



BRUNSWICK-GLYNN COUNTY JOINT WATER AND SEWER COMMISSION

2027 On-Call Boring Services

Technical Specifications for Pressure Testing

October 2026

**BRUNSWICK - GLYNN COUNTY JOINT WATER & SEWER
COMMISSION**

ON-CALL BORING SERVICES

TECHNICAL SPECIFICATIONS

DIVISION 15 - MECHANICAL

15044 - Pressure Testing of Piping

15075 - Horizontal Directional Drilling (HDD)

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SECTION 15044**PRESSURE TESTING OF PIPING****PART 1 - GENERAL****1.01 DESCRIPTION****A. Scope of Work:**

Hydrostatic testing shall be conducted for all pressurized piping systems. Pressure and leakage testing shall be performed in accordance with the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications.

1.02 MEASUREMENT AND PAYMENT

- A. Payment for Pressure Testing of Piping shall not be made separately. The cost thereof is included in the unit or lump sum price set forth for the items to which the pressure testing of piping is necessary. Reference Section 01025 Measurement and Payment for additional information.

PART 2 - PRODUCTS**2.01 GENERAL:**

- A. Testing fluid shall be potable water.

2.02 MATERIALS AND EQUIPMENT

- A. Unless otherwise indicated, Contractor shall provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 - EXECUTION**3.01 TESTING**

- A. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications as noted below.
1. Reference Section 2.5.3.8 of the JWSC Standards for hydrostatic testing of water mains.
 2. Reference Section 4.7.7 of the JWSC Standards for hydrostatic testing of force mains.

3. For hydrostatic testing of HDPE piping reference Section 15075. HDPE piping shall be tested separately from PVC
4. and DIP piping.

END OF SECTION

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SECTION 15075

HORIZONTAL DIRECTIONAL DRILLING

PART 1. GENERAL

1.01 SCOPE OF WORK:

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation for pipe 10 inches and larger outside diameter (OD), also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 QUALITY ASSURANCE:

The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit (i.e.: railroad, US ACOE, EPD, DOT, Etc.). Adherence to the specifications contained herein, or the BGJWSC Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD contractor shall be responsible for the repair of all damage to private and/or public property (at no expense to BGJWSC). Repair work shall meet all local and state rules and requirements.

1.03 QUALIFICATIONS:

The work specified in this Section requires significant previous experience and expertise in similar work to avoid negative impacts to public safety and the environment. Therefore, the Contractor performing the work shall be qualified, in BGJWSC's judgment, to complete the horizontal directional drilling work specified herein. **The Contractor shall submit substantiating evidence of qualifications, in accordance with the provisions of this Section and the Instructions to Bidders.** Failure to submit the required documentation may cause the Contractor to be declared unqualified to perform the scope of work for the project. **Contractor or subcontractor responsible for horizontal directional drilling operations shall perform all horizontal directional drilling operations including pipe joining/fusing.** In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to the Engineer of Record and Owner, as noted in the Instructions to Bidders with bid response.

1.04 PROJECT SCHEDULE AND COOPERATION:

The project schedule shall be established on the basis of working a normal work schedule as defined in the Special Conditions, or otherwise indicated in the Construction Drawings. Unless approved or requested otherwise by the Engineer of Record or Owner, normal or

general items of work, such as bacteriological testing, leakage and pressure testing, locate wire testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational and manpower limitations on the BGJWSC systems, BGJWSC may require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations may include line filling and flushing operation, tie-in work, (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing BGJWSC customers. The contractor shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to BGJWSC.

1.05 WARRANTY:

The Contractor shall supply to BGJWSC a one (1) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

The pipe manufacturer shall provide a warranty to the Contractor that the pipe conforms to these specifications and that the pipe shall be free from defects in materials and workmanship for a period of one (1) year from the date of final completion of the installation. The manufacturer's warranty shall be in a form acceptable to and for the benefit of BGJWSC and shall be submitted by the contractor as a condition of final payment. The manufacturer's warranty to the contractor shall in no way relieve the contractor from its unconditional warranty to BGJWSC.

The contractor shall warrant to BGJWSC that the methods used on the contract, where covered by patents or license agreements, are furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The contractor shall defend, indemnify, and hold BGJWSC harmless from and against any and all costs, loss, damage or expense arising out of, or in any way connected with, any claim of infringement of patent, trademark, or violation of license agreement.

1.06 REFERENCED STANDARDS:

- A. The work shall conform to applicable provisions of the BGJWSC Standards for Water and Sewer Design and Construction, and the following standards, latest editions, except as modified herein.
- B. American Water Works Association (AWWA) Standards:
 - AWWA C900 Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 inch through 60 inch.
 - AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.
 - ASTM D638 Standard Test Method for Tensile Properties of Plastics.
 - ASTM D2122 Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.

ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

ASTM E3261 Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

ASTM F412 Standard Terminology Relating to Plastic Piping Systems.

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.07 PERMITS:

The Contractor shall verify the existence of all necessary permits before commencing any work on the project.

1.08 SHOP DRAWING AND SUBMITTALS

A. Work Plan: Prior to beginning work, the Contractor must submit to the BGJWSC Representative a work plan detailing the procedure and schedule to be used to execute the project. Horizontal directional drilling shall not commence until the contractor has received written approval of all work plan submittals from BGJWSC.

1. Methods: The Contractor shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:
 - a. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for preparing as-builts.
 - b. Drilling fluid management plan.
 - c. Spoils handling and disposal plan.
 - d. Pipe storage and handling, addressing: Means and methods for protecting pipe and ensuring temperature control in accordance with the Contractor's installation calculations.
 - e. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
 - f. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.

- g. Quality control and testing procedures.
 - h. Safety plan.
2. Schedule: The Contractor shall provide a schedule for all horizontal directional drilling activities commencing with the site preparation and terminating on completion of testing and final acceptance of the installed pipe. The schedule shall address anticipated subsurface conditions and overall project requirements.
3. Equipment
- a. The contractor shall provide the make, model, and technical specifications for each of the following:
 - 1. Horizontal directional drill rig.
 - 2. Drilling system components.
 - 3. Downhole drilling assembly and reaming equipment.
 - 4. Downhole pressure sub.
 - 5. Guidance and control system.
 - 6. Pulling head.
 - 7. Swivel.
 - 8. Rollers.
 - 9. Solids separation and drill fluid recirculation systems.
 - 10. Pipe fusion equipment.
 - 11. Pipe fusion data logger.
 - 12. Pipe handling equipment.
 - 13. Pigs and pigging equipment.
 - b. The Contractor shall provide the following specific equipment information:
 - 1. Calibration certification for the pilot bore guidance and control system.
 - 2. Calibration certification for the heat fusion datalogger.
4. Supplemental Work Plan Requirements: The Contractor shall provide the following additional work plan submittals. The submission requirements for additional work plan submittals including number of copies and delivery of submittals shall follow the requirements outlined in the Submittals Section of the Special Conditions. Horizontal directional drilling shall not commence until the Contractor has received written approval of all supplemental work plan submittals.
- a. The Contractor shall submit acknowledgement of use of the Maintenance of Traffic plans in the Construction Drawings or shall submit alternate detailed Maintenance of Traffic plans for entry and exit pit sites and all areas of construction which will impact typical roadway or pathway use. Approval of Glynn County will be required for ALL Maintenance of Traffic plans with the ROW Permit.

- b. Frac-Out and Surface Spill Contingency Plan: Plans for mitigating the potential for inadvertent drilling fluid losses to surface, and for rapidly identifying and cleaning up spills near the investigation borings located along the project alignment. Investigation boreholes along the alignment have been backfilled as reported in the Geotechnical Report. The Contractor's work plans shall address the risk that investigation boreholes may contribute to the risk of drill fluid loss.
- c. Contingency plan for rapidly identifying, locating, and containing any drilling fluid returns.
- d. The Contractor shall submit a contingency plan to address procedures to be employed in the event any of the listed items occur.
 - 1. Utility strike, obstruction, or inability to advance drill pipe.
 - 2. Excessive deviation from proposed line and grade, as described within this Section.
 - 3. Inability to move pipe through borehole during pullback.
 - 4. Settlement or heave of roadways and structures within 50 feet of the alignment.

B. Calculations:

The Contractor shall submit final design calculations for BGJWSC's review and approval as soon as possible following Notice to Proceed, and in accordance with the Project Schedule section of the Special Conditions. Final design calculations shall support the Contractor's specific proposed means, methods, and products. The Contractor's final design calculations shall be prepared and sealed by a Licensed Professional Engineer registered to practice in the State of Georgia, and retained by the Contractor. Horizontal directional drilling shall not commence until the Contractor has received written approval of all design calculation submittals from BGJWSC.

At a minimum, design calculations shall demonstrate that the proposed pipe, equipment, and means and methods comply with the requirements of this Section and have been designed based on the design borepath, and installation means and methods, for anticipated installation and handling, hydrostatic, earth, and live loads, installation temperature and site conditions. Design calculations shall address the considerations and guidelines presented in ASTM F1962: Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

The Contractor shall supply copies of all other calculations required to support the required submittals for horizontal directional drilling. At a minimum, the following calculations should be included:

- 1. Maximum allowable pipe loading limits.
- 2. Pullback load calculation based upon proposed drill path plan and profile.
- 3. Buoyancy effect calculations.

4. Effects of ballasting plan on pipe pullback forces.
5. Hydrofracture analysis. This should include a maximum annular pressure curve and the respective formation pressure versus depth based on the proposed drill plan and profile.
6. Confirmation that design parameters do not exceed predicted installation stresses including factors such as tensile load, buckling and deformation.

C. Shop Drawing Submittals:

For all materials provided, Contractor shall provide copies of documentation (actual catalog data, brochures, drawings and descriptive literature) necessary to establish compliance with the Specifications in accordance with Submittals Section of the Special Conditions.

D. Construction Records:

1. Daily Reports: The Contractor shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to BGJWSC for approval prior to the commencement of drilling operations. Daily reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 30 feet during drilling, pre-reaming, and pullback:
 - a. Downhole tools and equipment in use.
 - b. Description of ground conditions encountered.
 - c. Description of drilling fluid.
 - d. Drilling fluid pumping rate.
 - e. Maximum and minimum downhole fluid pressures.
 - f. Drilling head location - at least every 10 feet along the bore path.
 - g. Drill stem torque.
 - h. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
 - i. Details of any unusual conditions or events.
2. Production and Record Drawings: The Contractor shall maintain at the construction site a complete set of field drawings for recording the as-built conditions. The Contractor shall plot as-built conditions on the field drawings, including the location in plan and elevation of the drill string, reaming head, and installed pipe, at the completion of each production shift. The Contractor shall compile and submit as-built data in accordance with the Project Record Documents requirements in the Special Conditions.
 - a. As-Built data provided to the Engineer of Record for incorporation into the Record Drawings shall include Horizontal Directional Drill pipe installation information in plan and profile views in AutoCAD format with X, Y, and Z coordinates in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD

88) conducted by a surveyor licensed in the State of Georgia. Directional Drill Bore Log shall be provided as part of the As-Built documentation and shall be in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD 88) and be relative to the established surface survey bench mark and baseline stationing that is tied to existing, fixed and visible sight features. Directional Drill Bore Log shall show recorded X, Y, and Z locations of the drill head at minimum every 20 feet in the AutoCAD format documentation.

3. Testing and Quality Control and Assurance Documentation: The Contractor shall maintain records for all testing and quality control and assurance procedures. The following records shall be provided to BGJWSC or BGJWSC's Representative on the day that information is acquired by the Contractor:
 - a. Manufacturer's Field Reports.
 - b. Test reports.
 - c. Fusion reports. For each weld, provide an electronic and printed report of the downloaded information for each weld. Fusion reports shall be submitted for review and approval to Engineer/Owner prior to initiating pullback operations.

1.09 NOTIFICATION:

The BGJWSC Representative must be notified 48 hours (minimum) in advance of starting the drilling work. The Directional Bore shall not begin until the proper preparations (see Work Plan) for the operation have been completed.

1.10 MEASUREMENT AND PAYMENT

Payment methodology for this item shall be as provided in Section 01025 – Measurement and Payments.

1.11 SITE PREPARATION:

- A. Prior to any alterations to work-site, Contractor shall video record and photograph entire work area in accordance with Section 01380: Construction Photographs and Video. Two (2) copies of such documentation shall be given to the BGJWSC Representative and Engineer and one (1) copy shall remain with Contractor for a period of two (2) years following the completion of the project. Pre-construction videos and photographs shall be reviewed and approved by BGJWSC and Engineer prior to disturbing project site.
- B. The Contractor shall coordinate utilities locates with Georgia811 (web site www.Georgia811.com). Once the locate service has field marked all utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, telecommunications, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar,

hand dig, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The Contractor shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

- C. Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.
- D. Following drilling operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted in accordance with Section 02220 Excavating, Backfilling, Compacting and the Construction Details.

1.12 ENVIRONMENTAL PROTECTION:

Contractor shall place erosion and sediment control measures between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, permits, and state, federal and local regulations. Contractor shall place approved protection methods to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

1.13 SAFETY:

Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

1.14 DOMESTIC WATER:

For the supply of domestic water during construction, the Contractor shall utilize a BGJWSC meter assembly (meter & backflow device) and pay for all water consumed.

PART 2. MATERIALS

2.01. HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:

- A. Materials:

Materials used for the manufacture of polyethylene pipe and fittings shall be

PE4710 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

B. Polyethylene Pipe

HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

C. Nominal Pipe Sizes

Nominal pipe sizes only are indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter.

D. Service Identification:

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. Colors for identifying piping service shall be in accordance with BGJWSC Standards for Water and Sewer Design and Construction.

E. Back-up Rings and Flange Bolts:

Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convuluted style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

F. Manufacturer's Quality Control:

The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.

G. Polyethylene Mechanical Joint (MJ) Adapters:

Mechanical connections of HDPE pipe to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a fusible polyethylene mechanical joint adapter with an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same DR rating as the pipe. Adaptors shall include longer T-bolts or all thread rods with nuts at the mechanical joint bell.

2.02 FUSIBLE POLYVINYL CHLORIDE (FPVC) PIPE (IF APPROVED BY OWNER):

- A. FPVC Pipe shall conform to AWWA C900, Ductile Iron Pipe Size (DIPS), DR18, and color coded. The pipe material shall be clean, virgin, National Sanitation Foundation No. 14, ASTM cell class 12454. FPVC 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. Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter.
- B. FPVC pipe shall not be bent beyond the manufacturer's recommended minimum allowable bend radius. The published allowable bend radius is applicable to all pipe alignments, including during handling and movement, as well as final positioning and installation.
- C. FPVC pipe shall not be subjected to a pull force greater than 80% of the manufacturer's recommended allowable pull force for the pipe wall thickness and size. Allowable pull force is the tensile load that may be safely applied to the pipe and is a function of the tensile stress capacity of FPVC and the cross-sectional area of the FPVC pipe section. FPVC pipe shall meet the cell class tensile stress capacity of 7,000 psi when the compound is tested per ASTM 1784. Safety factor shall be 2.5.

2.03 DRILLING FLUIDS SHALL BE A BENTONITE SLURRY.

2.04 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

- A. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.
- B. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris. Storage and handling of pipe shall be in accordance with manufacturer's recommendations.
- C. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.
- D. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry, as appropriate, shall be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion

of installation, and replace any and all plants, vegetation, and sod damaged, discolored or stained by drilling fluids. Contractor is responsible for the cost of disposal including but not limited to hauling and disposal charges.

- E. Disposal site for disposal of drilling fluids is the responsibility of the contractor or subcontractor involved with horizontal directional drilling. It shall be a state approved facility, permitted to accept drilling fluids and waste.

2.05 EQUIPMENT REQUIREMENTS

A. GENERAL:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety 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.

B. DRILLING SYSTEM

1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

2. Drill Head:

The drill head shall be steerable and shall provide the necessary cutting surfaces and drilling fluid jets.

3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better.

C. GUIDANCE SYSTEM:

Magnetic Guidance System (MGS) wireline, wireless or gyroscopic shall provide real time electronic data to the inspector on request. All daily data and project data shall be displayed on the "As Built". If deemed necessary, BGJWSC shall, at the contractor's expense, require a third party to verify the drill path profile and location of the installed line to BGJWSC satisfaction. The guidance system shall be capable of tracking at all depths up to forty feet (40') below the maximum proposed depth and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to $\pm 2\%$ of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

1. Bore Tracking and Monitoring:

At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length.

a. Downhole and Surface Grid Tracking System:

Contractor shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be continuously monitored and recorded at least once per drill pipe length.

b. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to BGJWSC. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

c. Drilling Fluid Pressures and Flow Rates:

Drilling fluid pressures including drilling fluid pressure in the borehole annular space and flow rates shall be continuously monitored and recorded by the Contractor. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

D. DRILLING FLUID (MUD) SYSTEM:

1. Mixing System:

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system or disposed of properly. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, and disposal facilities.

4. Drilling Fluid Viscosity

In the event that inadvertent returns or returns loss of drilling fluid occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify the Engineer of Record and Owner. The Engineer of Record, Owner and Contractor shall discuss additional options and work will then proceed accordingly.

5. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

6. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other

operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify the Engineer of Record and Owner of any inadvertent returns or spills and immediately contain and clean up the return or spill.

E. OTHER EQUIPMENT:

1. Pipe Rollers:

Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe and to protect trees during pipe pullback operations. Sizing and maximum spacing and location of pipe rollers along pipe length shall adhere to pipe manufacturer's recommendations.

2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the Engineer of Record and Owner.

3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the Engineer of Record and Owner prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

F. DATA LOGGER.

1. General:

A data logger shall be used to record and document all butt weld fusion processes. A record shall be made of every fusion weld made. The data logger shall be of a rugged, handheld computer as the recording device connected to a data collection device. The data collection device shall record the heater temperature and fusion pressure profile over time. All data shall be recorded and transmitted to the handheld computer where the joint report will be stored, viewed, printed, or transferred to a desk top computer for archiving. The operator associated with the fusion process

shall utilize the data logger report as one means to confirm a complete and proper weld. This data shall be made immediately available to the Engineer of Record and Owner, upon request. Unless approved otherwise by the Engineer of Record and Owner, a written or downloaded report for each fusion weld process shall be required and submitted to the Engineer of Record and Owner after the fusion weld process for review and approval prior to initiating pullback operations. If a potential defect fusion weld is suspected by the Engineer of Record, Owner or the Contractor, the work shall stop and a mutually acceptable (between the Contractor, Engineer of Record and Owner) corrective action plan shall be executed.

2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or the Engineer of Record and Owner approved equal.

PART 3. EXECUTION

3.01 DRILLING PROCEDURES

A. DRILL PATH:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

B. GUIDANCE SYSTEM:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial forces and measure drilling fluid discharge rate and pressure. The Engineer of Record and Owner shall have access to instrumentation and readings at all times during operation.

C. PILOT HOLE:

The pilot hole shall be drilled along the path shown on the plans and profile drawings. Unless approved otherwise by the Engineer of Record and Owner, the pilot-hole tolerances shall be as follows:

1. Elevation:

As shown on the plans.

2. Alignment:

As indicated; at a minimum three (3) feet within the right-of-way, easement, wetland boundary, or other restrictive designations.

3. Curve Radius:

The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by the Engineer of Record and Owner.

4. Entry Point Location:

The exact pilot hole entry point shall be within ± 5 feet of the location shown on the drawings without prior the Engineer of Record and Owner written permission for deviation.

5. Exit Point Location:

The exit point location shall be within ± 5 feet of the location shown on the drawings without prior the Engineer of Record and Owner written permission for deviation.

6. Limitations on Depth:

Pipe larger than bore hole path shall be specifically designed by the engineer and approved by the Engineer of Record and Owner. Where utilities cross under roads, the depth of cover shall comply with applicable authorizing agency and permit.

7. Water Main and Non-Water Main Separation Requirements:

The minimum separation requirements between water main and a non-water main shall be as required by Georgia EPD and in accordance with relevant permits. The current requirements are specified below:

- a. Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge.
- b. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

D. PULL BACK:

After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and

appropriate tools per the contractor's approved Work Plan. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull force at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.
2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.
3. External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the BGJWSC.
4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the Engineer of Record and Owner. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.
5. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify the Engineer of Record and Owner. The Engineer of Record, Owner and Contractor will discuss options and then work will proceed accordingly.

3.02 PIPE ASSEMBLY

A. GENERAL:

Pipe shall be welded/fused together in one length, if space permits. HDPE Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. FPVC pipe shall be placed on pipe rollers, in accordance with manufacturer's recommendations, before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately 0.10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

B. ACCEPTABILITY OF DAMAGED PIPE:

Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

C. BUTT FUSION LOG:

Each butt fusion shall be recorded and logged by an approved electronic monitoring device (Reference paragraph 2.04 F.2.) affixed to the fusion machine.

1. Joint data shall be submitted for review and approval to the Engineer/Owner prior to initiating pullback operations.
2. Joint data shall also be submitted as part of the As-Recorded information, in accordance with this specification.
3. Joint fusion reports shall reference station number and street name for geographical reference of installed location.

D. BUTT FUSION TESTING:

When requested by a the Engineer of Record and Owner, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test coupons shall be cut out. The test shall involve McElroy' "In Field Tensile Tester" which utilizes test coupons (conducted in accordance with manufacturer's recommendations) or BGJWSC pre-approved test methods and/or manufacturer.

E. MECHANICAL JOINING:

Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

F. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION:

Mains shall be constructed of the materials specified and as shown on the drawings. Pipe and fittings shall be carefully handled to avoid damage, and if feasible, while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks. Defective, damaged or unsound pipe or fittings shall be rejected. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. Only suitable soils shall be utilized in the backfill operation. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any time the pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the BGJWSC. Plugs shall remain in pipe ends until all water is removed from the trench. Any sand or foreign material that enters the pipe shall be removed from the pipe immediately. No pipe shall be installed when trench conditions (standing water, excess mud, etc.) or the weather (rain, etc.) is unsuitable for such work, except by permission of the Engineer of Record and Owner. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe. Lines shall be located as shown on the drawings. The Contractor shall investigate well in advance of pipe laying any conflicts which may require readjustments in planned locations and advise the Engineer of Record and Owner of the results of these investigations so that the necessary modifications may be determined.

Refer to BGJWSC Standards for Water and Sewer Design and Construction and other sections of the Technical Specifications for additional requirements.

3.03 SWABBING

- A. The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing of a new pipeline, swabbing shall be utilized as indicated below.
- B. All new watermains shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main.
- C. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the Contractor to provide temporary access and egress points for the cleaning, as required.
- D. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.
- E. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.
- F. The Contractor shall insert flexible polyurethane foam swabs (two pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. A BGJWSC representative shall be present for the swabbing process including swab insertion and retrieval.
- G. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.
- H. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.
- I. At the receiver or exit point for the poly swab, the Contractor is responsible for creating a safe environment for collection of debris, water and the swab. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab.
- J. Only with BGJWSC personnel on-site shall the supply valve from the existing distribution system be operated. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab(s) is/are retrieved.
 - 1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.
 - 2. Swabbing speed shall range between two and five feet per second.

- K. After the swabbing process, pressure testing and disinfection, as appropriate, of the pipe shall be completed in accordance with the BGJWSC Standards for Water and Sewer Design and Construction and this specification.

3.04 TESTING

A. DISINFECTION TESTS:

- 1. Upon satisfactory completion of the hydrostatic testing, all new water lines and other pipe related installations which may have been contaminated by the work shall be disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of AWWA Standard C651 – AWWA Standard for Disinfecting Water Mains, the Rules for Safe Drinking Water as published by the Georgia Environmental Protection Division, and as outlined in the BGJWSC Standards for Water and Sewer Design and Construction.

B. HYDROSTATIC (PRESSURE AND LEAKAGE) TESTS:

- 1. Contractor shall test FPVC pipelines installed under this Contract in accordance with Section 15044: Pressure Testing of Piping.
- 1. Contractor shall test HDPE pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the BGJWSC. All field tests shall be made in the presence of the BGJWSC Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by BGJWSC, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and DIP within the test section. If at all possible, the PVC and DIP test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. BGJWSC may elect to furnish suitable pressure gauges for these tests. If not, the Contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, with increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves. All HDD over 100 linear feet shall be air pressure tested (above ground) @ 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.
- 2. Unless it has already been done, the section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. If blow offs or other outlets are not available at high points for releasing air, the

Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDD installation.

3. Hydrostatic testing shall consist of 150 psig test pressures, based on the elevation of the highest point of the line or section under test. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the BGJWSC Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the BGJWSC Representative.
5. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.
6. Initial Phase of Pressure Testing: First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and DIP test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).
7. Final Phase of Pressure Testing:

The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails (see enclosed BGJWSC test form).

Table 1: Allowable Make Up Amount	
Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2- hour test
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

8.

In the event a section fails to pass the tests, the Contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the Contractor's expense.

9.

If, in the judgment of the Engineer of Record and Owner, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection of water mains shall be required if the line is de-pressurized for repairs prior to tying.

C. LOCATE WIRE:

Two locate wires shall be provided on all HDPE and FPVC installations. For HDD projects, locate wire shall be 10 AWG high strength copper-clad carbon steel with 30 mils (min) insulation. For open-cut portions of the project, the locate wire construction and testing shall meet the requirements as listed in the General Notes and Construction Details in the Construction Drawings. The external color shall be blue for water and green for wastewater. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". For HDD projects, there is no maximum length or interval

between locate wire stations. The testing and report requirements within the General Notes of the Construction Drawings shall be required except as modified herein. If both locate wires break or are not continuous (from end to end), the Contractor shall, at the Contractor's expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 25 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings.

D. TRACER WIRE AND DETECTION TAPE:

Contractor shall furnish and install locate wiring on all non-metallic watermain in accordance with JWSC Standard Details. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy five (475') foot intervals (maximum). In addition, all watermain shall have deflection tape installed two (2') feet above the pipe. Tracer wire and detection tape shall be as specified in paragraphs above.

Installed locate wiring shall be tested by the contractor as part of the inspection process, using a qualified tester and suitable testing equipment. The contractor shall notify the JWSC Inspector at least 48 hours in advance of the locate wire field testing schedule.

BGBGWSC RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

Project: _____

TEST SECTION: _____

BGJWSC REPRESENTATIVE: _____ SIGNATURE _____

TEST DATE: ____ / ____ / ____ TEST TIME: _____ BEGIN _____ END _____

OTHER TEST PHASE ATTENDEE'S:

PRESSURE AND LEAKAGE TEST CALCULATIONS:

____ WATER MAIN ____ WASTEWATER FORCE MAIN ____ RECLAIMED WATER MAIN

Line Pressure Test:

Start: _____ PSI (Minimum of 150 PSI or 2x operating pressure) End: _____ PSI

PSI Difference: _____ PSI (IF GREATER THAN 5 PSI, THE TEST FAILS)

TYPE OF HDPE PIPE (DR RATING) (1)	DIAMETER OF PIPE (INCHES) (2)	LINEAR FEET (3)	2-HOUR TEST FACTOR (see BGJWSC TABLE) (4)	TOTAL ALLOWABLE LEAKAGE (3X4) (5)
Total Allowable Leakage Amount (Gallons):				

Allowable Leakage Amount _____ Gal _____ Oz. (32 oz per qt; 120 of per gal)

Actual Leakage Amount _____ Gal _____ Oz.

Pressure and Leakage Test Results (Pass or Fail) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

BGJWSC 2 HOUR TEST FACTORS						
NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14" – 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48" – 0.1350	54" – 0.1570	

File No. _____

END OF SECTION