CLAYTON COUNTY Water AUTHORITY

1600 Battle Creek Road, Morrow, Georgia 30260

STANDARD SPECIFICATIONS FOR WATER DISTRIBUTION SYSTEMS AND SANITARY SEWER SYSTEMS

3rd Edition

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TABLE OF CONTENTS

DIVISION I POLICIES AND PROCEDURES

TABLE OF CONTENTS

DIVISION II DESIGN REQUIREMENTS

TABLE OF CONTENTS

DIVISION II DESIGN REQUIREMENTS

TABLE OF CONTENTS

DIVISION III MATERIAL REQUIREMENTS

TABLE OF CONTENTS

DIVISION III MATERIAL REQUIREMENTS

TABLE OF CONTENTS

DIVISION III MATERIAL REQUIREMENTS

TABLE OF CONTENTS

DIVISION IV CONSTRUCTION STANDARDS

TABLE OF CONTENTS

DIVISION IV CONSTRUCTION STANDARDS

TABLE OF CONTENTS

APPENDICES

LIST OF DETAILS

TABLE OF CONTENTS

DIVISION I POLICIES AND PROCEDURES

SECTION 1: SCOPE AND INTENT

1.01 Purpose

A. The purpose of this document is to set forth the uniform policies, procedures, design requirements, material requirements and construction standards of the Clayton County Water Authority as to comply with all applicable state and federal laws for the installation of water distribution systems and sanitary sewer systems.

B. The State of Georgia, Department of Natural Resources, Environmental Protection Division, Drinking Water Permitting and Engineering Program and Engineering and Technical Support Program have approved the Clayton County Water Authority's *Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems, 3rd Edition*. Copies of the approval notices are included in Appendix A.

1.02 Delegation

A. The Clayton County Water Authority shall review and approve the design and installation of water distribution systems and sanitary sewer systems that will be owned and maintained by the Clayton County Water Authority or that will discharge into said sanitary sewer system.

B. The State of Georgia, Department of Natural Resources, Environmental Protection Division, in letters dated 13 November 2000 and 15 March 2001, delegated to the Clayton County Water Authority the rights to review and approve the design and installation of additions to the existing Clayton County Water Authority water distribution system and sanitary sewer system. Copies of the letters delegating authority are included in Appendix B.

C. The delegation of review and approval to the Clayton County Water Authority is limited to the following.

1. Additions to the existing water distribution system.
2. Gravity flow sanitary sewer system additions up to 36 inches in diameter.
3. Sanitary sewer lift stations up to 700 gallons per minute flow rate.
4. Force mains up to 36 inches in diameter.

1.03 Variance

Under special conditions beyond the control of parties involved, the Clayton County Water Authority may vary from the specifications herein. The General Manager of the Clayton County Water Authority shall authorize any variance in writing. The State of Georgia, Department of Natural Resources, Environmental Protection Division, shall be notified of any variance in writing.

1.04 Amendments to the Specifications

A. The Clayton County Water Authority shall amend the *Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems,* as determined necessary to improve the systems' performance and integrity. The Department Manager of Program Management and Engineering of the Clayton County Water Authority shall approve amendments in writing.

B. The Clayton County Water Authority shall amend the *Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems, 3rd Edition* as required due to changes in applicable regulations. The State of Georgia, Department of Natural Resources, Environmental Protection Division, shall approve regulatory amendments in writing.

The listed words or acronyms shall mean the following:

ACI: American Concrete Institute.

ANSI: American National Standards Institute.

ASTM: American Society for Testing and Materials.

AWWA: American Water Works Association.

CCWA: Clayton County Water Authority.

CCWA Engineer: Clayton County Water Authority, Department Manager of Program Management and Engineering or authorized representative.

Clayton County T & D: Clayton County Transportation and Development Department.

CRSI: Concrete Reinforcing Steel Institute.

Design Engineer: The engineer or surveyor under whose direction the development plans submitted for review were prepared. Design Engineer shall be a Georgia Licensed Professional Engineer or Georgia Licensed Registered Land Surveyor having knowledge of water distribution system and sanitary sewer system design.

Developer: Any person, firm, corporation, association or partnership or any agent thereof who undertakes or proposes to undertake the development of land so as to constitute a residential subdivision, apartment complex, condominium or commercial/industrial/ institutional establishment.

DFT: Dry Film Thickness.

Diameter: Nominal inside diameter of pipe excluding bituminous or epoxy bonded coating thickness.

DIP: Ductile iron pipe.

Easement: Non-profitable interest in land owned by another that entitles its holder to a specific limited use.

Force Main: Piping, valves and other components of a single pressurized line used to convey raw water, potable water or sewage. A force main conveying potable water may have a limited number of service connections.

FMR: Factory Mutual Research.

Georgia EPD: State of Georgia, Department of Natural Resources, Environmental Protection Division.

GFI: Ground Fault Interrupt.

gpm: Gallons per minute.

Gravity Sewer: Piping and other components used to convey sanitary sewage in a non-pressurized system.

Lateral: Pipe extending from a sewer main to a street right-of-way or easement for the purpose of servicing a property (lot). The lateral shall be six (6) inches in diameter, shall not contain a manhole and shall be less than 250 feet in length.

Lift Station: All pumps, valves, wet wells, controls and other components used to pump sanitary sewage into a force main.

NEC: National Electrical Code, latest edition.

NEMA: National Electrical Manufacturers' Association.

No. 57 Stone: Class I embedment or backfill material consisting of manufactured aggregates (crushed stone) in accordance with ASTM D 2321-89 (Reapproved 1995) and ASTM D 2487-00. Percent passing sieve sizes are as follows: 100% passes 1-1/2", < or 10% passes No. 4 and < 5% passes No. 200.

Pavement: Any asphalt, concrete, gravel or dirt surface including curbs and sidewalks used by vehicles and/or pedestrians.

pcf: Pounds per cubic foot.

psi: Pounds per square inch.

PVC: Polyvinyl chloride.

Rock: Solid material being greater than one (1) cubic yard in size which by actual demonstration cannot, in the opinion of the CCWA Engineer, be reasonably excavated with a minimum 135 horsepower backhoe, in good condition and equipped with manufacturer's standard boom and rock points or similar approved equipment; and which must be systematically drilled and blasted or broken by power-operated hammer, hydraulic rock breaker or expansive compounds.

Rock Excavation: Removal of solid material, as the above specifies, and does not necessarily correspond to "rock" as implied by the names of geologic formations.

Sanitary Sewer System: Multiple pipes, manholes and other components that convey sewage and to which storm water, surface water, and ground water are not intentionally admitted.

SCADA: Supervisory Control and Data Acquisition system.

Service Connection: Fitting(s) connecting a service line or lateral from a property (lot) to a water main or sewer main.

Service Line: Pressurized pipe extending from a water main to a water meter or pressurized pipe extending from a water main to a fire hydrant.

Sewage: The combination of water-carried wastes from residential housing, institutional facilities, and commercial and industrial complexes together with such groundwater, surface water, and storm water as may inadvertently be present.

Sewer: A pipe or conduit that conveys sewage.

Sewer Main: Sewer to which one or more laterals are connected.

Sewer Outfall: Sewer to which one or more sewer mains are connected.

Sewer Trunk: Sewer to which one or more sewer mains or sewer outfalls are connected and discharges into a Water Reclamation Facility.

Suitable Soil: Soil that conforms to and as recommended by ASTM D 2321-89 (Reapproved 1995) and ASTM D 2487-00 and that is free of organic and/or deleterious material, expansive clay and rock fragments larger than three (3) inches.

UL: Underwriters Laboratory

Utility Contractor: Georgia Licensed Utility Contractor in accordance with the Official Code of Georgia, Chapter 43.

Water Distribution System: Pressurized pipes, valves and other components that convey potable water.

Water Main: Pressurized pipe used to convey potable water from a force main to a service line.

WRF: Water Reclamation Facility.

WPP: Water Production Plant.

3.01 General

A. The design of water distribution systems and sanitary sewer systems shall conform to the specifications herein.

B. Concurrent with plan submittal, the Design Engineer shall provide a completed Water Distribution/Sanitary Sewer Addition Submittal form. The Water Distribution/Sanitary Sewer Addition Submittal form is included in Appendix C.

3.02 Technical Review

A. Proposed water distribution system and sanitary sewer system plans shall be reviewed by the CCWA under the supervision of a Georgia Licensed Professional Engineer for technical adequacy and conformance to applicable requirements to determine that the systems are suitable for construction.

B. Upon receipt of a proposed development, the CCWA shall perform a feasibility study to determine whether the existing CCWA water distribution system and/or sanitary sewer system has sufficient capacity. The following review shall be completed.

Water Distribution System

1. The latest 12 months of reported production from the supplying WPP shall be examined to determine an average monthly production rate. A proposed development, whose supply requirement would cause the WPP to exceed the Georgia EPD permitted production rate, shall not be connected to the CCWA system.

2. Pressure and flow from the contributing water distribution system shall be examined to determine whether the additional supply requirement will adversely affect the surrounding system. A proposed development, whose supply requirement would adversely affect the surrounding system, shall not be connected to the CCWA system.

Sanitary Sewer System

1. The latest 12 months of reported discharge from the receiving WRF shall be examined to determine an average monthly flow rate. A proposed development, whose discharge would cause the receiving WRF to exceed the Georgia EPD permitted flow rate, shall not be connected to the CCWA system.

2. A capacity study shall be performed to determine whether the discharge from the development would exceed the capacity of the existing receiving sewers. A proposed development, whose discharge would exceed the capacity of the receiving sewers, shall not be connected to the CCWA system.

C. CCWA review comments shall be marked on Technical Review Checklists and noted on development plans in the color red (Red Line Comments). Technical Review Checklists used during the CCWA review are included in Appendix D.

3.03 Plan Processing

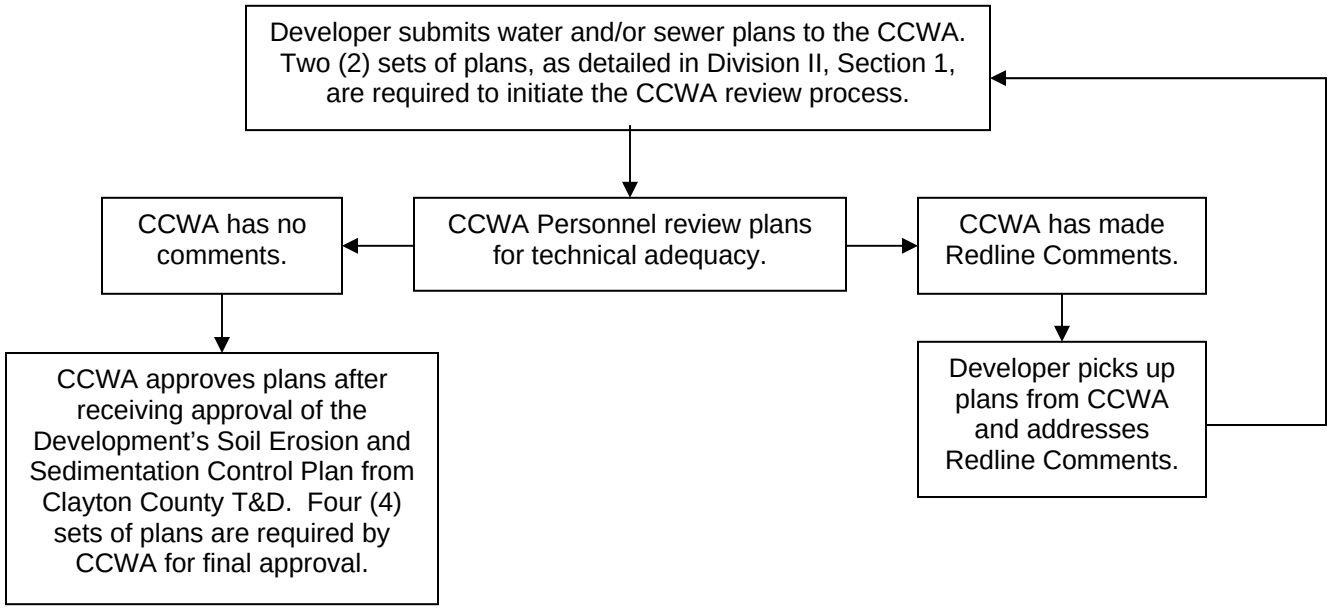
A. Water distribution system and/or sanitary sewer system plans shall be submitted to the CCWA. Two (2) separate sets of water distribution system and/or sanitary sewer system plans are required for each submittal during the CCWA review process.

B. The Design Engineer shall address CCWA review comments. Plans containing the original Red Line Comments shall accompany each re-submittal to the CCWA.

C. Four (4) separate sets of water distribution system and/or sanitary sewer system plans shall be required for final CCWA approval.

D. Soil Erosion and Sedimentation Control Plans pertaining to the overall Development shall be reviewed and approved by Clayton County T & D or the local issuing authority. Construction of any kind shall not begin on a project prior to the issuance of a Land Disturbance Activity permit.

E. The CCWA plan processing sequence is shown on the following chart.



3.04 Approval by Regulatory Agencies

A. The Developer's Engineer shall address all deficiencies and resubmit plans in accordance with Division I, Sections 3.02 and 3.03. Plans shall not be approved until all deficiencies have been addressed to the satisfaction of the CCWA Engineer.

B. Note that plan approval by the CCWA Engineer shall not be construed, in any manner, to relieve the Developer of his responsibility for strict compliance with the specifications herein and any applicable laws and regulations.

C. Installation of water distribution systems and/or sanitary sewer systems shall not commence on any development until the CCWA has granted final approval of water distribution system and/or sanitary sewer plans and Clayton County T&D or the local issuing authority has issued a Land Disturbance Activity permit.

D. Note that other agencies may have regulatory authority and the Developer is responsible for obtaining other agency approval. Other agencies could be, but are not limited to, State of Georgia Department of Natural Resources, State of Georgia Department of Transportation, United States Army Corps of Engineers, United States Environmental Protection Agency, Georgia Power Company and Southern Natural Gas.

3.05 Period of Plan Approval

The approval period of water distribution system and/or sanitary sewer system plans shall be six (6) months. Approved plans that are not initiated or are inactive for a six (6) month period shall become invalid. Should an approved plan be invalidated, the CCWA Engineer shall determine whether the plan is still valid or whether a new system design is required.

4.01 General

A. Components of water distribution systems and sanitary sewer systems, to be owned by the CCWA, should be situated within streets' rights-of-way.

B. The following water distribution system and sanitary sewer system components, to be owned by the CCWA, shall be situated within an easement that is granted to the CCWA, when a street right-of-way is not available.

1. Force main.
2. Water main.
3. Water meter/check valve assembly.
4. Fire hydrant.
5. Sewer main.
6. Sewer outfall.
7. Manhole.
8. Other components required by the CCWA.

C. An easement shall not encroach into a structure's foundation and shall be clear of all obstructions not associated with the water and/or sanitary sewer system including but not limited to construction debris, fencing and trees.

D. Property developed and occupied by a lift station and/or an access road, to be owned by the CCWA, shall be platted and deeded to the CCWA.

4.02 On-Site Easement

A. "On-site" easements are those easements falling within the boundaries of the current phase of the development that are shown on the plat and are recorded through the process of recording the final plat.

B. Developer shall grant to the CCWA, the exclusive right to construct, reconstruct, operate, maintain, repair, replace, improve, alter, remove, relocate and inspect water distribution systems and/or sanitary sewer systems that are situated over, across and under the land wherein the water distribution systems and/or sanitary sewer systems lie on the Developer's property.

4.03 Off-Site Easement

A. "Off-site" easements are those easements falling outside the boundaries of the current phase of the development and shall be provided by the Developer and recorded by the CCWA for each property owner. Easements through property owned by the developer, including water and sewer lines that will be included in later phases of the same project, must be treated as routine off-site easements.

B. Off-site easements shall be negotiated and acquired by the Developer with the property owner.

C. Construction of the off-site water distribution systems and/or sanitary sewer systems shall not begin until all off-site easements for system completion are acquired, recorded and received by the CCWA Engineer.

4.04 Easement Size

A. The minimum width of a permanent on-site/off-site easement associated with water distribution system and sanitary sewer system components shall be 20 feet.

B. The minimum size of an easement associated with a water meter/check valve assembly shall be 20 feet by 30 feet.

C. Easement width or size may be increased or decreased at the discretion of the CCWA Engineer.

4.05 Deeded Property

A. The minimum size of deeded property associated with a lift station shall be 60 feet by 60 feet.

B. The minimum width of deeded property associated with an access road shall be 20 feet.

C. The size or width of deeded property may be increased or decreased at the discretion of the CCWA Engineer.

5.01 General

A. The installation of water distribution systems and sanitary sewer systems shall be in accordance with the approved plans and specifications herein.

B. A set of plans stamped approved by the CCWA shall be present on the job site whenever work is being performed on the water distribution system and/or sanitary sewer system.

5.02 Utility Contractor

A. A licensed Utility Contractor shall install water distribution systems and sanitary sewer systems.

B. Prior to commencing construction activities on a proposed water distribution system and/or sanitary sewer system, the CCWA Engineer shall receive a copy of the Utility Contractor's License.

5.03 CCWA Installation

A. The CCWA shall perform the following system components installation at a cost to the Developer/Owner.

1. Supply materials and labor to install water meter and check valve assemblies from 5/8 inch in diameter through two (2) inches in diameter.

2. Supply labor to tap water main.

3. Supply materials and labor to install a sewer main tap for a private individual.

B. The installation of residential water service lines and meter boxes can be performed by the CCWA at a cost to the Developer or can be performed by the Developer's Utility Contractor with approval by the CCWA.

5.04 Insurance Requirements

A. Utility Contractors performing work on CCWA funded or partially funded projects shall comply with current CCWA insurance and bonding requirements.

B. Companies such as railroads, electric power suppliers, natural gas suppliers, etc. may require Utility Contractors to furnish insurance, in addition to CCWA requirements when crossing their respective easements. The Utility Contractor shall provide such insurance as required.

5.05 Inspection

A. A CCWA Inspector, under the supervision of a Georgia Licensed Professional Engineer, shall inspect water distribution systems and sanitary sewer systems during all phases of construction to ensure the systems are being constructed in accordance with the plans approved by the CCWA and specifications herein.

B. The Developer shall provide the CCWA Engineer a 48-hour notice prior to commencing construction on a water distribution system and/or sanitary sewer system.

C. The Developer/Utility Contractor shall, at all times, permit and facilitate inspection of work by the CCWA. The presence of a CCWA Inspector or CCWA Engineer on the site of work shall not be construed to, in any manner, relieve the Developer/Utility Contractor of their responsibility for strict compliance with the approved plans and specifications herein.

D. The CCWA Inspector shall not change or modify the approved water distribution and/or sanitary sewer system plans or specifications herein without written approval from the CCWA Engineer.

E. The CCWA Inspector shall inform the Developer/Utility Contractor when construction is deficient from the approved plans and specifications herein. Deficiencies shall be addressed in a timely manner as determined by the CCWA Inspector. Construction activities and other pertinent information shall be recorded on an Inspection Report included in Appendix E.

F. The Clayton County Building Department shall perform inspections relating to electric power supply.

G. Deficiencies not addressed in a timely manner shall be justification for the CCWA to stop work on a project. The CCWA Engineer shall issue a Stop Work Order to the Developer/Utility Contractor in writing. Continued work on a project after being issued a Stop Work Order shall be justification to inform the appropriate legal counsel or Clayton County Government Agency for necessary enforcement actions.

5.06 Testing

A. Water distribution systems and sanitary sewer systems shall be subjected to pressure testing, televising and mandrel testing as detailed in Division IV. Testing shall be performed at the expense of the developer.

B. The CCWA shall be given a 48-hour notice prior to any testing. A CCWA Inspector shall witness all testing.

C. Testing for the compressive strength of concrete and density of compacted soil shall be performed at the expense of the Developer by CCWA approved geotechnical and material testing companies. Materials not meeting required specification shall be removed, replaced and retested for compliance at the expense of the Developer.

D. Results of tests performed by testing companies shall be provided to the CCWA Engineer. Testing forms used by the CCWA are included in Appendix F.

6.01 General

A. Provided the Developer has complied with the terms of these Policies and Procedures and the installed water distribution system and/or sanitary sewer system is in accordance with the approved plans and specifications herein, the CCWA shall allow the Developer/Owner to connect the new system(s) into the CCWA system(s). Copies of the CCWA letters approving construction of the Developer's water distribution system and/or sanitary sewer system are included in Appendix G.

B. CCWA cannot authorize the conveyance of wastewater to and/or from an approved or unapproved sanitary sewer system by means of pumping and hauling.

C. The conveyance of wastewater onto the ground or into a receiving stream is prohibited.

6.02 Connection to Existing Systems

A. The CCWA Inspector shall be notified at least 48-hours in advance of connecting to the CCWA systems.

B. A CCWA Inspector shall be present during connection of the Developer's systems to the CCWA systems. Prior to installation, a CCWA Inspector shall approve all materials supplied by the Developer to be used in making the connection.

C. Upon completing a water distribution and/or sanitary sewer connection, the Developer's systems shall be valved-off and/or immediately plugged, respectively, until Final Acceptance.

D. Should an unauthorized connection or connection without the presence of the CCWA Inspector be made to the CCWA systems, the Developer shall be subject to a fine and/or refusal of service. Under any circumstance, the Developer shall expose and thoroughly clean all piping and components of the connection for inspection by the CCWA. Noncompliant connections and/or damage to the CCWA system shall be repaired/replaced in conformance with the approved plans and specifications herein at the expense of the Developer.

7.01 General

Acceptance of the Developer's water distribution system and/or sanitary sewer system shall be considered by the CCWA at such time as the Developer has met all terms and conditions of the specifications herein.

7.02 Final Inspection

Prior to final acceptance, a CCWA Inspector shall perform a final inspection of the water distribution system and/or sanitary sewer system after all pavement is installed. The final inspection shall determine the proper installation of valve and meter boxes, the integrity of manholes, and the presence of debris in sewers and curb markings. Results of the inspection shall be recorded on a Final Inspection Report and is included in Appendix H. Deficiencies encountered shall be immediately addressed and an additional final inspection shall be required.

7.03 Warranty

The Developer shall warrant the development's water distribution system and/or sanitary sewer system and hold the CCWA harmless against all costs, expenses and losses, including, without limitation, incidental and consequential damages, resulting from any defects in the Developer's water distribution system and/or sanitary sewer system, including without limitation, defects in material and workmanship, which are discovered or arise within a minimum period of two (2) years beginning on the date of final acceptance by the CCWA. A longer warranty period may be required on certain material requirements and/or construction standards as indicated in the specifications.

7.04 Final Acceptance

A. Final acceptance of the Developer's water distribution system and/or sanitary sewer system by the CCWA shall be when written, signed and dated by the CCWA Engineer. A copy of the CCWA Final Acceptance Letter is included in Appendix I.

B. Upon issuance of Final Acceptance Letter, the Developer's new system(s) may be opened to the CCWA system(s).

DIVISION II DESIGN REQUIREMENTS

SECTION 1: DESIGN AND PLAN PREPARATION

1.01 General

The design and plan preparation of water distribution systems and sanitary sewer systems shall conform to the specifications herein.

1.02 Licensed Professionals

A. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for a residential subdivision or parts thereof on a Developer's property shall be performed by a Georgia Licensed Professional Engineer or Georgia Licensed Registered Land Surveyor who has sufficient knowledge to properly perform the design.

B. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for property off-site of a Developer's property shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.

C. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for commercial/industrial property shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.

D. Force main and sanitary sewer lift station design and plan preparation shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.

E. The professional performing the design and preparing the plans shall seal each plan sheet with their stamp and sign their name across the stamp.

1.03 Reference Documents and Standards

General methods of design and construction shall conform to the specifications herein and the following. When standards conflict with one another, the CCWA Engineer shall determine the applicable standard.

A Georgia EPD, Minimum Standards for Public Water Systems, May 2000.

B. Georgia EPD, Rules and Regulations for Water Quality Control, Chapter 391-3-6, latest effective date.

C. Water Environment Federation, Regulation of Sewer Use, WEF Manual of Practice No. 3, latest edition.

D. Mississippi River Board of State Public Health and Environmental Managers, generally referred to as the "Ten (10) States Standards for Sewage Works".

E. Gravity Sanitary Sewer Design and Construction, American Society of Civil Engineers Manuals and Reports on Engineering Practice No. 60, Water Environment Federal Manual of Practice No. FD-5, revised April 1982.

F. Utility Accommodations Policy and Standards, Georgia Department of Transportation, Office of Utilities, latest edition.

G. American Water Works Association Standards, latest editions.

H. Soil Surveys of Clayton County, Georgia, by the United States Department of Agriculture, Soil Conservation Service.

I. American National Standards Institute Standards, latest editions.

J. American Society for Testing and Materials Standards, latest editions.

K. Occupational Safety and Health Administration regulations, latest editions.

L. Georgia Department of Transportation specifications and regulations, latest editions.

M. American Society of Mechanical Engineers standards, latest editions.

N. National Electrical Manufacturer's Association standards, latest editions.

O. American Concrete Institute standards, latest editions.

1.04 Plan Requirements

A. Water distribution system and/or sanitary sewer system plans shall be comprised of the following sheets as required. Each sheet should be 24 inches by 36 inches in size.

1. Cover Sheet.
2. Site Plan Sheet.
2. Grading Plan Sheet.
3. Storm Water System Plan Sheet.
5. Water Distribution System Plan Sheet.
6. Water Distribution System Details and Construction Notes Sheet.
7. Sanitary Sewer System Plan Sheet.
8. Sanitary Sewer System Profile Sheet.
9. Sanitary Sewer System Details and Construction Notes Sheet.
10. Sanitary Sewer Lift Station Plan and Cross-Section Sheet.
11. Sanitary Sewer Lift Station Details and Construction Notes.
12. Soil Erosion and Sedimentation Control Plan Sheet.
13. Soil Erosion and Sedimentation Control Detail Sheet.

B. Water distribution and/or sanitary sewer system plan sheets shall be prepared and include as a minimum the information detailed on the Technical Review Checklist included in Appendix D.

C. Concurrent with the initial submittal of water distribution system and/or sanitary sewer system plans to the CCWA, a completed Water Distribution/Sanitary Sewer Addition Submittal form shall be submitted. The CCWA plan review process shall not commence until the Water Distribution/Sanitary Sewer Addition Submittal form is received. The Water Distribution/Sanitary Sewer Addition Submittal form is included in Appendix C.

1.05 Modifications to Plans

Water distribution system and/or sanitary sewer system plans approved by the CCWA shall not be modified or deviated from during construction unless the CCWA Engineer approves modifications or deviations in writing.

1.06 As-Built Drawings

A. As-Built Drawings of the installed water distribution system and/or sanitary sewer system shall be prepared and sealed in accordance with Division II, Section 1.01.

B. As-Built Drawings shall be completed upon connecting the development's water distribution system and/or sanitary sewer system to the CCWA system.

C. As-Built Drawings shall show all street names, right-of-way widths, related easements, lot number, location, size and material of all water distribution system and/or sanitary sewer system components.

D. As-Built Drawings shall be prepared using a survey that ties the development's water distribution system and/or sanitary sewer systems horizontally and vertically to the following state plane coordinate system or as amended by the CCWA.

Horizontal Control:	North American Datum 83/94.
Vertical Control:	National Geodetic Vertical Data 88.
Grid Zone:	Georgia West 1002.

E. The following certification shall be included on the As-Built Drawings and signed by the Design Engineer:

"I certify that the water distribution system and/or sanitary sewer system depicted by this As-Built Drawing was constructed in accordance with the plans approved by the CCWA. The information submitted on this As-Built Drawing is to the best of my knowledge and belief, true, accurate and complete."

F. The Developer's water distribution system and/or sanitary sewer system shall not be considered complete until the As-Built Drawings have been reviewed and approved by the CCWA Engineer. Note that one (1) reproducible set of the approved As-Built Drawings shall be submitted to the CCWA Engineer. The approved As-Built Drawings shall also be submitted to the CCWA Engineer in digital format (AUTOCAD Version 14 or newer version).

2.01 General

A. The following section shall be used as a guideline for the design of water mains and service lines that will supply residential, apartment, commercial and industrial complexes.

B. The CCWA may require the above referenced complexes to have multiple connection points to existing force mains or water mains.

C. The following certification shall be made by the Design Engineer and included with Water Distribution System construction notes:

"I certify that the proposed water distribution system has been designed in accordance with the CCWA Specification document titled "Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems", Latest Edition including all amendments.

2.02 Design Usage Rates and Hydraulics

A. Design shall be based on the following average daily domestic usage rates. Daily usage rates may be increased at the discretion of the CCWA Engineer.

1. Residential House: 300 gallons per day per connection.
2. Apartment and Mobile Home: 233 gallons per day per unit.
3. Hotel and Motel: 126 gallon per day per room.
4. Commercial and Industrial: Indicate as required.

B. Indicate on plans whether structures require fire suppression systems. If so, then indicate the required fire suppression system usage rate (gallons per minute).

C. The designed system shall provide for the following fire flow demands in the development.

1. Residential Area: 750 gallons per minute.
2. Commercial/Industrial Area: 1,000 gallons per minute.

D. The following range of supply pressures shall be assumed when sizing system components.

Pressure (min.): 20 psi.
Pressure (max.): 150 psi.

2.03 Water Line Material and Size

A. Water mains and associated fittings shall be ductile iron with a minimum diameter of eight (8) inches.

B. Water main pipe assembly shall be push-on joint unless indicated otherwise.

C. Water main pipe assembly in a bore casing shall be restrained joint unless indicated otherwise.

D. Service line supplying a single fire hydrant within the right-of way shall be ductile iron with a minimum diameter of six (6) inches.

E. Service line serving one (1) residential lot shall be copper with a minimum diameter of three-quarter (¾) inch.

F. Service line serving two (2) residential lots shall be copper with a minimum diameter of one (1) inch. The service line shall be fitted with a copper tee. The tee and service lines, coming from the tee, shall have a minimum diameter of three-quarter (¾) inch.

G. Service line serving commercial/industrial buildings shall be copper with a minimum diameter of three-quarter (3/4) inch and a maximum diameter of three (3) inches or ductile iron sized as necessary for the demand.

2.04 Water Line Location

A. Situate water mains outside of pavement, within street right-of-way when possible, at five (5) feet beyond the back of curb or edge of pavement or at location approved by the CCWA Engineer.

B. Situate water mains on the north and east sides of streets when possible.

C. Water mains shall have a minimum ten (10) foot horizontal separation from any sewer.

D. Water mains constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.

E. A service line supplying a single lot shall be located nearest a respective property boundary as practical.

F. A service line serving two (2) lots, from the water main to the meter, shall be located in-line with the lots' common property boundary.

G. No water main or service line shall be constructed on solid waste landfills.

H. No water main or service line shall be constructed to serve a structure that is constructed on or to be constructed on a solid waste landfill.

I. Each water main and service line shall be locatable.

J. Use Detail Nos. 1.1, 2.1 and 2.2 when applicable.

2.05 Fire Hydrant Location and Spacing

A. Hydrants shall be situated within the street's right-of-way adjacent to the right-of-way boundary.

B. A hydrant shall be situated at the end of each cul-de-sac or dead end street.

C. Fire hydrants servicing residential areas shall be spaced a maximum of 500 feet as measured along the edge of pavement. No lot shall be greater than 250 feet from a fire hydrant.

D. Fire hydrants servicing commercial and industrial areas shall be spaced a maximum of 300 feet as measured along the edge of pavement.

E. Use Detail Nos. 3.1, 4.1 and 5.1 when applicable.

2.06 Valve Size and Location

A. Valves shall be of the same size as the pipe in which the valve is situated, unless noted otherwise.

B. A corporation valve shall be situated at the tap location into a water main of a three-quarter (3/4) inch or one (1) inch service line.

C. A ball valve shall be situated downstream of tapping saddle or tapping sleeve when tapping into a water main or force main with a 1-1/2 inch or two (2) inch service line. The ball valve shall be situated within a meter vault.

D. Gate valves shall be situated in-line with water mains as follows, unless noted otherwise. The placement of gate valves under pavement shall be allowed, unless noted otherwise.

1. Attach tapping gate valve immediately downstream of tapping saddle or tapping sleeve when tapping into water main or force main with a smaller water main or service line.

2. Situate gate valve immediately downstream of a tee when connecting into a water main.

3. Situate gate valve on each immediate side of a three (3)-way connection or four (4)-way connection.

4. Situate gate valve immediately upstream of a fire hydrant when hydrant is situated within street right-of-way.

5. Situate gate valve within street right-of-way when fire service extends beyond right-of-way.

6. Situate gate valve in water mains at a maximum spacing of 2,000 feet.

7. Gate valve shall be situated outside of vault immediately upstream and downstream of three (3) inch and larger water meter/check valve assemblies.

8. A slip type valve box shall be situated over a gate valve.

E. A curb stop shall be situated inside of meter box immediately upstream of five-eighths (5/8) inch through two (2) inch water meter/check valve assemblies.

F. Use Detail No. 6.1 when applicable.

2.07 Water Line Depth

A. Water mains and service lines to fire hydrants shall have a minimum suitable soil cover of four (4) feet. The depth of four (4) feet from finish grade to top of pipe shall be determined as follows.

1. As measured from edge of pavement (top back-of-curb) when the finish grade elevation of the pipe route is equal to or greater than adjacent pavement elevation.

2. As measured from finish grade elevation of the pipe route when the pipe route elevation is less than the adjacent pavement elevation.

3. Other depth approved by the CCWA Engineer.

B. Water mains crossing under a creek or ditch shall have a minimum suitable soil cover of two (2) feet.

C. Water mains shall have a minimum 18-inch vertical separation from any sewer.

D. Service lines under pavement shall have a minimum suitable soil cover of 2.5 feet as measured from top of curb or top of pavement.

E. Service lines outside of pavement shall have a minimum suitable soil cover of 1.5 feet as measured from the meter.

F. Water mains 18 inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.

G. Use Detail Nos. 1.1, 7.1 and 8.1 when applicable.

2.08 Thrust Restraint

A. Thrust restraint shall be installed at all fittings, hydrants, valves and other locations deemed necessary by the CCWA Engineer.

B. Thrust restraints at hydrants and valves shall be accomplished by installing a minimum of two (2) eyebolts on the hydrant or valve and tying to an adjacent fitting or concrete tie-back using three-quarter (3/4) inch stainless steel threaded rod.

C. Thrust restraint at fittings shall be accomplished by using one of the following methods.

1. Cast-in-place concrete blocking installed to dimensions as shown on thrust block detail.

2. Restrained joint pipe and fittings installed upon approval by CCWA Engineer.

D. Use Detail Nos. 3.1, 4.1, 9.1 and 10.1 when applicable.

2.09 Water Meters and Backflow Prevention

A. All water usage including fire and irrigation shall be metered and have backflow prevention devices.

B. All water usage shall be metered using a single meter when possible.

C. Meters shall be sized according to the anticipated demand and Division III, Section 7 of this document.

D. Each meter shall have a backflow device consisting of double check valve assembly.

E. Water meters and backflow devices shall be housed in boxes or vaults.

F. Water meters and backflow devices shall be situated within the street right-of-way or in an easement area.

F. Use Detail Nos. 11.1, 12.1, 13.1, 14.1, 15.1, 16.1 and 17.1 when applicable.

DIVISION II DESIGN REQUIREMENTS

SECTION 3: GRAVITY FLOW SEWERS

3.01 General

A. The following section shall be used as a guideline for the design of gravity flow sanitary sewer systems; pipe diameter not to exceed 36 inches.

B. Sanitary sewer system design shall incorporate the following CCWA Sewer Use Ordinances:

1. Section 98-7 (F) – Grease Management Program.
2. Section 98-7 (G) – Oil/Water and Sand/Grit Interceptors.

C. The following certification shall be made by the Design Engineer and included with Sanitary Sewer System construction notes:

"I certify that the proposed sanitary sewer system has been designed in accordance with the CCWA Specification document titled "Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems", Latest Edition including all amendments.

3.02 Design Flow Rates

A. Design shall be based in the following average daily flow rates for single-family and multi-family residences. Daily flow rates may be increased at the discretion of the CCWA Engineer.

1. Residential House: 300 gallons per day per connection.
2. Apartment and Mobile Home: 233 gallons per day per unit.
3. Hotel and Motel: 126 gallon per day per room.

B. Design of industrial and commercial sanitary sewer flow rates shall be a minimum of 1.5 times that of the design average daily water usage or as approved by the CCWA Engineer.

C. A peaking factor of 3.0 shall be used when determining a "Peak Design Flow". The peaking factor may be changed at the discretion of the CCWA Engineer.

3.03 Hydraulics

A. Gravity sewer pipe should be designed to carry “Peak Design Flow” at one-half full.

B. Gravity sewer pipe shall have straight alignment and consistent grade change between manholes.

C. Sewers shall yield mean velocities of not less than 2.0 feet per second based on the Manning Formula using an "n" value of 0.013.

D. Recommended and absolute minimum pipe slopes for gravity sewer based on the size of pipe to be installed are summarized in the following table.

Slope Requirements

Diameter	Absolute Minimum	Recommended Minimum
6-inch	0.40%	0.70%
8-inch	0.40%	0.70%
10-inch	0.29%	0.50%
12-inch	0.22%	0.40%
14-inch	0.22%	0.40%
15-inch	0.15%	0.30%
16-inch	0.15%	0.30%
18-inch	0.12%	0.24%
20-inch	0.12%	0.24%
21-inch	0.10%	0.20%
24-inch	0.08%	0.16%
27-inch	0.07%	0.14%
30-inch	0.06%	0.12%
36-inch	0.05%	0.10%

E. Sewers with slopes less than the recommended minimum may be accepted on a site by site basis.

F. The over sizing of pipe to meet minimum grade requirements shall be prohibited.

G. A tangent at a terminal manhole shall have a minimum slope of 1.00 %.

H. The maximum slope of a gravity sewer shall be 15.0%. When approved by the CCWA Engineer, slopes between 15.0% and 20.0% may be used with the addition of concrete anchors (dead man). The Developer's Engineer shall determine the size and spacing of anchors. The CCWA Engineer shall approve all anchor designs.

I. When increasing the size of gravity sewer pipe, pipe crowns shall be matched at manholes.

J. Angle formed by alignment of influent and effluent sewer pipe at manhole shall be greater than (>) or equal (=) to 90º and less than (<) or = to 270º.

K. The surcharging of manholes shall be prohibited.

3.04 Sewer Material and Size

A. Sewer outfall, sewer main and lateral pipe and associated fittings shall be ductile iron or PVC.

B. Sewer pipe assembly shall be push-on joint unless indicated otherwise.

C. Transition coupling used to connect pipes of differing material shall be rigid and made of steel and/or ductile iron or other material approved by the CCWA Engineer.

D. Sewer outfalls and sewer mains shall have a minimum diameter of eight (8) inches.

E. Laterals shall have a minimum diameter of six (6) inches.

F. Sewers of PVC shall not exceed eighteen (18) inches in diameter.

G. Sewers eighteen (18) inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.

3.05 Sewer Location

A. Situate sewer outfalls and mains at the centerline of a right-of-way when possible or at the centerline of an easement.

B. Sewer outfalls and mains shall have a minimum ten (10) foot horizontal separation from any water main.

C. Lateral from the sewer main to the structure being served shall be located nearest the center of the property as practical. A separate lateral shall service each property.

D. When possible, route laterals to manholes rather than direct connection into sewer main and as follows.

1. Lateral connections into an in-line manhole shall be limited to two (2).

2. Lateral connections into a terminal manhole shall be limited to three (3).

3. Invert of a lateral connection at a manhole shall be installed at an elevation not greater than (2) two feet above the invert of the manhole.

E. Sewer outfalls, mains and laterals constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.

F. Sewers shall not be installed under or over any lake, reservoir or detention pond.

G. No sewer system component shall be constructed on solid waste landfills.

H. No sewer system component shall be constructed to serve a structure that is constructed on or to be constructed on a solid waste landfill.

I. Each sewer outfall, sewer main and lateral shall be locatable by means of mylar tape, wire or other method approved by the CCWA Engineer.

J. Use Detail No. 1.1, 2.2 and 2.3 when applicable.

3.06 Sewer Depth and Structural Integrity

A. Sewer outfalls and mains shall have a minimum suitable soil cover of four (4) feet or other depth approved by the CCWA Engineer.

B. Sewer main shall be situated at a depth as to allow lateral to be constructed at a minimum two (2) percent slope from sewer main to probable structure location on each lot to be served assuming lateral is three (3) feet in depth at probable structure location.

C. Vertical connection of a lateral into a sewer main shall be prohibited.

D. Top of pipe shall be two (2) feet below any stream or ditch when crossed or paralleled.

E. DIP shall be used for the following conditions.

1. Where depth of soil cover is less than four (4) feet before or after sewer installation.

2. Where depth of soil cover is greater than fifteen (15) feet before or after sewer installation.

3. Where sewer crosses over or under a storm drain pipe.

4. Where sewer crosses over or under a water main.

5. Where sewer crosses under a stream or ditch.

6. Other locations deemed necessary by the CCWA Engineer.

F. When a sewer crosses under a stream, a minimum of two (2) cast-in-place concrete collars shall be installed on the pipe, down gradient from the stream.

G. Sewers shall have a minimum 18-inch vertical separation from any water main.

H. Use Detail Nos. 18.1, 19.1 and 20.1 when applicable.

3.07 Manhole Location and Spacing

A. Provide a manhole at each change in grade, pipe size, alignment, intersection and at terminal point of sewer.

B. Space manholes a maximum of 400 feet of continuous run for pipes 16 inches in diameter and smaller.

C. Space manholes a maximum of 500 feet of continuous run for pipes 18 inches in diameter and larger.

D. Manholes situated within the 100-year flood elevation zone shall have top of cover elevations above the 100-year flood elevation or cover shall be with gasket and bolted down.

E. Manholes situated within the 100-year flood elevation zone and/or the groundwater table shall be checked for buoyancy.

F. Manhole inverts shall be constructed to provide a smooth transition between influent and effluent piping.

G. Manholes situated in pavement shall have top of covers level with finished grade.

H. Manholes situated in non-paved areas shall have top of covers a minimum of twelve (12) inches above finished grade.

I. Use Detail No. 21.1 when applicable.

4.01 General

The following section shall be used as a guideline for the design of force mains where the pipe diameter does not exceed 36 inches.

4.02 Hydraulics

A. Force mains shall be sized to allow for a minimum velocity of 2 ft/s and a maximum velocity of 5 ft/s.

B. Sanitary sewer force mains shall not flow down grade into a receiving manhole.

C. Combination air release/vacuum valves shall be installed in force mains at all high points of elevation and spaced along apparent flat routes as determined by the CCWA Engineer.

4.03 Force Main Material and Size

A. Force mains and associated fittings shall be ductile iron with a minimum diameter of four (4) inches.

B. Water main pipe assembly shall be push-on joint unless indicated otherwise.

C. Water main pipe assembly in a bore casing shall be restrained joint unless indicated otherwise.

4.04 Force Main Location

A. Force mains shall be situated outside of pavement within a street right-of-way near the boundary of the right-of-way or centered within an easement.

B. Water distribution and raw water force mains shall be located on the opposite side of pavement from a sewer when possible and/or shall have a minimum ten (10) foot horizontal separation from any sewer.

C. Force mains constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.

D. No force main shall be constructed on solid waste landfills.

E. No force main shall be constructed to serve a component that is constructed on or to be constructed on a solid waste landfill.

F. Each force main shall be locatable by means of detection tape or wire as approved by the CCWA Engineer.

4.05 Force Main Depth

A. Force mains shall have a minimum suitable soil cover of four (4) feet. Depth from finish grade to top of pipe shall be determined as follows.

1. As measured from edge of pavement when pipe route existing/finish grade elevation is equal to or greater than adjacent pavement elevation.

2. As measured from pipe route existing/finish grade elevation when the route elevation is less than the adjacent pavement.

3. Other depth approved by the CCWA Engineer.

B. Force main crossing under a creek or ditch shall have a minimum suitable soil cover of two (2) feet.

C. Water distribution force mains shall have a minimum eighteen (18) inch vertical separation from any sewer.

D. Force mains eighteen (18) inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.

E. Use Detail Nos. 7.1 and 8.1 when applicable.

4.06 Thrust Restraint

A. Thrust restraint shall be installed at all fittings and other locations deemed necessary by the CCWA Engineer.

B. Thrust restraint at fittings shall be accomplished by using one of the following methods.

1. Cast-in-place concrete blocking installed to dimensions as shown on thrust block detail.

2. Restrained joint pipe and fittings installed upon approval by CCWA Engineer.

C. Use Detail No. 9.1 when applicable.

4.07 Combination Air Vacuum/Release Valves

A. Combination air vacuum/release valves shall be sized according to the manufacturer's recommendations.

B. Valves designated for use with water or sewage shall be used on the respective system.

C. Valve shall be housed in a "dog house" style manhole.

D. Use Detail No. 22.1 when applicable.

DIVISION II DESIGN REQUIREMENTS

SECTION 5: AERIAL PIPE

5.01 General

A. This section shall be used as a guideline for the design of aerial pipe that pertains to water distribution piping and sanitary sewers.

B. Requirements of Division II, Sections 2, 3 and 4, where applicable, shall apply to the design of aerial piping.

C. A pipe that crosses over a perennial or annual stream must not cause an impedance to navigation or cause water to pool upstream of the pipe.

5.02 Aerial Pipe Material

A. Aerial pipe shall be ductile iron or steel.

B. Aerial pipe assembly shall comply with manufacturers' recommendations.

C. Aerial pipe fittings shall comply with manufacturers' recommendations and specifications herein.

5.03 Aerial Pipe Support

A. Aerial pipe supports shall be situated on suitable soils. Prior to support design, soils beneath proposed aerial pipe route shall be examined by a soils testing company for bearing capacity and suitability for construction. A soils report shall accompany the proposed aerial route.

B. Aerial pipe support spacing shall not exceed 40 feet. Aerial pipe support spacing shall be based on results of the soil's bearing capacity and spacing recommendations of the pipe and fitting manufacturers.

C. Aerial pipe supports shall be comprised of concrete piers set atop concrete spread footings. Spread footing size shall be based on results of the soil's bearing capacity and reactive forces within the aerial pipe.

D. Minimum pier diameters and footing sizes shall be as summarized in Detail No. 23.1.

E. Pipe shall be secured to piers as indicated on Detail No. 23.1.

F. Use Detail No. 23.1 when applicable.

DIVISION II DESIGN REQUIREMENTS

SECTION 6: LIFT STATIONS

6.01 General

A. This section shall be used as a guideline for the design of lift stations capable of pumping up to 700 gallons per minute.

B. Pumps, motors and associated components that produce a complete lift station shall be furnished as a package by a single manufacture.

C. A backup power system shall be provided for each lift station.

D. Lift stations shall be monitored from remote location via SCADA. A single supplier shall furnish all components of the SCADA system.

E. Material requirements specific to lift stations, stand-by power and SCADA are included in this section.

F. A minimum of two (2) sets of operational and equipment manuals for each component of the lift station, backup power system and SCADA system shall be provided prior to final acceptance.

G. The following information shall be submitted and approved prior to plan approval.
   a) 100-year flood elevation contour; electrical and mechanical components shall be situated above the 100-year flood elevation.
   b) Total Dynamic Head (friction loss through force main, static head, friction loss through pumps and suction piping).
   c) Pump Net Positive Suction Head available and required.
   d) Pump operating system curve plotted onto manufactures' pump curve.
   e) Pump cycle time.
   f) Wet well buoyancy calculation.
   g) Radio communication path survey.

6.02 Lift Station Package

A. Pumps

   1. A minimum of two (2) above ground self-priming centrifugal pumps of the same size and capable of passing a three (3) inch diameter sphere shall be provided.

2. Pumps shall be generally as follows.
   a) Pump casing shall be Gray Iron No. 30.
   b) Impeller shall be open type, 2 vanes, 60-40-18 ductile iron.
   c) Impeller shaft shall be 4140 alloy steel.
   d) Wear plate shall be replaceable 1020 steel.
   e) Cover plate (removable), bearing housing, seal plate and flanges (class 125#) shall be Gray Iron No. 30.
   f) Flap valve shall be neoprene.
   g) Bearings shall be open ball with oil lubrication.
   h) O-rings shall be Buna N.
   i) Oil level sight gauge.
   j) Pressure relief valve (brass).
   k) Lifting eye.
   l) Pump casing shall be coated with a prime coat of a zinc based synthetic primer and finish coat be automotive grade acrylic enamel (white color).

3. Pumps shall be sized so that the operational system curve intersects the middle one-third portion of the pump operational curve. Each pump shall have the discharge capacity to overcome the development's peak discharge. Components shall be sized to provide two (2) to five (5) pump cycles per hour at average daily flow conditions.

4. Power shall be transmitted to pump by means of a V-belt drive assembly. Each drive assembly shall have a minimum of two (2) V-belts. Drive assemblies shall be enclosed on all sides by solid or perforated sheet metal.

5. Each pump shall be equipped with an automatic air release valve assembly. Valves shall open automatically during pump priming or re-priming cycle and shall close automatically at pump full flow to eliminate re-circulation of liquid to the wet well.

6. Each pump shall be equipped with suction and discharge pressure gauges mounted on a resilient panel. Pressure gauges shall be as follows.
   a) Four (4) inches in diameter.
   b) Glycerin filled for "no shock".
   c) Graduated from a 0-inch to 70-inch water column.
   d) Equipped with brass shut off valves and fittings.

6. The following list of spare pump parts shall be provided for each lift station.
   a) One (1) cover plate O-ring.
   b) One (1) rotating assembly O-ring.
   c) One (1) mechanical seal.
   d) One (1) set of rotating assembly shims.

Acceptable Manufacture - Model
Gorman-Rupp Company – Super "T" Series.
Other Approved.

B. Electrical

1. Each pump shall be equipped with a motor sized so that the pump operational system curve intersects the middle one-third portion of the pump operational curve. Motor shall not be overloaded at the design condition or at any head in the operational system curve. Each motor shall be generally as follows.
   a) Horizontal, open drip proof, induction type.
   b) Produce a normal starting torque with low starting current characteristics.
   c) Require 3-Phase, AC electric current.
   d) Copper windings.
   e) Housed in NEMA design cast iron frame.
   f) Frame and housing shall be coated with a prime coat of a zinc based synthetic primer and finish coat be automotive grade acrylic enamel (white color).

Acceptable Manufacturer
Toshiba.
Other Approved.

2. Electrical control components shall be housed in a NEMA 3R stainless steel panel enclosure.
   a) Control components shall be mounted to a removable back panel that is secured to the enclosure.
   b) Enclosure door shall be gasketed with neoprene, hinged and equipped with captive closing hardware.

3. A circuit breaker shall be provided for each pump motor.
   a) A padlocking operating mechanism shall be installed on each motor circuit breaker.
   b) Operator handles for the mechanism shall be located on the exterior of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the "Off" position.

4. A NEMA rated magnetic motor starter shall be provided for each pump motor.
   a) Power contacts shall be double-break and made of cadmium oxide silver.
   b) Motor starters shall be equipped to provide under voltage release and overload protection on all three phases.
   c) Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.
   d) Motors having a 20-horse power rating or larger shall be equipped with soft start.

5. Motor overload relays shall be provided and have visual trip indication with trip-free operation. Reset buttons shall permit resetting of each motor without opening control panel door.

6. Control circuits shall be protected by a circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.

7. A Hand-Off-Auto switch shall be provided for each pump to permit manual start and stop of each pump individually and to select automatic operation of each pump under control of the level control system.

8. A three position sequence selector shall be provided to select the automatic alternation of the pumps or to select pump number 1 to be the lead pump for each pumping cycle or to select pump number 2 to be the lead pump for each pumping cycle.

9. A run indication light for each pump shall be mounted on the panel enclosure. Light shall indicate that the motor is or should be running.

10. A thermostat shall be mounted on each pump to detect high temperature. Should excessive temperature exist, protection circuitry shall override level control system and turn off pump motors to protect against excessive temperatures. An indicator light shall be located on front of control panel. Pump shall remain locked out until pump motor is manually reset.

11. Elapse time indicator shall be mounted on each motor to indicate total run time in hours and tenths of hours.

C. Liquid Level Control

1. Liquid Level in wet well shall be monitored via "Electronic Pressure Switch 2000" (EPS-2000 controller) and shall include integral components to sense pressure conditions. The controller shall be equipped as follows.
   a) Level control electrical enclosure: NEMA 1 stainless steel.
   b) EMI and RFI suppression.
   c) DC-current power supply and 108 – 132/60/1 AC-current.
   d) Function in temperature range of 0^{o} F through 131^{o} F.
   e) Control range from zero (0) to twelve (12) feet with a repeat capacity of +/- 0.1 feet.
   f) Equipped with pump start delays preset at a fixed time delay of five (5) seconds to prevent simultaneous motor starts.

2. Provide high water alarm visible indicator on control panel. Maintain alarm signal until manual reset.

3. Provide high water alarm audio indicator. Maintain alarm signal until manual reset of silence circuit.

4. Discrete output signal wiring shall be installed on pre-wired terminal blocks for SCADA monitoring. The signal output shall be for wet well high level, pump motor temperature and pump operation status.

5. Provide the following liquid level elevations on design drawings: Lead Pump "On", Lead Pump "Off", Lag Pump "On", Lag Pump "Off", High Water Alarm.

D. Suction and Discharge Piping

1. Piping shall be minimum 4-inch diameter, flanged, ductile iron.

2. The following shall be provided on the suction side of the pumps.

a) Provide a flanged customer connection on each suction line drilled to a standard 125# template.
b) Provide long radius 90º reducing elbow at each pump. Elbow shall be no smaller than 4-inch diameter.
c) Provide long radius 90º reducing elbow at intake of each suction line. Elbow shall be 2-inches in diameter larger than the suction line. The elbow shall be aligned to the center of the wet well.

3. The following shall be provided on the discharge side of the pumps.
   a) Provide a flanged customer connection on discharge side drilled to a standard 125# template.
   b) Provide a stainless steel swing check valve at each pump.
   c) Provide a 3-way non-lubricated, taper type, plug valve providing drip tight shutoff.

4. Provide equivalent sized 2-way plug valve and tee at header pipe to permit emergency access to discharge force main after isolation of pumps.
   a) Valve body shall be cast iron with flanged end connections drilled to a standard 125# template.
   b) Valve shall be of the non-lubricated type, furnished with a drip-tight shutoff plug mounted in stainless steel or Teflon over phenolic bearings and shall have a resilient facing bonded to the sealing surface.
   c) Bypass connection shall be accessible behind the hinged access panel on the wet well side of the station enclosure and shall terminate with a male OPW type quick connect fitting.

E. Equipment Enclosure

1. Equipment Enclosure shall consist of fiberglass reinforced orthophthalic polyester resin, containing no fillers, with a minimum of 30% glass fibers approximately 1-1/4 inch long and a maximum of 70% resin.

2. Fiberglass shall be a minimum of 3/16-inch thick and exterior side coated with “green” pigmented resin. Interior side of fiberglass shall be coated with a polyester-rich resin or gel.

3. Enclosure style shall be one of the following.
   a) Enclosure shall consist of four (4) vertical corner panels, one (1) roof panel and four (4) hinged access panels. Hinged panels shall be secured

by key lockable handle operating a two-point latch. Locks shall be keyed to the standard CCWA configuration.

b) Enclosure shall be of the quanset type with movable cover that slides to right or left for access to enclosure. A separate access door shall be provided for routine maintenance.

4. Enclosure shall be equipped with louvered vent with sliding door for ventilation.

5. Enclosure shall be equipped with a roof or wall mounted ventilation fan, thermostatically controlled to operate above the temperatures of 70^{o}F. Fan motor and control circuit shall be protected by a thermal-magnetic air circuit breaker.

7. Enclosure shall be equipped with a duplex GFI utility receptacle providing 115 volt, AC-current. Receptacle shall be protected by a 15-amp thermal-magnetic circuit breaker.

8. Enclosure shall be equipped with a space heater (1300/1500 watt) AC-current with chord and grounding plug.

9. Enclosure shall be equipped with a 200-watt light. Fixture shall be vapor tight and centrally located to provide light to all components within enclosure. Light circuit shall be protected by a thermal-magnetic air circuit breaker.

F. Use Detail Nos. 24.1 and 25.1 when applicable.

Acceptable Manufacturer for Lift Station Package

1. Gorman – Rupp Company.
2. Other Approved.

6.03 Backup Power System

A. Each lift station shall be equipped with one (1) preassembled (factory built), skid-mounted, weatherproof, backup power system.

1. The backup power system shall monitor the incoming electrical utility and, should power from the utility be interrupted, supply the power required to operate one lift station pump motor and required controllers.

2. Backup power system shall perform using a maximum 85% of its rated capacity to operate two (2) motors in series or four (4) motors in staged series based on the pump motor's calculated load. System shall provide for a 10 to 15 second delay for start-up of the second motor(s); a 20 kw generator is a minimum.

3. Backup power system within 100 feet of an occupied structure shall be equipped with a sound attenuation device to reduce noise levels to less than 80 decibels.

4. A five (5) year warranty shall be provided for the backup power system.

B. The backup power system shall supply three-phase power and be generally equipped as follows.

1. Enclosure; enclosure shall house all components of the backup power system and shall include as a minimum the following.
   a) Seamless fiberglass cowling as follows.
      1) Fiberglass shall have a gel coating of suitable thickness and density to provide durability, abrasion resistance, color fastness, gloss retention and shall be impervious to sewage, grease, oil, diesel or other common chemicals.
      2) Walls and ceiling shall be solid fiberglass having minimum 3/16 inch thickness and constructed in accordance with ASTM D-579.
      3) Enclosure shall be capable of withstanding a wind load of 85 miles per hour. The roof shall be capable of withstanding a minimum loading of 30 psf. All beams and trusses shall be fiberglass.
      4) Exterior color of enclosure shall be white.
      5) Tip-up design equipped with mounted gas cylinders such that operator shall not exert more than 25 pounds of lifting force to tip the enclosure to the full open position.
      6) Enclosure shall be hinged securely at one end to a steel base. Hinges shall be for heavy duty use, cadmium plated and epoxy coated.
   b) Steel base as follows.
      1) Base shall of size to accommodate fiberglass cowling.
      2) Base shall be constructed of steel channel with transverse mid beams supporting a ¼ inch thick steel deck.

3) All steel surfaces shall be prepared to a SSPC –SP6 condition and finished with an epoxy coating system.
4) Steel base shall be fitted with an integral doubled wall fuel tank having such capacity as to supply engine/generator set for a 24-hour continuous operation period. Diesel fuel tank shall be furnished with a bacteria inhibitor to prevent bacteria buildup.

c) Louvers as follows.
1) Engine intake and exhaust louvers sized to provide sufficient air for both cooling and combustion.
2) Louvers shall be 2 inch multi-blade, minimum 12-gauge anodized aluminum, 6063-T5 alloy with removable 5/8 inch aluminum mesh.
3) A duct assembly shall be provided between the engine radiator and the exhaust louver.
4) Louvers and duct assemblies shall be factory installed.

2. Engine/generator; engine/generator set shall be manufactured by Onan/Cummings and include as a minimum the following.
a) Electric starter.
b) Positive displacement full pressure, lubrication oil pump with full flow lubrication oil filters.
c) Engine speed governor.
d) Battery and battery charging alternator with solid state regulator.
e) Fuel system as follows.
1) No.2 diesel fuel.
2) Replaceable dry element air cleaner, air supply, return and vent lines.
3) Fuel filter with replacement element.
4) Engine driven displacement fuel pump.
5) Fuel system piping. Piping shall be black iron.
f) Engine mounted thermostatically controlled water jacket heaters.
g) Engine cooling system as follows.
1) Engine mounted radiator system.
2) Belt driven pusher fan.
3) Coolant liquid and pump.
4) Thermostat temperature control.
5) Radiator with duct adapter flange.

h) Exhaust system as follows.
   1) Spiral type exhaust muffler. Muffler weight shall not be supported by the engine.
   2) Exhaust piping shall be routed through the side wall of the backup power system's base and terminated outside enclosure.
   3) Piping outside enclosure shall be insulated with a minimum 2-inch thick calcium silicate thermal insulation with aluminum shroud.
   4) Provide sound attenuation as required.

i) Engine protective devices to indicate alarm and engine shutdown as follows. Provide as discreet outputs for SCADA monitoring.
   1) Low coolant temperature alarm.
   2) Low coolant level shutdown.
   3) Low lubrication oil pressure alarm and shutdown.
   4) High coolant temperature alarm and shutdown.
   5) Over speed shutdown.
   6) Over crank lockout.
   7) Transfer switch off.
   8) External warning light. (outside cowling).

j) Alternator shall be as follows.
   1) 3-phase, broad range, reconnectable with12 leads.
   2) Single bearing and directly coupled to the drive engine through a flexible coupling for self alignment.
   3) 4-pole, revolving field type with static exciter and magnetic amplifier voltage regulator. Voltage regulation shall be within +/- 5% of the rated voltage. Sustained voltage dip shall be less than 12% of rated voltage when full load and rated power factor is applied. Recovery to stable operation shall occur within two (2) seconds.
   4) Alternator, exciter and voltage regulator shall be manufactured by the same manufacturer as the engine/generator.

k) The following set controls shall be included on a lighted unit mounted control module.
   1) Oil pressure gauge.
   2) Coolant temperature gauge.
   3) Running time meter.
   4) Charge rate ammeter.
   5) Manual reset field circuit breaker.
   6) Manual selector switch (Run-Stop-Remote).

7) Remote two (2) wire start control.
8) Automatic engine shutdown.

l) The following set control indicator lamps shall be on a mounted control module.
1) Run.
2) Fault.
3) Overcrank.
4) Overspeed.
5) Switch Off.
6) Low Engine Temperature.
7) Low Oil Pressure.

3. Automatic transfer switch shall be manufactured by the same engine/generator set manufacture and include as a minimum the following.
a) Switch shall be rated for.
1) Continuous operation over an ambient temperature range of -25º to 125 º Fahrenheit.
2) All classes of load, both inductive and noninductive at 600 volts and tungsten lamp loads at 250 volts.
3) To close on an inrush current up to and including 20 times the continuous rating of the switch without welding or excessive burning of the contacts.
4) To switch loads up to and including its interrupting current capacity.
5) To endure 6,000 cycles of operation at rated current at a rate of 6 cycles per minute without failure; one cycle shall consist of one complete opening and closing of both sets of contacts on an inrush current 10 times the continuous rating of the switch.
b) Switch shall have the following mechanical characteristics.
1) Terminal lugs for either copper or aluminum wire with cadmium oxide contacts.
2) Mechanical and electrical interlocks to prevent simultaneous energizing of both normal and emergency services.
3) Mechanically held on both normal and emergency sides.
4) 3-pole with solid neutral
5) 25-amp rated auxiliary contacts, two (2) on the line side, three (3) on the emergency side.

c) Switch shall have the following control logic.
   1) Signals engine/generator set to start in the event of a power interruption. A solid state time delay start shall be provided adjustable from 0 to 6 seconds.
   2) Monitors each ungrounded line with an adjustable voltage, solid state under voltage sensor to sense a decrease of voltage below a set point or a loss of voltage on any phase of the normal power source.
   3) Retransfers the load to the line after normal power restoration.
   4) Signals engine/generator set to stop after load retransfer to normal source.
   5) Provides a battery float charger to maintain fully charged cranking batteries.
   6) Provides test switch to simulate an interruption of power from the normal source.
   7) Provides an exerciser clock and selector switch (Load/Without Load) to automatically start the engine/generator set at regular intervals and allows it to run for a preset time period with load or without load.

d) Indicating lamps and meters shall be mounted for easy reading without opening doors.
   1) Indicating lamps shall include Green lamp (normal) and Red lamp (emergency) to indicate which source is supplying power to the load.
   2) Meter shall include Charge Meter to monitor battery charger output current.

e) The complete automatic transfer switch shall be mounted in a NEMA 1 rated enclosure, installed within the backup power system enclosure and wired to the engine/generator set at the manufacturer's facility.

<u>Acceptable Manufacturer</u>
1. Precision Systems.
2. Other Approved.

6.04 Telemetry

A. General

1. The lift station shall be equipped with a functioning radio-based telemetry system that is compatible with the existing CCWA Wastewater SCADA system.

2. The central computer system (CS) for the CCWA Wastewater SCADA system is situated at the CCWA facility located at 8890 Roberts Road in Jonesboro, Clayton County.

3. The lift station SCADA system design shall be completed in two (2) phases.

   A. Phase One. A radio survey shall be performed to determine the feasibility and scope of the radio communication path from the CS to the Lift Station site. The radio survey shall be submitted to and approved by the CCWA prior to CCWA approval of the development's proposed sewer system design.

      Acceptable Supplier
      1. Industrial Control Systems, Inc., Sandston, Virginia (804) 737-1700.
      2. Bristol Babcock, Inc., Altamonte Springs, Florida (860) 945-2200.
      3. Whitaker Electric Company, Inc., Appling, Georgia (706) 556-9692.
      4. Other Approved.

   B. Phase Two. One Process Instrumentation and Control System Supplier shall provide a complete SCADA system including but not limited to a remote telemetry unit (RTU), radio communication equipment, and necessary accessories. The system supplier shall provide all necessary hardware modifications and software programming of all computers and RTUs associated with SCADA system including necessary program modifications at the CS.

      Acceptable Supplier
      1. Industrial Control Systems, Inc., Sandston, Virginia (804) 737-1700.
      2. Curry Control Company, Lakeland, Florida (863) 646-5781.
      3. Other Approved.

B. Radio Survey – Phase One

1. Complete a radio survey to determine communication path from central CCWA SCADA system to lift station site. Coordinate site activities with the CCWA.
   a) Record coordinates at each site and identify their specific location on topography mapping software.
   b) Generate terrain and radio path analysis profiles. Profiles shall be used to calculate the line-of-site radio path between the desired locations including projected tower height. Profiles shall then be used to identify potential interference and/or the feasibility of each potential radio path.

2. Transmit controlled radio signals between potential sites of interest and measure the quality and strength of the received signal. Use the specific radio to be used in the actual application using the same power level that will be used under normal operating conditions.

3. Provide results of radio survey and recommendations in the form of a report to the CCWA for review. Include the following items (as a minimum) in the report.
   a) Topographic map showing central CCWA SCADA system site, proposed lift station site and radio path including repeaters (if necessary).
   b) Test Methods.
   c) Site Coordinates.
   d) Test Equipment and Recommendations.
   e) Radio Paths Measured.
   f) Antenna Height Recommendations
   g) System Recommendation

4. The CCWA shall approve the radio survey's results and recommendations prior to proceeding with the design of the lift station SCADA system.

C. Remote Telemetry Unit – Phase Two

1. Remote Telemetry Unit (RTU) shall provide the interface between field signals and the CS. The RTU shall distribute communication, acquire data and control functions for the SCADA system. The following is a minimal list of functions required to be monitored; more functions may be required (i.e. for series staged station) or at the discretion of the CCWA.
   a) Generator Fail: Alarm if the generator is in a failed condition.
   b) Pumps 1 and 2 Run Status: Display the pump ON or OFF status. Calculate the pump elapsed runtime. Allow the runtime to be manually reset at the operator workstation.
   c) Pumps 1 and 2 Remote Run/Stop: Provide for the pump to be remotely started and stopped. The remote start and stop function shall operate only in the pump local selector switch is in the AUTO position.
   d) Pumps 1 and 2 High Temperature: Alarm on pump high temperature.
   e) Pumps 1 and 2 Pressure: Display continuous pump suction and discharge pressures.
   f) Lift Station Level: Display continuous lift station wet well liquid level. Alarm on Low Level in wet well (Less than 4.25mA dc signal).
   g) High Water Level Alarm: Display if the High Water Level switch is activated.
   h) RTU Power Monitoring: Alarm on AC power failure or Low Battery Power.

2. Performance.
   a) RTU shall operate as a subordinate to the CS. RTU shall have all data acquisition, communication and control function necessary to interface with CS.
   b) RTU shall support full or partial scan by the CS.
   c) Data acquisition functions shall include but are not limited to the following.
      1) RTU shall scan all input points at least every second for current value.
      2) Store in buffer memory: currents values of all I/O, pulse input accumulations and filtered values of analog inputs.
      3) RTU response to interrogations shall use the buffer memory contents.
   d) All analog inputs have first order exponential digital filtering with programmable filter constants downloaded from the CS.
      1) Default values for filter constants stored in ROM.

2) Filter constants expressed as time constants, range from 10 to 100 seconds with corresponding sample intervals ranging from 1 to 10 seconds.
3) As a minimum, filter constants individually adjustable by RTU.
4) Individual filter constants not required per analog input point.

e) RTU shall utilize real-time, multitasking firmware to implement system communication protocol, local data acquisition and control functions.
1) Shutdown due to loss of power shall not result in the loss of programs.
2) Startup after restoration of power shall not require manual or CS intervention.
3) Upon startup, RTU shall configure itself for its connected inputs and outputs and use default values for all initializations. RTU shall indicate its power reset condition to the CS in its reply to the first scan after reset. The CS shall then download all revised initialization constants. Firmware design utilizes a watchdog timer to monitor proper operation.

f) All integrated circuits are second sourced.

3. Interfaces
a) Types
1) With communication circuits to the CS.
2) With lift station input and output signals.
3) With power source.

b) RTU shall use a radio communication link utilizing a modem suitable for interface with the radio. Radio shall operate at a 9,600 baud with characteristics to match limitations of the radio channel. The RTU communicates with the CS at 9,600 baud in a asynchronous or synchronous format in a half-duplex mode over a party line channel.

c) Input/Output
1) All Input/Output (I/O) points shall be in accordance with ANSI C37.90.
2) Discrete Inputs (DI) shall be external with normally open or normally closed contacts. RTU impresses a dc voltage on the contact to read their status. Internal RTU logic optically isolated from external contacts. Provide means to limit read current to 100 mA maximum.

Noise filters or other techniques shall be utilized to reject short time constant noise, contact bounce and 60-Hz pickup.

3) Analog Inputs (AI) shall be 4 to 20 mA dc signals in accordance with ISA S50.1 and be fully isolated with a maximum impedance of 250 ohms. Accuracy shall be +/- 0.25% of full scale under all operating temperature conditions. Common mode rejection is at a 100 dB minimum. Normal mode noise rejection is at a 40 dB minimum for frequencies of 60Hz and above.
4) Discrete Outputs (DO) shall have interposing relays with SPDT contact. Relays shall have a 5-amp rating and suited for 100,000 operations at 25º C. DO shall be Latch Type or Momentary Type. Latch Type Output shall not change state on loss of power by RTU. Momentary Type Output shall be single pulse with an adjustable duration ranging from 0.2 to 2 seconds.
5) Analog Outputs (AO) shall be 4 to 20 mA dc signals in accordance with ISA S50.1, Type 2, Class L and be fully isolated. Accuracy shall be +/- 0.25% of full scale under all operating temperature conditions. Resolution shall be 0.1% of full scale or better.

d) Power
1) RTU shall operate on 117-volt rms. The RTU shall have internal power On/Off switch and an On status LED.
2) Power supply shall have an ac/dc converter, a battery charger and dc/dc converters. Power supply shall trickle charge battery when ac power is On and fail over to battery when ac power is Off.
3) Provide batteries sufficient to power RTU for a minimum of four (4) hours after loss of 117-volt ac power. Battery shall be of the sealed lead acid/calcium gelled electrolyte maintenance free type with rated trickle charge life in excess of two (2) years.
4) RTU shall have an ac power fail detection circuit relay. A Discrete Input shall be created upon detection of an ac power failure.

<u>Acceptable Manufacturer – Product</u>

1. Allen Bradley – Micrologix 1500.
2. Other Approved.

D. Panel Fabrication – Phase Two

1. Panel including all components (i.e. instruments, wiring and enclosure) shall be fabricated at the Process Instrumentation and Control System Supplier's factory.
2. Provide temperature control as follows.
   a) Panel shall be sized to adequately dissipate heat from components mounted inside panel or in panel face.
   b) Panel shall have thermostatically controlled space heater to maintain internal panel temperature above dew point.
3. Provide electrical as follows.
   a) Feeder circuits.
      1) One or more 120V ac, 60Hz.
      2) Provide for feeder circuit conduit entry.
      3) Provide terminal board for termination of wires.
   b) Panel Power.
      1) Provide main circuit breaker and a circuit breaker on each individual branch circuit distributed from panel.
      2) Branch circuit shall blow only branch breaker and not trip main breaker.
      3) Breakers shall be located to provide clear view and accessibility when panel door is opened.
   c) Circuit Wiring.
      1) A maximum of 20 devices shall be on a single circuit.
      2) Multiple units shall perform parallel operations.
      3) Provide for panel lighting and service duplex outlet on separate 15-amp 120V ac branch circuit.
   d) Signal Distribution.
      1) 4 to 20 mA dc signals may be distributed as 1 to 5V dc within panel.
      2) 4 to 20 mA dc signals shall be isolated outside panel.
      3) Signal wiring shall be twisted, shielded pairs.
   e) Signal Switching.
      1) Use dry circuit type relays or switches.
      2) 4 to 20 mA loops shall not be interrupted during switching.
   f) Relays.
      1) General: Plug-in type socket to rail mounting.
      2) General: Provide dust cover and hold-down clips with relay enclosure.

3) Signal switch relay with gold or silver contact material having an expected mechanical life of 10,000,000 operations and expected electrical life at rated load of 100,000 operations with an LED or neon indicator lamp.
4) Control circuit switch relay (non-latching) with silver cadmium oxide alloy contact having an expected mechanical life of 10,000,000 operations and expected electrical life at rated load of 100,000 operations with an LED or neon indicator lamp and push-to-test button.
5) Control circuit switch relay (latching) with silver cadmium oxide alloy contact having an expected mechanical life of 500,000 operations and expected electrical life at rated load of 50,000 operations with an LED or neon indicator lamp.
6) Control circuit switch relay (time delay) with silver cadmium oxide alloy contact having time delay set point and mode of operation with an integral potentiometer adjustment with knob external to dust cover.

Acceptable Manufacturer

1. Potter and Brumfield.
2. Allen Bradley.
3. Other Approved.

g) Power supply.
   1) Provide as required to power instruments requiring external dc power including two-wire transmitters and dc relays.
   2) Convert 120V ac, 60Hz power to dc power of appropriate voltage so that instruments will operate within required tolerances.
   3) Provide output over voltage and over current protection devices.
   4) Enclosure shall be NEMA 1 rated.
   5) dc supply line to each individual two-wire transmitted shall be fitted with an indicating type fuse mounted for easy replacement.

h) Internal Light and Service Outlet.
   1) Provide 100-watt incandescent light operated by switch.
   2) Mount inside and in the top of back of panel.
   3) Provide protective metal shield for light.
   4) Provide three-wire, 120V, 15 amp duplex receptacle.

i) Use following table for standard pushbutton colors and inscriptions. Use black colored lettering on white and yellow buttons. Use white colored lettering on black, red and green buttons.

Tag Function	Inscription	Color
O/O	On/Off	Red/Green
O/C	Open/Close	Red/Green
O/C/A	Open/Close/Auto	Red/Green/White
O/O/A	On/Off/Auto	Red/Green/White
M/A	Manual/Auto	Yellow/White
S/S	Start/Stop	Red/Green
Reset	Reset	Red
Emergency Stop	Emergency Stop	Red

j) Use following table for standard light colors and inscriptions. Use black colored lettering on white and amber lenses. Use white colored lettering on red and green lenses.

Tag Function	Inscription	Color
On	On	Red
Off	Off	Green
Open	Open	Red
Closed	Closed	Green
Low	Low	Green
Fail	Fail	Amber
High	High	Red
Auto	Auto	White
Manual	Manual	Amber
Local	Local	White
Remote	Remote	Amber

4. Panel enclosure shall be as follows.
   a) NEMA 4X rated and constructed of a minimum 14-gauge Type 316 stainless steel. Size shall be 36”H x 36”W x 12”D.

b) Enclosure shall have a rubber-gasketed door with a continuous hinge. Door shall be secured to enclosure with stainless steel lockable quick-release clamps.

Acceptable Manufacturer
1. Hoffman Engineering Co.
2. Other Approved.

E. Radio Communication Equipment – Phase Two

1. Transceiver
   a) Transceiver shall contain FM transmitter and FM receiver suitable for operation in the 902 – 928 MHz spread spectrum band.
   b) Transceiver shall operate from power provided by the RTU; provide solid-state circuitry throughout.
   c) Designate transmitter emission in accordance with FCC Rules and Regulations.

   Acceptable Manufacturer – Product
   1. Microwave Data Systems – Model 9810, 902-928 MHz Spread Spectrum.
   2. Other Approved.

2. Transmission Cable
   a) Cable shall have performance characteristics suited for overall system functional requirements.
   b) Cable shall have a minimum bend radius of 10 inches
   c) Cable shall have a dielectric jacket and be suited for direct burial and other outdoor design environments.

   Acceptable Manufacturer – Product
   1. Heliax – Model LDF.
   2. Other Approved.

3) Antenna
   a) Antenna shall be suited for outdoor environments.
   b) Antenna shall provide a low resistance dc path to ground for lightning protection.

   Acceptable Manufacturer – Product
   1. Omni (Decibel Products) – Model DB586, 6dB Omnidirectional Antenna.
   2. Yagi (MaxRad) – Model MYG303-ED, 6dB Yagi Antenna.
   3. Other Approved.

4) Tower and Mast
   a) Tower and mast shall support antenna at an elevation to achieve functional requirements.
   b) Tower shall be self-supporting (without guide wires).
   c) Lightning arrestors shall be provided and connected to ground rods by cable.
   d) Use Detail No. 25.3 when applicable. Provide "as required" dimensions.

   Acceptable Manufacturer
   1. Pirod / Valmont.
   2. Rohn Industries.
   3. Other Approved.

6.05 Wet Well

A. A wet well shall be provided with each lift station. Wet well shall have a minimum 6-foot inside diameter (or equivalent rectangular area).

B. Wet well shall be sized in conjunction with pump level control to provide 2 to 5 pump cycles per hour at average daily flow conditions.

   1. Wet well shall resist floatation during construction.

   2. Access to the wet well shall be provided via a 2-foot diameter manhole ring and light weight cover situated two (2) feet centered from inside edge of wet well.

C. Use Detail No. 25.1 when applicable.

6.06 Equipment Pads

A. Lift station shall be secured by expansion or cast-in anchors to a monolithically poured steel reinforced concrete slab. The slab shall have a minimum depth of eight (8) inches. The slab shall extend a minimum of two (2) feet beyond the outside edges of the wet well and a minimum of three (3) feet beyond the edges of the lift station enclosure.

B. Backup power system shall be secured by expansion or cast-in anchors to a monolithically poured steel reinforced concrete slab. The slab shall have a minimum depth of eight (8) inches. The slab shall extend a minimum of six (6) inches beyond all sides of enclosure.

6.07 General Electrical Requirements

A. Electrical service to lift station site area shall be 3-phase, AC current.

B. Service Entrance, main disconnect, mini-power center and SCADA panel shall be secured to a fabricated steel (galvanized) stand.

C. Service entrance shall meet the requirements of the local electric utility.

D. Main Disconnect and mini-power center shall be sized to meet NEC code.

E. Service wire to all components shall be stranded copper cable sized to meet NEC code and placed in conduit. Service wire within fenced site area shall be underground except where entering equipment.

1. Below grade conduit shall be rigid, schedule 40, PVC meeting requirements of NEMA TC-3 and UL 651. Joints shall be slip-on and glued in accordance with manufacturers instructions.

2. At-grade, above-grade and/or concrete encased conduit shall be rigid galvanized steel meeting the requirements of ANSI C80.1 and UL 6. Joints

shall be threaded with galvanized fittings meeting the requirements of UL 514B. Set screw and threadless compression fittings shall not be permitted.

3. At-grade or above-grade conduit shall not have horizontal runs greater than 12 inches. Horizontal runs of conduit shall be supported by a minimum of two concrete anchored uni-strut (galvanized).

F. Area security light shall consist of a photocell having a minimum 150 watt metal halide fixture. The light shall be installed at a minimum height of 15 feet above finished grade. The light pole shall be tubular steel and factory finished with a dark bronze color coating. The light pole shall be anchored in accordance with the manufacturer's recommendations.

G. All components shall be grounded to copper grounding rods in accordance with NEC code.

1. Ground rods shall be copper-clad having minimum diameter of 5/8-inch with a length of 10 feet.

2. Ground conductors shall be stranded copper.

3. Ground connections shall be of the exothermic weld type suitable for exposure to elements or direct burial.

H. Provide electrical site plan with design submittal.

I. Use Detail No. 25.5 when applicable.

6.08 Property and Site Area

A. A minimum 60-foot by 60-foot area of property, to be donated to the CCWA, shall be provided for each lift station. The lift station and associated components shall be situated within 40-foot by 40-foot site area; a larger property/site area may be required.

B. A 12 (twelve) foot wide access drive situated within a 20 foot wide strip of property, to be donated to the CCWA, shall be provided for each lift station. The access drive shall intersect a public right-of-way. Road material may be changed as approved by the CCWA Engineer.

C. The property boundary shall be situated no closer than fifty (50) feet from the nearest structure.

D. Corners of lift station site area shall be at same elevation.

E. Lift station site area shall be sloped away from slab covering the wet well at a minimum 1.0% slope.

F. Potable water and a non-freeze yard hydrant shall be provided at each lift station.

G. Provide plug valve in force main at a maximum distance of 20 feet from lift station.

H. Site area (minimum 40-foot by 40-foot) shall be fenced.

I. That portion of the lift station site area not in concrete shall be covered with stone (size R2) at a minimum depth of six (6) inches. Stone shall be placed atop a geotextile fabric liner.

J. Property area outside fenced area shall be landscaped.

K. Use Detail Nos. 25.7 and 25.8 when applicable.

6.09 Fence and Landscaping

A. A minimum 5-foot clearance shall be provided from fence to major components (i.e. lift station, generator, SCADA tower, electrical stand)

B. Fence shall have height of six (6) feet with three (3) stands of galvanized barbed wire atop posts.

1. Fence mesh shall be 9-gauge wire (galvanized).

2. Top rail shall be 1-5/8 inch diameter schedule SS40.

3. Intermediate post shall be 2-inch diameter schedule SS40.

4. Corner and gate posts shall be 3-inch minimum diameter schedule SS40.

5. Gate shall have a width of twelve (12) feet, two 6-foot swing gates positioned in location approved by the CCWA.

6. Gate shall be secured by the CCWA with a keyed lock conforming to the CCWA standard; and

7. “No Trespassing” signs to include lift station name, address and emergency phone numbers shall be installed on all fenced sides by the CCWA conforming to the CCWA standard.

C. Property outside of the fenced area shall be landscaped.

1. Install weed barrier fabric over all areas to receive landscaping.

2. Install evergreen shrubbery spaced not greater than five (5) feet apart around the fenced area. Shrubbery shall have a minimum height of three (3) feet at the time of planting and shall have a mature height of at least six (6) feet. Prepare soil in accordance with shrubbery planting instructions.

3. Install wood mulch, clean of dirt, around shrubbery and to the edge of the easement area. Mulch shall have a depth of three (3) inches.

D. Use Detail Nos. 26.1 and 27.1 when applicable.

DIVISION III MATERIAL REQUIREMENTS

SECTION 1: DUCTILE IRON PIPE AND FITTINGS

1.01 Pipe Classification

A. Ductile iron (push-on) pipe four (4) inches and six (6) inches in diameter shall be Class 51 in accordance with ANSI/AWWA C151/A21.51, latest revisions.

B. Ductile iron (push-on) pipe eight (8) inches in diameter and larger shall be Class 50, unless noted otherwise, in accordance with ANSI/AWWA C151/A21.51, latest revisions.

C. Ductile iron flanged pipe shall have a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C115/A21.15, latest revisions.

D. Ductile iron restrained-joint pipe shall be of the flex-ring type having a welded bead lock ring having a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C151/A21.51, latest revisions.

1.02 Fitting Classification

A. Ductile iron fittings for use with push-on joint pipe shall be standard mechanical, compact series, with a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.

B. Ductile iron flanged fittings shall be in accordance with ANSI/AWWA C110/A21.10, latest revision. Flanged fittings up to twelve (12) inches in size shall have a minimum pressure rating of 350 psi. Flanged fittings over twelve (12) inches in size shall have a minimum pressure rating of 250 psi.

C. Ductile iron restrained-joint fittings shall be of the flex-ring type having a minimum pressure rating of 250 psi in accordance with ANSI/AWWA C110/A21.10 and C153/A21.53, latest revisions.

1.03 Gaskets and Bolted Connections

A. Gaskets shall be as follows.

1. Gaskets for push-on and standard mechanical joints shall be plain rubber (Styrene Butadiene Copolymer) in accordance with ANSI/AWWA C111/A21.11, latest revisions.

2. Gaskets (FIELD LOK®) and (MJ FIELD LOK®) used to restrain push-on joint pipe and/or standard mechanical joint fittings, respectively, shall be plain rubber (Styrene Butadiene Copolymer) modified with stainless steel teeth in accordance with ANSI/AWWA C111/A21.11, latest revisions.

3. Gaskets for restrained joint pipe of the flex-ring type and restrained joint fittings of the flex-ring type shall be plain rubber (Styrene Butadiene Copolymer) modified with ductile iron segments in accordance with ANSI/AWWA C111/A21.11, latest revisions.

4. Gaskets for flanged joints shall be 1/8-inch thick, full-faced, clothed reinforced rubber in accordance with ANSI/AWWA C110/A21.10 and C115/A21.15, latest revisions.

B. Retaining glands and adapter coupling shall be as follows.

1. Retaining gland for use with standard mechanical joint fitting where joint restraint is not required shall be in accordance with ANSI/AWWA C110/A21.10 through C153/A21.53, latest revisions.

2. Retaining gland (MEGALUG®) for use with standard mechanical joint fitting, where the gland acts as the restraining mechanism, shall include gripping wedges with torque limiting twist-off nuts and shall be in accordance with ANSI/AWWA C110/A21.10 through C153/A21.53, latest revisions.

3. Retaining gland (MJ FIELD LOK®) for use with standard mechanical joint fitting, where the gasket acts as the restraining mechanism, shall be in accordance with ANSI/AWWA C110/A21.10 through C153/A21.53, latest revisions.

4. Adapter coupling (Foster Adapter®) shall be a bolt-through positive restraining connector between two standard mechanical joints. Adapter coupling shall be in accordance with ANSI/AWWA C153/A21.53, latest revisions.

C. Bolts shall be as follows.

1. Bolts and nuts used for standard mechanical connections shall be tee head type with heavy hex nut conforming to ASTM A563 in accordance with AWWA C111.

2. Bolts and nuts used for flanged connections shall be hex type of low carbon steel, cadmium plated or zinc plated conforming to ASTM A307 in accordance with AWWA C110 and C115.

1.04 Coatings and Linings

A. Ductile iron pipe and fittings placed on or beneath the ground surface shall have an exterior coating of asphalt (one mil) in accordance with ANSI/AWWA C151/A21.10, latest revisions.

B. Ductile iron pipe and fittings placed above the ground surface shall have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

C. Ductile iron pipe that crosses or runs parallel to a gas transmission main, which is or may be catholically protected, shall be encased in polyethylene tubing, eight (8) mil minimum thickness, and taped in accordance with ANSI/AWWA C105/A21.5.

D. Ductile iron pipe and fittings used in the distribution of potable water shall be cement lined in accordance with ANSI/AWWA C104/A21.4, latest revisions.

E. Ductile iron pipe and fittings used in sanitary sewer systems shall be cement lined in accordance with ANSI/AWWA C104/A21.4, latest revision and cement lining sealed with asphalt in accordance with ANSI 21.10, latest revision and AWWA C110, C115, C151 or C153, latest revisions.

F. Ductile iron fittings in lieu of an asphalt coating and cement lining may be coated and lined with five (5) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Fittings shall be listed by a certifying agency that the coating complies with ANSI/NSF 61.

1.05 Pipe Marking

The following information shall be cast in or stamped on each pipe.

A. Weight, class or nominal thickness.
B. Casting period.
C. Manufacturer's identifying mark.
D. Year the pipe was manufactured.
E. The letters "DI" or "DUCTILE".

Acceptable Manufacturers - Product

Ductile iron pipe and fittings shall be domestically manufactured.

1. American Cast Iron Pipe Company – pipe and fittings.
2. U.S. Pipe Company – pipe and fittings.
3. S&B Technical Products - FIELD LOK® and MJ FIELD LOK® gasket.
4. EBAA Iron Sales, Inc. - MEGALUG® gland.
5. U.S. Pipe Company, Tyler/Union - MJ FIELD LOK® gland.
6. Infact Corporation - Foster Adapter®.
7. Other Approved.

2.01 Pipe Classification.

A. Steel pipe shall have a minimum wall thickness of 0.25 inches and be in accordance with ASI standards.

B. Wall thickness shall be increased as necessary to minimize deflection and deformation.

2.02 Transition Coupling

Coupling used to connect pipes of differing material shall be as follows.

A. Middle ring shall be carbon steel in accordance with ASTM A513, ASTM A635 or ASME SA675 GR60.

B. Followers shall be ductile iron.

C. Bolts and nuts shall be carbon steel in accordance with ANSI/AWWA C111/A21.11.

D. Gaskets shall be Buna (S blend).

2.03 Coatings and Linings

A. Steel pipe used for water distribution and sewer shall be coated and lined in accordance with Division III, Section 12.

B. Steel pipe used as casing shall not require a coating or lining unless otherwise indicated.

Acceptable Manufacturers - Product

Steel pipe and fittings shall be domestically manufactured.

1. As approved – pipe.
2. Dresser – Transition Coupling.
3. Smith Blair – Transition Coupling.
4. Other Approved.

3.01 Pipe Classification

A. Buried service three-quarter (¾) inches in diameter to one (1) inch in diameter shall be seamless, annealed copper tube conforming to the requirements of ASTM B-88, Type "K".

B. Buried service greater than one (1) inch in diameter shall be hard-drawn copper tube conforming to the requirements of ASTM B-88, Type "L".

C. All exposed or above-ground service shall be hard-drawn copper tube conforming to the requirements of ASTM B-88, Type "L".

3.02 Fittings

A. Fittings for annealed copper tube, Type "K", shall be brass flared type conforming to ASTM B-16 or B-124.

B. Fittings for hard-drawn copper tube, Type "L", shall be wrought copper conforming to ASTM B-75 and ANSI B16.22 for silver brazed joints. Lead free solder and flux shall be used in making connections.

C. Meter couplings and tail pieces shall be cast brass threaded type.

Acceptable Manufacturers
Copper components shall be domestically manufactured.
1. As Approved.

4.01 Casing for Copper Pipe

A. PVC pipe shall be used as a casing for copper water service lines that are to be installed under pavement.

B. PVC pipe used as a casing shall be a minimum of Schedule 40, Class 200.

C. PVC casing pipe shall have a minimum diameter of two (2) inches.

4.02 Sewer Pipe Classification

A. PVC pipe used as sewer shall be SDR 26 push-on joint type with O-rings in accordance with ASTM 3034.

B. Gaskets shall be plain rubber.

4.03 Sewer Pipe Fitting Classification

PVC fittings shall be in accordance with ASTM 3034.

Acceptable Manufacturers
PVC pipe shall be domestically manufactured.
1. As Approved.

5.01 Gate Valve

A. Gate valves three (3) inches in diameter and smaller shall be as follows.

1. Valves shall be all brass or bronze construction.

2. Valves shall have solid wedge gate, rising stem, and threaded bonnet.

3. Valve end connections shall be compatible with pipe material in which valve is installed.

B. Gate valves four (4) inches in diameter and larger shall be as follows.

1. Water supply service shall be in accordance with AWWA 509 for resilient seated valves.

2. Water supply service shall be in accordance with AWWA 515 for reduced wall thickness resilient seated valves.

3. Valve body shall be ductile iron with all exterior surfaces coated with a fusion-bonded epoxy coating.

4. Valves shall be bronze mounted, beveled geared, with a non-rising stem and O-ring stem seals.

5. All exposed fasteners, nuts and bolts shall be stainless steel.

6. Valves shall open in a counter-clockwise direction.

7. Valve end connections shall be flanged or standard mechanical.

8. Buried valves shall be nut operated; non-buried valves shall have hand-wheel operators.

C. Gate valves used in conjunction with a tapping saddle shall be as follows:

1. Offset type that allows the tapping device to mount to the pipe and pass through the opened valve.

2. End connection to the tapping sleeve shall be flanged. End connection to accept pipe shall be mechanical joint.

D. Gate valves four (4) inches and larger shall be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16. Fittings shall be listed by a certifying agency that the coating complies with ANSI/NSF 61.

E. The following information shall be cast in or stamped on each gate valve.

1. Manufacturer's identifying mark.
2. Pressure Class.
3. The letters "DI" or DUCTILE.
4. Place of Manufacturing.

Acceptable Manufacturers

Valves shall be by a domestic manufacturer that produces only ductile iron bodied valves.

1. American Darling.
2. U.S. Pipe Company.
3. Mueller Company - Ductile Iron Valves only.
4. M&H Valve Company - Ductile Iron Valves only.

5.02 Butterfly Valve

A. Valves shall be in accordance with AWWA C504.

B. Materials used in the fabrication of the valve shall meet all related requirements of ASTM.

C. Valve bodies shall be ductile iron with integrally cast flanged ends or standard mechanical ends. Flange drilling shall be in accordance with ANSI B16.1. Two trunnions for shaft bearings shall be integrally cast with valve body.

D. Valves shall be bubble tight at rated pressures with flow in either direction and shall be capable of throttling service.

E. Valve disc shall rotate 90º from full open position to tight shut position.

F. Valves shall be tight closing, rubber seated with seats applied to the body or disc. Valve seats on 30 inch and larger diameter valves shall be field adjustable and replaceable without dismounting operator, disc or shaft and without removing valve from pipe. Mating seat shall be stainless steel or Monel.

G. Valves shall be fitted with sleeve type bearings contained in hubs of valve body. Bearings shall be corrosion resistant and self-lubricating.

H. Valve operators shall hold valve in any intermediate position between full open and full close without creeping or fluttering.

1. Manual operators shall be worm gear or traveling nut type and shall be fully enclosed.

2. Valves for buried service shall be furnished with a ground level valve position indicator unless otherwise approved by the CCWA Engineer.

3. Valves for above ground service shall be furnished with a valve position indicator arrow to give valve position at any point from full open to full close.

4. Valves shall open when turning operator in a counter-clockwise direction.

I. Valves shall be coated as follows.

1. Valve placed on or beneath the ground surface shall have an exterior coating of asphalt (one mil) in accordance with ANSI/AWWA C151/A21.10, latest revisions.

2. Valve in lieu of an asphalt coating may be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.

3. Valve placed above the ground surface shall have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

Acceptable Manufacturers

1. M&H.
2. Pratt
3. Other Approved.

5.03 Double Check Valve

A. Double check valves shall be in accordance with AWWA 506, ASSE 1013 and USC-FCCC. Check valves shall be UL listed and approved by FMR.

B. Double check valves ¾ inch in diameter through two (2) inches in diameter shall be bronze bodied having corrosion resistant moving parts with bronze threaded unions on both sides of the device.

C. Double check valves 2-1/2 inch in diameter and larger shall be bronze, cast iron or ductile iron bodied having corrosion resistant moving parts with flanged end connections.

D. Double check valves with reduced pressure zone assemblies shall have a sufficient air gap at the relief port and discharge shall drain away from the assembly.

E. Double check valve assemblies shall be equipped as standard with four (4) test cocks and two (2) resilient seated shut off valves.

F. Valve may be coated with six (6) to eight (8) mils of fusion bonded epoxy in accordance with AWWA/ANSI C550 and C121/A21.16.

G. Valve may have an exterior manufacturer applied universal phenolic primer (one mil) capable of accepting an epoxy coating. Finish coat shall be in accordance with Division III, Section 12.

Acceptable Manufacturers – Product

1. Watts - Double Check (3/4” to 2”): U007QT.
2. Watts - Double Check (3” to 10”): 709 or 757 w/OSY Valves.
3. Wilkins - Double Check (3” to 10”): 350A or 950 w/OSY Valves.
4. Conbraco/Apollo – Double Check (3/4” to 2”): 40-100 T Series.
5. Conbraco/Apollo – Double Check (3” to 10”): 4S DC Series w/OSY Valves.
6. Conbraco/Apollo – Double Check (3” to 10”): 4D-100 Defender w/OSY Valves.
7. Watts - Reduced Pressure Zone Check Valve (3/4” to 2”): 909S-QT.
8. Watts - Reduced Pressure Zone Check Valve (3” to 6”): 909 w/OSY Valves.
9. Wilkins - Reduced Pressure Zone Check Valve (3” to 6”): 375 or 975 w/OSY Valves.
10. Conbraco/Apollo – Reduced Pressure Zone (3/4” to 2”): 40-200 T Series.
11. Conbraco/Apollo – Reduced Pressure Zone (3” to 4”): 40-200 w/OSY Valves.
12. Conbraco/Apollo – Reduced Pressure Zone (6” to 10”): 4S-RP w/OSY Valves.
13. Other Approved.

5.04 Corporation Valve

A. Corporation valves shall be of the ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.

B. Corporation valves shall withstand a working pressure of 150 psi.

C. Corporation valves shall have crosscut threading, for direct tap into pipe, and a flared copper outlet.

D. Corporation valves shall be ¾ inch or one (1) inch in size as required by the service.

Acceptable Manufacturers

Corporation valves shall be domestically manufactured.

1. Ford Meter Box Co.
2. Mueller Brass.
3. A.Y. McDonald Mfg.
4. Other Approved.

5.05 Curb Stop

A. Curb stops shall be of the ball valve type and manufactured of bronze in conformance with ASTM B61, ASTM B62 and NSF 61.

B. Curb stops shall withstand a working pressure of 150 psi.

C. The internal ball shall be manufactured of low carbon steel coated with brass.

D. Internal O-rings and seats shall be of Buna-N.

E. Curb stops shall be fitted with iron pipe threads on the influent side and flared copper on the discharge side.

F. Curb stops shall be fitted with wing locks suitable to accept a keyed padlock.

G. Curb stops shall be ¾ inch, one (1) inch or two (2) inches in size as required by the service.

Acceptable Manufacturers

Curb stops shall be domestically manufactured.

1. Ford Meter Box Co. for ¾ inch and 1 inch sizes.
2. Mueller Brass.
3. A.Y. McDonald Mfg.
4. Other Approved.

5.06 Plug Valve

A. Plug shall be as follows.

1. Eccentric plug (non-lubricated) having a standard port design.

2. Plug shall be cast iron in accordance with ASTM A126.

3. Plug shall have a resilient facing of carboxylic acrylonitrile butadiene or chloropene.

B. Valve shall be generally comprised as follows.

1. Body shall be cast iron, Class B, in accordance with ASTM A126.

2. Seat shall be nickel, raised and welded to the body.

3. Bearings shall be oil impregnated permanently lubricated stainless steel Type 316 in accordance with ASTM A743 Grade CF-8M.

4. Packing shall be acrylonitrile butadiene V-type.

C. End connections shall be as follows:

1. Non-buried service shall have flanged ends having an ANSI 125/150 pound rating standard face and drilled.

2. Buried service shall have standard mechanical joint ends in accordance with AWWA C111-64 with retaining gland that acts as a restraining mechanism.

D. Actuator type shall be as follows:

1. Non-buried service shall have G-series worm gear with 8-inch diameter hand wheel actuator input, clockwise to close.

2. Buried service shall have G-series worm gear for buried service, with 2-inch square nut actuator input, clockwise to close.

E. Valve interior and exterior surfaces shall have one (1) coat, 4 to 5 mils of TNEMEC 140 Pota-Pox Plus epoxy paint, surface preparation of SSPC-SP10.

Acceptable Manufacturers

1. Dezurik.
2. Other Approved.

5.07 Combination Air/Vacuum Release Valve

A. Valve shall automatically release large quantities of air during pipeline filling and automatically allow air to reenter the pipeline when internal pressure of the pipeline approaches a negative value (vacuum). Valve shall automatically release small quantities of air from the pipeline while under normal pressure conditions.

B. Valve shall be suitable for the respective service (water or sanitary sewer) having a working pressure of 150 psi and a test pressure of 225 psi.

C. Valve inlet and outlet shall be sized as required. Where the option permits, ANSI 125 lb. flanged connections shall be utilized.

D. Valve body, cover and baffle shall be cast iron, Class B in accordance with ASTM A126.

E. Seat and orifice button shall be Buna-N.

F. All internal components shall be stainless steel T304 in accordance with ASTM A240, A269, A276 and PH 15-7 MO.

Acceptable Manufacturers
Combination Air/Vacuum Release Valve shall be domestically manufactured.

1. Val-Matic Valve and Manufacturing Corp.
2. Other Approved.

5.08 Valve Box

A. Valve boxes shall be of the two-piece type and manufactured of cast iron.

B. Valve boxes shall have an internal diameter of 5.25 inches.

C. Valve boxes shall be fitted with a cast iron cover with the word “WATER” or “SEWER” integrally cast in the cover depending on the service.

Acceptable Manufacturers
1. Bingham-Taylor.
2. Other Approved.

6.01 Tapping Sleeve

A. Tapping sleeves shall be of the split type and manufactured of ductile iron or stainless steel (preferred). Stainless steel sleeve shall be used when tapping cast iron pipe. Ductile iron shall conform with ANSI/AWWA standards. Stainless Steel shall be type 304 (18-8).

B. Gaskets shall be virgin nitrile (Buna-N, NBR).

C. Sleeve outlet shall be flanged or mechanical joint in accordance with ANSI/AWWA C110/A21.1.

Acceptable Manufacturers – Product

1. U.S. Pipe – T28 on ductile iron main only.
2. Power Seal– Part No. 3490 (stainless steel) on cast iron and ductile iron mains.
3. Smith Blair – Part No. 663 or 665 (stainless steel) on cast iron and ductile iron mains.
4. Ford Meter Box– FTSS (stainless steel).
5. Romac for 1-1/2 inch and 2 inch taps.
6. Other Approved.

6.02 Tapping Saddle

A. Tapping saddles shall be stainless steel. Ductile iron shall conform with ANSI/AWWA standards. Stainless Steel shall be type 304 (18-8).

B. Stainless steel saddles shall be used when tapping for 1-1/2 inch or 2 inch service lines.

C. Tapping saddles shall seal with pipe by an O-ring gasket virgin nitrile (Buna-N, NBR).

D. Saddle outlet to pipe shall be flanged or tapped with pipe threads.

Acceptable Manufacturers - Product

1. Smith Blair - 313 with 015 stainless steel bales (4" to 16") for 2" iron pipe threads.
2. Smith Blair - 366 with 015 stainless steel straps (18" to 40") for 2" iron pipe threads.
3. Smith Blair – 372 for pipe diameters 4 inches through 12 inches.
4. Powerseal – 3412AS for pipe diameters 3 inches through 12 inches.
5. Powerseal – 3416AS for pipe diameters 14 inches through 36 inches.
6. Ford Meter Box– FS 303.
7. Romac - 306 for pipe diameters 3 inches through 12 inches.
8. Romac - 305 for pipe diameters 14 inches through 24 inches.
9. Other Approved.

7.01 Residential and Light Commercial

A. Water meters shall be positive displacement type with oscillating piston or rotating disk having a magnetic drive conforming to AWWA C-700 and a sealed register conforming to AWWA C-707.

B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
5/8	0.25 to 25	98.5% at ¼ gpm
¾	0.75 to 35	97% at 3/8 gpm
1	1.25 to 70	95% at ¾ gpm
1-1/2	2.5 to 120	95% at 1-1/4 gpm
2	2.5 to 170	95% at 2 1/2 gpm

C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.

D. The size of the meter and a flow direction arrow shall be cast in raised figures on the outer casing. The manufacturer's serial number shall be permanently affixed to the outer case and shall be visible from the topside.

E. The sealed register shall be of the straight reading type and have a full test dial on the face. The register shall be fitted with an external or internal locking device so that the register can only be removed with specialized tools.

F. Meters shall have a corrosion resistant strainer that is easily removed without the meter itself being disconnected from the service line.

G. The register shall measure flow in gallons and shall be read by visual inspection and remote data relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.

H. Meter connections to 5/8 inch and one (1) inch service lines shall be with a meter spud. Meter connections to 1-1/2 inch and two (2) inch service lines shall be with a two (2) bolt flange.

Acceptable Manufacturers

1. Badger Meter, Inc.
2. Other Approved.

7.02 Commercial and Industrial

A. Water meters shall be Class I or II turbine type with magnetic drive, reduction gearing and straightening vanes conforming to AWWA C-700 and the register shall be permanently hermetically sealed conforming to AWWA C-707.

B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
* 1-1/2	4 to 200	98.5% at 2.5 gpm
* 2	4 to 310	95% at 2.5 gpm
3	5 to 550	95% at 4 gpm
4	4 to 1,250	95% at 2.5 gpm
6	4 to 2,500	95% at 2.5 gpm
8	4 to 4,500	95% at 2.5 gpm
10	4 to 7,000	95% at 2.5 gpm

* For fire service in building and irrigation service only.

C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.

D. The size and model of the meter and a flow direction arrow shall be cast in raised figures on both sides of the outer casing. The manufacturers serial number shall be permanently affixed to the outer case and shall be visible from the topside.

E. Meters shall have a separate measuring chamber that shall be easily removable from the outer case. The measuring chamber shall be constructed of Water Works bronze (minimum 85% copper content).

F. The register shall be of the straight reading type and have a full test dial on the face. The register shall be fitted with an external or internal locking device so that the register can only be removed with specialized tools.

G. The register shall measure flow in gallons and shall be read by visual inspection and remote data relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.

H. The meter shall have internal straightening vanes installed on the meters inlet. The straightening vanes shall be easily removable. The straightening vanes shall not be cast as part of the main case or molded as part of the measuring chamber.

I. The meter shall be equipped with either an internal or external strainer as shown in the following table and detailed in items “K” and “L”.

METER STRAINER SIZE (in)	STRAINER CONFIGURATION
1-1/2 to 4	Internal with Test Port
1-1/2 to 4	External Bronze
6 to 10	External Ductile Iron/Cast Iron

J. Where meters are equipped with an internal strainer, the strainer shall be cast as part of the meter’s main case. The internal strainer screen and cover plate shall be located at the meter’s inlet between the inlet flange and measuring chamber. The internal strainer screen shall be of the V-shape design and externally accessible without disturbing the meter’s pipeline setting or measuring chamber assembly. A test port of adequate capacity shall be located on the meter’s main case adjacent to the outlet flange. The strainer shall be listed by UL and approved by FMR.

K. Where meters are equipped with an external strainer, the strainer and cover plate shall be located at the meter's inlet between the inlet flange and measuring chamber. The strainer screen shall be of the V-shape design and accessible without disturbing the meter's pipeline setting or measuring chamber assembly. The strainer shall be listed by UL and approved by FMR.

L. Meter connection to the service line shall be flanged, Class 125# and conform to ANSI 16.1 for diameter, drilling pattern and thickness. Where companion flanges are required, flanges shall be cast iron and tapped with American Standard internal taper pipe threads. Bolts, nuts and gaskets associated with companion flanges shall be provided for connection to the meter only.

Acceptable Manufacturers

1. Badger Meter, Inc.
2. Other Approved.

7.03 Fire Service

A. Water meters shall be Class II turbine type with magnetic drive, reduction gearing and straightening vanes conforming to AWWA C-703 and the register shall be permanently hermetically sealed conforming to AWWA C-707.

B. Meters shall be capable of operating up to a working pressure of 150 psi and have an operating flow range shown on the following table.

SIZE (in)	OPERATING FLOW RANGE (gpm)	LOW FLOW REGISTRATION
4	10 to 1,250	95% at 6 gpm
6	20 to 2,500	95% at 15 gpm
8	30 to 4,500	95% at 20 gpm
10	50 to 7,000	95% at 30 gpm

C. Meter outer case shall be constructed of Water Works bronze (minimum 75% copper content) and shall be split case. External fasteners shall be corrosion resistant.

D. The size and model of the meter and a flow direction arrow shall be cast in raised figures on both sides of the outer casing. The manufacturers serial number shall be permanently affixed to the outer case and shall be visible from the topside.

E. Meters shall have a separate measuring chamber that shall be easily removable from the outer case. The measuring chamber shall be constructed of Water Works bronze (minimum 85% copper content).

F. The register shall be of the straight reading type and have a full test dial on the face. The register shall be secured by means of a locking device located in the interior of the outer case so that the register can only be removed with specialized tools.

G. The register shall measure flow in gallons and shall be read by visual inspection and remote data relay. The electronic register shall be provided to function with reading devices as manufactured by Itron, Inc.

H. The meter shall have internal straightening vanes installed on the meters inlet. The straightening vanes shall be easily removable. The straightening vanes shall not be cast as part of the main case or molded as part of the measuring chamber.

I. The meter shall be equipped with an external strainer as listed by UL and approved by FMR. The strainer assembly shall be ductile iron and located upstream of the meter's inlet flange. The strainer screen shall be stainless steel and V-shape design. The strainer screen shall have a net open area at least four (4) times that of the pipe opening. The strainer screen shall be accessible without disturbing the meter's pipeline setting or measuring chamber assembly.

J. Meter connection to the service line shall be flanged, Class 125# and conform to ANSI 16.1 for diameter, drilling pattern and thickness. Where companion flanges are required, flanges shall be cast iron and tapped with American Standard internal taper pipe threads. Bolts, nuts and gaskets associated with companion flanges shall be provided for connection to the meter only.

Acceptable Manufacturers

1. Badger Meter, Inc.
2. Other Approved.

7.04 Fire/Domestic Combination Service

A. The fire portion of the combination service shall comply with Division III, Section 7.03.

B. The domestic portion of the combination service shall comply with Division III, Section 7.01 and be accomplished via by-pass piping. By-pass piping shall be brass with threaded connections. Domestic service piping shall be 1-1/2 inches in diameter for a four (4) inch fire service. Domestic service piping shall be two (2) inches in diameter for a six (6) inch and larger fire service.

C. The by-pass assembly shall be fitted with a bronze bodied check valve situated immediately downstream of the meter. The check valve shall be UL listed and approved by FMR. The use of electronic switching devices or spring loaded check valves shall be prohibited.

D. The by-pass assembly shall be fitted with two (2) lockable bronze bodied ball valves; one (1) situated upstream of the meter and one (1) situated downstream of the check valve.

7.05 Water Meter Boxes (Residential and Light Commercial)

A. Meter assemblies ranging in size from 5/8 inch to two (2) inches shall be housed in meter boxes manufactured from high-density polyethylene or fiber reinforced plastic.

B. Meter box lids shall be fiber reinforced plastic. Minimum outside dimensions of the lid shall be 16-5/8 inches by 11-7/16 inches. Down legs on each corner shall be a minimum of 1-1/2 inches long.

Acceptable Manufacturers

1. D/FW Plastics.
2. CDR – 24 inches by 60 inches for 1-1/2 inch and 2 inch meter assemblies.
3. Other Approved.

7.06 Water Meter Vaults (Commercial and Industrial)

A. Vaults shall be constructed of concrete block, pre-cast concrete or cast-in-place concrete (preferred).

B. Vaults shall be designed to withstand a minimum H-10 Line Load. Additional design strength may be required.

C. Vaults for 3-inch through 6-inch meter/back flow assemblies shall be sized to the following inside dimensions: 8 ft x 8 ft x 6 ft (min.) depth and 12 ft x 8 ft x 6 ft (min.) depth. Vaults for meter/back flow assemblies larger than 6-inch shall be sized accordingly while maintaining minimum clearances as shown on applicable details.

D. Meter vaults shall have a minimum six (6) inch thick concrete reinforced base slab. A 12 in x 12 in drain opening shall be cast in the slab. The drain shall be serviced by a 12 inch bed No. 57 stone wrapped with geofabric. The bed of No. 57 stone shall extend to the edges of the excavation.

E. Where vaults are constructed of concrete block, the block shall be 8”x12”x16” in size. Each block wall cell shall be reinforced vertically to a minimum with a No. 5 bar, tied to the slab reinforcing. Block cells shall be filled with a minimum 3,000 psi grout. Longitudinal joints between blocks shall be reinforced with wire.

F. Where vaults are constructed of pre-cast or cast-in-place concrete, the walls shall be a minimum of six (6) inches thick and steel reinforced. Wall reinforcing shall be tied to the slab reinforcing.

G. Vaults shall be covered with a removable pre-cast concrete cover. The cover shall be a minimum of six (6) inches thick and steel reinforced. Cover shall be sealed to top of walls using neoprene gasket material.

H. Where two (2) pre-cast vaults are situated together to form one (1) larger vault, each of the two (2) vaults shall have their separate cover.

I. An aluminum access hatch, minimum 48 inches by 72 inches in size shall be cast in the cover slab. The access hatch shall be situated as shown on details.

J. Bottom side of the meter assembly shall have a minimum twelve (12) inch clearance from the top of the floor slab.

K. Meter assembly shall be supported at a minimum of two (2) points by galvanized pipe saddles. Backflow assembly shall be supported at a minimum of one (1) point by galvanized pipe saddles. Pipe saddles shall be capable of carrying the weight of the assembly. Pipe saddle height shall be adjustable via screw jack. Pipe saddle shall have a minimum four (4) inch square base, one-quarter (1/4) inch thick.

L. Pipe penetrations (annulus between concrete and outside face of pipe) shall be sealed with a mechanical type rubber modular seal or seal approved by the CCWA Engineer.

M. Vault cover shall extend three (3) inches above finished grade.

Acceptable Manufacturers
1. As Approved.

7.07 Vault Access Hatches

A. Vault access shall be via aluminum double hatch having a minimum clear opening of 48 inches by 72 inches. Clear opening dimensions may be increased.

B. Access shall be rated to withstand a minimum H-10 Line Load. Design strength of access hatch may be increased.

C. Access hatch shall have a manual locking arm device to prevent hatch lids from closing.

D. Access hatch shall be capable of being secured using a keyed lock.

Acceptable Manufacturers
1. As Approved.

8.01 Fire Hydrant

A. Fire hydrants shall be of the compression type, closing with line pressure, complying with AWWA C502 for 150 psi working pressure and NFPA, 1993 edition.

B. Hydrants shall have a 4-1/2 inch main valve and a non-freeze design with an automatic drain that closes fully when main valve is opened.

C. Hydrants shall be furnished having factory burying depths of 4'-6" or 5'-0". Deeper burying depths shall be accomplished using extension kits provided by same manufacturer. Break-away device shall be situated +/- 3 inches from finished grade.

D. Hydrant standpipe, fittings and upper barrel shall be ductile iron. Parts designed to break away may be cast iron.

E. Hydrant bolts below ground level shall be stainless steel.

F. Hydrant lead to main line connection shall be mechanical joint.

G. The means of attaching the barrel to the standpipe shall permit 360º rotation of the barrel.

H. Hydrant barrel shall break away from the standpipe at an elevation above ground level without causing damage to the standpipe and stem. When barrel is broken away, internal valve shall function and repairs shall be permitted without excavating or turning off water supply.

I. Hydrants shall be bronze mounted and all internal working parts shall be bronze. Valve seat shall screw into retainer.

J. Internal working parts shall be removable without disturbing the barrel.

K. The operating nut situated atop the hydrant shall be hexagonal and constructed of ductile iron or cast iron and open in a counter clockwise direction. The threads shall be enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal lubricated by a grease or oil reservoir.

L. Hydrant shall be equipped with two 2-1/2 inch threaded (7.5 threads per inch) hose connections and one 4-1/2 inch threaded (4 threads per inch) hose connection. Hose and pump connections shall be threaded and pinned to seal the connection to the barrel. Threads shall comply with National Standard Threads. Each connection shall be equipped with a cap and chain.

Acceptable Manufacturers – Product
Approved manufacturers must produce only ductile iron fire hydrants.
1. American - Darling M73.
2. U.S. Pipe - M94.
3. Mueller Company - A421: Ductile Iron Hydrant
4. M&H Valve Company - 129: Ductile Iron Hydrant

8.02 Yard Hydrant

A. Yard hydrant shall be self-draining, non-freeze and operated by lever handle. Lever handle shall be capable of being secured with a keyed lock.

B. Yard hydrant shall be fitted for a standard three-quarter (¾) inch hose connection.

C. Exterior casing shall be schedule 40 galvanized steel and internal operating parts shall be of bronze and the plunger shall be neoprene.

Acceptable Manufacturer - Product
1. Iowa – No. 34.
2. Other Approved.

9.01 General

A. Manholes and wet wells shall be cylindrical and constructed of steel reinforced pre-cast concrete or other concrete structure approved by the CCWA Engineer.

B. Manholes shall have a minimum inside diameter of four (4) feet and be fitted at grade with a cast iron ring and cover.

C. Wet wells shall have a minimum inside diameter of six (6) feet and be accessed via a lightweight cast iron ring and cover.

D. An existing or newly installed manhole intersected by a sanitary sewer force main and the next downstream manhole shall be lined in accordance with Division III, Section 12 "Environmental Coatings".

E. A newly installed lift station wet well and underside of slab over wet well shall be lined in accordance with Division III, section 12 "Environmental Coatings".

9.02 Pre-cast

A. Pre-cast sections shall be manufactured, tested and marked in accordance with ASTM C478.

B. Minimum compressive 28-day strength of concrete in all sections shall be 4,000 psi.

C. Maximum allowable absorption of moisture by concrete shall not exceed 8% of dry weight.

D. Pre-cast sections shall consist of a base section, riser section and eccentric cone top or flat slab top section, as conditions require. Top cone section of manhole housing an air release valve shall be concentric. The sections shall form a continuous uniform assembly.

E. Joints between each section shall be tongue and groove type sealed with a preformed gasket meeting requirements of Federal Specification SS-S-00210, “Sealing Compound, Preformed Plastic for Pipe.

F. Each section shall have not more than two (2) holes for purposes of handling. The holes used for handling shall be tapered and shall be plugged with rubber stoppers or grout after installation.

G. Pipe openings in sections shall be fitted with an integrally cast flexible rubber boot or other approved flexible joint connector. A manufacturer supplied stainless steel band shall be used to seal boot to pipe.

H. Manhole sections shall be fitted with solid cast iron steps of standard pattern conforming to ASTM A-48 or polypropylene plastic coated steel steps conforming to ASTM A615 and ASTM D-4101 and shall be integrally cast into manhole sections. Steps shall be twelve (12) inches wide and spaced at 1'0" on center.

I. Wet well sections shall not be fitted with steps.

J. Manhole base section's invert shall be constructed of cast-in-place concrete or brick and mortar. Invert shall have a "U" shaped channel that matches inverts of the influent and effluent pipes. Invert shelf above "U" shaped channel shall have a minimum 12:1 slope.

9.03 Pre-cast "Dog House"

A. Pre-cast "Dog House" Manholes shall comply with this section.

B. Dog house opening shall be pre-cast by the manufacturer. Field cutting-in dog house opening shall be prohibited.

C. Size of dog house opening shall be as recommended by the manhole manufacturer.

D. Annulus between pipe and opening shall be grouted water tight with non-shrink grout.

9.04 Brick and Mortar

A. Brick used as part of manhole construction shall be either solid or cored, medium hard or better, Grade MA conforming to ASTM C-32 for sewer and manhole brick.

B. Mortar used as part of manhole construction shall be comprised of one (1) part Portland cement to two (2) parts clean sand. The sand shall conform to ASTM C-144.

C. Water shall be clean, potable and free from deleterious amounts of alkalis, acids and organic matter.

9.05 Frames and Covers

A. Manhole rims, toe pockets, frames and covers shall be cast iron conforming to ASTM A-48 for Class 30 Gray Iron Castings.

B. Manhole frames and covers shall be a nominal twenty-four (24) inches in diameter and weigh not less than 340 pounds.

C. Manhole covers shall have the word “WATER” or “SEWER”, according to the service, cast on top in letters two (2) inches high.

D. Manhole frames and covers shall be thoroughly cleaned and painted or coated with a bituminous paint. Defective castings that have been plugged or otherwise treated shall not be used.

E. Manhole covers required to be bolt-down shall be secured with not less than four (4) stainless steel bolts as provided by the manufacturer.

F. Covers situated in paved areas shall be raised to finished grade using no more than five (5) courses of brick and mortar.

G. Covers situated in non-paved areas shall be integrally cast in the top cone section.

Acceptable Manufacturers

1. As Approved.

10.01 Concrete Design

A. Concrete mix design shall be in accordance with ACI 318-89.

1. 28-Day Strength: 4,000 psi, unless otherwise noted.
2. Type: Normal Weight.
3. Slump Range: 3 inch to 5 inch.
4. Weight: 135 pcf to 160 pcf.
5. Air Content: 5% to 7%.
6. Water-Cement Ratio: 0.45 Maximum.
7. Fly Ash: Do Not Use.
8. Chlorides: Do Not Use
9. The use of admixtures shall require the approval of the CCWA Engineer.

B. Concrete materials shall be in accordance with applicable ASTM standards.

1. Portland Cement: Meeting ASTM C150, Type I, natural color, domestic manufacturer. Use only one brand of cement throughout project.
2. Fine Aggregates: Meeting ASTM C33-86.
3. Coarse Aggregates: Meeting ASTM C33-86, No. 57 Stone.
4. Water: Clean, potable and free from deleterious amounts of alkalis, acids and organic matter.

10.02 Reinforcement

A. Reinforcement bars shall be in accordance with ASTM A615, Grade 60, deformed.

B. Welded wire fabric shall be in accordance with ASTM A185. Use size as indicated on drawings.

C. Bar supports, chairs and spacers shall comply with the CRSI Manual for Placing Reinforcing Bars.

D. Reinforcement shall be secured in proper position using No. 16-1/2 or No. 16 gauge black soft-annealed wire.

10.03 Formwork

A. Forms shall be as follows.

1. Pre-engineered steel.
2. Pre-engineered reinforced fiberglass.
3. Lumber: No. 2 Southern Yellow Pine.
4. Plywood for exposed finish: HDO-EXT-APA overlay plywood or B-B Plyform-EXT-APA.
5. Plywood for unexposed finish: C-C EXT-APA.
6. Earth, provided earth is dry, level and stable.

B. Form ties shall be break-back type with 5/8 inch removable vinyl sleeve or one (1) inch diameter break-back cone type.

10.04 Curing and Sealing Compounds

A. Moisture retaining cover shall meet ASTM C171-69 (1980): Waterproof paper, polyethylene film or burlap.

B. Curing and sealing compound shall meet ASTM C309-81, Type 1, Class B: Clear acrylic base.

10.05 Epoxy Bonding Agent

A. The use of an epoxy, bonding agent shall require the approval of the CCWA Engineer.

B. A bonding agent shall be used during the placement of reinforcing steel into existing concrete and shall be of a two (2) component, 100% epoxy resin adhesive system.

10.06 Acrylic Latex Bonding Agent

A. The use of an acrylic, latex, bonding agent shall require the approval of the CCWA Engineer.

B. A bonding agent shall be used as an aid in applying a concrete surface patch or finish to existing concrete and shall be an acrylic polymer emulsion base chemical bonding system.

Acceptable Manufacturers

1. As Approved.

11.01 Mortar and Grout Materials

A. Portland Cement shall meet ASTM C150, Type I, natural color, domestic manufacturer. Use only one brand of cement throughout project.

B. Masonry Cement shall meet ASTM C91-89, non-staining, 22% maximum air content by volume.

C. Hydrated Lime shall meet ASTM C207-79 (1988), Type S.

D. Aggregates for mortar shall meet ASTM C144-87 and ASTM C404-87, size 2 natural and shall be clean, hard and washed sand.

E. Aggregates for cement grout shall meet ASTM C404-87, fine aggregate, size 1.

F. Water reducing and plasticizing admixtures are acceptable.

G. Admixtures containing calcium chloride shall be prohibited.

H. Water shall be clean, potable and free from deleterious amounts of alkalis, acids and organic matter.

I. Non-shrink Grout: Submit products for approval by CCWA Engineer.

11.02 Mortar and Grout Proportions

Proportion materials by volume in accordance with ASTM C270-88a or as follows.

A. Mortar: One (1) part Masonry cement to ½ part Portland cement to aggregate proportioned at not less than 2-1/4 nor more than three (3) times the volume of cementious material used.

B. Grout: One (1) part Portland cement and ¼ to ½ parts hydrated lime to aggregate, proportioned at not less than three (3) times the combined volume cement and lime used.

11.03 Concrete Masonry Units

A. Concrete masonry units shall be in accordance with ASTM C90-85, light weight, Grade N, Type 1.

B. Concrete masonry units shall have a nominal face dimension of 8”x 8”x16” or 8”x12”x16”.

C. Concrete masonry units shall have a minimum compressive strength of 2,500 psi, based on net area.

D. Concrete masonry units damaged in any manner shall not be used.

11.04 Joint Reinforcement

Horizontal joints between concrete masonry units shall be reinforced as follows.

A. Use cold drawn wire meeting ASTM A82-88.

B. Longitudinal rods shall be nine (9) gauge galvanized deformed wires with nine (9) gauge galvanized cross wires welded to form triangular style pattern.

C. Width of reinforcement shall be two (2) inches less than the total wall thickness.

D. Provide reinforcement in ten (10) foot lengths with prefabricated corners and tees at intersecting walls of same design and finish.

Acceptable Manufacturers
1. As Approved.

12.01 Materials Requiring Coatings

A. Materials for buried surface shall be coated as indicated in their respective section.

B. The following materials shall have exterior coatings manufacturer applied or field applied.
   1. Piping and appurtenances
   2. Supports
   3. Pumps
   4. Valves
   5. Equipment and appurtenances

C. The following materials shall be lined by the manufacturer or field applied:

   1. Manhole intersected by a sanitary sewer force main and next downstream manhole.
   2. Lift station wet well and slab area above wet well.

12.02 Coating Schedule

A. Non-Submerged Ferrous Metal
   Minimum Surface Preparation: SSPC – SP6
   Generic System Type: Aliphatic Polyurethane

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	3.0	P-14	2.0	#69
2	3.0	Armorgaurd	2.0	#69
3	2.0	5500	2.0	#74

B. Submerged Ferrous Metal
Minimum Surface Preparation: SSPC – SP10
Generic System Type: Polyamide Epoxy

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	5.0	PE-54	5.0	#20 P-Pox
2	5.0	PE-54	5.0	#20 P-Pox

C. Non-Submerged Non-Ferrous and Galvanized Metal
Minimum Surface Preparation: SSPC – SP6 (non-ferrous); SP1 (galvanized)
Generic System Type: Aliphatic Polyurethane

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	0.5	VW Prime	5.0	#69
2	2.0	5500	2.0	#74

D. Submerged Non-Ferrous and Galvanized Metal
Minimum Surface Preparation: SSPC – SP10 (non-ferrous); galvanized per coating manufacturer. Generic System Type: Polyamide Epoxy

Coat No.	Induron		Tnemec	
	DFT	Product	DFT	Product
1	0.5	VW Prime	5.0	#69-1211
2	5.0	PE-54	5.0	#69

Acceptable Manufacturers

1. Induron.
2. Tnemec.
3. As Approved.

12.03 Manhole and Wet Well Lining

A. Line existing concrete manhole with a modified aliphatic amine epoxy mortar or aggregate filled epoxy coating system or other coating system approved by the CCWA Engineer.

B. Materials required for concrete surface preparation/restoration, lining and finishing shall be supplied by the same manufacturer.

C. Line new manhole, wet well and underside of slab over wet well with an integrally cast polyvinyl chloride or high density polyethylene liner.

Acceptable Manufacturers - Product

1. Tnemec - Chembloc H2S (existing manhole coating system0.
2. Sauereisen - Sewergard 210, 210S, 210RS (existing manhole coating system).
3. A-LOK Products, Inc. - Duraplate 100 (new manhole, wet well, slab integrally cast liner).
4. Agru America - AGRU Sure Grip (new manhole, wet well, slab integrally cast liner).
5. As approved.

13.01 Stabilization Stone

A. Stabilization stone shall be No. 57 size and conform to ASTM C33-78 unless noted otherwise.

B. Maximum stone size shall be 1-1/2 inches unless noted otherwise.

C. Stone shall be clean, tough, uniform quality, durable fragments of crushed rock, free from flat, elongated, soft or disintegrated pieces, or other objectionable matter occurring either free or as coating on stone.

13.02 Detectable Underground Utility Marking Tape

A. Tape shall have a minimum overall thickness of 5 mils in accordance with ASTM D2103 and a width as follows.

1. 2-inch width for pipes up to 12 inches in diameter.

2. 3-inch width for pipes 14 to 24 inches in diameter.

3. 6-inch width for pipes 30 and 36 inches in diameter.

B. Tape shall have a 0.35 mil solid aluminum foil core with a reverse print laminate to the aluminum foil.

C. Tape shall have a tensile strength of 35 pounds per inch in accordance with ASTM D882.

D. Tape shall be color-coded in accordance with the American Public Works Association as follows.

1. “Blue” for potable water and associated lines.

2. “Green” for sanitary sewer and associated lines.

Acceptable Manufacturers
As Approved.

13.03 Other Materials

Materials not covered in Division III, Material Requirements, shall be in accordance with the approved plans.

1.01 Contractor License

A. A licensed Utility Contractor shall install any underground utility or component thereof.

B. Prior to commencing construction activities on a CCWA approved project, the CCWA Engineer shall receive a copy of the Utility Contractor's License.

1.02 Utility Notification

A. The Official Code of Georgia, Title 25, Chapter 9 requires that utilities be located in the proposed work area prior to commencing any clearing, grading or excavation activity.

B. The Utilities Protection Center can be reached at (770) 623-4344 or 1-800-282-7411.

C. The Utilities Protection Center shall be notified at least three (3) business days prior to commencing work.

1.03 Work Commencement

A. Clearing and grubbing activities shall not commence on any project until Clayton County T & D has issued a Land Disturbance Activity Permit.

B. Work on a water distribution system and/or sanitary sewer system shall not begin until the CCWA approves the development plans.

C. The CCWA Engineer shall receive a 48-hour notice prior to commencing construction activities on a water distribution system and/or sanitary sewer system.

D. A set of plans stamped approved by the CCWA shall be present on the job site during all phases of construction of the water distribution system and/or the sanitary sewer system.

E. The installation of water distribution piping shall not begin until curb and gutter has been installed.

1.04 Miscellaneous Standards

Construction standards not covered in Division IV, Construction Standards, shall be in accordance with the approved plans. Construction should comply with the Department of Labor, Occupational Safety and Health Administration, 29 Code of Federal Regulations Part 1926, Subpart P, revised July 1, 1995.

2.01 General

A. Work covered by this section shall include all labor, equipment and accessories required to distribute material.

B. All materials installed as part of an extension to the existing water distribution system and sanitary sewer system shall be new.

2.02 Delivery

Equipment and facilities shall be furnished for unloading and distributing pipe, equipment and materials.

2.03 Handling

A. Pipe shall be handled by use of forklift or excavator using choker straps or cable.

B. Any pipe, equipment or material dropped or dumped during handling procedures shall be subject to rejection by the CCWA without further justification.

2.04 Storage

A. Pipe shall not be strung more than 1,000 feet beyond the point where pipe is being laid.

B. Drainage ditches shall not be obstructed.

C. Necessary arrangements shall be made to store pipe, fittings, valves and accessories that cannot be distributed along the route.

2.05 Maintenance and Protection

A. The contractor shall be responsible for maintenance and protection of all pipe, equipment and material.

A. All equipment shall be boxed, crated or otherwise completely enclosed and protected during transportation, handling and storage.

C. Equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material.

D. All equipment shall be protected from exposure to elements and shall be kept dry at all times.

E. Pumps, motors, valves, control panels, instrumentation, electrical equipment and other equipment having anti-friction or sleeve bearings shall be stored in a weather-tight enclosure which is maintained at a minimum air temperature of 60°F.

F. Any pipe, equipment or material damaged by impact, vibration, abrasion, discoloration or other damage shall be repaired in accordance to manufacturer instructions or replaced at the discretion of the CCWA.

3.01 Clearing and Grubbing

A. Prior to commencing clearing activities, areas designated by the plans to be cleared shall be demarcated using survey ribbon, stakes or other suitable means.

B. In areas to be cleared, all trees, stumps, buried logs, brush, grass and other unsatisfactory materials shall be removed.

C. Trees to remain in or near work area shall be protected from clearing activities.

D. All damaged trees over three (3) inches in diameter shall be repaired by an experienced nursery expert.

E. Tap roots and other projections exceeding 1-inch in diameter shall be grubbed out to a depth of at least 18 inches.

F. All holes remaining after grubbing activities shall be filled with suitable material and properly compacted in layers to density required for in-place backfill.

G. All materials cleared and grubbed shall be disposed of off-site in accordance with applicable local, state and federal regulations.

H. Burning of any material or debris shall not be permitted on CCWA property.

I. Prior to and upon completion of clearing and grubbing activities, install erosion control and sedimentation measures as identified on the Erosion Control and Sedimentation Plan prepared by the Design Engineer.

J. Prior to commencing any other job site activity, installed erosion control and sedimentation measures shall be inspected and approved by Clayton County T & D.

3.02 Topsoil Stockpiling

A. Remove topsoil to full depth encountered in areas to be graded and stockpile soil and install erosion control devices as indicated on drawings.

B. Soil shall be placed such that the integrity of an excavation or proposed excavation is not jeopardized.

C. Soil shall not be stockpiled against tree trunks.

D. Stockpile shall be shaped to drain.

3.03 Removing Pavement

A. Removal of pavement shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies.

B. Pavement shall be marked squarely and neatly to size of excavation.

C. Pavement shall be scored and broke along the marked lines using a rotary saw and jackhammer. Pavement shall not be machine pulled for initial brake.

D. Upon removal, pavement shall be loaded and disposed of off-site.

E. Adjacent pavement damaged during construction shall be removed as described above.

F. Driveways and sidewalks shall be removed to their full width from the edge of curb or road pavement to the nearest construction/control joint.

G. Curbs shall be removed for the entire length from control joint to control joint.

4.01 Soil Excavation

A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.

B. Excavated soil shall be placed in a location such that the integrity of the excavation is not jeopardized.

C. Excavation walls shall be sloped or stepped in accordance with recognized industry standards.

D. The Contractor shall assume the responsibility for design and construction of excavation shoring and bracing capable of supporting excavations and construction loads.

E. The excavation shall provide space for foundation work and inspection.

F. Excavations shall be covered in accordance with applicable regulations and/or barricaded and roped-off with identifying tape during work progress.

4.02 Rock Excavation

A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.

B. Rock shall be excavated to a minimum depth of six (6) inches below grades indicated on drawings.

C. The Contractor shall be responsible for determining methods required for removal of rock or hard materials.

D. Perform blasting only after receiving written approval from the CCWA Engineer and regulatory agencies.

E. A licensed explosive contractor shall perform blasting operations.

F. Blasting operations shall be conducted in accordance with all local, state and federal regulations.

G. Excavated rock shall not be used as backfill in the pipe trench.

4.03 Pipe Trench Excavation

A. Pipe trenching shall comply with excavation and rock excavation specifications.

B. Trench should be excavated to natural undisturbed soil.

C. Where unsuitable material is encountered, over excavate through unsuitable material and backfill to required grade with No. 57 stone. The CCWA Inspector shall determine depth of over excavation.

D. Where encountered, remove rock to a minimum of six (6) inches below required bottom of trench elevation and backfill to required grade with No. 57 stone.

E. Bottom of trenches shall be prepared so that the entire length of the pipe barrel is supported.

F. Maintain trenches dry at all times using pumps, well points or other dewatering means.

G. Limit trenching to not greater than 300 feet ahead of completely backfilled work.

H. In populated areas, cover or barricade open trenches until completely backfilled.

I. Open trenches shall be made safe at all times.

5.01 Pipe Bedding

A. PVC sewer shall be laid atop a minimum of four (4) inches of No. 57 stone. No. 57 stone shall be extended to the top of pipe. Stone shall be shovel sliced from beneath the pipe up to one-half (½) the pipe diameter.

B. DIP may be laid atop undisturbed suitable soil.

C. Valves shall be laid atop a minimum of eight (8) inches of No. 57 stone. No. 57 stone shall be extended up to one-third (1/3) the valve diameter. Stone shall extend twelve (12) inches in all directions of valve. Stone shall be shovel sliced.

D. Fire hydrants shall be set atop a minimum of eighteen (18) inches of No. 57 stone. Stone shall extend up six (6) inches above drain holes. Stone shall extend eighteen (18) inches to the sides of the hydrant.

E. Yard hydrants shall be set atop a minimum of six (6) inches of No. 57 stone. Stone shall extend up six (6) inches above drain hole. Stone shall extend twelve (12) inches to the sides of the hydrant.

5.02 Pipe, Fitting, Valve and Fire Hydrant Installation

A. Prior to placement, the interior of pipes, fittings and valves shall be cleaned free of dirt and debris.

B. Pipe, fittings, valves and accessories shall not be laid or jointed in water.

C. Pipe, fittings, valves and accessories shall be lowered into their respective positions using an excavator with choker straps or cables. A slight hole shall be dug where pipes are to be jointed to relieve pipe bell of any load. Pipe barrel shall be supported for its entire length.

D. Gravity flow pipe shall be laid to the consistent grade change as indicated on drawings and aligned straight using pipe laser or transit.

E. Pressure flow pipe shall be aligned to follow route. Pipe alignment shall not be deflected greater than 75% of the manufacturer's recommended maximum deflection.

F. Install compression type gaskets in accordance with manufacturer's instructions to ensure proper joint sealing.

G. Pipe shall be jointed in accordance with manufacturer's instructions. The mating ends (bell and spigot) shall be thoroughly cleaned and soaped before jointing. The mating ends shall be aligned and shoved together using a steady force.

H. Connections of fittings, valves and fire hydrants shall be with bolts and nuts as supplied with the component. Upon tightening, a minimum of two (2) bolt threads shall be exposed to ensure proper thread engagement.

I. Retaining gland of mechanical joint shall be evenly spaced from the fitting or valve for its entire circumference upon installation.

J. After jointing pipe, repair any damage to pipe's protective coating in accordance with manufacturer's instructions or replace pipe.

K. Prior to jointing consecutive pipe, backfill previously jointed pipe with sufficient material to prevent movement.

L. Place a plug in the open end of uncompleted laid piping at the end of each day.

M. Any component of a piping system disturbed after installation may be required to be taken up and reinstalled.

5.03 Thrust Blocking

A. Thrust blocking shall be installed at all bends, tees, valves, fire hydrants and points where thrust may develop in pressurized piping.

B. Thrust blocking shall consist of cast-in-place concrete, tie rods, combinations thereof or other method approved by the CCWA Engineer.

C. Cast-in-place concrete blocking shall be formed to the required dimensions and installed against undisturbed earth. Blocking size may be increased based on soil bearing capacity.

D. Concrete shall have a minimum 3,000 psi compressive strength at 28 days.

E. Bolts and nuts shall be protected from concrete coverage.

5.04 Manhole and Wet Well Installation

A. Manholes and Wet Wells shall be set atop a twelve (12) inch bed of No. 57 stone that extends a minimum of twelve (12) inches beyond all exterior sides.

B. The bedding of No. 57 stone may be replaced with a six (6) inch layer of steel reinforced cast-in-place concrete.

C. The bed shall be prepared so that the manhole is set level.

D. Manhole sections shall be handled with lifting straps or hooked cables using a minimum of two (2) of the manufactured manhole lifting holes.

E. Manhole sections shall be positioned such that influent and effluent piping enter the center of their respective opening not pinching the rubber boot seal. Pipe shall not rest on invert of opening.

F. Stainless steel boot clamps shall be tightened in accordance with the manufacturer's instructions.

G. Annulus between pipe and rubber boot shall be grouted with non-shrink grout prior to commencing backfill operations.

H. An invert shall be built in each manhole to transition flow from the influent pipe to the effluent pipe.

I. The built invert shall be shaped as a “U” channel and match the inverts of the influent and effluent pipes.

J. Inverts shall be built of cast-in-place concrete or brick and mortar. Note that brick and mortar inverts shall be finished on top with a ½-inch layer of mortar.

K. Prior to jointing consecutive sections, tongue-and-grooved ends shall be cleaned free of dirt and debris.

L. Tongue-and-grooved ends shall be fitted with preformed gasket sealing compound.

M. Manhole sections shall be stacked level and plumb at all times.

N. Manhole sections shall be stacked such that interior steps are vertically aligned.

O. Manhole lifting holes shall be sealed using non-shrink grout throughout the entire depth of hole.

P. Upon bringing manhole to finished grade with brick and mortar (if applicable), set ring and cover with non-shrink grout.

Q. Manholes shall be kept free of dirt and debris.

5.05 Meter Box and Vault Installation

A. Meter boxes shall be installed as follows.

1. Meter box shall be set atop undisturbed or compacted soil. Backfill around box shall be compacted using a hand tamp.

2. Top of meter box shall be set flush with finished grade. Meter box shall not be set in a depression.

3. Soil level within meter box shall be to the bottom of the meter assembly and free of debris.

B. Meter vaults shall be installed as follows.

1. Meter vault shall be bedded atop undisturbed or compacted soil. Backfill around vault shall be compacted in accordance with Division IV, Section 6.

2. Vaults shall be set atop a minimum 12 inch layer of No. 57 stone that extends a minimum of twelve (12) inches beyond the outside face of all walls.

3. The bedding of No. 57 stone may be replaced with a six (6) inch layer of steel reinforced cast-in-place concrete.

4. The stone filled sump beneath vault drain shall be fully encased in a geo-fabric membrane.

5. The bed shall be prepared so that vault is set level.

6. Annulus between pipe and wall openings shall have a flexible water tight seal installed prior to commencing backfill operations.

7. Prior to installing vault cover, abutting ends shall be cleaned free of dirt and debris.

8. Abutting ends of vault and cover shall be fitted with preformed gasket sealing compound.

9. Vault lid lifting holes shall be sealed using non-shrink grout throughout the entire depth of hole.

10. Vault shall be kept free of dirt and debris.

11. Top of vault lid shall be set three (3) inches above finished grade. Vault shall not be set in a depression.

5.06 Borings and Casings

A. Construction shall be performed so as not to interfere with, interrupt or endanger roadway and railway surface and activity thereon, and minimize movement of the surface, structures and utilities above and in the vicinity of the casing.

B. Work shall be coordinated and be in compliance with the appropriate highway and railroad agencies and their policies.

C. Contractor shall monitor ground movement during construction. Contractor shall be responsible for all settlement or up heave resulting from casing operations and shall repair and restore moved or damaged property to its original condition.

D. Work shall not interfere with storm water drainage devices. Storm water and/or groundwater shall be controlled and shall not enter any excavation or boring.

E. Boring and jacking operations shall be performed from an excavation located at one end of the section to be bored. The excavation shall be kept dry at all times.

F. Boring and jacking of casings shall be completed by dry auger boring without jetting, sluicing or wet boring. Free boring (boring without casing) shall be prohibited. The boring diameter shall be essentially the same as the outside diameter of the casing.

G. Boring may be advanced slightly ahead of jacked casing in a manner that will prevent voids forming in the earth around the perimeter of the casing. Horizontal and vertical alignment of the casing shall be frequently checked.

H. When rock is encountered, the Utility Contractor at his option may continue to install the casing by removing the rock through the casing. Should the CCWA or other governing agencies determine the rock cannot be removed through the casing then an alternate means of crossing shall be determined.

I. Casings damaged during installation shall be repaired. Should the damaged casing prevent the installation of the pipe, then that boring and casing shall be abandoned.

J. Casing lengths shall be as long as practical. Jointing shall be accomplished by single grooved butt welding for the entire circumference of the pipe.

K. Casing shall be cleaned free of dirt and debris prior to installing pipe.

L. After casing installation is complete, the proposed pipe can be installed. The pipe shall be installed to proper grade and alignment according to the contract documents.

M. Pipe shall be supported within casing to limit radial movement to a maximum of one (1) inch.

N. A minimum of one (1) spacer shall be provided for each nominal section of pipe. Casing spacers shall be attached to the pipe at a maximum of 18 to 20 foot intervals.

O. The annulus between the pipe and casing, at each end, shall be sealed using brick and mortar.

5.07 Pipe and Valve Identification

A. The marking of utilities immediately after installation is required as detailed in the Official Code of Georgia, Code 25-9 “Georgia Utility Facility Protection Act”.

B. Install mylar detection tape and/or other detectable wire, during backfill operations, above nonferrous pipe or any pipe having more than six (6) feet of cover. Detection tape or wire shall be installed centered, approximately 12 to 18 inches above the pipe.

C. Service lines and valves shall be locatable via marked curbing or other CCWA approved method. Adjacent street curb to service line and valves shall be marked via saw-cut as follows. Curb markings shall be a minimum of four (4) inches in height.

1. “W” for water service location.
2. “V” for water valve location.
3. “S” for sewer service location.

6.01 Backfill

A. Excavations shall be backfilled using suitable material.

B. Place no backfill until any poured concrete has developed design compressive strength.

C. Place backfill against below grade walls in uniform level lifts to prevent wedging action.

D. Backfill shall not be placed on surfaces that are saturated, frozen or containing frost or ice.

E. Place backfill in excavations as follows.

1. Backfill in loose lifts not exceeding 6 inches when compacting using manual tamping devices (jumping jack).

2. Backfill in loose lifts not exceeding 12 inches when compacting using vibrating/ramming devices (sheep-foot vibratory roller).

F. Any settlement shall be filled and compacted to conform with adjacent surfaces.

G. Material remaining after completion of backfill operations shall be disposed off-site.

6.02 Compaction

A. Backfill shall be compacted using manual tamping devices or vibrating/ramming devices.

B. Use manual tamping devices as follows.

1. When area is inaccessible to vibrating devices and within 5 feet of below grade walls (includes manholes).

2. From bottom of pipe trench to twelve (12) inches above the top of pipe.

C. Compaction requirements are as follows.

1. Backfill, beneath and within 10 feet of the building line of any structure, proposed structure or other area determined by the CCWA, shall be compacted for the entire depth to a minimum of 100% of the maximum dry density as determined by a Standard Proctor Analysis.

2. Backfill, beneath any road, walk, proposed improvement or area determined by the CCWA shall be compacted for the entire depth to a minimum of 100% of the maximum dry density as determined by a Standard Proctor Analysis.

3. Backfill in road right-of-way and not described above shall be compacted the entire depth to a minimum of 95% of the maximum dry density as determined by a Standard Proctor Analysis.

4. Backfill not described above shall be compacted for the entire depth to a minimum of 90% of the maximum dry density as determined by a Standard Proctor Analysis.

6.03 Compaction Testing

A. Soil samples from the proposed construction area shall be analyzed for maximum dry density in accordance with ASTM 698 – Method C.

B. The extent of testing required shall be dependent upon soil conditions, Contractor's methods of construction and regulatory requirements.

C. Minimum compaction testing shall be as follows.

1. Backfill in excavations shall be tested at 2-foot lift intervals per 1,000 square feet of fill or as deemed necessary by the CCWA Inspector.

2. Backfill in trench excavations shall be tested at 2-foot intervals per 400 linear feet of fill or as deemed necessary by the CCWA Inspector.

7.01 Grading

A. Grade areas to lines and elevations indicated on drawings or to surrounding surface grades.

B. Graded areas shall be within 0.10 foot of required subgrade elevation and shall not permit the ponding of water.

C. In areas to receive grassing, redistribute stockpiled topsoil over graded areas to a minimum depth of four (4) inches. Provide additional topsoil to achieve required depth.

D. Where finish grade meets or abuts curbs, walks or pavement, uphill grades shall be slightly higher than curb or pavement to permit drainage.

E. Excess soil and debris shall be removed from the jobsite.

F. Stabilize site in accordance with the approved soil erosion and sedimentation control plan.

7.02 Replacing Pavement

A. Existing pavement shall be replaced in accordance to the standards required by Clayton County T & D and/or the Georgia Department of Transportation.

B. Construction shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies.

C. Pavement shall be reinstalled immediately after completing backfill operations and compaction requirements.

D. Driveways and sidewalks shall be replaced to their full width from the edge of curb or road pavement to the nearest construction/control joint.

E. Curbs shall be replaced for the entire length from control joint to control joint.

F. Removed pavement shall be disposed offsite.

G. Use Detail Nos. 28.1 and 29.1 when applicable.

8.01 General

A. The following tests shall be performed as indicated at the expense of the Developer/Utility Contractor.

B. Water distribution systems and/or sanitary sewer systems failing the required tests shall be repaired at the expense of the Developer/Utility Contractor.

8.02 Hydrostatic (Water Main and Force Main)

A. Water distribution piping and force mains shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard C600, latest revision.

B. Combination air/vacuum release valves, corporations and curb stops and fire hydrant shall be installed at the high point of elevation in the pipe line system to release air.

C. Pipe shall be filled with potable water to a pressure of 250 psi and pipe pressure allowed to stabilize.

D. Pressure shall be maintained, without the addition of water, for a minimum period of two (2) hours.

E. Test shall be considered acceptable when a water pressure of 250 psi is maintained for a period of two (2) hours.

8.03 Air Pressure (Gravity Flow)

A. All gravity sewer pipe shall be subjected to a low air pressure test in accordance with Unibell UNI-B-6-90.

B. Pipe shall be free of dirt and debris.

C. During testing, personnel shall not be permitted in manholes connected to pipe being testing.

D. The internal air pressure of the pipe shall be raised to approximately four (4) psi.

E. The test shall begin when the stabilized pressure is at a minimum of 3.5 psi.

F. Test shall be considered acceptable when an air pressure equivalent to the stabilized pressure is maintained for a period of 10 minutes.

8.04 Televising (Gravity Flow)

A. Sanitary sewers shall be televised to ensure integrity.

B. Pipe shall be free of dirt and debris.

C. Televising cable attached to a video monitor shall be directed through pipe to view for the following deficiencies.

1. Cracks in pipe and liner material.
2. Rolled gaskets.
3. Leaking joints.
4. Deviations from line and grade – Sewer pipe shall be viewed from one manhole to the next adjacent illuminated manhole. Pipeline shall show more than three-quarters (3/4) of the opening at the opposite end of the pipeline.
5. Pipe deformations.
6. Other deficiencies.

D. Test shall be considered acceptable when the televised pipe does not reveal the deficiencies indicated in Item C.

8.05 Mandrel (Gravity Flow)

A. Sanitary sewers shall be tested for deformation using a mandrel in accordance with ASTM D 3034.

B. Pipe shall be tested when backfill and compaction are complete.

C. Pipe shall be free of dirt and debris.

D. Chords shall be attached to each end of the mandrel. One chord shall be passed through the section of pipe being tested. One chord shall be used to retrieve the mandrel should the pipe not allow passage.

E. The mandrel shall be sized such that its outside dimension is 5% less than the actual inside diameter of the pipe.

F. Test shall be considered acceptable when mandrel passes freely through pipe.

8.06 Static Water Level (Wet Well)

A. Test wet well for infiltration/exfiltration after receiving field approval of wet well lining installation.

B. Visually inspected wet well for infiltration.

C. Fill wet well with potable water to a level equal to the high water alarm elevation and mark that elevation.

D. Test shall be considered acceptable when a water level drop of less than one-quarter (<1/4) inch is measured after a 24 hour period.

E. Wet well sections exhibiting infiltration/exfiltration shall be replaced.

9.01 General

A. All newly installed water distribution piping and piping affected during construction shall be disinfected in accordance with AWWA C651.

B. All disinfection procedures shall be coordinated with the CCWA inspector.

C. CCWA personnel shall operate existing valves during disinfection procedures.

D. The CCWA shall be involved in disinfecting the following in-place piping.

1. Water mains.
2. Service connections up to and including water meters and back flow prevention devices.

E. The CCWA shall supply an appropriate chlorine solution and complete disinfection procedures.

F. Water for disinfection shall be provided by the CCWA at no expense to the contractor. Excessive use of water during disinfection procedures, as determined by the CCWA, may be reason for charges to be levied against the contractor.

G. Collection and testing of water samples shall be performed by the CCWA.

H. No water piping system shall be placed in service until written approval is received from the CCWA Engineer.

I. The Contractor shall be responsible for preventing soil erosion associated with disinfecting procedures.

9.02 Initial Flushing

A. Prior to disinfection, the Contractor shall flush piping system with sufficient water to create a minimum velocity in the pipe of 2.5 ft/s.

B. Flushing shall be performed by pushing water through a laid section of pipe with one end of section open to the atmosphere above existing grade.

C. Piping shall be flushed until water sampled from the piping yields a turbidity measurement of 0.5 NTUs or less.

D. All piping and components associated with service connections shall be thoroughly flushed with fresh potable water prior to installation.

E. Upon completion of flushing, laid pipe with one end open to atmosphere shall be re-laid to depth indicated in Construction Drawings.

9.03 Chlorination and Flushing

A. The CCWA shall introduce a chlorine solution having a concentration of 50 to 100 milligrams per liter (mg/l) into the water main.

B. Upon introducing the chlorine solution, all valves associated with the water main shall be fully operated to ensure complete disinfection.

C. All piping and components associated with service connections shall be thoroughly flushed with a 200 mg/l chlorine solution.

D. Water main shall have a minimum 25 mg/l chlorine residual after a 24-hour retention period.

E. After the 24-hour retention period, flush heavy chlorinated water from system through fire hydrants. When necessary, the Contractor shall provide sodium thiosulfate to neutralize the chlorine residual. Contractor shall apply sodium thiosulfate in accordance with manufacturer's recommendations.

F. Flushing shall continue until water in main has a residual chlorine concentration of 1 mg/l.

9.04 Disinfection Testing

A. After chlorination and flushing is complete, the CCWA shall collect water samples from the system and perform 24-hour analyses in accordance with the Georgia Rules for Safe Drinking Water.

B. After the initial 24-hour analysis is complete and acceptable, a volume of water determined by the CCWA Inspector shall be flushed from the water system and water samples shall be collected for a second 24-hour analysis.

C. After the second 24-hour analysis is complete and acceptable, the water main may be put into service.

D. Disinfection of the water main shall be repeated until testing is acceptable.

E. Laboratory analyses shall be performed and certified by the CCWA.

10.01 Formwork

A. Formwork shall comply with ACI 347R-94.

B. Contractor shall be responsible for design and construction of concrete formwork capable of supporting construction loads. Forms shall be as follows.

1. Pre-engineered steel.
2. Pre-engineered reinforced fiberglass.
3. Wood.
4. Earth.

C. Construct formwork to lines and elevations as shown on drawings.

D. Construct forms to be removed without hammering or prying against concrete.

E. Plug holes in existing forms to prevent leakage of cement.

F. Clean forms of dirt and debris prior to each use.

G. Form ties shall be as follows.

a. Break-back type with 5/8-inch removable sleeve or 1-inch cone type.

b. For retaining walls and walls below liquid level, provide ties with positive water stop projection at center of wall.

H. Prior to placement of reinforcing steel, apply form release agent to formwork. Release agent shall be evenly applied and compatible with type form being used.

I. Construct bulkheads with shear keys at separation of pours.

J. Shear key width shall be 1/3 of the wall or slab thickness.

K. Removal of formwork shall take place only after concrete has developed sufficient strength to support itself and resist damage during removal.

L. Forms used below grade shall be removed prior to backfill.

10.02 Steel Reinforcement

A. Shop fabricate reinforcement to shape and dimensions as indicated on drawings.

B. Use no bars or wire mesh with kinks or bends not shown on the drawings.

C. Secure reinforcement in forms in accordance with the drawings, ACI 315, ACI 318 and CRSI "Recommended Practice for Placing Reinforcing Bars".

D. Steel reinforcement shall set atop concrete bricks and/or be spaced using steel highchairs. When highchairs are used as a form spacer, the highchair feet shall be plastic dipped.

E. Concrete coverage over reinforcing shall be as follows.

1. Concrete cast against earth .....3 inches.
2. Formed concrete exposed to earth or weather .....2 inches.
3. Slabs and walls exposed to wet conditions.....2 inches.
4 Interior slabs and walls .....¾ inch.

F. Splice reinforcement a minimum of 48 times (x) bar diameter. Mechanical splices shall be prohibited.

G. Steel reinforcement, at the time cement is placed, shall be free of dirt, rust and debris. Reinforcement with flaking rust shall not be used.

H. Conduits and pipes shall have same concrete coverage as reinforcing steel.

I. Tie wire shall be used to secure reinforcing.

J. Joints in wire mesh shall be lapped one wire spacing plus 2 inches. Wire mesh shall have one (1) inch of concrete cover at forms.

10.03 Placement

A. Place concrete in accordance with ACI 301-89, Chapter 8.

B. Place no concrete until all embedded items and reinforcement have been placed in accordance with the plans.

C. A CCWA Inspector shall approve formwork layout and placement of steel reinforcement prior to placing concrete. Provide 24-hour notice prior to placing concrete.

D. Concrete shall not be placed on loose, saturated or frozen soil.

E. Concrete shall not be placed in water unless approved by the CCWA Engineer.

F. Concrete shall be placed only when ambient temperature is at 40º F and rising or place concrete in accordance with ACI 306-R88.

G. During hot weather (>80°F), place concrete in accordance with ACI 305-R89.

H. Saw control joints as soon as concrete can be traveled by foot without leaving impressions. Saw joint depth shall be ¼ of the slab depth.

I. Consolidate all placed concrete with vibrator of suitable vibrations per minute.

J. Do not pull or push concrete with vibrator.

K. Do not drop concrete more than four (4) vertical feet.

10.04 Finishing

A. Screed floor slabs or tops of walls by use of straight edge or screed board.

B. Concrete shall be finished as follows.

1. Interior slab to receive setting bed.....float finish.
2. Interior slab exposed .....trowel finish.
3. Exterior slab exposed .....broom finish.
4. Exterior wall/column exposed .....rubbed finish.
5. Unexposed concrete.....form finish.

10.05 Curing

A. Prevent freshly placed concrete from premature drying and protect from excessive hot or cold temperatures.

B. Maintain freshly placed concrete, without drying, at a relatively constant temperature.

C. Begin curing after placement and finishing of concrete as soon as free water has disappeared from concrete surface.

D. Curing methods shall be by the continuous application of water or by applying a liquid membrane forming curing-sealing compound to the fresh concrete surface.

1. Curing by the continuous application of water shall occur for a period of not less than 72 hours.

2. After application of liquid membrane forming curing-sealing compound, maintain continuity of coating and recoat areas damaged during curing period. Curing period shall be not less than 72 hours.

E. Do not apply liquid curing sealing compound to concrete that is to be finished with a coating material such as paint, flooring material, etc.

DIVISION IV CONSTRUCTION STANDARDS

SECTION 11: ENVIRONMENTAL COATINGS

A. Priming, painting and special coating of all surfaces shall include but are not limited to the following.

1. Piping and appurtenances.
2. Supports.
3. Pumps.
4. Valves.
5. Equipment and appurtenances.
6. Concrete and masonry.
7. Structural and miscellaneous metals.

B. Priming, painting and special coating of all surfaces shall be in accordance with the coating manufacturer's recommendations.

C. A manufacture's representative of the approved coating system shall field approve all surface preparation and coating application when lining manholes and wet wells.

Appendix A — *Georgia EPD Sanitary Sewer Approval Letter*

Georgia Department of Natural Resources

Environmental Protection Division, Watershed Protection Branch
4220 International Parkway, Suite 101, Atlanta, Georgia 30354
404/675-6232

Reply to:
Engineering & Technical Support Program
Phone: 404/675-6233; Fax 404/675-6246

January 3, 2006

Mr. Clifford W. Beroset, P.E.
Clayton County Water Authority
1600 Battle Creek Road
Morrow, Georgia 30260

RE: Clayton County Water Authority
Standard Construction Specifications
Clayton County
EPD Project No. 25-541

Dear Mr. Beroset:

The Georgia Environmental Protection Division has completed its review of the revised Clayton County Water Authority Standard Construction Specifications. All of our comments have now been satisfactorily addressed. We are returning one copy of the approved standard construction specifications for your use and are retaining an additional copy for our files.

If you have any questions or concerns please feel free to contact me at (404) 675-1656 or via email reginald_williamson@dnr.state.ga.us.

Sincerely,

Reginald Williamson

Reginald Williamson, Engineer
Engineering & Technical Support Program

cc: M. Wade Brannan, General Manager, Clayton County Water Authority
Terray R. Hicks, Deputy Manager, Clayton Water Authority

Appendix A *Georgia EPD Water Distribution Approval Letter*

Georgia Department of Natural Resources

2 Martin Luther King Jr. Drive, S.E., Atlanta, Georgia 30334
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division

Reply To:
Drinking Water Permitting & Engineering Program
2 Martin Luther King Jr. Dr., S.E., Suite 1362 East
Atlanta, Georgia 30334

April 5, 2006

Clifford Beroset
Clayton County Water Authority
1600 Battle Creek Road
Morrow, Georgia 30260

RE: **Standard Specification Approval**
Clayton County Water Authority
Clayton County, Georgia
WSID# 0630000

Dear Mr. Beroset:

The standard specifications for the Clayton County Water Authority have been reviewed and are hereby approved by the Drinking Water Permitting and Engineering Program of the Environmental Protection Division.

Reminder, following installation, all new and repaired water lines and appurtenances shall be flushed, pressure tested and disinfected. Samples shall be collected and tested for satisfactory microbiological quality of the water, prior to placing the lines into service.

All materials used and come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

Any pipe, solder, or flux which is used in the installation or repair of the public water distribution system shall be lead free with not more than 8.0% lead in pipes and fittings and not more than 0.2% lead in solders and flux.

When applicable, a land disturbing activity permit must be obtained (either from local government or EPD, as applicable) prior to the start of any construction. If applicable to your site, you must file a Notice of Intent (NOI), with the Environmental Protection Division, to be covered under the General Permit for Stormwater Discharge Associated with Construction.

One set of the approved standard specifications are being returned herewith and one set is being retained for our files.

Sincerely,

Sheila Pippin
Environmental Engineer
Drinking Water Permitting & Engineering Program
Phone:(404) 657-8283

Appendix B Georgia EPD Sanitary Sewer Delegation Letter

**DELEGATION AGREEMENT FOR
REVIEW AND APPROVAL OF
SEWER SYSTEM EXTENSIONS**

1.0 PURPOSE

Pursuant to Rules and Regulations for Water Quality Control Chapter 391-3-6 paragraph .02, the Environmental Protection Division (EPD) can delegate the review and approval of certain types of sewer system extensions to local governments that have demonstrated the capability for such review and approval. This delegation of responsibilities to local governments means the local governments are authorized by the Division to review and approve the sewer extensions for construction. Sewer systems include: new systems, extensions to new areas and replacement sanitary sewers. Types of sewer systems are limited to: gravity sewers, force mains and pumping stations.

The Division hereby delegates the review the approval of all sewer systems within and tributary to the Clayton County Water Authority system with the following exclusions:

- Sewers greater than 36 inches in diameter.
- Pump stations with capacity greater than 700 gallons per minute.
- Sewer force mains greater than 36 inches in diameter.

2.0 PROCEDURES

In order to fulfill the terms of this agreement, the Clayton County Water Authority hereby agrees to enact procedures which will accomplish the following:

2.1 Determine that the water pollution control plant (WPCP) to which the proposed sewer extension will be tributary is capable of accepting the project wastewater for treatment.

2.2 Determine that the submain, principal sewer and interceptor to which the proposed sewers are tributary are capable of transporting the project wastewater to the WPCP for treatment.

2.3 Determine that the sewers are not constructed on or serving structures constructed or proposed to be constructed on solid waste landfills.

2.4 Determine that the proposed sewers have been designed by registered professionals in accordance with acceptable provisions of recognized design referenced in general use. References include: WEF Manual(s) of Practice, ASCE Manuals and Reports on Engineering Practice, Recommended Standards for Sewage Works, latest Edition, Great Lakes Upper Mississippi River Board of State Sanitary Engineers (10-State Standards), Environmental Protection Agency (EPA) Publications, WEF Journals and other technical publications widely recognized in establishing design standards.

2.5 Review and approve completed plans and specifications for technical adequacy and conformance to applicable requirements and determine that they are suitable for bid and construction purposes. Plans and specifications must be prepared by registered professionals in accordance with Code 4-3-15-2 of the Official Code of Georgia Annotated relating to the regulation and certification of professional engineers and land surveyors and in accordance with Georgia Rules and Regulations for Water Quality Control 391-3-6-.02. Construction specifications must be approved by the EPD prior to adopting as the Clayton County Water Authority's Standard Construction Specifications.

2.6 Ensure the reviews are performed under the supervision of a professional engineer registered in the State of Georgia.

2.7 Conduct construction inspections during construction to ensure that the construction is done in accordance with the approved plans and specifications and the Erosion and Sedimentation Act 12-7-1 et. seq. and all other related Acts and ordinances.

2.8 Ensure the construction inspections are performed under the supervision of a professional engineer registered in the State of Georgia.

2.9 Determine that the construction is done in accordance with approved plans and specifications prior to project acceptance.

2.10 Own and maintain the sewer system after project acceptance.

2.11 Maintain in a responsible manner, records and documentation of approved projects for EPD's overview.

2.12 Maintain an up-to-date set of sewer maps.

3.0 OVERVIEW

In order to ensure compliance with this agreement, the Clayton County Water Authority agrees to cooperate with the EPD in a joint overview effort to be conducted at annual intervals.

4.0 DISSOLUTION OF AGREEMENT

This agreement may be canceled without prior notice by the action of either party giving written notice of intent to cancel.

Appendix B *Georgia EPD Sanitary Sewer Delegation Letter*

For the Georgia Environmental Protection Division

Date: 3/15/01

Harold F. Reheis, P.E.
Director

For the Clayton County Water Authority

Date: 3/13/01

M. Wade Brannan
General Manager

GEORGIA DEPARTMENT OF NATURAL RESOURCES

4220 International Parkway, Atlanta, Georgia 30354

Reply To:
Engineering & Technical Support Program
Suite 101
404/675-6233

Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
David Word, Assistant Director
Environmental Protection Division
404/656-4713

March 15, 2001

Mr. Mike Thomas
Clayton County Water Authority
1600 Battle Creek Road
Morrow, Georgia 30260

RE: EPD Project No. 21139
Clayton County Water Authority
Sewer Review Delegation Agreement
Clayton County

Dear Mr. Thomas:

Enclosed is a copy of the executed sewer review delegation agreement for your files. We have retained the original for our files.

The delegation agreement requires an annual overview of the Clayton County Water Authority's performance in complying with the delegation. We will contact your staff to schedule the first overview in approximately one year.

If you should have any questions, please do not hesitate to contact this office.

Sincerely,

Mark Beebe

Mark Beebe, Engineer
Engineering & Technical Support Program

MB
h:/2001/21139
Enclosure

cc: EPD-Northwest Regional Office
ATTN: Mr. Jim Sommerville

Appendix B Georgia EPD Water Distribution Delegation Letter

G. Upon completion of construction, the water system owner must own and maintain the water lines.

H. All pertinent records and documentation of the approved projects must be maintained for EPD's overview, along with an up-to-date set of water system distribution maps.

I. The system owner's engineer must evaluate and determine the capability of the system's wastewater treatment facilities to support each water using facility that is added to the water system.

J. The system owner or the engineer must submit a yearly report to EPD each January, listing each addition approved during the previous year and the number of service connections within each addition.

Please notify this office of any changes in your engineer's status and/or in the submitted standard construction specifications. Should you have any questions, please contact this office at (404) 657-8283

Sincerely,

Sheila D. Pippin
Environmental Engineer
Drinking Water Permitting & Engineering Program

Appendix B Georgia EPD Water Distribution Delegation Letter

DELEGATION OF REVIEW AND APPROVAL FOR LIMITED WATER SYSTEM ADDITIONS

WATER SYSTEM NAME : Clayton County Water Authority COUNTY: Clayton

* Water System ID No. : 0630000

a) Does the water system has its own water supply sources: (YES) NO (circle one)

* b) Does the water system purchase water from another system(s): (YES) NO (circle one)

If YES, name the water suppliers: City of Atlanta, Dekalb Co., Fayette County

* High Demand Times Only

WATER SYSTEM'S ENGINEER/CONSULTANT:

Name: Capstone Engineering, Neal Spradlin, PE

Georgia PE Registration No: 23386

Address : 45 Little Road

Sharpsburg, GA 30277

Phone: 770-502-9748 Fax: 770-502-9748

TO EPD:

Enclosed is a copy of the Standard Construction and Material Specifications for the Georgia Environmental Protection Division's (EPD) review and approval. I request that the above named permitted public water supply system be granted permission for its engineer(s) to review and approve the construction of "limited" water system projects (subdivisions, apartment complexes and shopping centers, only) as additions to its existing permitted public water distribution system. These water system addition projects, which includes the water lines to connect these facilities to the existing permitted system's distribution lines are considered routine in nature. In the event that a proposed water system addition project has the potential for significant environmental impact or which generates substantial public concern, EPD still reserves the right to review that project. I understand that annual reporting of the approved projects is required.

During the review, approval and construction of the water system projects, steps will be taken to ensure that no part of the water mains, service lines, and the structures that they are going to be connected to these water lines are being located on or in close proximity to an abandoned landfill site or any other site used for waste disposal.

This delegation for review and approval of limited water system additions may be canceled without prior notice by the either party giving a written notice of intent to cancel.

FOR THE PUBLIC WATER SUPPLY SYSTEM (Authorized Representative)

Name (please print): M. Wade Branan Title: General Manager

Signature : M Wade Branan Date: 10/26/00

FOR THE DRINKING WATER PERMITTING & ENGINEERING PROGRAM, EPD

Name (please print): Sheila D Pippin Title: Environmental Engineer

Signature : Sheila D Pippin Date: 11-13-00

Appendix C Water Distribution / Sanitary Sewer Addition Submittal

The Developer/Owner or authorized representative shall provide the following information.

General Information

1. Project/Development name:_____
2. Developer's/Owner's name:_____
3. Developer's Engineer or Surveyor:_____

   Georgia P.E. No.:_____ Expiration Date:_____

   Georgia R.L.S. No.:_____ Expiration Date:_____
4. Proposed service area (acres): Immediate:_____Ultimate:_____
5. Type of Development (Check those that apply):

   Residential:_____ Commercial:_____ Industrial:_____ Other:_____

   (If other, explain)_____
6. List population to be served:_____ density/acre:_____

Water Distribution Information

1. List design water use for Development (gallons/day):_____

   (Provide Detail)_____

   _____
2. List pipe diameters, pipe material and pipe lengths:

   _____

   _____
3. List number of fire hydrants:_____
4. List number of valves:_____
5. List type, number and size of meters:_____

   _____

Appendix C Water Distribution / Sanitary Sewer Addition Submittal

Sanitary Sewer Information

1. Does or will the Development contain any of the following services (Check those that apply): Food Service:_____ Automotive Service:_____ Carwash Service:_____

   For checked services, provide proposed capacity of oil/grease interceptor and/or

   sand/grit interceptor to be installed (gallons):_____

   Existing and proposed Developments shall comply with the CCWA Grease Management Program, Sewer Use Ordinance Sections 98-7(F) and 98-7(G).

2. List average daily sewer usage rate (gallons/day):_____

   (Provide Detail)_____

   _____

3. If producing industrial wastewater, describe waste characteristics:

   _____

   Gallons/day produced:_____ Describe pretreatment received:_____

   _____

4. List sewer design flow (gallons/day): Average:_____Peak:_____

5. Design biochemical oxygen demand (BOD) (lbs/day): Average:_____

6. List pipe diameters, pipe material and pipe lengths:_____

   _____

   _____

7. List number of manholes:_____

8. List number and size of service connections:_____

   _____

   _____

Appendix C Water Distribution / Sanitary Sewer Addition Submittal

Lift Station Information

1. List number and size (Hp) of motors/pumps:_____
2. List pump operating duty point flow rate (gallons/minute):_____
3. List inside diameter of wet well (ft):_____

Force Main Information

1. List pipe diameter, pipe material and pipe length:_____
2. List flow velocity (feet/second):_____
3. List number and type of combination air/vacuum release valve(s):_____

_____

Appendix C Water Distribution / Sanitary Sewer Addition Submittal

The Clayton County Water Authority shall provide the following information.

General Information

The CCWA shall certify the following statement.

"I certify that no component of a water distribution system or sanitary sewer system will be constructed on a solid waste landfill. In addition, no component of a water distribution system or sanitary sewer system will be constructed to serve structures that are constructed or proposed to be constructed on a solid waste landfill."

_____
(Signature)

Water Distribution Information

1. List the Water Production Plant (WPP) that will supply the development:_____

   _____

2. List the WPP's production capacity (gallons/day):_____

   Georgia EPD Permitted production capacity (gallons/day):_____

   List the latest twelve (12) month average production (gallons/day): _____

   _____

   _____

3. List known pressure and flow problems in proposed Development's immediate area:

   _____

4. Does the WPP have the capacity to supply the proposed development?
   Yes:_____ No:_____

Appendix C Water Distribution / Sanitary Sewer Addition Submittal

Sanitary Sewer Information

1. List the Water Reclamation Facility (WRF) that will service the development:

   _____

2. List the WRF's treatment capacity (gallons/day):_____

   Georgia EPD Permitted treatment capacity (gallons/day):_____

   List, by month, the average daily flow (MGD) and effluent concentrations (mg/l) for biochemical oxygen demands (BOD_5) and suspended solids (SS) for the immediately preceding 12 months for the wastewater (on discharge monitoring reports).

Month	Flow	BOD_5	SS	Month	Flow	BOD_5	SS	Month	Flow	BOD_5	SS

3. Does the listed WRF have the treatment capacity to service the proposed Development? Yes_____ No_____

4. Sewer Capacity

   List diameter (inches) of existing sewer main to receive development:_____

   List pipe material:_____

   List date pipe was installed:_____

   List maximum pipe flow capacity (gallons/day):_____

   List current pipe flow (gallons/day):_____

   List current I/I in pipe (gallons/day):_____

5. Does the existing sewer have the capacity to service the proposed development? Yes_____ No_____

Appendix D Technical Review Checklist

General Submittal Information

1. Development Name:_____

2. Water Distribution / Sanitary Sewer Addition Submittal form received: Yes_____ No_____
   (Plan review shall not begin until the submittal form is received.)

3. Have copies of DOT / Utility rights-of-way permits and drawings been received:
   Yes _____ No _____ NA_____
   (Plans shall not be approved until all DOT / Utility rights-of-way permits and drawings are received.)

4. Have all off-site easements been received: Yes _____ No _____ NA_____
   (Plans shall not be approved until all off-site easements are received.)

5. Has a copy of the Soil and Water Technical review been received from Clayton County T & D or the Georgia Soil and Water Conservation Commission: Yes_____ No_____ NA_____
   (Plans shall not be approved until a copy of the Soil and Water Technical review is received.)

Notes to Design Engineer

1. Two (2) sets of plans are required to initiate the plan review process.

2. Four (4) sets of plans are required for plan approval.

3. Items marked “No” shall be submitted and/or corrected as indicated on checklist.

4. Items marked (redlined) on the plans shall be submitted and/or corrected as indicated.

5. Items marked “Yes” or “NA” (Not Applicable) require no further action.

6. Return redlined plans with each re-submittal.

7. As-built drawing shall be provided in digital format (Autocad 14 or as amended by the CCWA) and one (1) reproducible hard copy.

_____ _____
Review by Engineering Date

_____ _____
Review by Maintenance & Construction Date

_____ _____
Review by General Services Date

Comments_____

_____

_____

Appendix D Technical Review Checklist

General Plan Set Submittal Requirements

1. Yes____ No____: Two (2) sets of plans submitted.
2. Yes____ No____: Plans submitted with Cover Sheet.
3. Yes____ No____: Utility Locate Note on every sheet including the cover sheet.
4. Yes____ No____: Site Plan submitted showing the overall Development including all phases.
5. Yes____ No____ NA____: Grading Plan submitted.
6. Yes____ No____ NA____: Storm Water System Plan submitted.
7. Yes____ No____ NA____: Water Distribution System Plan submitted.
8. Yes____ No____ NA____: Water Distribution System Details and construction notes on separate sheet.
9. Yes____ No____ NA____: Sanitary Gravity Sewer System Plan submitted.
10. Yes____ No____ NA____: Sanitary Gravity Sewer System Profile submitted.
11. Yes____ No____ NA____: Sanitary Gravity Sewer System Details and construction notes submitted on separate sheet.
12. Yes____ No____ NA____: Lift Station Site Plan submitted.
13. Yes____ No____ NA____: Lift Station Electrical Site Plan submitted.
14. Yes____ No____ NA____: Lift Station Details and construction notes submitted.
15. Yes____ No____ NA____: Force Main Plan and Profile submitted
16. Yes____ No____ NA____: Force Main Details and construction notes submitted
17. Yes____ No____ NA____: Soil Erosion and Sedimentation Control Plan submitted.
18. Yes____ No____ NA____: Soil Erosion and Sedimentation Control Details and construction notes submitted.
19. Yes____ No____: Design Engineer/Surveyor seal with their signature across seal on every sheet including detail sheets. Note: Surveyor for residential on-site work only.

Comments_____

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Appendix D Technical Review Checklist

Cover Sheet Requirements

1. Yes____ No____: Project Title shown.
2. Yes____ No____: Developer/Owner name, address, telephone and fax number shown.
3. Yes____ No____: Design Engineer name, address, telephone and fax number shown.
4. Yes____ No____: Name and telephone number of 24-hour Contact Person shown.
5. Yes____ No____: Source of Project Funding, agency name and project number shown.
6. Yes____ No____: Detailed Project Site Location Map with street names and North Arrow shown.
7. Yes____ No____: Drawing Sheet Index shown.
8. Yes____ No____ NA____: Symbol Legend shown.
9. Yes____ No____: Land Lot(s), District and County shown.

Site Plan Sheet Requirements

1. Yes____ No____: North Arrow shown.
2. Yes____ No____ NA____: Symbol legend shown.
3. Yes____ No____: Drawing scale shown.
4. Yes____ No____: Drawing to scale as shown.
5. Yes____ No____: Property owners' names adjacent to Development shown.
6. Yes____ No____: Number of lots or development units shown.

Comments_____

_____

_____

Appendix D Technical Review Checklist

Water Distribution System Plan Sheet Requirements

1. Yes____ No____ NA____: Following statement included in water distribution system and/or sanitary sewer system notes: "The water distribution system and/or sanitary sewer system shall be installed in accordance with the approved plans and specifications contained within the CCWA document titled, *Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems*, Latest Edition.

2. Yes____ No____ NA____: Plans indicated prepared using the following state plane coordinate system. Horizontal: NAD 83/94, Vertical: NGVD 88, Grid Zone: GA West 1002.

3. Yes____ No____: North Arrow shown.

4. Yes____ No____: Drawing scale shown.

5. Yes____ No____: Drawing to scale as shown.

6. Yes____ No____ NA____: Symbol legend shown.

7. Yes____ No____ NA____: Grading Plan shown in gray scale.

8. Yes____ No____ NA____: Storm Water System Plan shown in gray scale.

9. Yes____ No____: Street(s) right(s)-of-way shown.

10. Yes____ No____ NA____: 100-year flood plain contour and associated elevation shown.

11. Yes____ No____ NA____: 25-foot State Waters Buffer shown.

12. Yes____ No____ NA____: 50-foot State Water Quality Critical Area shown.

13. Yes____ No____ NA____: Wetlands area shown.

14. Yes____ No____ NA____: The proposed system is not situated on a legally or illegally established landfill.

15. Yes____ No____ NA____: The proposed system will not service a structure situated over a legally or illegally established landfill.

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Comments_____

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Appendix D Technical Review Checklist

Water Distribution System Requirements

1. Yes____ No____: Existing water main route shown and correct.
2. Yes____ No____: Existing water main pipe size shown and correct.
3. Yes____ No____ NA____: Proposed water main/distribution system route shown.
4. Yes____ No____ NA____: Proposed water design usage rate indicated for each connection.
5. Yes____ No____ NA____: Structures requiring fire sprinkler systems are indicated.
6. Yes____ No____ NA____: Fire sprinkler system design usage rate indicated.
7. Yes____ No____ NA____: Connecting location of Development's proposed water main to existing water main shown and correct.
8. Yes____ No____ NA____: Connecting location of Development's proposed single service connection to existing water main shown and correct.
9. Yes____ No____ NA____: Note stating "Tapping saddle and tapping gate valve for connection to existing water main to be provided and installed by Developer. CCWA to core tap for a fee of $325.00." shown.
10. Yes____ No____ NA____: Proposed bore location(s) shown and correct.
11. Yes____ No____ NA____: Proposed bore casing type, size, thickness and length shown and correct.
12. Yes____ No____ NA____: Proposed water main located on north and/or east side(s) of street(s) and inside right(s)-of-way.
13. Yes____ No____ NA____: Proposed water main pipe size, pipe material and pipe class shown and correct.
14. Yes____ No____ NA____: Proposed water main depth indicated and correct.
15. Yes____ No____ NA____: Proposed water main separated from sanitary sewer as follows. Horizontal separation: 10 foot min. Vertical separation: 18 inch min.
16. Yes____ No____ NA____: Total length of pipe indicated and correct.

Comments_____

_____

_____

Appendix D Technical Review Checklist

17. Yes____ No____ NA____: Total number of fire hydrants indicated and correct.

18. Yes____ No____ NA____: Note stating "Water main pipe shall not be installed until curb and gutter is installed." shown.

19. Yes____ No____ NA____: Proposed water meter/backflow assembly and associated easement for single service shown and correct. 20 ft by 30 ft minimum easement if assembly not within street right-of-way.

20. Yes____ No____ NA____: Proposed fire meter/backflow assembly and associated easement for single service shown and correct. 20 ft by 30 ft minimum easement if assembly not within street right-of-way.

21. Yes____ No____: Structure(s) not within proposed easement(s). Structures shall not be located in any easement.

22. Yes____ No____ NA____: Proposed service connection(s) location(s) to proposed water main shown and correct.

23. Yes____ No____ NA____: Note indicating "Water service connections to water main and service lines to be installed by the Developer".

24. Yes____ No____ NA____: Existing fire hydrant(s) shown and location(s) correct.

25. Yes____ No____ NA____: Proposed fire hydrant(s) shown and location(s) correct.

26. Yes____ No____ NA____: Proposed fire hydrant(s) spacing correct as measured along edge of pavement and as follows. Residential maximum spacing: 500 feet, Commercial maximum spacing: 300 feet.

27. Yes____ No____ NA____: Proposed fire hydrant in cul-de-sac shown and location correct.

28. Yes____ No____ NA____: Gate valves shown and valve size correct at proposed fire hydrants.

29. Yes____ No____ NA____: Proper hydrant lead pipe size, pipe material and pipe class from water main.

30. Yes____ No____ NA____: Proper location and number of valves at proposed main intersections shown.

31. Yes____ No____ NA____: Underground Utilities Locations Detail shown and conforms to CCWA requirements.

32. Yes____ No____ NA____: Long Side Service Detail shown and conforms to CCWA requirements.

Comments_____

_____

_____

Appendix D Technical Review Checklist

33. Yes____ No____ NA____: Fire Hydrant Detail shown and conforms to CCWA requirements.

34. Yes____ No____ NA____: Fire Hydrant in Cul-de-sac Detail shown and conforms to CCWA requirements.

35. Yes____ No____ NA____: Valve Box Detail shown and conforms to CCWA requirements.

36. Yes____ No____ NA____: Pipe Depth at Edge of Pavement Detail shown and conforms to CCWA requirements.

37. Yes____ No____ NA____: Pipe Bedding Detail shown and conforms to CCWA requirements.

38. Yes____ No____ NA____: Thrust Block Dimensions Detail shown and conforms to CCWA requirements.

39. Yes____ No____ NA____: Thrust Restraint at Fitting Detail shown and conforms to CCWA requirements.

40. Yes____ No____ NA____: Residential Water Meter and Meter Box Detail shown and conforms to CCWA requirements.

41. Yes____ No____ NA____: Commercial Domestic Water Meter Detail shown and conforms to CCWA requirements.

42. Yes____ No____ NA____: Fire Meter Detail shown and conforms to CCWA requirements.

43. Yes____ No____ NA____: Combination Domestic/Fire Water Meter Detail shown and conforms to CCWA requirements.

44. Yes____ No____ NA____: Water Meter Vault Detail shown and conforms to CCWA requirements.

Comments_____

_____

_____

Appendix D Technical Review Checklist

Sanitary Gravity Sewer System Plan Sheet Requirements

1. Yes____ No____ NA____: Following statement included in water distribution system and/or sanitary sewer system notes: "The water distribution system and/or sanitary sewer system shall be installed in accordance with the approved plans and specifications contained within the CCWA document titled, *Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems*, Latest Edition.
2. Yes____ No____ NA____: Plans indicated prepared using the following state plane coordinate system. Horizontal: NAD 83/94, Vertical: NGVD 88, Grid Zone: GA West 1002.
3. Yes____ No____: North Arrow shown.
4. Yes____ No____: Drawing scale shown.
5. Yes____ No____: Drawing to scale as shown.
6. Yes____ No____ NA____: Symbol legend shown.
7. Yes____ No____ NA____: Grading Plan shown in gray scale.
8. Yes____ No____ NA____: Storm Water System Plan shown in gray scale.
9. Yes____ No____ NA____: Street(s) right(s)-of-way shown.
10. Yes____ No____ NA____: Existing easement(s) shown.
11. Yes____ No____ NA____: Proposed easement(s) shown.
12. Yes____ No____ NA____: 100-year flood plain contour and associated elevation shown.
13. Yes____ No____ NA____: 25-foot State Waters Buffer shown.
14. Yes____ No____ NA____: 50-foot State Water Quality Critical Area shown.
15. Yes____ No____ NA____: Wetlands area shown.
16. Yes____ No____ NA____: The proposed system is not situated on a legally or illegally established landfill.
17. Yes____ No____ NA____: The proposed system will not service a structure situated over a legally or illegally established landfill.

Comments_____

Appendix D Technical Review Checklist

Sanitary Gravity Sewer System Requirements

1. Yes____ No____: Existing sanitary gravity sewer system route shown and correct.

2. Yes____ No____: Existing sanitary sewer gravity main size shown and correct.

3. Yes____ No____ NA____: Proposed Development with food service facility, car wash, and/or auto repair facility shown with grease/grit/oil interceptor. If yes or no, plans are to be reviewed by CCWA Environmental Compliance.

4. Yes____ No____ NA____: Proposed sanitary sewer gravity main route shown.

5. Yes____ No____ NA____: Connecting location of Development's proposed sanitary gravity sewer main to existing sanitary sewer manhole shown and correct.

6. Yes____ No____ NA____: Connecting location of Development's proposed sanitary gravity sewer main to existing sanitary gravity sewer main via "dog house" manhole shown and correct.

7. Yes____ No____ NA____: Connecting location of Development's proposed sanitary single service lateral connection (< 250 ft) to existing sanitary sewer manhole shown and correct.

8. Yes____ No____ NA____: Connecting location of Development's proposed sanitary single service lateral connection to existing sanitary gravity sewer main via tapping saddle shown and correct.

9. Yes____ No____ NA____: Proposed bore location(s) shown and correct.

10. Yes____ No____ NA____: Proposed bore casing type, size and length shown and correct.

11. Yes____ No____ NA____: Proposed sanitary single service lateral routes shown and less than 250 ft.

12. Yes____ No____ NA____: Proposed sanitary gravity sewer main located at the centerline of the street(s) right(s)-of-way and/or easement(s).

13. Yes____ No____ NA____: Proposed sanitary gravity sewer main pipe size, pipe material and pipe class shown and correct.

14. Yes____ No____: Structure(s) not within proposed easement(s). Structures shall not be located in any easement.

Comments_____

_____

_____

Appendix D Technical Review Checklist

15. Yes____ No____: Proposed sanitary sewer does not cross a lake, reservoir, pond or detention pond.

16. Yes____ No____: Proposed sanitary sewer does not cross over a water distribution main.

17. Yes____ No____ NA____: Proposed dumpster pad drain does not discharge to sanitary sewer system.

18. Yes____ No____ NA____: Slope of sewers between manholes shown and are calculated correctly.

19. Yes____ No____ NA____: Slopes of sewers are within minimum and maximum CCWA specifications.

20. Yes____ No____ NA____: Ending sewer tangent(s) slopes are = or > 1.00%.

21. Yes____ No____ NA____: Angle between influent and effluent sewers at manhole = or > 90º.

22. Yes____ No____ NA____: Ductile iron pipe used at depths less than 4 feet and greater than 15 feet.

23. Yes____ No____ NA____: Ductile iron pipe used over and under storm water sewers and water distribution piping.

24. Yes____ No____ NA____: Proposed sanitary sewer separated from water main as follows. Horizontal separation: 10 foot min. Vertical separation: 18 inch min.

25. Yes____ No____ NA____: A minimum coverage of 2 feet of soil exists when crossing a stream.

26. Yes____ No____ NA____: A minimum coverage of 2 feet of soil exists when crossing a ditch.

27. Yes____ No____ NA____: Flow arrows are shown along the proposed sewer main.

28. Yes____ No____: Existing manholes labeled.

29. Yes____ No____ NA____: Proposed manholes numbered correctly.

30. Yes____ No____ NA____: Sewer stubs to service adjacent properties shown.

30. Yes____ No____ NA____: Manhole cover elevations shown and accurate to vertical scale.

31. Yes____ No____ NA____: Manhole cover in paved area indicated to be set flush with finished pavement.

Comments_____

_____

_____

Appendix D Technical Review Checklist

32. Yes____ No____ NA____: Manhole cover in non-paved area indicated to be set a minimum of 12 inches above finished grade.

33. Yes____ No____ NA____: Manhole cover in 100-yr flood plain above flood plain elevation or cover shown as being with gasket and bolted down.

34. Yes____ No____ NA____: Manholes not situated in detention pond.

35. Yes____ No____ NA____: Manhole spacing is = or < 400 feet.

36. Yes____ No____ NA____: Manhole inlet and outlet invert elevations shown.

37. Yes____ No____ NA____: Inlet and outlet elevations accurate and accurate to vertical scale.

38. Yes____ No____ NA____: No inside drop manholes (by CCWA Engineer Approval Only)

39. Yes____ No____ NA____: No outside drop manholes (by CCWA Engineer Approval Only).

40. Yes____ No____ NA____: No dog house style manholes (by CCWA Engineer Approval Only)

41. Yes____ No____ NA____: Is the following note indicated: ”Detection tape or wire shall be installed above all non-ferrous pipe and all ferrous pipe having a bury depth of six (6) feet or more. Mylar detection tape or ferrous wire shall be installed two (2) feet below finished grade such that sewer and/or lateral can be detected after burial.”

42. Yes____ No____ NA____: Pipe Bedding Detail shown and conforms to CCWA requirements.

43. Yes____ No____ NA____: Sewer Service Connection Detail shown and conforms to CCWA requirements.

44. Yes____ No____ NA____: Manhole Sections Detail shown and conforms to CCWA requirements.

Comments_____

_____

_____

Appendix D Technical Review Checklist

Lift Station Requirements

1. Yes____ No____: Lift station site area shown on sanitary sewer system plan sheet and site location acceptable.

2. Yes____ No____: Access road to lift station site area shown on sanitary sewer system plan sheet and acceptable.

3. Yes____ No____: Sanitary sewer route to lift station site area shown on sanitary sewer system plan sheet and acceptable.

4. Yes____ No____: Lift station force main route shown on sanitary sewer system plan sheet and acceptable.

5. Yes____ No____: Potable water supply route to lift station site area shown on sanitary sewer system plan sheet and acceptable.

5. Yes____ No____: Potable water supply pipe is situated a minimum of 10 feet from the gravity sanitary sewer and sewer force main route.

6. Yes____ No____: Electrical service route to lift station site area shown on sanitary sewer system plan sheet and acceptable.

7. Yes____ No____: Electrical service to lift station site shown as being overhead or underground and 3-phase power.

8. Yes____ No____ NA____: The proposed system is not situated on a legally or illegally established landfill.

9. Yes____ No____ NA____: The proposed system will not service a structure situated over a legally or illegally established landfill.

10. Yes____ No____ NA____: Lift Station electrical and mechanical components are situated above the 100-year flood elevation.

11. Yes____ No____: Radio path survey and SCADA recommendations submitted and approved.

12. Yes____ No____: Lift station site plan submitted and drawn to scale.

13. Yes____ No____: A minimum 40-foot by 40-foot site area is shown for the lift station.

14. Yes____ No____: A minimum 60-foot by 60-foot easement area is shown for the lift station.

Comments_____

_____

_____

Appendix D Technical Review Checklist

15. Yes____ No____: Edge of easement area extends 10 feet beyond all sides of the site area (i.e. if site area is 40 feet by 45 feet, then easement area is 60 feet by 65 feet).

16. Yes____ No____: A minimum 12 foot wide paved access road is shown.

17. Yes____ No____: A minimum 20 foot wide easement is shown for the access road.

18. Yes____ No____: Lift station enclosure situated a minimum of 5-feet from fence and location within site area acceptable.

19. Yes____ No____: Lift station concrete slab dimensions shown and acceptable.

20. Yes____ No____: Emergency generator situated a minimum of 5-feet from fence and location within site area acceptable.

21. Yes____ No____: Emergency generator concrete slab dimensions shown and acceptable.

22. Yes____ No____: SCADA tower situated a minimum of 5-feet from fence and location within site area acceptable.

23. Yes____ No____: SCADA tower and mast height indicated on plan.

24. Yes____ No____: Potential surrounding houses will not interfere with radio signal path.

25. Yes____ No____: Electrical stand situated a minimum of 5-feet from fence and location within site area acceptable.

26. Yes____ No____: Area security light location within site area acceptable.

27. Yes____ No____: Yard hydrant location within site area acceptable.

28. Yes____ No____ NA____: Ground elevation is shown and is the same along the edges of the site.

29. Yes____ No____: Lift station site area shown with gravel and sloped away from wet well in accordance with CCWA requirements.

30. Yes____ No____: Site area enclosed with 6-foot high fence with 12-foot double swing gate.

31. Yes____ No____: Plug valve shown in force main shown and within fenced site area.

32. Yes____ No____: Area between fence and edge of easement landscaped and materials acceptable.

Comments_____

_____

_____

Appendix D Technical Review Checklist

33. Yes____ No____: Electrical site plan submitted and drawn to scale.

34. Yes____ No____: Underground conduit routes to lift station components shown.

35. Yes____ No____: Below grade conduit shown as being rigid, schedule 40 PVC or galvanized steel.

36. Yes____ No____: At grade and above grade conduit shown as being galvanized steel.

37. Yes____ No____: Lift station pumps and housing detail submitted and conforms to CCWA requirements.

38. Yes____ No____: Pump size and motor horsepower indicated on lift station pumps and housing detail.

39. Yes____ No____: Total Dynamic Head calculation submitted and correct.

40. Yes____ No____: Net Positive Suction Head Required and Net Positive Suction Head Available calculations submitted and correct.

41. Yes____ No____: Lift station system's operating curve plotted onto manufactures' pump performance curve.

42. Yes____ No____: A minimum 6-foot diameter wet well provided for lift station and shown on lift station wet well detail that conforms to CCWA requirements.

43. Yes____ No____ NA____: Wet well buoyancy calculation submitted and correct.

44. Yes____ No____: Lift station cycle time calculation submitted and each pump operates for 2 (two) to 5 (five) minutes per cycle and each pump starts/stops 3 to 5 times per hour.

45. Yes____ No____: Lead Pump On elevation shown and correct on lift station wet well detail that conforms to CCWA requirements.

46. Yes____ No____: Lead Pump Off/Lag Pump Off elevation shown and correct on lift station wet well detail that conforms to CCWA requirements.

47. Yes____ No____: High Water Alarm/Lag Pump On elevation shown and correct on lift station wet well detail that conforms to CCWA requirements.

48. Yes____ No____: Generator kilowatt rating calculation shown and correct.

49. Yes____ No____: Generator transfer switch amp rating shown and correct.

Comments_____

_____

_____

Appendix D Technical Review Checklist

50. Yes____ No____: SCADA tower base detail shown and conforms to CCWA requirements.

51. Yes____ No____: Electrical panel stand detail shown and conforms to CCWA requirements.

52. Yes____ No____: Lift station by-pass valve configuration detail shown.

53. Yes____ No____: Lift Station Pump and Housing Detail shown and conforms to CCWA requirements.

54. Yes____ No____: Lift Station Wet Well Detail shown and conforms to CCWA requirements.

55. Yes____ No____: Lift Station Wet Well Detail shown and conforms to CCWA requirements.

56. Yes____ No____: Wet well lining material indicated.

57. Yes____ No____: Yard Hydrant Detail shown and conforms to CCWA requirements.

58. Yes____ No____: Chain Link Fence Detail shown and conforms to CCWA requirements.

Comments_____

Appendix D Technical Review Checklist

Force Main

1. Yes____ No____: Proposed force main route shown and acceptable.
2. Yes____ No____: Proposed force main 20 foot easement shown.
3. Yes____ No____: Structure(s) not within proposed easement(s). Structures shall not be located in any easement.
4. Yes____ No____: Force main depth indicated and correct.
5. Yes____ No____: Force main profile shown and correct.
6. Yes____ No____: Proper location and minimum spacing of combination air/vacuum release valve(s).
7. Yes____ No____: Proper type, size and model number of combination air/vacuum release valve(s) indicated.
8. Yes____ No____: Proposed discharge point shown.
9. Yes____ No____ NA____: Proposed bore location(s) shown and correct.
10. Yes____ No____ NA____: Proposed bore casing type, size and length shown and correct.
11. Yes____ No____: Proposed force main pipe size, pipe material and pipe class shown and correct.
12. Yes____ No____: Pipe Depth at Edge of Pavement Detail shown and conforms to CCWA requirements.
13. Yes____ No____: Pipe Bedding Detail shown and conforms to CCWA requirements.
14. Yes____ No____: Thrust Block Dimensions Detail shown and conforms to CCWA requirements.
15. Yes____ No____ NA____: Thrust Restraint at Fitting Detail shown and conforms to CCWA requirements.
16. Yes____ No____ NA____: Combination Air/Vacuum Release Valve shown and conforms to CCWA requirements.
17. Yes____ No____ NA____: Manhole at force main discharge point and next downstream manhole shown to be lined or coated.

Comments_____

_____

_____

Appendix E *Inspection Report*

Development Name: _____

Contractor Name: _____

1. Has a copy of the Utility Contractor's License been received by the CCWA Engineer?

   Yes_____ No _____, If No, Stop Work.

2. Is work being performed in accordance with the plans and specifications?

   Yes_____ No _____, If No, List the deficiencies below.

3. Are all erosion control and sedimentation measures associated with work in accordance with the plans and specifications?

   Yes_____ No _____, If No, Notify CCTD.

4. Have easements for off-site work been submitted to CCWA Engineer?

   Yes_____ No _____, If No, work shall not be permitted on off-site properties.

_____

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_____

CCWA Inspector Signature:_____ Date:_____

Appendix F — *Mandrel Test Report*

Development Name: _____

Contractor Name: _____

Note: Testing shall be performed when section of pipeline being tested has been completely backfilled and all compaction requirements have been met.

Does the CCWA have soil compaction test results? Yes_____ No _____

Indicate inside diameter of pipe being tested. _____

Indicate outside diameter of mandrel being used. _____

Is mandrel size in accordance with size specification? Yes_____ No _____

Date	From Station No. / To Station No.	Mandrel Test Accepted (Yes / No)
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____

If Mandrel Test not accepted, list station numbers and describe actions to correct deflected pipe. _____

_____

CCWA Inspector Signature:_____ Date:_____

Appendix F *Pressure Test Report*

Development Name: _____

Contractor Name: _____

Note: Testing shall be performed when section of pipeline being tested has been completely backfilled and all compaction requirements have been met.

Does the CCWA have soil compaction test results? Yes_____ No _____

Indicate type of system being tested (Water Distribution/Gravity Sewer/Force Main)

Indicate test pressure (psi) _____

Date	From Station No. / To Station No.	Pressure Test Accepted (Yes / No)
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____

If Pressure Test not accepted, describe actions to correct pipe or joint. _____

_____

_____

CCWA Inspector Signature:_____ Date:_____

Appendix F *Visual Test Report*

Development Name: _____

Contractor Name: _____

Note: Testing shall be performed when section of pipeline being tested has been completely backfilled and all compaction requirements have been met.

Does the CCWA have soil compaction test results? Yes_____ No _____

Attach TV Testing Report by subcontractor to this report.

Date	From Station No. / To Station No.	Visual Test Accepted (Yes / No)
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____
_____	_____/_____	_____

If Visual Test not accepted, list station numbers and describe actions to correct pipe or joint.

_____

_____

CCWA Inspector Signature:_____ Date:_____

Appendix G Sewer Construction Acceptance Letter

Date

Developer
Street Address
City, State Zip Code

Dear Developer:

This letter will serve as notice that the sanitary sewer as built by Contractor in the development known as Name, Land Lot # of the #th District, Clayton County, Georgia, meets all specifications and sewer construction methods of Clayton County Water Authority.

Upon request for a final inspection, the said sanitary sewer will be accepted by the Authority for maintenance after paving of the streets and all manholes are set to finished grade of the street and free of debris. No sewage shall be permitted in said lines until a final letter of acceptance is obtained from this office. Please complete and return the appropriate attached forms for the owner's affidavit, the easement form, the contractor's affidavit, and the project value before requesting the final inspection.

Until the Authority gives the final letter, the developer will be responsible for any type of maintenance to the sanitary sewer system.

Sincerely,

CCWA Manager
Program Management and Engineering

CCWA Inspector
Program Management and Engineering

cc: Maintenance and Construction, CCWA

Appendix G Water Construction Acceptance Letter

Date

Developer
Street Address
City, State Zip Code

Dear Developer:

This letter will serve as notice that the water system as built by Contractor, in the subdivision known as Name, Land Lot # of the #th District, Clayton County, Georgia, meets all specifications and water construction methods of Clayton County Water Authority.

Upon request for a final inspection, the said water distribution system will be accepted by the Authority for maintenance after paving of the streets and all valves and hydrants are set to finished grade of the street or shoulder. No water meter will be installed until a letter of final acceptance is obtained from this office.

Until the Authority gives the final letter, the developer will be responsible for any type of maintenance to the water distribution system.

Sincerely,

CCWA Manager
Program Management and Engineering

CCWA Inspector
Program Management and Engineering

cc: Maintenance and Construction, CCWA

Appendix H Final Lift Station Inspection Report

Development Name: _____

Contractor Name: _____

Lift Station

1. Has a manufacturer's representative inspected and approved the lift station? Yes ____ No ____. If yes, attach the manufacturer's approval inspection and testing report.

2. Is wet well, underside of lift station slab and pipe penetrations lined with an approved liner? Yes ____ No ____.

3. Has a manufacturer's representative inspected and approved the wet well lining? Yes ____ No ____. If yes, attach the manufacturer's approval inspection report.

4. Are suction lines and appropriate elbows properly installed and grouted to the wet well floor? Yes ____ No ____

5. Are pump control "On" and "Off" elevations in accordance with the approved plans? Yes ____ No ____.

6. Is the enclosure a minimum 5 ft from the fence? Yes ____ No ____.

Electrical

1. Is the above grade electrical conduit rigid galvanized tubing? Yes ____ No ____.

2. Are the above grade electrical conduit horizontal runs less than 12 inches and supported by galvanized unistrut? Yes ____ No ____.

3. Are all electrical and SCADA panels secured to a common stand (galvanized)? Yes ____ No ____.

4. Has a manufacturer's representative inspected and approved the generator? Yes ____ No ____. If yes, attach the manufacturer's approval inspection and testing report.

5. Is the generator securely anchored to the slab? Yes ____ No ____.

6. Has a manufacturer's representative inspected and approved the SCADA system? Yes ____ No ____. If yes, attach the manufacturer's approval inspection and testing report.

7. Is the tower a minimum 5 ft from the fence? Yes ____ No ____.

8. Has the proper security lighting been installed and tested? Yes ____ No ____.

Site Area

1. Is the overall site area a minimum of 60 feet by 60 feet? Yes ____ No ____.

2. Is the fenced area a minimum 40 feet by 40 feet? Yes ____ No ____.

3. Is the site area graded in conformance with the approved plans and in a manner that storm water will flow away from the wet well?
   Yes ____ No ____.

4. Is the area within the fence covered with a geofabric and a minimum of 6 inches of R-2 size stone? Yes ____ No ____.

5. Does the yard hydrant meet specifications? Yes ____ No ____.

6. Does the fence and 12-foot swing gate meet specifications? Yes ____ No ____.

7. Is a 10-foot wide area beyond all sides of the fence landscaped with evergreen shrubbery, weed guard fabric and mulch? Yes ____ No ____.

8. Is the access road in accordance with the approved plans? Yes ____ No ____.

9. Is a meter and backflow device set in the right-of-way for the service water?
   Yes ____ No ____.

Force Main

1. Is a plug valve installed in the force main and situated within the fenced area?
   Yes ____ No ____.

2. Is the combination air/vacuum release valve the correct model? Yes ____ No ____.

Appendix H Final Lift Station Inspection Report

3. Does the combination air/vacuum release valve function properly during force main operation? Yes ____ No ____.

4. Is the manhole that receives the force main discharge and the next downstream manhole coated with an approved coating system. Yes ____ No ____.

5. Has a manufacturer's representative inspected and approved the manhole coatings? Yes ____ No ____. If yes, attach the manufacturer's approval inspection report.

Are all lift station components functioning properly and site area complete and ready to be accepted by Clayton County Water Authority?

Yes_____ No_____ If no, List Reasons_____

_____

CCWA Inspector:_____ Date:_____

CCWA General Services:_____ Date:_____

Appendix H Final Sewer Inspection Report

Development Name: _____

Contractor Name: _____

1. Have the following sewer tests been passed on all sections of the system:

   Visual: Yes ____ No ____; Mandrel: Yes____ No ____; Air Pressure: Yes ____ No ____

2. Is all road pavement over sewers complete: Yes _____ No _____

3. Are all crossings and valves identified by saw-cuts in the curb: Yes_____ No_____

4. Are all manhole covers flush with pavement: Yes _____ No _____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

5. Are all manhole covers of correct size and weight: Yes _____ No _____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

6. Is the word "SEWER" cast into all manhole covers: Yes _____ No _____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

6. Are all manhole sections in good condition without cracks: Yes _____ No _____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

7. Are all manhole inverts complete with smooth transition: Yes _____ No _____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

8. Are all manhole inverts free from dirt and debris: Yes ____ No ____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

9. Are all manhole steps properly installed and spaced: Yes ____ No ____

   (If No, List Station No.s _____, _____, _____, _____, _____, _____, _____)

Is the sewer system ready to be accepted by the Clayton County Water Authority?

Yes _____ No _____ If No, List Reasons _____

_____

If yes, have all sewer line plugs been removed: Yes ____ No ____

CCWA Inspector Signature:_____ Date:_____

Appendix H *Final Water Inspection Report*

Development Name: _____

Contractor Name: _____

Water Main

1. Have the following water tests been passed on all sections of the system:

   Pressure Tests: Yes_____ No_____ Disinfection: Yes_____ No_____

2. Is all road pavement over water system complete: Yes_____ No_____
3. Are all hydrants and valves at curb grade: Yes_____ No_____
4. Are all crossings and valves identified by saw-cuts in the curb: Yes_____ No_____
5. Are the water services installed correctly: Yes_____ No_____
6. Are all the meter boxes set to grade: Yes _____ No_____
7. Are all the valves on hydrants and in-line valves on: Yes_____ No_____

Meters Vaults

1. Are vaults the correct size: Yes_____ No_____
2. Do vaults have a concrete base with drain: Yes_____ No_____
3. Are access hatches the correct size and material: Yes_____ No_____
4. Do the vault lids have 4 lifting points: Yes_____ No_____
5. What type of meter is installed: Fire _____ Domestic _____ Combination_____
6. Is double check valve an approved model: Yes_____ No_____

Is the water system ready to be accepted by Clayton County Water Authority?

Yes_____ No_____ If no, List Reasons_____

_____

CCWA Inspector:_____ Date:_____

Appendix I Final Sewer Acceptance Letter

Date

Developer
Street Address
City, State Zip Code

Dear Developer:

This letter will serve as notice that the sanitary sewer as built by Contractor in the development known as Name, Land Lot # of the #th District, Clayton County, Georgia, has been accepted by Clayton County Water Authority for permanent maintenance and operation. We appreciate your cooperation in this matter.

If you have any questions or comments, please call me at 770-960-5248.

Sincerely,

CCWA Manager
Program Management and Engineering

CCWA Inspector
Program Management and Engineering

cc: Maintenance and Construction, CCWA

Appendix I *Final Water Acceptance Letter*

Date

Developer
Street Address
City, State Zip Code

Dear Developer:

This letter will serve as notice that the water system as built by Contractor in the development known as Name, Land Lot # of the #th District, Clayton County, Georgia, has been accepted by Clayton County Water Authority for permanent maintenance and operation. We appreciate your cooperation in this matter.

If you have any questions or comments, please call me at 770-960-5248.

Sincerely,

CCWA Manager
Program Management and Engineering

CCWA Inspector
Program Management and Engineering

cc: Maintenance and Construction, CCWA

AMENDMENT NO. 1 to the Above Referenced Specifications.

Approval Date: 18 April 2006

Amend: Division II, Subsection 2.01 "Water Line Material and Size" **as follows:**

Delete: existing Item "E".
Add: new Item "E" **as follows:**

E. Service line to serve a residential house on one (1) residential lot shall be copper with a minimum diameter of three-quarter (¾) inch. Note the following exception.

Exception: In the City of Morrow, the service line shall be copper with a minimum diameter of one (1) inch.

Delete: existing Item "F".
Add: new Item "F" **as follows:**

F. Service line to serve two (2) separate residential houses on two (2) separate residential lots shall be copper with a minimum diameter of one (1) inch. The service line shall be fitted with a copper tee. The tee and service lines, coming from the tee, shall have a minimum diameter of three-quarter (¾) inch. Note the following exception.

Exception: In the City of Morrow, each residential house shall be served by a single service line. A single service line shall not be fitted with a tee to serve two (2) separate residential houses on two (2) separate residential lots.

Rename: existing Item "G" **to** Item "H" **as follows**:

H. Service line serving commercial/industrial buildings shall be copper with a minimum diameter of three-quarter (3/4) inch and a maximum diameter of three (3) inches or ductile iron sized as necessary for the demand.

Add: new Item "G" **as follows:**

G. Where three (3) or more fee simple town home units are attached to form a common structure, each single town home unit shall be provided a copper service line having a minimum diameter of one (1) inch.

AMENDMENT NO. 1 to the Above Referenced Specifications.

Amend: Division II, Subsection 2.09 "Water Meters and Backflow Prevention" **as follows:**

Delete: existing Item "C".
Add: new Item "C" **as follows:**

C. Meters shall be sized according to the anticipated demand and Division III, Section 7 of this document. Note the following exceptions.

Exceptions:

1. In the City of Morrow, a residential house shall be provided water through a meter having a minimum size of one (1) inch.

2. Where three (3) or more fee simple town home units are attached to form a common structure, each single town home unit shall be provided water through a meter having a minimum size of one (1) inch.

AMENDMENT NO. 2 to the Above Referenced Specifications.

Approval Date: 15 November 2006

Amend: Division III, Subsection 5.04 "Corporation Valve" **as follows:**

Delete: existing Acceptable Manufacturers.
Add: new Acceptable Manufacturers **as follows:**
Acceptable Manufacturers

1. Ford Meter Box Co.
2. Mueller Brass Co.
3. A.Y. McDonald Mfg.
4. Cambridge Brass.
5. Other Approved.

Amend: Division III, Subsection 5.05 "Curb Stop" **as follows:**

Delete: existing Acceptable Manufacturers.
Add: new Acceptable Manufacturers **as follows:**
Acceptable Manufacturers

1. Ford Meter Box Co. for ¾ inch and 1 inch sizes.
2. Mueller Brass Co.
3. A.Y. McDonald Mfg.
4. Cambridge Brass.
5. Other Approved.

AMENDMENT NO. 3 to the Above Referenced Specifications.

Approval Date: 12 December 2006

Amend: Division II "Design Requirements", Section 6 "Lift Stations", Subsection 6.04 "Telemetry" **as follows:**

Delete: existing Subsection 6.04 "Telemetry".
Add: new Subsection 6.04 "Telemetry" **as follows:**

6.04 Telemetry

A. A monitoring/dialer system shall interface the lift station alarms to a cellular phone network. Upon receipt of one or more alarm trips, the system shall automatically dial out to the phone network with preprogrammed messages.
   1. The system shall have the capability to monitor from 8 to 48 dry contacts or digital inputs, 8 to 48 analog inputs or energize from 4 to 24 relays in any combination.
      a) Each input shall monitor a set of dry contacts (normally-closed or normally-open).
      b) The dialer shall monitor the AC power and battery voltage continuously.
   2. Upon detecting an alarm on any of its inputs, a low battery condition or detecting loss of its AC power, the system shall begin dialing the first of up to 16 user programmed telephone numbers; each number shall be up to 50 digits.
   3. The system shall speak user-recorded messages to the called party describing its location and the alarm conditions that are present. The system shall verbally request that an acknowledgement be given. The system shall continue calling until the call is completed and acknowledged.
      The dialer shall provide acknowledgement of alarms from:
      a) The front panel.
      b) An input channel.
      c) A phone that is called with an alarm.
      d) A dial-in from a remote location with appropriate access codes.
   4. The dialer shall be situated in a NEMA 4X enclosure.

   Acceptable Manufacturer – Product
   1. Antx, Inc. - Antx DiaLog™ Elite dialer.
   2. Other Approved.

AMENDMENT NO. 3 to the Above Referenced Specifications.

B. A fixed cellular terminal shall transmit signals from the lift station to the cellular phone network.
   1. Air interface standard shall be as follows.
      a) GSM 900/1800 Phase 2+.
      b) GSM 850/1900 TIA/EIA J-STD-007.
   2. Transmit power as follows.
      a) GSM 850 and 900: 2 watts.
      b) GSM 1800 and 1900: 1 watt.
   3. Frequency ranges as follows.
      a) GSM 850: Transmit (824-849 MHz), Receive (869-894 MHz).
      b) GSM 900: Transmit (890-915 MHz), Receive (935-960 MHz).
      c) GSM 1800: Transmit (1710-1785 MHz), Receive (1805-1880 MHz).
      d) GSM 1900: Transmit (1850-1910 MHz), Receive (1930-1990 MHz).

   Acceptable Manufacturer – Product
   1. Telular Corporation - Phonecell® SX5e cellular terminal.
   2. Other Approved

C. Input/Output wiring shall use quick-disconnect pluggable connectors.

D. Electrical Protection shall be as follows.
   1. Transient voltage/surge protection shall be provided on power line, telephone and all input channels.
   2. Solid-state surge protection shall be provided on digital input, analog input, serial port, parallel port, telephone and AC power circuitry.
   3. All fuses shall be solid-state automatically resettable such that the user is not required to manually change a fuse.

AMENDMENT NO. 4 to the Above Referenced Specifications.

Approval Date: 16 April 2008

Amend: Division I "Policies and Procedures", Section 5 "Installation", Subsection 5.02 "Utility Contractor" **as follows:**

Delete: existing Subsection 5.02 "Utility Contractor".
Add: new Subsection 5.02 "Utility Contractor" **as follows:**

5.02 Utility Contractor

A. A licensed Utility Contractor, pre-approved by the CCWA, shall install water distribution systems and sanitary sewer systems.

B. Prior to commencing construction activities on a proposed water distribution system and/or sanitary sewer system, the CCWA Engineer shall receive the latest copy of the Utility Contractor's License.

AMENDMENT NO. 5 to the Above Referenced Specifications.

Approval Date: 04 September 2008
Effective Date: 01 February 2009

Amend: Division III "Material Requirements", Section 8 "Hydrants", Subsection 8.01 "Fire Hydrant" **as follows:**

Add: new Item "M" to Subsection 8.01 "Fire Hydrant" **as follows:**

M. Fire hydrants must conform to the specifications for National Standard fire hydrants for ordinary water works service of the American Water Works Association. Each fire hydrant installed after February 1, 2009 shall include a Davidson Anti Terrorism Valve (ATV) designed to protect against accidental backflow and intentional contamination of drinking water via the hydrant. The ATV shall be a stealth check valve located internal to the upper barrel of the hydrant and shall consist of four main parts.
   1. A sleeve-insert valve seat made of E coated or fusion bonded epoxy steel. The top of the valve seat shall have a machined slot to accommodate an EPDM quad ring which will provide an impenetrable seal between the seat and the valve.
   2. A valve made of brass with machined slots to accommodate an o-ring between the valve and the upper stem.
   3. A stainless steel machined upper stem will replace the original upper stem. The brass valve shall be attached to the upper stem in such a manner as to provide free vertical movement along the shaft.
   4. A stainless steel spring that shall fit around the upper stem and be of adequate compression strength and length that sufficient pressure is placed on the valve to provide an impenetrable seal when the hydrant is not in use and yet allow water to flow freely when the hydrant is flowed.

Amend: Division III "Material Requirements", Section 8 "Hydrants", Subsection 8.01 "Fire Hydrant", Acceptable Manufacturers - Product **as follows:**

Add: new Item "5" to Acceptable Manufacturers - Product **as follows:**

5. Davidson Hydrant Technologies, Inc. – Davidson Anti Terrorism Valve.

AMENDMENT NO. 5 to the Above Referenced Specifications.

Amend: Division IV "Construction Standards", Section 5 "Installation", Subsection 5.02 "Pipe, Fitting, Valve and Fire Hydrant Installation" **as follows:**

Add: new Item "N" to Subsection 5.02 "Pipe, Fitting, Valve and Fire Hydrant Installation" **as follows:**

N. Installation of the Davidson Anti Terrorism Valve shall be made a technician certified by the manufacturer.