDE (PVC) NON-PRESSURE PIPING
 - A Gravity sanitary sewer leakage testing may include appropriate water or low-pressure air testing. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. Water exfiltration or infiltration test shall be performed with a minimum positive head of two feet. The air test, when used, shall be conducted in accordance with either ASTM F1417 or UNI-B-6.
 - B Gravity sanitary sewers that contain mechanical jointing in addition to fused PVC joints may need to be tested for excessive leakage.
- 3.11 DISINFECTION OF POTABLE WATER PIPING
 - A Chlorine granules shall not be used or present near the pipe ends while the pipe sections are being joined.

B After installation and successfully passing all required testing, the fusible polyvinyl chloride (PVC) pipeline shall be disinfected prior to being put into service. Unless otherwise directed by the owner or engineer, the pipeline shall be disinfected per AWWA C651.

3.12 INTERMEDIATE TESTING

Short lengths or segments of the pipe may be tested separately in accordance with standard testing procedures and safety practices, as approved by the owner and engineer.

END OF SECTION

Attachment 1 GEOHYDRO ENGINEERS

Report of Subsurface Exploration and Geotechnical Engineering Evaluation

New Water Line Crossing State Route 54 and Veterans Parkway Fayetteville, Georgia Geo-Hydro Project Number 211832.20

Prepared for Croy Engineering, LLC January 25, 2022

January 25, 2022

Ms. Melanie Head Croy Engineering, LLC 200 North Cobb Parkway Building 400, Suite 413 Marietta, Georgia 30062

> Report of Subsurface Exploration and Geotechnical Engineering Evaluation New Water Line Crossing State Route 54 and Veterans Parkway Fayetteville, Georgia Geo-Hydro Project Number 211832.20

Dear Ms. Head:

Geo-Hydro Engineers, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation for the above referenced project. The scope of services for this project was outlined in our proposal number 211832.P0 dated November 4, 2021.

PROJECT INFORMATION

The project involves a new water line crossing beneath State Route 54 on the east side of Veterans Parkway in Fayetteville, Georgia. Figure 1 in the Appendix shows the approximate site location.

The new water line will be a 16-inch diameter FPVC pipe installed inside a 20-inch diameter FPVC casing. The casing will be installed using trenchless methods such as jack-and-bore or horizontal directional drilling. The plans provided to us show an invert elevation as much as 13 feet below current ground elevations. The plan excerpt below shows the proposed water line crossing, and the annotated aerial photograph shows current site conditions.







EXPLORATORY PROCEDURES

The subsurface exploration consisted of two machine-drilled test borings performed at the approximate locations shown on Figure 2 included in the Appendix. The test borings were located in the field by Geo-Hydro by measuring angles and distances from existing site reference points. The ground surface elevation shown on boring B-1 was interpolated from the *Water Main Extension Veterans Parkway* drawings prepared by Rochester & Associates dated October 5, 2021. The ground surface elevation shown on boring B-2 was interpolated from topographic information available on the Fayette County Tax Assessors website. Neither elevation is certified as correct by this engineer. Users of the data do so at their own risk. In general, the locations and elevations of the borings should be considered approximate.

Standard penetration testing, as provided for in ASTM D1586, was performed at select intervals in the soil test borings. Soil samples obtained from the drilling operation were examined and classified in general accordance with ASTM D2488 (Visual-Manual Procedure for Description of Soils). Soil classifications include the use of the Unified Soil Classification System described in ASTM D2487 (Classification of Soils for Engineering Purposes). The soil classifications also include our evaluation of the geologic origin of the soils. Evaluations of geologic origin are based on our experience and interpretation and may be subject to some degree of error.

Beginning at the depth of auger refusal, rock coring was performed in boring B-2. Coring was performed in general accordance with ASTM D2113. Rock samples were classified in accordance with the procedures outlined in *A Guide to Core Logging for Rock Engineering*, Bulletin of the Association of Engineering Geologists, Vol. XV, No. 3, 1978, and *Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core* (ASTM D6032).

Descriptions of the soils encountered, groundwater conditions, standard penetration resistances, and other pertinent information are provided in the test boring records included in the Appendix.

REGIONAL GEOLOGY

The project site is located in the Southern Piedmont Geologic Province of Georgia. Soils in this area have been formed by the in-place weathering of the underlying crystalline rock, which accounts for their classification as "residual" soils. Residual soils near the ground surface, which have experienced advanced weathering, frequently consist of red brown clayey silt (ML) or silty clay (CL). The thickness of this surficial clayey zone may range up to roughly 6 feet. For various reasons, such as erosion or local variation of mineralization, the upper clayey zone is not always present.

With increased depth, the soil becomes less weathered, coarser grained, and the structural character of the underlying parent rock becomes more evident. These residual soils are typically classified as sandy micaceous silt (ML) or silty micaceous sand (SM). With a further increase in depth, the soils eventually become quite hard and take on an increasing resemblance to the underlying parent rock. When these materials have a standard penetration resistance of 100 blows per foot or greater, they are referred to as partially weathered rock. The transition from soil to partially weathered rock is usually a gradual one, and



may occur at a wide range of depths. Lenses or layers of partially weathered rock are not unusual in the soil profile.

Partially weathered rock represents the zone of transition between the soil and the indurated metamorphic rocks from which the soils are derived. The subsurface profile is, in fact, a history of the weathering process which the crystalline rock has undergone. The degree of weathering is most advanced at the ground surface, where fine-grained soil may be present. And, the weathering process is in its early stages immediately above the surface of relatively sound rock, where partially weathered rock may be found.

The thickness of the zone of partially weathered rock and the depth to the rock surface have both been found to vary considerably over relatively short distances. The depth to the rock surface may frequently range from the ground surface to 80 feet or more. The thickness of partially weathered rock, which overlies the rock surface, may vary from only a few inches to as much as 40 feet or more.

Stream valleys in the Piedmont Region may contain alluvial (water-deposited) soils, depending on ground surface topography, stream flow characteristics, and other factors. By nature, alluvial soils can be highly variable depending upon the energy regime at the time of deposition. Coarse materials such as sand or gravel are deposited in higher energy environments, while fine grained materials such as silt and clay are deposited in low energy environments. Alluvial soils may also contain significant organic materials, and are frequently encountered in a loose, saturated condition. In many cases, fine-grained alluvial soils will be highly compressible and have relatively low shear strength.

Geologic conditions at the site have been modified by previous construction activities.

TEST BORING SUMMARY

Starting at the ground surface, borings B-1 and B-2 encountered about 2 and 3 inches of topsoil, respectively. Beneath the topsoil, boring B-1 encountered fill materials extending to a depth of about 6 feet. The fill material was classified as clayey sand with colloidal organic material. Standard penetration resistances of 3 and 5 blows per foot were recorded in the fill.

Beneath the fill materials or surface materials, both borings encountered residual soils typical of the Piedmont Region. The residual soils were classified as sandy clay, clayey sand, and silty sand. Standard penetration resistance recorded in the residual soils ranged from 10 to 55 blows per foot.

Partially weathered rock was encountered in boring B-1 at a depth of about 17 feet. A lens of partially weathered rock was encountered in boring B-2 between depths of about 3 and 6 feet. Partially weathered rock is locally defined as residual material with a standard penetration resistance of 100 blows per foot or greater.

Boring B-2 encountered conditions causing auger refusal at depth of 12 feet. Auger refusal is the condition that prevents advancement of the boring using conventional soil drilling techniques. The material causing auger refusal may consist of a boulder, a lens or layer of rock, the upper surface of relatively massive rock, or other hard material.



Starting at the depth of auger refusal, rock coring was performed in boring B-2 to sample the refusal materials. Beneath the depth of auger refusal, the boring recovered moderately to slightly fractured biotitic gneiss. The recovery percentage (REC) was 82 percent, and the rock quality designation (RQD) was 80 percent.

At the time of drilling, groundwater was not encountered in the test borings. For safety reasons, the borings were backfilled with soil cuttings after drilling completion.

For more detailed descriptions of subsurface conditions, please refer to the test boring records included in the Appendix.

Boring	Approx.	Groundwater*		Bottom of Fill		Тор	of PWR	Auge	r Refusal	B Tern	oring nination
	Elevation	Depth (feet)	Approx. Elevation								
B-1	958	NE		6	952	17	941	NE		25	933
B-2	966	NE		NE		3	963	12	954	22	944

Summary of Subsurface Conditions

All Depths in this Summary Table are Approximate NE: Not Encountered *Groundwater level measured at the time of drilling PWR: Partially Weathered Rock



EVALUATIONS AND RECOMMENDATIONS

The following evaluations are based on the information available on the proposed construction, the data obtained from the exploratory borings, and our experience with soils and subsurface conditions similar to those encountered at the explored locations. Because the test borings represent a statistically small sampling of subsurface conditions, it is possible that conditions between the test borings may be substantially different from those indicated by the borings.

- Boring B-1 was performed at the north end of the planned alignment and encountered partially weathered rock at a depth of about 17 feet, which corresponds to an approximate elevation of 941. Based on the drawings provided to us, 941 corresponds to an elevation about 6 feet below the lowest point of the planned water line crossing. Boring B-2 was performed about 75 feet south of the southern end of the new water line crossing, and encountered rock at an approximate elevation of 954. The drawings provided to us show the majority of the water line crossing below elevation 954. We expect the crossing for the water line to encountered fill materials, partially weathered rock, and possibly rock along the alignment.
- Based on the results of the borings, we expect the southern end of the crossing to encounter rock before transitioning to soil along the northern portion of the planned alignment.
- Boring B-1 encountered fill materials extending to a depth of about 6 feet. The fill contained some organic material, but the boring did not encountered boulders or other debris within the fill. Nevertheless, it is important to note that boulder fill is common in road embankments, and debris-laden fill materials may be encountered between the test borings.
- Groundwater was not encountered in the test borings. Groundwater is not anticipated to be a concern for construction.

The following sections provide recommendations regarding these issues and other geotechnical aspects of the project.

Excavation Characteristics and Reuse of Excavated Materials

Based on the results of the borings, difficult excavation conditions requiring rock removal or rock drilling are likely to be encountered at the southern end of the planned crossing alignment. If necessary, partially weathered rock can typically be removed with properly sized equipment. A budget allowance should be included for rock excavation or rock drilling.

For construction bidding and field verification purposes it is common to provide a verifiable definition of rock in the project specifications. The following is a typical definition of trench rock:



• <u>Trench Rock:</u> Material occupying an original volume of at least one-half cubic yard which cannot be excavated with a hydraulic excavator having a minimum flywheel power rating of 123 kW (165 hp); such as a Caterpillar 322C L, John Deere 230C LC, or a Komatsu PC220LC-7; equipped with a short tip radius bucket not wider than 42 inches.

Earth Slopes

Temporary construction slopes should be designed in strict compliance with OSHA regulations. The exploratory borings indicate that most soils along the alignment are Type B and C as defined in 29 CFR 1926 Subpart P. In general, we recommend that temporary construction slopes in residual soil above the groundwater level be no steeper than 1H:1V for excavation depths of 20 feet or less. Temporary excavation slopes in fill materials or below the groundwater level should be no steeper than 1.5H:1V for excavation depths of 20 feet or less. Temporary construction slopes should be closely observed on a daily basis by the contractor's "competent person" for signs of mass movement: tension cracks near the crest, bulging at the toe of the slope, etc. The responsibility for excavation safety and stability of temporary slopes should lie solely with the contractor.

We recommend that extreme caution be observed in trench excavations. Several cases of loss of life due to trench collapses in Georgia point out the lack of attention given to excavation safety on some projects. We recommend that applicable local and federal regulations regarding temporary slopes, and shoring and bracing of trench excavations be closely followed.

Temporary Excavation Bracing

Based on the general setting of the project area, it may not be possible to allow for excavation of the driving and receiving pits by sloping back the excavation sides at a gradient no steeper than 1.5H:1V. Site disturbance can be reduced significantly by shoring the pit excavations. Temporary shoring systems such as internally-braced sheet piling or internally-braced soldier pile and wood lagging can be used. The primary disadvantage of internally braced excavation support systems is the obstruction caused by the bracing. The selection and design of a specific excavation bracing system should be left to the contractor. Geo-Hydro and Croy should review the proposed excavation bracing system.

Structural Fill

The following recommendations are provided for any ancillary backfill associated with the project and restoration of the jack-and-bore/directional drilling pits.

Materials selected for use as structural fill should be free of organic debris, waste construction debris, and other deleterious materials. The material should not contain rocks having a diameter over 4 inches. It is our opinion that the following soils represented by their USCS group symbols will typically be suitable for use as structural fill and are usually found in abundance in the Piedmont: (SM), (ML), and (CL). The following soil types are typically suitable but are not abundant in the Piedmont: (SW), (SP), (SC), (SP-SM), and (SP-SC). The following soil types are considered unsuitable: (MH), (CH), (OL), (OH), and (Pt).



Laboratory Proctor compaction tests and classification tests should be performed on representative samples obtained from the proposed borrow material to provide data necessary to determine acceptability and for quality control. The moisture content of suitable borrow soils should generally be no more than 3 percentage points below or above optimum at the time of compaction. Tighter moisture limits may be necessary with certain soils.

It is possible that highly micaceous soils could be utilized as structural fill material. The use of such materials will require very close attention to quality control of moisture content and density. Additionally, it is our experience that highly micaceous soils tend to rut under rubber-tired vehicle traffic. Continuous maintenance of areas subjected to construction traffic is typically required until construction is completed.

Suitable fill material should be placed in thin lifts. Lift thickness depends on the type of compaction equipment, but a maximum loose-lift thickness of 8 inches is generally recommended. The soil should be compacted by a self-propelled sheepsfoot roller. Within small excavations such as in utility trenches, around manholes, above foundations, or behind retaining walls, we recommend the use of "wacker packers" or "Rammax" compactors to achieve the specified compaction. Loose lift thicknesses of 4 to 6 inches are recommended in small area fills.

We recommend that structural fill be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). The upper 12 inches of pavement subgrades should be compacted in accordance with Georgia DOT requirements to at least 100 percent of the standard Proctor maximum dry density (ASTM D698). Additionally, the maximum dry density of structural fill should be no less than 90 pcf. Geo-Hydro should perform density tests during fill placement.

* * * * * *

We appreciate the opportunity to serve as your geotechnical consultant for this project, and are prepared to provide any additional services you may require. If you have any questions concerning this report or any of our services, please call us.

Sincerely,

GEO-HYDRO ENGINEERS, IN No. 35695 OFESSION A. Marty Peninger, P.E. Georgia Geotechnical Manage mpeningere@geohydro.com

Luis E. Babler, R.E. Chief Engineer Iuis@geohydro.com

AMP/LEB/211832.20 - New Water Line Crossing - State Route 54 - Geotechnical Report leb



APPENDIX













LEGEND. Test boing	
	Approximate Scale: 1"=100'
Figure 2: Boring Location Plan	New Water Line Crossing State Route 54 and Veterans Parkway Fayetteville, Georgia Geo-Hydro Project Number 211832.20

Symbols and Nomenclature

Symbols

	Thin-walled tube (TWT) sample recovered
	Thin-walled tube (TWT) sample not recovered
•	Standard penetration resistance (ASTM D1586)
50/2"	Number of blows (50) to drive the split-spoon a number of inches (2)
65%	Percentage of rock core recovered
RQD	Rock quality designation - % of recovered core sample which is 4 or more inches long
GW	Groundwater
	Water level at least 24 hours after drilling
	Water level one hour or less after drilling
ALLUV	Alluvium
ТОР	Topsoil
PM	Pavement Materials
CONC	Concrete
FILL	Fill Material
RES	Residual Soil
PWR	Partially Weathered Rock
SPT	Standard Penetration Testing

Approximate				
Relative Density				
very loose				
loose				
firm				
very firm				
dense				
very dense				
Approximate				
Consistency				
Consistency very soft				
Consistency very soft soft				
Consistency very soft soft firm				
Consistency very soft soft firm stiff				
Consistency very soft soft firm stiff very stiff				
Consistency very soft soft firm stiff very stiff hard				

Drilling Procedures

Soil sampling and standard penetration testing performed in accordance with ASTM D 1586. The standard penetration resistance is the number of blows of a 140-pound hammer falling 30 inches to drive a 2-inch O.D., 1.4-inch I.D. split-spoon sampler one foot. Rock coring is performed in accordance with ASTM D 2113. Thin-walled tube sampling is performed in accordance with ASTM D 1587.



B-1

Test Boring Record



Project: New Water Line Crossing - SR 54 & Veterans Parkway										Project No: 211832.20								
	Locati	ion: Ke i	nnesa	aw, Ge		Date: 12/29/21												
	Metho	d: AST	M D2	113 ar	nd ASTM D6151	GWT at Drilling: Not Encountered			G.S. Elev:	9	58							
	Driller	: Premi	er (A	uto-Ha	ammer)	GWT at 24 hrs: N/A (Boring Backfilled)			Logged By	: KD .	I							
	Elev. (Ft)	Depth (Ft)	GWT	Symbol		Description		N Value & RQD	Standa	rd Penetra (Blows/Fo	ation Tes ot)	on Test						
					_\Topsoil (Approxim	ately 2 inches)		<u>) 10</u>	20 30	<u>40 50 60</u>	70 80	<u>) 90100</u>						
		_			Very loose to loose sand (SC) with col	e dark brown clayey fin loidal organics (FILL)	e to coarse	3	•									
	- 955	_																
		5—			Stiff rod find to cor	arso sandy clay (CL) (F		5 -	•									
	- 950	_				arse sanuy olay (OL) (P		10	•									
		-			(SC)	ed and gray clayey fine	to coarse sand	t cc										
-		-						20										
	- 945	_																
		 15					17			•								
						d rock sampled as grav	silty fine to	_										
	- 940	_			coarse sand (SM)	a rook sampled as gray												
4/22		20—						50/4" -					$\downarrow \blacklozenge$					
0.GDT 1/2	- 035	_																
EO HYDRC	900	_						50/4"										
G.GPJ G		25			Boring Terminated	l at 25 feet		- <u>50/1</u> "										
K CORING	- 930	_																
ORD ROC		30-																
Remarks:																		
₽L																		

B-2

Test Boring Record



Proje	Project: New Water Line Crossing - SR 54 & Veterans Parkway										Project No: 211832.20				
Loca	ition: Ke	nnesa	aw, Ge	eorgia		Date:	12/2	29/21							
Meth	od: AST	M D2	2113 ar	nd ASTM D6151	GWT at Drilling:	Not Encoun	tered	G.S. Elev:		966					
Drille	er: Prem	ier (A	uto-Ha	ammer)	GWT at 24 hrs:	N/A (Boring I	Logged By: KDJ								
Elev. (Ft)	Depth (Ft)	GWT	Symbol		Description		N Value & RQD	Standa	Standard Penetration Test (Blows/Foot)						
□)		0	Sy Contraction of the second se	Topsoil (Approxim. Very firm brown ar (RESIDUUM) Partially weathered fine to coarse sand Very dense brown Very dense brown ar Very firm brown ar Auger Refusal at 1 12'-0" Light gray, c massive, moderate GNEISS. Fracture light brown discolo Boring Terminated	ately 3 inches) Ind red silty fine to coarse d rock sampled as brow d (SM) and red silty fine to coarse I 2 Feet - Begin Rock C lark gray, slightly decorrely to slightly fractured, s extremely narrow to roration.	se sand (SM) vn and red silty arse sand (SM) se sand (SM) oring nposed, BIOTITIC harrow, clean,	22 50/4" 55 21 Core Run 1 12'-0" to 22'-0" REC=82% RQD=80%						20100		
	30-														
Remarks:															



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Informational HDD Bore Layout (Not a Design or Submittal Document)

Attachment 3



Note: This is an informational layout and not a design or submittal document.

Informational HDD Bore Layout (Not a Design or Submittal Document)

Attachment 4

Underground Solutions[®] as AEGION company



Note: This is an informational layout and not a design or submittal document.