



SOUTH GRANVILLE WATER AND SEWER AUTHORITY

STANDARD WATER SPECIFICATIONS

**Adopted by the
South Granville Water and Sewer Authority**

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INTRODUCTION

This document has been developed by the South Granville Water and Sewer Authority's Utility Department to outline the Authority's policies, standards, and specifications as they pertain to Water and Sewer. This Document is not intended to replace or override any accepted Industry Standard; Local, State, or Federal Laws; or any "Best Engineering Practices". Any discrepancies or deviations from this document must be approved in writing by the Authority's Utility Director prior to any construction. The contents of this document are subject to change at anytime without notice.

Water and Sewer Allocations

Water and Sewer allocations shall be made in accordance with the Authority's Allocation Policy. For a copy of the application and policy, contact the SGWASA main office.

Line Extensions within the Authority or Extensions to the Authority's System

If an extension of the Authority's water or sewer system is proposed, the extension will be approved by the SGWASA Board. No extension shall result in cost being borne by the authority unless the extension is initiated by the Authority to improve efficiency or reduce costs. To initiate such an extension request, please submit a letter of request to the South Granville Water and Sewer Authority, Attn: Utility Director, 415 Central Avenue, Suite B, Butner, NC 27509. Questions concerning such an extension can be directed to the South Granville Water and Sewer Authority's Utility Director at (919) 575-3367.

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PART ONE

GENERAL PROVISIONS

All water and sewer main extensions and service connections to the Authority's utility system must be approved, prior to construction, by the Utility Department. All sewer and water services in public right-of-way are to be installed by Authority forces or by a licensed utility contractor. Sewer taps in dedicated easements will either be made by Authority Forces, licensed utility contractors or licensed plumber. All water and sewer connections in new subdivisions are responsibility of the developer. All water services will be metered, and the meter will be located at the right-of-way or in a 2 foot dedicated utility easement adjacent to the right-of-way.

During installation of any water or sewer system that is to be connected to the South Granville Water and Sewer Authority, if the procedures outlined in this document are not strictly adhered to, the Authority reserves the right to

- 1 require the installation to be uncovered for visual inspection;
- 2 reinstallation or retesting of the installation in question;
- 3 refusal of acceptance of the installation;
- 4 and/or refusal of acceptance of the entire project.

The authority shall be held harmless to any and all costs associated with any deviation from the procedures outlined in this document.

Testing and Inspections

It is the responsibility of the Engineer of Record to have a representative present during construction and testing. This representative must be present at least 25% of the time during construction and 100% of the time during all testing procedures. The cost associated with inspections will be paid for by the developer.

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A. Well Policy

Wells inside the Authority will require a permit from the County Health Department. If a well is installed, there shall be no connection to the Authority's water system.

B. Flood Policy

New and replacement water and sewer systems shall be designed and constructed to be flood resistant in flood prone areas as indicated on FEMA Flood Maps. .

C. Service Connections in Water Line Easements

Water service connections in existing water main easements shall be conducted only by South Granville Water and Sewer Authority.

D. Water Main/Easement Relocation Policy

The Utility Department shall only consider requests for relocation of Water mains and easements proposed as a remedial action to resolve conflicts such as encroachment of existing buildings, houses, and other such permanent structures. The total cost of relocation of sewer mains and dedication of new easements shall be at the expense of the property owner, such as engineering cost, survey cost, recordation of maps, surplus property procedure, etc.

E. Construction Water

All water used from the South Granville Water and Sewer Authority Public Utilities system must be metered.

F. Fire System Billing

Any Fire System that uses water for routine testing of pumps and/or appurtenances shall have an appropriate sized meter put into place and shall be billed in accordance with the SGWASA Rate Schedule. If the test water is returned to the SGWASA sewer system, appropriate sewer charges shall be applied.

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PART TWO

PUBLIC WATER AND SEWER EXTENSION POLICIES

The minimum size water main is six inches for residential areas unless approved by the Utility Director, or it is on a residential cul-de-sac of 400 feet or less (measured along cul-de-sac centerline from street centerline to radius point of cul-de-sac) in length, in which case a two inch main will be allowed with an approved underground hydrant or blow-off at the end. All other land uses shall adhere to the Authority/County/Municipal long range plans.

PART THREE

BACKFLOW/CROSS CONNECTION PREVENTION PROGRAM

A. Policy

All backflow/cross connection devices and installations must meet State and Authority minimum design standards/guidelines as indicated in the most recent amended Rules Governing Public Water Supplies by the N.C. Dept. of Environment and Natural Resources and/or the South Granville Water and Sewer Authority Public Services Standard Specifications, whichever is the most stringent. All assemblies approved for use must have prior approval by Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC), or the American Society of Sanitary Engineering (ASSE).

All connections for fire systems connected with the public water system shall be protected with an approved double check detector check valve assembly as a minimum requirement. All fire systems using toxic additives or booster pumps (which includes a FDC or Fire Department Connection) shall be protected by an approved reduced pressure principal detector assembly.

All new water services shall be provided with backflow prevention devices adjacent to the meter box or vault. All backflow preventers must be installed above ground with an insulated box and shall be reviewed by the Utility Department.

All these above ground enclosures must have adequate drainage provided for (depending on the size of the device). All new residential service meter assemblies shall be installed in a single (standard or modified) meter box. All new residential service meter setters shall have a dual check valve incorporated as a standard part of the meter setter assembly.(See Detail U-24)

B. Installation

- 1) There will also be strict enforcement of the 12" minimum distance above the floor or ground and a 60" maximum height above the floor or ground.

Also the backflow prevention device(s) must be readily accessible at all times. Readily accessible means that only a one piece cover must be removed to test the device or perform maintenance on that device. There must also be a minimum clearance around the device of 18".

- 2) The minimum drain size in an above ground vault installation for double check valve assemblies and double detector check valves will depend on the size of the device.
- 3) Defacing a backflow prevention device will not be allowed. Defacing would include anything that might obscure pertinent information on that device (i.e.) name plate, serial number, etc. Any device that is missing a name tag or information stamped in the body will not be considered to be an acceptable device installation and must be replaced upon notification of the Authority.

C. Testing

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Backflow prevention devices must be installed, tested maintained by certified persons that have completed an approved Cross Connection School. It is also required that all commercial, industrial, and irrigation backflow assemblies be tested at the time of installation and annually thereafter. All devices must also have the rubber parts changed every five years. Testing Certificates shall be mailed to Backflow Prevention ORC, South Granville Water and Sewer Authority, 415 Central Avenue, Suite B, Butner, NC 27509.

PART FOUR

WATER DESIGN STANDARDS (Public and Private Systems)

Described in this section are the general design standards which are to be followed by all parties in preparing subdivision, utility extension, and utility replacement plans for the South Granville Water and Sewer Authority. These design standards will ensure that the citizens of the Authority will continue to have good water and sewer facilities. Private systems located within the SGWASA Utility Service Area shall be constructed to these standards minus the exceptions listed under Private Systems, Section V.

All engineering plans for public and private water systems must meet State and Authority minimum design standards as indicated in the most recent amended Rules Governing Public Water Supplies and Public Wastewater Collection Systems by the N.C. Dept. of Environment and Natural Resources and/or the South Granville Water and Sewer Authority Standard Specifications, whichever is the most stringent. All projects must be certified by an engineer of record.

Plan and profile drawings shall be prepared by a registered professional engineer signed, sealed and dated showing the various elements of the utility mains and shall include an overall utility plan layout on a single sheet with scale no smaller than 1 inch=200 feet. The utility drawings shall be on separate sheets, free of landscaping and other details not pertinent to the utility plans. The water and sewer drawings may be on the same sheets. All utility engineering drawings shall be on paper 24 inches by 36 inches. All sewer drawings will show all structures which shall include but not be limited to drainage ditches, storm drains, streams, ponds, lakes, buildings, streets, driveways and other existing utilities.

No plans will be approved for construction until all off-site easements have been obtained. All plans shall show the existing utilities and their size with the existing easements. Off-site drainage shall be indicated on the plans along with the proposed utilities. These plans shall include the service stubs for the individual lots to be served.

Once installed, "as built" plans in paper form and digital form shall be provided to the Authority showing the utilities. The digital form will be specified by the Utility Director. "As built" drawings for the utilities shall be submitted to the Utility Department at the time of acceptance of the project by the Authority. All service stubs shall be shown on the "as built" plans and shall be referenced to the property lines. Prior to construction approval of sewers for public maintenance, recorded sewer easement plats must be submitted to the Utility Department.

I. WATER DESIGN

A. Locations

1.0 All mains are to be within dedicated street rights-of-way except major transmission mains not affording direct service connection unless approved by the Utility Director. When required minimum widths of permanent and construction water line easements, for public water lines, are:

Permanent/Construction	
2" through 10" main	- 20 feet wide/20 feet wide
12"through 24" main	- 30 feet wide/20 feet wide

Larger size easements are to be determined by the Utility Department if depths exceed eight feet. All water line easement boundaries must be field staked and flagged by developer's surveyor and at his expense.

2.0 Unless specified by the Utility Director in writing prior to construction, all contiguous water line easements shall be constructed in a fashion so that maintenance equipment and vehicles can travel from one end to the other without

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having to turn around or enter from a different point. Access to any easement shall not have to be made using a private owner's driveway or property. This may require driveway pipe to be installed at creek/stream crossings. If driveway pipe are required, they shall be placed the entire width of the easement.

3.0 The minimum combination easement width for sanitary sewer and water line is 30 feet. There must be a separation of 10 feet between outside diameters of pipes and 10 feet from the center line of the sanitary sewer to the easement line. Such easements are to be recorded as "South Granville Water and Sewer Authority Sanitary Sewer and Water Line Easement".

4.0 All off-site easements shall be acquired by the developer. These off-site easements shall be recorded by map and by deed of easement. The easements shall be dedicated to the South Granville Water and Sewer Authority and entitled "South Granville Water and Sewer Authority Sanitary Sewer Easement". The dedication of these easements shall be recorded and recorded plats must be submitted to the Utility Department prior to construction approval of the plans.

5.0 No permanent structure or impoundment shall be constructed on water line easement or mains.

B. Size

- 1) Major mains are to be sized according to the Authority/County Water Feasibility Report and/or South Granville Water and Sewer Authority Utility Director.
- 2) In all residential districts, mains shall be six inch and eight inch.
- 3) Within residential cul-de-sacs, 400 feet and less (measured along the cul-de-sac centerline from the street centerline to the cul-de-sac radius point) in length serving single family developments, a 2-inch water main is permissible. (Such a 2 inch waterline will be Schedule 80 PVC in accordance with Part Six Section IV of these specifications.) If the cul-de-sac is serving a multi-family development, then a minimum of 6-inch main is required. Water main sizes shall not be reduced except at street intersections or at fire hydrant locations on cul-de-sacs.
- 4) The South Granville Water and Sewer Authority is required to provide a minimum pressure of 20 psi. If an individual needs greater pressure, then it is their responsibility to incorporate the necessary booster pumping facilities. If an individual needs reduced pressure, then it is their responsibility to incorporate the necessary pressure reduction facilities.
- 5) Fire flows shall be determined by the Fire Marshall for commercial/industrial property. It is the responsibility of the developer/company/corporation to satisfy any fire flow conditions.
- 6) Private fire lines for all land uses shall be a minimum of six (6) inches in diameter and shall be provided with either a double detector check valve or a reduced pressure detector valve, whichever is applicable and built to Authority standards.

C. Elevated Water Tanks

In some circumstances, the Utility Department may choose to accept for permanent ownership and maintenance elevated water tanks designed in accordance with the Authority Standards. Tanks that are needed/intended for fire flows for an individual site will not be considered for acceptance. Those tanks suitable for acceptance by the Utility Department must meet the following criteria:

- (a) Be determined by the Utility Director to be in the "best interest" of the Authority.
- (b) Be necessary due to limitations imposed by existing Authority facilities.

Elevated storage tanks shall be of the type that have an inlet pipe/orifice that deposits water near the top and a discharge pipe/orifice that discharges from the bottom. Any overflow pipes shall be on the outside of the tank and placed in a fashion that dissipates all energy and discharges in a safe and acceptable manner.

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For any new tank to be considered for acceptance, Utility Services Company, Incorporated; Post Office Box 1350, 535 Courtney Hodgins Blvd, Perry, Georgia, 31069; (800) 223-3695 shall be contacted and hired to review the design, fabrication, and construction of the tank. The cost of this service shall be paid for by the developer.

Any existing tank that has not been constructed under Utility Services Company, Inc.'s supervision and is requested to be accepted shall be brought up to new standard's as outlined by Utility Services Company, inc. at the owner/developer expense.

D. Fire Hydrants

All fire hydrants shall be manufactured by Clow and shall be the Clow Medallion with a 5 ¼" Main Valve opening three way (two hose nozzles and one STORZ pumper nozzle) and shall meet AWWA Standard C502.

1.0 All fire hydrants shall be installed on a 6-inch lead with a hydrant branch valve. All hydrants are to be located at the right-of-way or in a two foot easement adjacent to the right-of-way and installed as per Standard Detail W-4. The branch valve shall be no greater than one foot from the main and inside the pavement when possible. If it is not possible to place the valve in the pavement then a two (2) foot square by six (6) inch deep poured in place concrete pad shall be placed around the valve box. The valve and hydrant shall be mechanically restrained (rodded) to the main and blocked with thrust blocking.

2.0 In all residential districts, there shall be a fire hydrant located at each street intersection. The maximum distance between fire hydrants in these districts, measuring along public street centerlines and/or other private travel ways, shall be 500 feet. All parts of all buildings shall be within 300 feet of a fire hydrant.

3.0 There shall be at least one fire hydrant at each street intersection. If any non-single family residential (except agricultural)uses exist on either side of a public street the maximum distance between fire hydrants measuring along public street centerlines, and/or other private travel ways, shall be 500 feet. All parts of all buildings shall be within 300 feet of a hydrant. There shall be a fire hydrant located within 500 feet of all supply connections for stand pipe and sprinkled buildings.

4.0 In conservation buffer districts (agricultural uses), the fire hydrant spacing shall be determined by the Utility Director but shall not exceed 1000 feet.

5.0 On divided roads, fire hydrants shall be alternately spaced on opposite sides of the roadway for a maximum longitudinal spacing between alternating sides of 500' in non-residential areas and 300' in residential areas.

6.0 When the relocation of an existing fire hydrant is approved by the Utility Department, the existing hydrant branch will be plugged at the tee or tapping valve with a mechanical plug. If the existing main/tee is lead joint, the tap or tee will need to be cut out and a new section of pipe(nipple) installed with ductile iron repair joint.

7.0 When hydrant extensions are used, they must be manufactured by the same manufacturer as the hydrant on which they are being used.

8.0 Fire hydrants shall be painted red with the bonnet color coded in accordance with the results of flow tests as approved by the Fire Marshall. Bonnets shall be painted as follows:

<u>COLOR</u>	<u>FLOW TEST RESULTS (GALLONS PER MINUTE)</u>
RED	LESS THAN 500
YELLOW	501 TO 999
GREEN	1000 TO 1499
BLUE	1500 OR GREATER

E. Valves

1.0 Each proposed new intersection shall have the same number of main line valves as the number of streets, i.e., a four-way intersection shall have four main line valves, a TEE intersection shall have three main line valves.

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2.0 Each fire hydrant shall have a hydrant branch valve, and installed as per Standard Detail W-4.

3.0 Main line valves on straight runs between street intersections shall be spaced no greater than the distances given below and shall be located within fifty (50) feet of the nearest hydrant to their location.

Main Size	Maximum Spacing
6"	600'
8"	1000'
10"	1000'
12"	1000'
16"	1000'
24"	1500'

4.0 High and low pressure water distribution systems may be connected with specific approval of the Utility Director. Such connections shall be made with approved check valves positioned with direction of flow from low to high pressure, and a fire hydrant shall be installed on the high pressure side of the check valve. The check valves shall be installed in a standard manhole or vault. A four foot manhole shall be used for six and eight-inch valves and a five foot manhole for twelve-inch valves. Larger size check valves shall be housed in vault, and the size of the vault shall be approved by Utility Director.

5.0 Mains twelve inches and larger in diameter which have a change in elevation of ten feet or greater shall have an air release valve installed at the highest elevation of such change, as per Standard Detail W-18. Additional air release valves may be required by the Utility Director on mains less than 12 inches based on elevation changes of ten feet or greater.

6.0 Any water service consumer which has a water static pressure greater than eighty psi is required by North Carolina State Building Code to install and maintain a pressure reducing valve. The pressure reducing valve will be installed on the building service line after the meter. Such device must be installed before the Authority will allow the actual water connection. This installation is covered by the Plumbing Code and is not maintained by the Utility Department.

7.0 Pressure reducing stations shall be installed when directed by the Utility Director to connect high and low pressure systems. The pressure reducing valve shall allow enough flow from the high side and to maintain a specified pressure on the low side and will not reduce the high side below a certain amount. This type valve will be a back pressure sustaining pressure reducing valve.

F. Installation

1.0 All water mains shall be installed with a minimum cover of three feet from the top of finished ground to pipe crown and shall be in accordance with all applicable Authority Standards.

- a. When mains are to be installed to a dead end or mains are stubbed for future extension, at least one 18' joints of pipe, or more when required, shall be designed with a welded thrust collar or "Mega-lug" in accordance with Standard Detail W-8, of these specifications. The main shall be terminated with a valve. This terminating valve shall be rodded to this "deadman" thrust blocking with a minimum of two ¾-inch threaded rods. All mains up to 16 inch in size shall be designed in accordance with Standard Details W-8A OR W-8B. The blow-off for 16-inch and larger mains shall require approval by the Utility Director.

Mains which are determined to be extended in the future must also terminate with a full size main line gate valve prior to the last two joints of pipe.

2.0 When PVC C-900 class 200 pipe is used, the last joint(S) on dead ends shall be of ductile iron pipe with the thrust collars as shown in Standard Details W-7, W-8, W-8A, and W-8B. Valves used with PVC C-900 water mains shall be anchored in place with a footing design as shown in Standard Detail W-15.

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3.0 Service connections 2 inches and smaller shall be made on all C-900 PVC pipe by using service saddles and corporation cocks. Direct taps with corporation cocks shall be allowed on ductile iron pipe except for certain main sizes and service as indicated in Part Seven, Section II, Item H, of this Handbook. Services 4 inches and larger will require tapping sleeves and valves as shown in Standard Detail W-14. See material specifications for type of acceptable tapping saddle. (See Part Six, II, F and I for more details on service line connections.)

5.0 Service connections shall be allowed on mains 24" and smaller installed in dedicated street rights-of-way. All service connections will be made perpendicular to the main. When two mains are existing in the street right-of-way, the main which provides the best flow and pressure for that parcel shall be tapped. This determination shall be made by the Utility Department.

6.0 Meter installations shall be in accordance with the applicable Standard Details W-21 through W-31. Only multiple meter installations may be located on private property. All other meters must be installed in the right-of-way or in approved easements adjoining the right-of-way. Meters must be installed adjoining the property it is serving.

Fees for such installation are adopted periodically by the Authority.

In non-residential water distribution systems, water meters may be located in the rear of the building with prior approval by the Utility Department. The meters will be installed such that the meter locations conform to the units in the building as viewed from the rear of the building. The meters must be installed in an elevated area behind permanent curb and gutter or protected by bollards so that vehicles cannot be located over the meters. Each meter must be labeled on the exterior with a sign indicating the address on a painted sign or painted on the pavement at each meter. Each meter setter must also have a permanent weather-proof tag wired on the angle valve by the plumber.

7.0 If a lot fronts on two or more streets, then the water meter should be located on the same street as property street address.

8.0 When multi-family developments and non-residential land uses are using gang meter installation, then the construction plans shall show the unit and meter numbering sequence for each building. Gang meter assemblies shall be located in front of the building. If the building number is odd, then the unit and meter letter sequence shall be read from left to right when facing the building. If the building number is even, then the unit and meter letter shall read from right to left when facing the building. All service lines shall be connected to the correct meter based on sequential number or letter assignment. The unit and meter letter identification must be shown on the construction plans for installation approval. The correction of errors in the proper meter/unit pairing, detected later, will be the responsibility of the original installer. The gang meter installation shall be in accordance with Standard Details W-25 and W-26. Upon completion of the installation, tests will be conducted to prove order of connections are correct.

Gang meter assemblies shall be centered around the service line coming from the main as shown in Standard Detail W-24.

9.0 The installation or use of Master Meters shall be approved by the SGWASA Executive Director.

10.0 Private distribution systems installed behind a master water meter will be built to the applicable State Plumbing Code and Department of Human Resources Standards and shall meet the requirements of the Authority's Private Distribution System Standards.

G. Limits of Installation

All water mains, of proper size as determined by the Utility Department, shall be installed complete, along all boundaries abutting existing public roadways, from property line to property line regardless of the land use, proposed lot arrangement of the subdivided property or the availability of connection to a main in service. Within all dead-end streets that may be extended, the water main must extend to the property line of the subdivision.

II. GENERAL INSTALLATION STANDARDS

A. Horizontal Relation of Water Mains to Sewers

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Lateral Separation of Sewers and Water Mains. Water mains shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation in which case:

The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

*Note: All distances measured from outside diameter to outside diameter.

B. Vertical Relation of Water Mains to Sewers

Crossing a Water Main Over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18-inch vertical separation in which case both the water main and sewer shall be constructed of ductile iron and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.

Crossing a Water Main Under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of (ferrous) ductile iron and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing and maintain a minimum of 18" vertical separation. Both lines shall have a section of the main pipe centered at the point of crossing. (no joints within 10 feet of the crossing on either line)

*Note: All distances measured from outside diameter to outside diameter.

C. Vertical Relation of Sanitary Sewer Mains & Water Mains to Storm Sewer

When a sanitary sewer or water main is crossing over or under a storm sewer, a vertical separation of 18 inches shall be maintained unless both lines are of ductile iron. Distance measured outside diameter to outside diameter.

D. General Vertical Clearance

When other underground utilities are encountered 12 inches of separation should be maintained.

III. PRIVATE SYSTEMS

Private water distribution and sewer collection systems proposed for connection to the Authority's public system now or in the future shall conform to all the public system standards listed within this text except for the following considerations:

Private Water System

1.0 Private water distribution lines shall not be required to be located within public right-of-way or publicly dedicated easements.

2.0 No 3-inch mains shall be allowed for private water distribution system. Only even size mains of 2-inch and larger sizes (4,6,8, etc.) shall be approved.

3.0 Those private systems located behind a master meter will conform to the requirements of the Plumbing Code and the Department of Environment and Natural Resources regulations.

PART FIVE

PERMITS & APPROVALS

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During the course of designing and prior to constructing a utility project, various permits and approvals from the Authority and State Government must be secured. Below is a brief description of some of the major permits that may be required on these projects. First will be discussed the South Granville Water and Sewer Authority permits and approvals followed by a brief discussions of the necessary State permits.

South Granville Water and Sewer Authority Permits and Approvals

1.0 Allocation of Water and Sewer from South Granville Water and Sewer Authority

Any request for allocation from SGWASA must be submitted in writing to the Executive Director, 415 Central Avenue, Suite B, Butner, NC 27509. All allocations will administered in accordance to the SGWASA Allocation Policy.

2.0 Line construction and extensions

Any request for extension of the South Granville Water and Sewer Authority's Water or Sewerage Systems must be made in written form to the Utility Director, South Granville Water and Sewer Authority, 415 Central Avenue, Suite B, Butner, NC 27509. This written request must include a preliminary plan of the proposed extension and a schedule setting forth the proposed beginning and completion for all phases of the project.

Requests for extensions within the South Granville Water and Sewer Authority's Authority will be evaluated by the Utility Department and presented to the Authority Board for approval.

3.0 All applicable submittals and approvals/permits shall be acquired prior to any utility construction.

Wetland Permit

It is the responsibility of the developer/engineer to verify if wetlands exist on a project. The regulatory agency that controls wetlands is the US Army Corp of Engineers and or NC Department of Environment and Natural Resources. If wetlands are present it is developers/engineers responsibility to obtain necessary permits and see that they are strictly adhered to.

NCDOT Encroachment Permit

If a project involves a State maintained road or highway, the engineer or contractor must submit the necessary highway encroachment forms to the North Carolina Division of Highways. The encroachment agreement must first be submitted for execution by the South Granville Water and Sewer Authority through the Utility Department. The engineer/developer will pick-up executed forms from the Utility Department then deliver to NCDOT.

All applicable Erosion and Sedimentation Programs, Buffer Ordinances, Storm water Ordinances, and any other local/state/federal laws, ordinances, and policies must be obeyed.

PART SIX

MATERIAL SPECIFICATIONS FOR WATER MAINS

I. GENERAL MATERIAL REQUIREMENTS

Current specifications of the American Society for Testing Materials (ASTM), American Water Works Association (AWWA), Ductile Iron Pipe Research Association (DIPRA), American Association of State Highway and Transportation Officials (AASHTO), National Sanitation Foundation (NSF), and the American National Standards Institute (ANSI) shall apply in all cases where material is covered by an item in these specifications. All material used shall conform fully to these current standards or be removed from the job at the direction of the Utility Director or his designee.

Pipe specimens shall be subjected to tests by an independent testing laboratory at such time as the Utility Director may direct or as specified herein. Rejection of pipe not meeting these specifications will be ordered removed by the inspector, and such pipe shall be immediately removed from the job site and not transported to any portion of the project being constructed.

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Detail or shop drawings of fire hydrants, valves, air release valves, tapping sleeves, tapping saddles, concrete, and other materials must be approved by the design Engineer of the project prior to installation. A copy of these approved submittals will be submitted to the Utility Director prior to installation.

These specifications are not to be considered as proprietary in any way*. When a particular brand is listed, it is only used as an aid in describing the type of material being requested. If a particular brand is used that is differently from the listed brand in these specifications, it must be pointed out in writing on the shop drawings prior to submittal to the Utility Director.

*The exception to this is the required Fire Hydrant – Clow Medallion 3 way with a 5 ¼" Main Valve opening three way (two hose nozzles and one pumper nozzle)

II. MATERIALS - DUCTILE IRON PIPE AND FITTINGS

A. Ductile Iron Pipe

All ductile iron pipe shall be a minimum of Class 50, 51, 52, or Pressure Class 350 designed in accordance with AWWA Standards C-150. Design shall be done for external and internal pressures separately, using the larger of the two for the next design thickness. An additional allowance shall be made for corrosion and casting tolerances. The thickness design for external and internal pressures shall use the following conditions:

- 1.0 3' minimum cover ;
- 2.0 Laying condition - Type 1 (unless pipe manufacturer recommends a different Type Trench based on pipe size and/or material);
- 3.0 A minimum working pressure of 200 psi for pipes 24" and smaller in diameter, and for pipe larger than 24" the design working pressure shall be as determined by the Utility Director, and
- 4.0 A surge pressure of 300 psi.

All calculations for class thickness shall be in accordance with AWWA Standard C-150, and the calculations shall be submitted to the Utility Director for approval prior to shipping any pipe. The minimum class thickness shall be class "50" or Pressure Class "350" for pipes 4 inches through 24 inches in diameter.

The ductile iron pipe shall be manufactured in accordance with all applicable requirements of AWWA Standard C-151 latest revision. The ductile iron pipe shall be supplied in nominal lengths of 18 or 20 feet.

The ductile iron pipe shall be cement-mortar lined with a seal coat in accordance with AWWA Standard C-104 latest revision. Ductile iron pipe shall be bituminous coated in accordance with AWWA C-151 latest revision.

Pipe joint shall be mechanical or "push-on" manufactured in accordance with AWWA Standard C-111 latest revision.

Each joint of ductile iron pipe shall be hydrostatically tested before the outside coating and inside lining are applied at the point of manufacture to 500 psi. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture or leakage of the pipe wall.

All materials used in the production of the pipe are to be tested in accordance with AWWA Standard C-151 latest revision for their adequacy within the design of the pipe, and certified test results are to be provided to the owner upon request. All certified tests, hydrostatic and material are to be performed by an independent testing laboratory at the expense of the pipe manufacturer.

Push-on and mechanical joint pipe shall be as manufactured by the American Cast Iron Pipe Company, United States Pipe and Foundry Company, Griffin Pipe Products Company, McWayne Cast Iron Pipe Company.

Restrained joints shall be TR Flex or Lok Tyte as manufactured by U.S. Pipe, Lok=Fast or Lok-Ring as manufactured by American Pipe, Super-Lock as manufactured by Clow, or Bolt-lok or Rigid-lok as manufactured by Griffin.

B. Ductile Iron Fittings

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All fittings shall be manufactured in accordance with AWWA C-110 or C-153 for ductile iron compact fittings. The fittings shall be tested and the manufacturer shall provide certified test results when requested by the owner. This testing shall include hydrostatic proof testing of the fittings.

All fittings shall be all-bell and of the mechanical joint. Mechanical joints shall be manufactured in accordance with AWWA Standards C-111.

All fittings shall be ductile iron and shall have a minimum working pressure rating of 250 psi and a minimum iron strength of 25,000 psi.

All fitting interiors shall be cement-mortar lined in accordance with AWWA Standard C-104, and the outside shall be bituminous coated. Megalug glands may be used where restraint is needed except when welded restraining rings are required. Megalugs provide additional restraint, but not intended to replace concrete blocking.

C. Gate Valves

Ductile Iron resilient wedge style valves and tapping valves shall be used for all main line and hydrant branch valves in sizes from 2" through 12". American, Clow, M&H, Mueller, and Waterous valves in accordance with AWWA C500, C-509, C-515, or the appropriate AWWA standard as applicable, shall be used. All gate valves shall be coated with an epoxy coating per AWWA C550. All resilient wedge valves shall have internal and external epoxy coating, o-ring seals at the stuffing box and bonnet to body and dual o-rings at the stem seal above the thrust collar.

Tapping valves shall be the same valves, subject to the standards, providing that tapping valves shall have the tapping ring.

Gate valves twelve (12) inches in diameter and smaller, shall be mechanical joint or hub-end all-bell. They shall be "o" ring, open-left valves of the non-rising stem type. These valves shall be designed for a minimum of 175 psi working pressure and 500 psi hydrostatic test pressure with a two (2) inch operating nut – opening left. Valves shall be ductile iron.

D. Butterfly Valves

Butterfly valves larger than 12 inches in diameter shall be Class 250B and shall conform to the latest AWWA Standards C-504 latest revision, as manufactured by Clow, Mueller, Kennedy, Pratt, or American for rubber sealed butterfly valves and valve operating assemblies. "O" ring seals shall also be used exclusively with worm gear.

Butterfly valves thirty (30) inches and larger shall be Class 250B, with ductile or cast iron-epoxy lined body, and ductile iron-epoxy coated disc.

Valve end connections shall be mechanical joint or flange, as required by the detail drawings. Valve seats shall be stainless steel, bronze mating or resilient material. Resilient seat shall be mechanically attached to the valve disc, or mechanically retained in the valve body. Resilient seat shall be fully field adjustable by mechanical means. Valve disc shaft shall be stainless steel with either stub or thru-shaft design. Shafts shall be provided with two-way disc thrusters that are fully adjustable from the outside. Valve shaft bearings shall be heavy duty bronze or chemically inert nylon, properly fitted into hubs integrally cast in the body of the valves.

Butterfly valve operators shall be worm gear type as manufactured by Philadelphia Gear Works or EPI. The valve operator shall be furnished with a two-inch square operating nut, and be so mounted that the valve will open-left (counter-clockwise). The butterfly valve operator shall be AWWA stops, be suitable for submersible service and be sized in accordance with AWWA torque requirements for full 250B rated valve. The valve operator shall be mounted on extended yoke legs so that adjustable main valve shaft packing may be serviced without removal of the operator. Cover plates shall be provided on the yoke legs to prevent dirt from reaching the packing gland.

The manufacturer of the butterfly valve shall be fully responsible for the satisfactory performance of the assembled valve and operator unit. The specified operators shall be factory mounted by the valve manufacturer and shipped to the job site as an operating unit. External painting, hydrostatic testing, travel stop adjustments and crating for

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shipment shall be in complete compliance with the latest AWWA specification for butterfly valves. Butterfly valves shall be Mueller, American, Kennedy, Pratt or approved equal.

All butterfly valves shall be installed in a standard eccentric precast manhole (diameter appropriate with size valve. (See detail W-16).

E. Air Release Valves

Air release valves shall be two (2) inch Crispin Pressure Air valves, Model P 20, with a vacuum check unit, two (2) inch Val-Matic, Model VM-45, with a vacuum check unit or equal as approved by the Utility Director. These valves shall be suitable for 175 psi working pressure and designed to allow air to escape automatically while the main is in service and under pressure. The valve shall be housed in a South Granville Water and Sewer Authority approved eccentric manhole and shall be installed in accordance with Standard Detail W-18 of these specifications. Air release valve locations shall be approved by the Utility Director, or as shown on the plans.

F. Tapping Sleeves and Tapping Saddles

Tapping sleeves shall be Clow or Mueller mechanical joint, Mueller Outlet Seal, American Uniseal or Kennedy Square Seal or Clow F5205 or F5207. One hundred percent stainless steel sleeves may also be used, as manufactured by Clow, Mueller, Rockwell, Romac, or Ford provided that all metallic parts of the sleeves shall be 100% stainless steel including bolts and nuts. All sleeves shall have a minimum of 250 psi working pressure. All taps shall be machine drilled--no burned taps will be allowed.

Tapping saddles may be used on mains 16-inches and larger. Tapping saddles shall be manufactured of ductile iron providing a factor of safety of 2.5 at a working pressure of 250 psi. In main sizes of 30-inch and larger, ductile iron tapping saddles as manufactured by American Pipe Company or US Pipe Company shall be utilized.

Saddles shall be equipped with a Standard AWWA C-110 latest revision flange connection of the branch. Sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddle. Straps shall be of alloy steel. The American tapping saddle, U. S. pipe ductile non-tapping saddle, or an approved equal shall be used. Saddles may be used for taps one-half the size of the main or less (i.e. 8-inch tapping saddle for use on a 16-inch main).

G. Valve Boxes

Adjustable valve boxes shall be gray cast iron of the dimensions specified in Standard Details W-17 of these specifications. Lids shall have the word "Water" case into the lid. All load-bearing castings must be domestically cast and so indicated by the manufacturers name and "USA" in castings. All traffic castings must be Class 35 or greater.

H. Fire Hydrants

Fire hydrants shall comply with AWWA C-502 latest revision as manufactured by Clow - Medallion 3-way fire hydrant with a 5.25 valve opening. (see Standard Details W-4). All nozzles shall be provided with cap and cap retaining chain. The hydrant valve opening shall be five and one fourth inches.

Hydrants shall be open-left type and shall have a six-inch mechanical joint elbow. The hydrant barrel shall be of sufficient length to provide a minimum of three and one-half feet bury and be of the break-away impact type.

I. Water Service

Water service pipe for 3/4 - to 2-inch connections shall be type "K" soft copper with no joints or couplings in the right-of-way except that 2 inch connections may use schedule 80 glue-joint PVC with tracing tape as approved by the Utility Director. On these copper water services, the fittings shall be compression copper type brass fittings. Type K copper shall conform to ASTM B88 Standard Specification for Seamless Copper Water Tube. 2 INCH Schedule 80 water services shall conform as specified in Part Seven Section IV below.

Corporation cocks for direct taps may be used on ductile iron pipe and shall have AWWA Standard tapered threads. Unions shall be three (3) piece copper to copper.

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Gang meter assemblies may be allowed on 3/4-inch to 2-inch service connections and shall conform to the requirements shown in Standard Detail W-24 through W-26.

Service saddle shall be all bronze with double bronze straps and with a neoprene "O" ring gasket attached to the body. The clamp shall have corporation cock threads. These clamps shall be as Mueller H-16100 series, Jones J 979 or approved equal.

For services greater than 2 inches, the water service pipe shall be 4, 6, 8 or 12 inches in diameter and shall be of ductile iron pipe. Cast iron fittings shall be used on these services. All taps will be made by using the appropriate size tapping sleeve and valve (Standard Detail W-14). On a "dry line", the connection may be made with a "TEE and Valve" as shown in Standard Detail W-15.

Coppersettors or copper meter yokes shall be 5/8 X 3/4 inch and 7 inches in height as manufactured by Ford for the 3/4 inch connections. Coppersettors or copper meter yokes shall be 1 inch and 10 or 12 inches in height as manufactured by Ford for the 1 inch connections. Coppersettors and yokes shall have a ball inlet valve with locking wings and a dual check valve.

Coppersettors or copper meter yokes shall be 1.5 inch or 2 inch and 12 inches in height as manufactured by Ford for the 1.5 inch and 2 inch connections respectfully. The 1.5 inch and 2 inch coppersettors shall have a lockable ball inlet valve, a flanged angle dual check valve, a bypass with locking wings with a dual check valve on the bypass.

All Coppersettors shall have locking wings on the angle valve and be of the Ford angle double check type. All coppersettors shall be outfitted with a screen on the inlet side of the setter prior to the water meter.

Meters

All water meters shall be set by the South Granville Water and Sewer Authority Utility Department or under their direct supervision. All meters 2" and larger shall have test ports and a by-pass. All meters types shall be specified by the Utility Director. Meters shall be radio read as determined by the Utility Director.

J. Meter Boxes and Vaults

All single meter residential meter boxes shall be located in non-load bearing areas and centered with the structure being served, unless approved by the Utility Director. All single meter residential meter boxes shall be constructed of synthetic polymer or plastic as detailed on sheets W- 21, W-22, and W-23. All meter vaults shall be constructed of precast concrete, cast-in-place concrete as detailed on sheets W-29.

III MATERIALS - CLASS 200 PVC PRESSURE WATER PIPE

A. PVC Pressure Pipe for Water Systems

Class 200 PVC pressure pipe conforming to the requirements AWWA Standard C-900 latest revision shall be allowed if:

- 1.0 3' minimum cover
- 2.0 The working pressure is less than 150 psi, and the surge pressure is less than 35 psi, or
- 3.0 The sum of the working and surge pressures is less than 185 psi.

The engineer shall prove that the PVC Class 200 pipe is being installed in an area that meets the requirements listed above. All calculations and measurements shall be prepared by a registered engineer, and this work shall be compatible with cast or ductile iron fittings.

All PVC pipe shall be furnished with an elastomeric gasketed compression type joint, and the appropriate gasket(s) shall be furnished with each length of pipe.

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All pipes and materials are to be tested according to the requirements of AWWA Standard C-900-75. Certified test results are to be provided to the Utility Departments when requested. These tests shall be performed by an independent testing laboratory at the expenses of the pipe manufacturer.

B. Fittings and Valves

All fittings shall be of ductile iron or cast iron and shall conform to the requirements of AWWA Standard C-110. Connections to the fittings and valves shall be made by mechanical joints. These fittings and valves shall conform to the requirements listed in Part Seven, Section Two.

C. Service Connections

Service connections shall be made through the use of tapping service saddles for PVC pipe with D.I. outside diameter. These tapping service saddles shall have corporation cock threads and shall provide a maximum amount of bearing area along the axis of the pipe to keep the pipe from deforming while the saddle is being tightened. The saddle must provide full support around the circumference of the pipe. Tapping saddles for PVC pipe shall be as Clow Twin-Seal brass tapping saddle, Mueller bronze double strap series H 16100, Jones J 996 or an approved equal by the Utility Department. All taps shall be machine cut, in accordance with the manufacturer's recommended procedures.

IV MATERIALS – 2 INCH SCHEDULE 80 PVC PRESSURE WATER PIPE AND WATER SERVICES

A. PVC Pressure Pipe for Water Systems

SCHEDULE 80 PVC (SCH80) pressure pipe, fittings, and solvents conforming to the requirements

ASTM STANDARD D 1784	RIGID VINYL COMPOUNDS
ASTM STANDARD D 1785	PVC PLASTIC PIPE, SCHEDULE 80
ASTM STANDARD D 2464	PVC THREADED FITTINGS, SCHEDULE 80
ASTM STANDARD D 2467	PVC PLASTIC FITTINGS, SCHEDULE 80
ASTM STANDARD D 2564	SOLVENT CEMENTS FOR PVC PIPES AND FITTINGS
NSF STANDARD 14	PLASTIC PIPING COMPONENTS AND RELATED MATERIALS
NSF STANDARD 61	DRINKING WATER SYSTEM COMPONENTS – HEALTH EFFECTS

latest revisions shall be allowed if:

- 1.0 The pipe bears the stamp of NSF for potable water
- 2.0 3' minimum cover
- 3.0 The working pressure is less than 150 psi, and the surge pressure is less than 35 psi, or
- 4.0 The sum of the working and surge pressures is less than 185 psi.

The engineer shall prove that the SCH80 PVC pipe is being installed in an area that meets the requirements listed above. All calculations and measurements shall be prepared by a registered engineer, and this work shall be compatible with cast or ductile iron fittings.

All SCH80 PVC pipe shall be furnished with a SOLVENT CEMENT type joint, and the appropriate fittings shall be furnished with each length of pipe.

All pipes and materials are to be tested according to the requirements of ASTM D 1785. Certified test results are to be provided to the Utility Departments when requested. These tests shall be performed by an independent testing laboratory at the expenses of the pipe manufacturer.

B. Fittings

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All fittings shall be of SCH80 PVC and shall conform to the requirements listed above. Connections to other pipes of different material, yokes, copper setters, and valves shall be made by mechanical joints or threaded coupling.

C. Service Connections

Service connections shall be made through the use of tapping service saddles for PVC pipe with C.I. outside diameter. These tapping service saddles shall have corporation cock threads and shall provide a maximum amount of bearing area along the axis of the pipe to keep the pipe from deforming while the saddle is being tightened. The saddle must provide full support around the circumference of the pipe. Tapping saddles for PVC pipe shall be as Clow Twin-Seal brass tapping saddle, Mueller bronze double strap series H 16100, Jones J 996 or an approved equal by the Utility Department. All taps shall be machine cut, in accordance with the manufacturer's recommended procedures.

V. MATERIALS - STEEL ENCASEMENT PIPE

Steel pipe for boring installations shall be high strength steel, welded or smooth-wall seamless manufactured in accordance with ASTM A252 and consisting of grade 2 steel with a minimum yield strength of 35,000 psi. The minimum casing pipe wall thickness shall be 0.375" for bored encasement.

The outside of the pipe shall be coated with 2 coats of a compatible black epoxy with a total dry film thickness of 8 – 10 mils per coat. Epoxy coating shall be Tnemec Hi-Build Tneme-Tar Series 46H-413, or approved equal.

Pipe ends shall be right-angled and shall be compatible to receive a "Dresser style 62" - Type I or approved equal mechanical transition coupler. The pipe shall be coated inside and outside, in accordance with AWWA C203-97, ASTM standards and any additional requirements of the N.C.

Department of Transportation or the American Railway Engineering Associations' specifications if applicable. All encasement pipe must be approved by the appropriate controlling agency (i.e. NCDOT, RR, etc.) prior to ordering the material.

All carrier piping shall be slip joint ductile iron and the minimum inside diameter casing shall be eight inches greater than the inside dimension of the carrier pipe as follows:

Carrier Pipe Steel Nominal Diameter	Casing Pipe Minimum Inside Diameter
4 inch (private only)	12 inch
6 inch	14 inch
8 inch	16 inch
12 inch	20 inch
16 inch	24 inch

Both ends of the casing shall be mortared. Metal "spider" pipe alignment devices shall be installed in all casings with a minimum of two "spiders" per pipe joint one fourth of the pipe joint length in from both the bell and spigot ends. See Detail W-36.

VI. BACKFLOW PREVENTION DEVICES

All assemblies must have prior approval by Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC), or the American Society of Sanitary Engineering (ASSE).

All backflow prevention devices installed on fire systems shall have leak detector capabilities built into the device.

All backflow devices will be installed in accordance with PART THREE – BACKFLOW/CROSS CONNECTION PREVENTION PROGRAM .

All connections for fire systems connected with the public water system shall be protected with an approved double check detector check valve assembly as a minimum requirement. All fire systems using toxic additives or booster pumps (which includes a FDC or Fire Department Connection) shall be protected by an approved reduced pressure principal detector assembly.

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DOUBLE CHECK VALVES (DCV)

All double check valves shall conform to AWWA Standard C510. The device shall be constructed from Ductile Iron. It shall consist of two (2) mechanically independent, spring loaded, center stem, guided check valves. The device shall have a cast ductile iron body, with a single access cover. The assembly shall have four (4) vertical shut off valves which are quarter-turn, full-port, resilient seated and ball type which are constructed with low lead material, less than 0.25% lead content (ASTM C90500) or approved equal. Supplied with full ported gate valves.

REDUCED PRESSURE ZONE DEVICE (RPZ)

All Reduced pressure Zone assemblies shall conform to AWWA Standard C511. It shall consist of two (2) mechanically independent, spring loaded, center stem guided check valves. It shall also have a hydraulically dependent differential pressure relief valve with the sensing passage set in an integral cast unleaded bronze body, with a single access cover. The assembly shall have four (4) vertical test cocks and two shut off valves which are quarter-turn, full-port, resilient seated and ball type which are constructed with low lead material, less than 0.25% lead content (ASTM C90500) or approved equal.

BACKFLOW DEVICE DETERMINATION -DETERMINATION OF DEGREE OF HAZARD

I. Degree of Hazard:

A. Severe: Actual or potential threat of contamination that presents an imminent danger to the public health with consequence of serious illness or death.

B. Moderate: One that presents foreseeable and significant potential for pollution, nuisance, aesthetically objectionable or other undesirable alterations of the drinking water supply.

II. Backflow Prevention Assembly Requirements:

Degree of hazard	RPZ*	DCVA**	Air Gap
Severe	X -----		X
Moderate -----		X -----	

* Reduced pressure zone

** Double check valve assembly

*** This is not intended to be an exhaustive list

III. Facilities that Require Installation of a Backflow Preventer***:

A. Moderate hazard - DCVA:

1. Fire sprinkler systems without booster pump facilities or chemical additives.
2. Connection to tanks, lines and vessels that handle non-toxic substances.
3. Lawn sprinkler systems without chemical injection or booster pumps.
4. Most commercial establishments.
5. Automatic service stations, bakeries and beauty shops with no health hazard and bottling plants with no back pressure.
6. etc.

B. Severe hazard - RPZ or air gap:

1. Lawn sprinkler systems with chemical injection or booster pump
2. Wastewater treatment plants
3. Connection to an unapproved water system or unapproved auxiliary water supply
4. Connection to tanks, pumps, lines, steam boilers or vessels that handle sewage, lethal substances, toxic or radioactive substances
5. Fire sprinkler systems with booster pump facilities or chemical additives
6. Buildings with five or more stories above ground level
7. Hospitals and other medical facilities
8. Morgues, mortuaries and autopsy facilities

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9. Metal plating facilities
10. Bottling plants (subject to back pressure)
11. Canneries
12. Battery manufacturers
13. Exterminators and lawn care companies
14. Chemical processing plants
15. Dairies
16. Film laboratories
17. Car wash facilities
18. Dye works
19. Laundries
20. Swimming pools
21. Water front facilities
22. etc.

PART SEVEN

I. WATER CONSTRUCTION STANDARDS (Public and Private Systems)

The requirements contained in this section shall apply to water main installations constructed for the Utility Department or for private developers who may or may not dedicate the water improvements to the Authority. All necessary construction permits must be obtained before construction may begin in accordance with North Carolina State Law.

1. SCOPE OF WORK

a. The contractor shall furnish all materials, equipment, and labor for excavation, installation, backfilling of water mains and related appurtenances as shown on the plans. The Utility Director or his designee(s) shall conduct all Authority inspections on main extension projects.

b. It shall be the contractor's responsibility to notify the Utility Department at least twenty-four hours in advance of beginning any construction work on any project. The contractor must call the Utility Department at (919) 575-3367 and give the location, project name, individual's name, company name, start date and indicate if it involves water extensions.

c. Once construction has begun, the contractor shall contact The Utility Department at (919) 575-3367 each morning to notify where and what will be done that day. Any work requiring inspectors observation outside of the normal workday, Monday-Friday, 8:00 a.m. to 4:00 p.m. shall be charged at the current inspector hourly rate.

d. If a developer, engineer or contractor proceeds with the main installation prior to permit issuance or notification the Authority may require the work to be reinstalled and the developer, engineer or contractor shall be fully liable for all actions and costs, including prosecution by the Authority or the State for proceeding with installation prior to issuance of appropriate permit(s) or notification.

e. "Field changes" are not considered approved by the Utility Department unless revised plans have been submitted to the Utility Department, reviewed and approved. Therefore, the contractor that proceeds with construction prior to this approval, is at his/her own risk.

1. GENERAL TESTING REQUIREMENTS

The Authority may perform and shall require the contractor to perform, such destructive and nondestructive testing, as it deems necessary in order to inspect the materials and workmanship. These tests shall be in accordance with the procedures established by AWWA C605, ASTM and AASHTO. The Authority shall reserve the right to modify the procedures in testing ditch and backfill compaction to allow a deeper test to be made by using the sand-core method and/or nuclear testing gauges.

2. HANDLING AND STORAGE OF MATERIALS

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- a. The contractor shall be responsible for the shipping and storing of all water materials. The contractor shall replace any material which is damaged or defective.
- b. The loading and unloading of all pipe, valves, hydrants, and other accessories shall be in accordance with the manufacturer's recommended practices and shall at all times be performed with care to avoid any damage to the material.
- c. The contractor shall locate and provide the necessary storage areas for materials and equipment. If private property is being used for storage areas, then the contractor must have the written consent from the owner. Without this written consent, all material and equipment shall be stored within the existing rights-of-way and easements of the project. Unless approved by the Utility Director or NCDOT, pipe may not be prestrung along job site; it must be delivered to and removed from job site each day. In extenuating circumstances when the inspector authorizes pipe to remain on the project from one day to the next, the ends of the pipe must be sealed.
- d. All materials, once on the job site, shall be stored in accordance with the manufacturer's recommendations. All PVC Pipe and fittings shall be covered to protect it from the sun and UV rays from the time of delivery to placement into the ground.
- e. All pipes shall be kept free of dirt and other debris. Any damage relating to the coating of the various materials for water mains shall be repaired in a manner approved by the Authority.
- f. The contractor shall be responsible for safeguarding and protecting all material and equipment stored on the job site. The contractor shall be responsible for the storage of materials in a safe and workmanlike manner to prevent injuries, during and after working hours, until the project is complete.

3. BARRICADES, SIGNS AND STREET PROVISIONS

- a. Signs, barricades, warning lights, guard rails and flaggers shall be employed as necessary when construction endangers either vehicular or pedestrian traffic. These devices shall remain in place until the traffic may proceed normally again. The contractor shall hold the Authority harmless for any damages or injuries caused by the construction of water mains and the activities associated with the construction.
- b. Detours and all traffic control measures shall be set up and maintained by the contractor under the direction of the South Granville Water and Sewer Authority's Utility Department and the North Carolina Department of Transportation. Notice must be given a week in advance of the detour so that necessary notification of the traveling public may be made. The contractor will furnish all barricades, signs, lights and other safety devices to protect his/her construction. The contractor is in no way relieved of liability for providing this protection because others approve the detour.
- c. Construction work zone signs and signing procedures shall conform to the MUTCD and supplements and to all applicable federal, state and local codes. The contractor shall be responsible for securing the necessary permits from the Authority's and the State's Department of Transportation and Inspections for all work to be performed in the public rights-of-way.

4. PROPERTY PROTECTION

Trees, fences, poles and all other property shall be protected unless their removal is authorized, and any property not authorized for removal, but damaged by the contractor, shall be restored by the contractor to the owner's satisfaction.

5. GENERAL CONSTRUCTION SAFETY

- a. The contractor and any subcontractors shall be responsible for the total compliance with all federal, state and local ordinances, laws and regulations as related to safe construction practices and to protecting the employees and the public's health and safety.
- b. The contractor shall ensure that all Occupational Safety and Health Administration (OSHA) regulations and standards are followed during all phases of the construction project.

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- c. The Authority shall not be responsible for the contractor's adherence to OSHA regulations and standards. However, the Authority may report known violations or unsafe practices to the appropriate enforcement agency.
- d. The contractor shall be required to furnish safety equipment necessary to inspect the work including, but not limited to ladders, gas detectors/oxygen sensors, blowers, etc.

6. ENCROACHMENT CONTRACTS AND PERMITS

- a. Prior to actual construction, the contractor shall acquire the necessary encroachments from NCDOT when working within the rights-of-way of state system roads or highways. The encroachment permit shall be kept on the job site at all times.
- b. The contractor shall be responsible for securing all other local, state and federal permits required for the utility construction.
- c. The contractor must have an approved set of permitted construction plans on site at all times.

7. PAVEMENT REMOVAL AND REPLACEMENT

- a. All pavement to be removed shall be cut along straight lines with the appropriate equipment. Street cuts on Authority Streets shall be approved as part of the project approval. State streets shall be approved as part of the NCDOT Encroachment. The removal and replacement of the pavement shall conform to the information shown in Details W-1 & W-2. All cuts of Authority streets must be patched the same day.
- b. Pavement cuts shall be confined to a maximum trench bottom width as shown in Details W-1 thru W-3, plus six inches on either side.

8. VALVE OPERATIONS

- a. No valve in the existing system shall be operated without following the procedure outlined below. Failure to comply with these requirements shall be grounds for suspension of pipe-laying operations until written assurance can be obtained from a company official that such noncompliance will not occur again. The contractor should be aware that the Authority regards violations of these requirements as justifying punitive measures.

Notification procedures are as follows:

The contractor shall notify the Utility Department's Utilities Division at (919) 575-3367 in order to request the operation of any valves. At least twenty-four hours notice must be given to the Utility Department, and at least twenty-four hours notice must be given to each customer affected by a water cut-off. The contractor is responsible for notifying the affected customers. All valve operations shall be done by a Utility Department personnel or by the Authority's inspector for a particular project. It is illegal for anyone other than a South Granville Water and Sewer Authority employee to operate an existing water main valve, unless accompanied by a South Granville Water and Sewer Authority employee.

When calling the Utilities Division as required prior to granting approval for operating the valves and dispatching a crew, the contractor shall call the Utilities Division and give the following information:

- Name of person calling;
- Name of company;
- Telephone number of company;
- Location of valve and map number if available;
- Reason for requesting operating and whether to be closed or open;
- Time valve to be opened or closed, and
- Approximate time water line to be out of service.

Each time a contractor needs a valve operated, he/she shall again secure permission, following the steps outlined.

- b. System valves shall be defined as any valve, which has main pressure against either gate face. c. Newly installed tapping valves and control valves to networks not yet accepted for service are considered as system valves. Valves within a network still under construction are not considered as system valves.

9. CONSTRUCTION WATER

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The South Granville Water and Sewer Authority Utility Department does not provide free or otherwise un-metered construction water for any construction project. Hydrant meters may only be moved with the express written permission of the Utility Department. In residential areas hydrant meters may not be used for the filling of swimming pools unless prior approval of the Utility Department. Contractors are responsible for adequate construction water for their job sites in one of the following approved manners:

- a. Apply for permanent water service connection at the Finance Department, 415 Central Avenue, Suite B, Butner, NC 27509, (919)575-3367. Sufficient lead-time (6 weeks) should be provided for all new service taps and all fees must be paid in full prior to the work order being authorized.
- b. Apply to the Utility Department (919) 575-3367 as to the availability of a hydrant meter. There are a limited number of these meters and they are reserved in advance. All appropriate billing information must be provided and fees paid prior to the meter being issued. Customers are responsible for notifying the Utility Department if the meter is not registering usage. If a hydrant meter is available the following information is required:
 - (1) Meter location;
 - (2) Billing address, telephone number, and responsible party name;
 - (3) Location of hydrant;
 - (4) Water to be used for;
 - (5) Duration of use and frequency of meter reading,
 - (6) Meters must be brought to 415 Central Avenue, Suite B, Butner, NC 27509 for monthly reading.
- c. Purchase bulk water from SGWASA Water Plant.
- d. Hydrant meters accounts are billed monthly. Failure to report usage in timely manner for billing or accounts that are not paid in full will result in the loss of water service and the closing of the account with the Authority.
- e. Hydrant meters will only be set when the temperature is over 35 degrees. Damage to meters from the cold weather or abuse will be charged to the customers.
- f. It is a violation of the Authority to establish a direct connection to a fire hydrant to fill a tank or tank vehicle. It is also illegal to use a RP or Double detector check valve on a domestic or fireline service for temporary water service. Violations will result in loss of service, fines, and other measures as specified by State and Local Law.

Note: Individuals caught using water unmetered and/or unauthorized by the Utility Department will be prosecuted to the fullest extent of the law.

10. EXCAVATION

- a. **Prior to any excavation or construction, the contractor shall locate all existing utilities in the field. If help is needed in locating utilities operated by the Utility Department, the contractor should contact the Utilities Division (919) 575-3367.**
- b. Trench width shall be a minimum of six inches plus outside diameter of pipe and a maximum of twenty-four inches plus outside diameter of pipe, unless OSHA requires additional trench width. Trench width shall be measured between the faces of the cut at the top elevation of the pipe bell as shown in Detail W-3.
- c. Trench bottom conformation, where no special bedding is required, may be that referred to herein as flat bottom where the trench bottom is excavated slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Where the trench bottom is inadvertently cut below grade, it shall be filled to grade with an approved material and thoroughly tamped compacted to 95% or use #67 stone to bring to grade.
- d. The maximum length of open trench shall be no more than three hundred feet, unless approval is obtained from the Utility Director.
- e. The contractor shall, at the his/her own expense, keep all trenches free from water during the excavation for construction of foundations, masonry, water mains. The water shall be pumped out of the trench or build check dams to keep it out of the ditch in such a manner as not to cause injury to the public health, private property or the work in progress. Erosion control measures shall be taken during this pumping.
- f. In trenches where water is present or dewatering is required, the trench shall be stabilized with #67 stone. When the contractor encounters material during trench excavation, at the opinion of the inspector, or Utility Director, that is unsuitable (i.e. "muck"), this material shall be replaced with material that is considered suitable prior to the pipe laying operations. In this case, construction fabrics may be required to prevent the migration of side support away from the pipe.
- g. Safety and convenience of the public necessitate that all work, including excavation, be done in such a manner as to cause minimum traffic interruption, both pedestrian and vehicular. Utilities such as fire hydrants, valves, etc., shall be accessible at all times. Gutters and drains shall be left open and clear at all times, and the contractor shall be responsible for all drainage around his work. Unless specifically waived by the Utility Director, provisions shall

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be made to maintain vehicular traffic on all streets in which work is in progress, and suitable walkways shall be maintained for pedestrian travel.

- h. Sheeting or bracing shall be used wherever necessary to prevent failure of the trench banks. All sheeting shall conform to AASHTO and OSHA safety standards. The decision of the Utility Director or Engineer relative to bracing for the protection of property of the Authority shall be binding upon the contractor. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the backfill and trench walls.

11. ROCK EXCAVATION

- a. Rock shall be defined as that solid material that cannot be excavated, in the opinion of the Utility Director or Engineer, by any means other than drilling and blasting, drilling and wedging, or boulders and broken concrete exceeding 1 cubic yard in volume. Rock shall be excavated to the same limits as earth excavation except that the trench shall be made six inches lower than the outer bottom of the pipe, and this six inches shall be refilled with six inches of #67 stone and thoroughly compacted to the sub-grade level. No soft or disintegrated rock which in the opinion of the Utility Director or Engineer that can be removed with hand picks or power operated shovels, no previously blasted rock or broken rock, and no rock outside the minimum limits of the trench shall be measured or paid for as rock. Manholes shall be excavated to nine inches outside the exterior masonry footing and to a depth as shown on the plans or standards, and only that excavation actually done within these limits shall be measured for payment. All trenches for purpose of rock measurement shall be assumed as having vertical walls. Payment for rock shall not necessarily be made because the contractor blasts the material. In order to assure payment for rock, the overburden must be cleared first, and the rock ascertained and profiled in lengths as specified by the Utility Director or Engineer. If the contractor drills and blasts before the over burden is taken off, and the Utility Director or Engineer, after inspection of the material, decides that the material could have been taken out by power driven shovels, no payment shall be made for rock excavation. All blasting shall be done under the supervision of the Utility Director or Engineer and subject to all applicable regulations. The Authority reserves the right to require the removal of rock by means other than blasting where any pipe or conduit is either too close to or so situated with respect to the blasting as to make blasting hazardous. Rock shall be paid for at the unit price bid per cubic yard for the amount removed measured in place. Rock taken from the ditch shall immediately be hauled away and disposed of by the contractor. No additional compensation shall be made for disposing of the rock. Rock removed shall be paid for as per the accepted bid for the unit price. The contractor shall reimburse the amount for rock not excavated. Otherwise, when rock excavation exceeds the bid quantity, the unit price in the bid shall be paid for the rock in excess.
- b. Blasting procedures shall conform to all applicable local, state and federal laws and ordinances. A blasting permit shall be obtained from the County Fire Marshall's Office, prior to any blasting. The application shall be obtained 24-hours before any blasting takes place, and the Fire Marshal may specify the hours of blasting. The contractor shall take all necessary precautions to protect life and property, including the use of an approved blasting mat where there exists the danger of throwing rock or overburden. The contractor shall keep explosive materials that are on the job site in special constructed boxes provided with locks. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a galvanometer is employed to check cap circuits. Where blasting takes place within five-hundred feet of a utility, structure or property which could be damaged by vibration, concussion or falling rock, the contractor shall be required to take seismograph readings and to keep a blasting log containing the following information for each and every shot.
 - 1) Date of shot
 - 2) Time of shot
 - 3) Crew Supervisor
 - 4) Number and depth of holes
 - 5) Approximate depth of overburden
 - 6) Amount and type of explosive used in each hole
 - 6) Type of caps used (instant or delay)
 - 7) The weather
 - 8) Seismograph instrument and readings
- c. This blasting log shall be made available to the Utility Director or Engineer upon request and shall be kept in an orderly manner. It shall be the contractor's responsibility to have adequate insurance to cover any damages resulting from blasting so to hold the South Granville Water and Sewer Authority harmless from any claims.

II. WATER MAINS AND RELATED ACCESSORIES

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A. Trench Preparation

1.0 Trench excavation shall conform to the line and depth shown on the plans or as directed by the Utility Director. The trench shall be properly braced and drained so that workmen may work therein safely and efficiently. When water is being pumped from the trench, the pump discharge shall follow natural drainage channels, drains or storm sewers. In discharging trench water, it will be necessary to follow standard erosion control measures so as to minimize erosion and sedimentation.

2.0 The width of the trench may vary with the depth of cut and other conditions the trench shall be in accordance with the dimensions set forth by OSHA and other information shown on Standard Details W-3 and W-3A.

3.0 The foundations for ductile iron and C-900 PVC water pipe 12 inches or less shall conform to the minimum requirements described below:

- a. The foundation for ductile iron pipe shall be a firm and stable flat bottom (Type 1) trench with bell holes so that the pipe rests uniformly on the entire barrel length. (See Standard Detail W-3 and W – 3A). If unstable conditions are encountered, the trench shall conform to the requirements of Section I.10.of this part.
- b. The foundation for C-900 PVC water pipe shall be a firm flat bottom trench with a minimum of four inches of #57 stone (Class I) material properly compacted with bell holes. If unstable conditions are encountered, the trench shall conform to the requirements of Section I.10 of this part. (See Standard Detail W-3 and W-3A).

3.1 The foundations and bedding for ductile iron and C-900 PVC water pipe 14 inches and larger shall conform to the Standard Laying Conditions for Ductile iron and C900 Pipe illustrated in W-3A as recommended by the Pipe Manufacturer in accordance with the type of pipe, specific laying conditions, laying depth, and any other conditions/situations that could affect the performance of the pipe.

4.0 Pipe clearance in rock shall be a minimum of six inches below and on each side of the pipe for sized sixteen inches and less in diameter. For sizes larger than sixteen inches in diameter, the minimum clearance shall be nine inches below and on each side.

B. Pipe Installation

1.0 Ductile iron pipe shall be installed in accordance with the requirements of AWWA Standard C-600. PVC pipe shall follow the requirements of ASTM D-2321 and shall be installed and tested in accordance with AWWA C605.

2.0 Water pipe shall be laid to the line and grade shown on the plans with all valves, and hydrants located as shown on the plans. There shall be a minimum horizontal separation between water and sewer utilities of ten feet and a vertical separation of 18 inches.

3.0 Protection shall be afforded to all underground and surface structures using methods acceptable to the Utility Director or Engineer. This protection shall be furnished by the contractor at the contractors own expense.

4.0 Deviation from line and grade maybe made only with the written permission of the Utility Director or Engineer when such deviations arise from grade or line conflicts with existing utilities, structures or other sources of conflict.

5.0 Subsurface explorations shall be made by the contractor at the direction of the Utility Director or Engineer where it is necessary to determine the location of existing pipes, valves or other underground structures.

6.0 Depth of pipe cover shall be three feet. Depth of cover shall be measured from the established street grade or the surface of the permanent improvement to the top of the barrel of the pipe.

7.0 After the foundation has been properly graded, bedded when applicable, and the bell holes dug, the pipe and accessories shall be carefully lowered into the trench by approved methods. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. All damaged pipe and accessories shall be properly repaired or removed from the job. All damaged pipe shall be replaced at the expense of the contractor, unless otherwise directed by the Inspector.

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8.0 Pipe shall be swabbed clean with sodium hypochlorite solution before it is laid, and any pipe which cannot be cleaned with a swab shall be removed and cleaned with suitable apparatus. Any pipe showing evidence of oil, tar or grease shall be permanently marked and removed from the job.

9.0 Laying of pipe and jointing of pipe shall be done according to manufacturer's recommendation with care being taken to provide uniform bearing for the pipe. Bell and spigot of pipe shall be cleaned and properly lubricated where a mechanical joint of a "push on" type joint is employed. No chlorine powder or tablets shall be put in the lines during construction.

10.0 Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be permitted to enter pipe.

11.0 Pipe cutting for inserting valves, fittings or closure pieces shall be done in a neat and workman like manner in accordance with the manufacturer's recommendations and without damage to the pipe.

12.0 Bell ends will face the direction of laying unless otherwise directed by the Utility Director or Engineer. For lines on an appreciable slope, the Utility Director or Engineer may also require that bell ends face upgrade.

13.0 Maximum horizontal deflections for ductile iron pipe shall be as follows for and eighteen foot joint of pipe:

Size Pipe	MAXIMUM DEFLECTION IN INCHES	
	MJ	Push-on-Joint
6"	27"	19"
8	20	19
10	20	19
12	20	19
14	13	11
16	13	11
18	11	11
20	11	11
24	9	11
30	9	11
36	8	11
42	7	7
48	7	7

14.0 The maximum horizontal deflection for C-900 PVC pipe shall be in accordance with the manufacturer's recommendations for each twenty foot joint of pipe.

15.0 When installing a water main, the horizontal separation between water and sewer shall be ten feet. If this separation cannot be maintained due to existing conditions, the only variation allowed is the water main in a separate trench with the elevation of the water main at least 18 inches above the top of the sewer line and must be approved by the Utility Director.

16.0 When a water main crosses another utility line or main (sanitary sewer, storm sewer), separation between the mains shall be in accordance with PART FOUR WATER DESIGN STANDARDS, II GENERAL INSTALLATION STANDARDS. Any changes in these clearances must be approved by the Utility Director. All crossing within these vertical clearances shall be filled with #67 stone, unless otherwise specified by the utility that is being crossed (i.e. NCPS GAS requires sand to be placed around their gas lines at any crossing – rock is not to be used.). All distances are measured from the outside diameter to outside diameter.

17.0 When a water line passes over or under a storm sewer, vertical separation of 18 inches shall be maintained unless both lines are of ductile iron or encased in concrete. A concrete pad shall be poured between the two. No extra compensation shall be allowed for the pad.

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18.0 Railroad crossings shall be made following all precautionary construction measures required by the railroad officials, and no extra compensation will be allowed by the Utility Director or Engineer, unless otherwise provided in the Special Provisions.

19.0 All water crossings under the state system roads shall be made in accordance with the requirements of the Division of Highways as defined in their encroachment permits. No extra compensation will be allowed.

20.0 Where conditions are, in the opinion of the Utility Director or Engineer, unsuitable for laying pipe because of weather or trench conditions, the contractor shall be required to cease work until permission is given by the Utility Director or Engineer for work to commence again providing such conditions have been corrected.

C. Setting Valves and Valves Boxes

1.0 Valves shall be set at locations shown on the plans with care being taken to support the valve properly and to accurately position the valve box over the operating nut of the valve. Where pavement is existing, the box shall be adjusted to finished street grade as shown in Standard Detail U-20. When valves are located in street rights-of-way, but out of pavement, the boxes shall be adjusted to finished grade and a concrete pad two-feet square and six-inches thick shall be poured around the box one-half inch from the top. When valves are located outside of street rights of way, the boxes shall be at finish grade, and concrete block two-feet square and six-inches thick shall be poured around the box at grade line. Valve locations out of street rights-of-way shall be marked with some type of metal post having a minimum diameter of two inches and a minimum bury of three feet with a minimum of three feet exposed. The exposed portion shall be painted bright orange and shall be placed so that a valve operating tool has free operation.

2.0 Valve box covers in the road right-of-way that do not seat exactly evenly in the ring, a layer of tar will be placed in the top section to ensure proper seating. Valves boxes must be sealed down with tar adhesive.

3.0 All valves used with C-900 PVC pipe shall be set on concrete footings and secured in place with anchor rods. (See Standard Detail W-15).

4.0 On C-900 PVC water pipe installations when thrust collars and blocking are needed on dead ends, ductile iron pipes shall be used in these locations.

5.0 When a tapping sleeve and valve are being used, the valve, sleeve and machine assembly shall be air tested to hold to 200 psi for a five-minute duration in the presence of the inspector prior to drilling or tapping the main. The valve shall be in the closed position during the testing.

D. Setting Fittings

1.0 Fittings shall be set at locations shown on the plans with care being taken to properly "bell-up" joints and support the body of the fitting. All dead-end lines shall be plugged with mechanical joint plugs or caps and anchored by using thrust collars and blocking as shown on Standard Details W7 through W15.

2.0 All fittings used with C-900 PVC pipe shall be set on concrete footings and secured in place with anchor rods.

E. Setting Blow-Offs and Release Valves

1.0 Blow-Offs and drainage branches shall not be connected to any sewer, submerged in any stream, or be installed in any other manner that will permit back siphonage into the distribution system.

2.0 All air release valves and blow-offs shall be installed as shown on Standard Details W-18. Air release valves must be such that provisions can be made by the contractor to get the flow of water to a natural drainage way. The contractor is responsible for whatever provisions are necessary to accomplish this.

F. Setting Hydrants

1.0 Specific directions are required for the setting of all hydrants. In streets where paving is proposed in the near future, the contractor will be given line and grade stakes for hydrants. It is mandatory for the contractor to preserve

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these stakes for the inspector to verify that the hydrant was set correctly and had this fact verified by the inspector. The contractor will not be required to alter line or grade on this hydrant without extra compensation; however, the one-year of warranty on materials and workmanship applies. In areas where paving is not anticipated in the near future, hydrants shall be set according to the inspector's directions. In general, hydrants shall be located in a manner to provide complete accessibility and minimize possibility of damage from vehicles or injury to pedestrians.

2.0 Hydrant installation shall be shown in Standard Detail W-4 and will be rodded the entire length from main to hydrant and appropriate concrete blocking placed behind the hydrant.

3.0 Before a hydrant is set, all dirt and foreign matter shall be removed from the interior of the hydrant.

G. Reaction Blocking

1.0 All fittings or components subject to hydrostatic thrust shall be securely anchored by the use of concrete thrust blocks poured in place, unless otherwise directed by the engineer. The reaction areas required for these thrust blocks shall be given to the contractor by the inspector, and the contractor shall install the blocks according to directions provided by the inspector. Where concrete must be reinforced, the contractor shall furnish such reinforcing as is required. The contractor shall furnish all reaction blocking and reinforcement at no additional cost to the Authority.

2.0 Required reaction bearing areas will be taken from the schedule herein. (See Standard Details W-7 through W-15) Areas given are vertical planes measured in solid material normal to the thrust line of the fitting.

3.0 Material for reaction blocking shall be transit-mixed concrete. This concrete shall have a twenty-eight day compressive strength of 3000 psi. Any metal used to resist thrust which is not encased in concrete shall be galvanized or otherwise treated for corrosion resistance or shall be painted as directed by the engineer.

4.0 Valves on ductile iron lines shall be supported with reaction blocking as shown in Standard Details W-14 and W-15.

H. Service Connections

1.0 Taps shall be made only on a line under pressure and after the main has been tested and chlorinated. No tap on dry lines shall be allowed, unless specific authorization from the engineer is obtained.

2.0 Taps shall be at an angle of forty-five degrees to a perpendicular plane through the center line of the pipe as shown is in Standard Detail W-21.

3.0 The maximum size of direct taps shall be as follows:

Main Size	Maximum Tap Size
2" and 4"	3/4"
6"	1 1/2"
8" and larger	2"

On four, six and eight inch mains, larger size taps may be made by using a service saddle. On all C-900 PVC pipes the appropriate service saddles shall be used for making service connections.

4.0 Services larger than two inches shall be made by using a tapping sleeve and valve. The service line from the main shall be:

- 4-inch D.I. for 3- or 4-inch services;
- 6-inch D.I. for 5- or 6-inch service; and
- 8-inch D.I. for 8-inch services.

The typical tapping sleeve and valve is shown in Standard Drawing W-14.

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- 5.0 No taps or services shall be made on the 24-inch or larger transmission mains.
- 6.0 Before any water services are installed, the main shall be thoroughly flushed using a flow velocity sufficient to scour the pipe interior.
- 7.0 Each meter yoke shall be flushed before the installation crew proceeds to the next service installation.

I. General Water Main Testing Sequence

Water mains shall be tested in the following general sequence (Flushing and chlorination, and chemical dechlorination procedures shall be in accordance with Continuous-feed methodology in AWWA Standard C651):

The continuous-feed method consists of completely filling the main to remove air pockets, flushing the completed main to remove particulates, and ruling the main with potable water. The potable water shall be chlorinated so that after a 24-hr holding period in the main there will be a free chlorine residual of not less than 50 mg/L.

Placing of calcium hypochlorite granules. At no time shall hypochlorite tablets or granules be placed into the waterline during construction without written permission from the Utility director.

Preliminary flushing. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec (0.76 m/sec) unless the Authority determines that conditions do not permit the required flow to be discharged to waste. This determination will be placed into writing by the Utility Director. Table 1 shows the rates of flow required to produce a velocity of 2.5 ft/sec (0.76 m/sec) in commonly used sizes of pipe. Note that flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity and pigging of the main may be required.

For 24-in. (600-mm) or larger diameter mains, an acceptable alternative to flushing is to broom-sweep the main, carefully removing sweepings prior to Chlorine the main.

The table below illustrates required flow and openings to flush pipelines (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter <i>in.</i>	Flow Required to Produce 2.5 ft/sec (approx.) Velocity in Main <i>(mm)</i>	Size of Tap, <i>in. (mm)</i>			Number of 2 1/2-in. (64-mm) Hydrant Outlets
		<i>gpm (L/sec)</i>	1 (25)	1 1/2 (38)	
			Number of Taps on Pipe ¹		
4	(100)	100 (6.3)	1		1
6	(150)	200 (12.6)		1	1
8	(200)	400 (25.2)		2	1
10	(250)	600 (37.9)		3	1
12	(300)	900 (56.8)			2
16	(400)	1,600 (100.9)		4	2

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2^{1/2}-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4^{1/2}-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

¹Number of taps on pipe based on discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

Procedure for Chlorinating the main

1. Water supplied from a temporary, backflow-protected connection to the existing distribution system or other approved supply source shall flow at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in W-5. The main should

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undergo hydrostatic testing prior to disinfection.

Standard Detail W-5 Suggested combination blowoff and sampling tap

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of Chlorine fed at a constant rate such that the water will have not less than 50 mg/L free Chlorine AFTER 24 HOURS. To ensure that this concentration is provided, measure the Chlorine concentration at regular intervals in accordance with the procedures described in the current edition of *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12, or using appropriate Chlorine test kits approved by the Utility Director.

3. As an optional procedure, as required by the Authority, water used to fill the new main during the application of chlorine shall be supplied through a temporary connection. This temporary connection shall be installed with an appropriate cross-connection control device, consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hr, during which time valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hr period, the treated water in all portions of the main shall have a residual of not less than 50 mg/L of free chlorine.

4. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for the application of liquid chlorine. (The danger of using direct-feed chlorinators is that water pressure in the main can exceed gas pressure in the chlorine cylinder. This allows a backflow of water into the cylinder, resulting in severe cylinder corrosion and the escape of chlorine gas.) The preferred equipment for applying liquid chlorine is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be made of material capable of withstanding the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

The details of the various tests are described in the following sections. No chlorine shall be placed in the line during construction. All tests need to be done under the supervision of the Authority inspector. The Authority inspector must be notified at least 24 hours and not more than 72 hours to testing.

J. Hydrostatic Tests

1.0 All main installations shall be pressure tested between each main line valve in accordance with AWWA C-600 for Ductile Iron pipe and AWWA- C605 for PVC Pipe. The test shall be performed using a suitable pump and an accurate pressure gauge with an accurate metering device. Immediately upon completion of a section of main, 150 psi (+ - 5 psi) of pressure shall be applied and held for three hours or 200 psi (+ - 5 psi) of pressure shall be applied and held for two hours. The Authority reserves the right to dictate which pressure test shall be done. The acceptable leakage rate shall not exceed .092 gallons per inch of pipe diameter per 1,000 feet of pipe per hour.

Failure of the water main to comply with the above acceptable leakage rate, shall require the contractor to replace any defective materials to insure a watertight installation. After any inadequacies have been corrected, the leakage rate will again be tested. This test shall be repeated until that portion of main is brought to compliance with the permissible leakage rate.

2.0 Prerequisite conditions for inspection prior to testing shall be as follows:

a. Hydrants shall be properly located, operable plumb and at correct elevation. Pressure test shall be against the hydrant seat – the hydrant gate valve shall be in the open position. This must be verified before testing begins.

b. Valves shall be properly located, operable and at correct elevation. Valve boxes or manhole shall be centered over operating nuts, and the top of the box or manhole shall be at proper elevation.

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c. Lines shall be properly vented where entrapped air is a consideration.

K. Chlorination

1.0 All additions or replacements to the water system, including fire lines and backflow prevention devices, shall be chlorinated before being placed in service. Such chlorination must take place under the supervision of an inspector.

2.0 Pipe subjected to contaminating materials shall be treated as directed by the Utility Department or Engineer. Should such treatment fail to cleanse the pipe, replacement shall be required. The Authority shall bear no portion of any cost sustained by the contractor in meeting this specification.

3.0 Chlorination of a completed line shall be carried out after completing the pressure test and in the following manner.

a. Taps will be made at the control valve at the upstream end of the line and at all extremities of the line including valves. These taps shall be located in such a manner as to allow HTH solution to be fed into all parts of the line.

b. A solution of water containing high test hypochlorite (70%) available chlorine or chlorine gas solution shall be introduced into the line by regulated pumping at the control valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of greater than 50 ppm total chlorine 24 hours after introducing the solution into the line. The chart below shows the minimum required quantity of 70% HTH compound to be contained in solution in each 1000-foot section of line to produce the desired concentration of 50 ppm. Please note that this is the minimum to create a solution at 50 ppm, higher dosages will be needed to meet the required 50 ppm after 24 hours.

Pipe Size	Pounds High Test Hypochlorite (70%) Per 1000 Feet of Line
6"	0.88
8"	1.56
10"	2.42
12"	3.50
14"	4.76
16"	6.22
20"	9.76
24"	14.00
30"	21.00
36"	31.50
48"	56.00

c. The HTH solution shall be circulated in the main opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped in at a constant rate for each discharge rate in order that a uniform concentration will be produced in the mains.

d. Service shall be sterilized by methods acceptable to the Utility Director or Engineer, and the contractor shall have the same responsibility for laterals as for mains in regard to bearing full cost of any corrective measures needed to comply with bacteriological or other requirements.

e. HTH solution shall remain in lines for no less than twenty-four hours, unless otherwise directed by the Utility Director or Engineer.

f. Extreme care will be exercised at all times to prevent the HTH solution from entering existing mains.

M. Bacteriological Sampling

1.0 Free residual chlorine after twenty-four hours shall be at least 50 ppm, or the Utility Department or Engineer will require the lines be rechlorinated at no cost to the Authority.

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2.0 . Mains will be flushed with a blow-off assembly of sufficient size to effectively clean the main (see detail W-19). Flushing of lines may proceed after twenty-four hours, provided the free residual chlorine analysis is satisfactory. Flushing shall be continued until a DPD check shows that the lines contain only the normal chlorine residual. During times of water shortages or distribution main problems, the flushing operation may be delayed. The Utility Department shall determine when flushing so the inspector must advise the Utility Department of the construction location, size and length of mains. All tests will be done in the presence of an inspector. Flushing will be for short durations. Sufficient precautions must be taken to the satisfaction of the inspector to ensure that the impact of the water is absorbed and the water is conveyed without erosion or property drainage.

3.0 Sample for bacteriological analysis shall be collected for each section of pipe between main line valves by the Utility Department after flushing is completed. The contractor shall furnish such help as may be required so secure these samples. If for any reason the Utility Department discontinues collecting or analyzing samples, an appropriately certified lab will be used to process the samples. Lab selection will be approved by the Utility Director in Writing prior to any samples being taken.

4.0 Resampling for new main which fail their first test due to inadequate flushing and excessive turbidity will require payment (in advance) of \$50 retest charge to the South Granville Water and Sewer Authority by the contractor.

5.0 In the event that two successive bacteriologic tests fail, that section of the main shall be rechlorinated by the contractor and new tests performed prior to moving to the next section of main.

N. Backfilling Pipe

1.0 The backfilling of the trench after the pipe installation and testing shall be in accordance with Standard Details U-3-5 for ductile iron and PVC pipe respectively.

- a. Ductile iron pipe shall be backfilled with suitable native material. No rocks, boulders or stone four inches or larger shall be included in the backfill for at least two feet above the top of the pipe.
- b. The haunching for PVC pipe shall be with 4 inches of #57 stone to the springline of the pipe. Care shall be taken to work the stone haunching well under the bottom of the pipe. The initial and final backfill shall be with suitable native material. No rocks, boulders or stone four inches or larger shall be included in the backfill for at least two feet above the top to the pipe.
- c. For PVC pipe, 4 inches of #57 stone may be allowed for the bedding, haunching and initial backfill if the contractor can verify that this type of soil is native to the site by having soil tests made by a soil testing agency. Soil samples shall be taken on 200 feet intervals and to a depth equal to or greater than the trench bottom elevation shown on the plans or in the specifications.

These results must be approved by the Utility Director prior to pipe installation. The allowable soil classes as defined in ASTM D-2321 are described below:

- (1) Class I - Angular, 6 to 40mm (1/4 to 1 1/2 inch), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone and crushed shells.
- (2) Class II - Coarse sands and gravels with maximum particle size of 40mm (1 1/2 inch), including variously graded sands and gravels containing small percentage of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. (GW - well graded gravel, GP - poorly graded, gravel, SW - well graded sand, SP - poorly graded sand.)
- (3) Class III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included in this class. (GM - silty gravel, GC - clayed gravel, SM - silty sand, SC - clayey sand.) all of the requirements of ASTM D-2321 and these specifications.

2.0 All backfill shall be compacted in six-inch layers measured from the pipe foundation upward. Back-fill shall be compacted to at least 95% of maximum soil density in those areas where the supporting capacity of the soil is of prime consideration. Laboratory determination of maximum soil, density will follow the procedure of AASTHO T99

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latest revision. Field determination of the density of the soil in place shall follow the procedure of AASTHO T191 or T204 latest revisions. The result of any one test may be a minimum of 90% of maximum density, but the average of any three tests in an area shall be 95% of maximum density. All tests shall be conducted at the direction of the Utility Director or Engineer, and the cost of such tests will be borne by the contractor with the provision that the Authority will test an area two times only where both tests fail. The contractor shall then be required to submit satisfactory evidence that his ditch compaction meets the specifications.

PVC pipe after construction, the contractor shall furnish a material that can be located by a metal detector. Such material shall be installed at the top of trench after backfilling operations and prior to surface restoration to a minimum depth of six inches and a maximum depth of eighteen inches. Such material shall be as that manufactured by Lineguard, Incorporated, or equivalent. This material shall be included in the base bid price for the pipe.

4.0 Deficiency of backfill material shall be supplied by the contractor where this deficiency results from any cause other than rejection of unsuitable backfill material (other than rock) by the Utility Department or Engineer. In cases where the Utility Department or Engineer disapproves backfill material the contractor shall provide suitable backfill material.

Where excavated material has been rendered unsuitable, either before or after excavation, by inclement weather or type of material, the contractor must correct the moisture or furnish replacement backfill material at the contractor's own expense.

O. As Built Plans

"As built" plans and profiles shall be furnished to the Utility Department by the Engineer upon completion and acceptance of the public main by the Authority and completion of private systems. The "as built" plans shall have at least two measurements to all valves, hydrants, and mains referenced to a fixed object located in the field, along with the depth information. "As built" plans of installed utilities shall be furnished to the Authority prior to issuance of the letter of acceptance. All service stubs shall be shown and located with respect to the property lines for each lot on the "as built" plans. "As-Builts" of utilities needs to show the overall water and sewer system layout along with the property or subdivision boundaries and connecting manhole. The water distribution system should show mains sizes, material, hydrants, valves, blow-off assemblies and any other relevant information (backflow preventers, air release valves, manholes, etc.). "As built" plans and profiles shall be in the form of permanent hardcopy and electronic form as specified by the Utility Director.

GENERAL ACCEPTANCE

The developer or his representative must notify the Utility Departments' Engineering Inspector, in writing, before installation and for scheduling inspection. Once the project is complete a punch list and inspection is scheduled noting any deficient items. Once the deficient items are repaired and/or replaced to meet Authority standards and specifications the developer or his/her representative shall submit the following items to the Authority's Utility Department.

- a. A professional engineer's certified statement of the cost of the public utilities installed.
- b. "As-Built" plans and profile shall be furnished by the engineer upon completion and acceptance by the Authority as stated above.
- c. The developer is responsible for ensuring a one-year written warranty to the Authority prior to issuance of the letter of acceptance.
- d. The developer and/or engineer shall provide a recorded map to the Authority showing all public rights-of-way and easements.
- e. Graphical Information System Data (GIS) shall be provided in accordance with the following:

GIS Requirements Section 1 – Overview

The Contractor will be required to conduct a field survey and collect specific attribute information for all water and sewer system features relevant to the current project. This information will be used by SGWASA to update the existing water and sewer system GIS Database. The Contractor will be provided with an electronic template dataset containing the framework and attribute details for each data layer within SGWASA's utility database. The dataset can be provided to the Contractor in multiple formats so that Contractors of various technical capabilities can collect and submit project

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data to SGWASA. The following list briefly describes the approved formats and provides a link to each of the file locations:

- ESRI GIS database (Preferred) [Geodatabase Files](#). * ArcGIS Standard License Level Required
- ESRI shapefiles [Shapefile Templates](#). * Minimum of ArcGIS Basic License Level Required to edit shapefiles.
- Excel spreadsheet template [Excel Templates](#). * Note – Excel files will be sufficient to fulfil Contractor’s requirements on point features. Contractors will need to export line features to shapefiles format and/or provide an AutoCAD drawing file to provide the location of line features.

* See section 3 BELOW for the full address of the documents. The electronic documents are available from SGWASA upon request.

The Contractor will return the completed database, shapefiles, or spreadsheet to SGWASA after data collection. All data collected by the Contractor will ultimately be formatted by SGWASA for use in the ESRI GIS database. Feature collection will be required for the following water and sewer data layers:

WATER

LAYER NAME	DESCRIPTION
ARV	Air Release Valve
Fittings	Various types
Hydrant	Fire Hydrant
Meter	Water meter
Tank	Water tank
Valve	Water valve
Main	Water main
Service	Water service connection

SEWER

LAYER NAME	DESCRIPTION
PS	Pump station
SWR_ARV	Sewer air release valve
SWR_CO	Sewer cleanout
SWR_FITTINGS	Sewer fittings, various types
SWR_MH	Sewer manhole
WWTP	Wastewater treatment plant
SWR_FM	Force main
SWR_Gravity	Sewer gravity main
SWR_SERVICE	Sewer service connection

Specific data collection and formatting requirements for each feature layer listed is contained within Appendix A – located with the online files, as PDF documents. Refer to GIS Requirements Section 2 for technical details on the field survey GPS and Accuracy requirements.

GIS Requirements Section 2 – GPS and Accuracy Requirements

The Contractor is required to conduct a field survey and collect specific attribute information for all water and sewer system features relevant to the current project. This information will be used by SGWASA (Owner) to update the existing water and sewer system databases. The Contractor will be provided with an electronic template dataset containing the framework and attribute details for each data layer within SGWASA’s utility database. The dataset provided to the Contractor will be in the format of an ESRI GIS database, ESRI shapefiles, or an Excel spreadsheet template, depending on the Contractor’s technical capabilities.

The Contractor is required to collect field survey information for the following system features:

WATER DISTRIBUTION DATA

LAYER NAME	DESCRIPTION	Collection Method
ARV	Air Release Valve	GPS
Fittings	Various types	Various, GPS not required
Hydrant	Fire Hydrant	GPS
Meter	Water meter	GPS

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Tank	Water tank	GPS
Valve	Water valve	GPS
Main	Water main	N/A (Record Drawing)
Service	Water service connection	N/A (Record Drawing)

SEWER COLLECTION DATA

LAYER NAME	DESCRIPTION	Collection Method
PS	Pump station	GPS
SWR_ARV	Sewer air release valve	GPS
SWR_CO	Sewer cleanout	GPS
SWR_FITTINGS	Sewer fittings, various types	Various, GPS not required
SWR_MH	Sewer manhole	GPS
WWTP	Wastewater treatment plant	GPS
SWR_FM	Force main	N/A (Record Drawing)
SWR_Gravity	Sewer gravity main	N/A (Record Drawing)
SWR_SERVICE	Sewer service connection	N/A (Record Drawing)

The field survey will utilize GPS survey methods for the collection of detailed locational attribute data, as applicable. The locational data for all POINT features must be collected to the following specifications:

1. Survey grade accuracy
2. Referenced to the North Carolina State Plane Grid, US Survey Foot, Zone 3200
3. Referenced to horizontal datum NAD83; vertical data to NAVD88
4. All GPS points must be taken at the center of the feature.
5. Sewer Manhole (SWR_MH) requires elevation data of the manhole rim and each pipe invert. Pipe invert elevations should either directly surveyed or supplied by grade rod measurement from the manhole rim to the pipe invert measured to the nearest 0.1 (one-tenth) of a foot.
6. Specific attribute information is required for each feature type and must be collected and documented as a component of the field survey. A reference sheet (PDF) containing the list of specific attribute requirements for each layer is provided in Appendix A.
7. LINEAR features (Water Main, Water Service, Sewer Gravity, Sewer Service, Force Main) will be added to the Owner's database by logical connections determined through the collection of GPS POINT features.

All features data points must be collected as specified in Items 1 – 7 above unless otherwise specifically agreed upon by SGWASA.

GIS Requirements Section 3 – Attribute Requirements

Appendix A provides a detailed explanation of attributes the Contractor is required to complete for each feature specified in the Water and Sewer database. Any attribute with "Engineer/Contractor" in the "Populated By" column should be completed and any attribute with a choice list ("Select" column) specified in the document will be limited to those values. In addition to Appendix A, these detailed attribute descriptions are contained within the links to each approved submittal format.

Full Address to template files.

Geodatabase - <https://www.dropbox.com/sh/5an0x2sveosiv1g/AACep7cRAGAgC8JDWI2u2xJna?dl=0>

Shapefiles - https://www.dropbox.com/sh/6luds4fi4sam6uj/AABBqDvgimaKGSsHiqmsD_R6a?dl=0

Excel Sheet Templates - https://www.dropbox.com/sh/zzjd00a9z5kmc3t/AACoGeru_Px5wBBgF3BK7A87a?dl=0

P. SURFACE RESTORATION

- a. All disturbed surfaces and property thereon, shall be restored to a condition equal to that existing before construction began, and the contractor shall maintain and be responsible for all ditches in paved streets, curbs, gutters or sidewalks until the contractor repaves the trench cuts. The contractor, with permission of the inspector, may place temporary or permanent asphaltic material in the cut.
- b. All easements will be seeded with grass and left so they can be mowed by conventional mowers, unless approved by the Utility Department for rip-rap or other specified material. In remote areas, easements will be seeded with a quality fescue grass. In residential areas, easements will be seeded with either falcon or rebel fescue or leaf mulch

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at the request of property owner. The contractor shall guarantee a good uniform stand of grass and shall reseed any bare or thin spots. The contractor will be responsible for a one-year warranty on materials and workmanship.

Q. EROSION CONTROL

Erosion control measures shall be performed by the contractor, conforming to the requirements of, and in accordance with plans approved by the State of North Carolina Department of Environment and Natural Resources, North Carolina Sedimentation Control Commission and South Granville Water and Sewer Authority Utility Department, and as per the erosion control plan portion of the construction drawings and these specifications. The sedimentation and erosion control plan and permit shall remain on site at all times. The contractor shall not allow mud and debris to accumulate in the streets. Should the contractor pump water from trenches during construction, appropriate siltation preventative measures shall be taken prior to the entry into any storm drain or stream. All measures must be taken so that stormwater runoff does not go to the pipes or manholes of the utility system. All materials used for erosion control shall be approved by the Engineer prior to installation by the contractor.

- a. Temporary and permanent erosion control measures shall be shown on the plans. Temporary and permanent erosion control work shall be coordinated throughout the project to provide effective and continuous erosion control throughout construction and post construction, which minimizes siltation of streams, lakes, reservoirs, other water impoundments, ground surface, or other property. Seeding and mulching shall be carried out immediately behind construction.
- b. Temporary erosion control measures shall include but not be limited to swaled easements, silt fences, crushed stone check dam devices, silt basins (sedimentation traps), mulching, earth berms, and rip-rap.
- c. Permanent erosion control measures shall include but not be limited to swaled easements, rip rap and seeding of disturbed areas.
- d. Erosion and siltation shall be controlled on projects by using swales to control run-off and convey run-off to controlled discharge points, by silt fences, rip-rap, crushed stone, and earth berms to contain silt, with pipe culverts where major access or haul roads cross drainage ditches or streams, silt basins where pipe lines cross drainage ditches or streams, and seeding and mulching will be performed as soon after pipe installation as possible. When temporary measures are removed after completion of the project the disturbed area must be stabilized, if necessary.

R. MAINTAINING SERVICE

When replacing or extending water mains, the contractor shall maintain existing water services.

S. GUARANTEE

The contractor shall guarantee all material, equipment and workmanship for a period of at least one-year after final acceptance by the Authority. The Utility Department is responsible for the issuance of final acceptance letters by the Authority.

T. WETLAND/STREAM BUFFERS

Conditions of 401/404 permits shall be strictly followed to the satisfaction of Corps of Engineers. All Neuse Riparian buffers shall be maintained as required by the North Carolina Division of Water Quality.

U. WATER MAIN AND SERVICE ABANDONMENT

Water services to be abandoned must be turned off and capped at the corporation cock. Water main abandonment must be performed in accordance with a plan approved by the Utility Department. Service and main abandonment require inspection by the Utility Department at (919) 575-3367.