B. Design Standards

(To be used in conjunction with Section C – Construction Specifications)

1. General

a. Future Extensions

Generally, the capacities of sanitary sewer lines and water lines should be designed for the estimated ultimate build out population of the service area being considered for development. Any known future development(s) shall be considered.

The Professional Services Firm shall also estimate the ultimate build out population for the total sewer shed area. Future population densities should consider the Augusta County Comprehensive Plan, Zoning Ordinance, and Subdivision Ordinance as applicable. Based on the results of this estimate, the Authority may participate in system improvements in accordance with the Authority OPPM *Policy No. 10.2 System Improvements*.

The Professional Services Firm and Construction Contractor are required to design and construct its system properly sized to permit future extensions. Elevation of the sewer system must be designed such that future extensions can serve the entire area which naturally drains toward the system. Stubouts and/or easements for water and/or sewer shall be provided to adjoining property lines where in conformance with the Augusta County Comprehensive Plan or as deemed appropriate by the Authority to provide for future extension of the systems. Easements, and where practical, stubouts to adjacent properties shall be provided beyond edge of pavement or other obstructions to allow for future extensions to properties with no access to water/sewer service while minimizing damage to existing/proposed improvements.

b. Design Calculations

Calculations showing estimated water demand and sewer flow based on the criteria outlined in these Standards shall be submitted for review with all plans that include public utilities. Calculations shall demonstrate that the existing utility infrastructure is capable of handling the demand of the proposed development. Otherwise, the calculations shall identify the deficiencies and provide recommendations for improvement as part of the proposed development.

All water line and sewer line extensions shall be accompanied by one set of hydraulic and capacity calculations respectively. Calculations should address such issues as available/required fire flow and domestic demand, pipe size and capacity, velocity, percent slope, etc. Additional requirements for design are set forth in Section B.2. for Water, and in Section B.3. for Sewer. Submission of calculations for minor extensions may be waived upon written approval of the Authority's Engineering Department.

Design calculations are also required to be submitted for other water/sewer facilities such as storage tanks, booster stations, sewage pump stations etc. in accordance with these Standards. However, VDH and/or DEQ authorization is also required. Documentation shall be provided to the Authority that VDH and/or DEQ approval has been obtained when required. For water storage tanks, minimum storage volume shall be as detailed in the Authority's Water and Sewer Master Plan for the affected service

area unless otherwise approved by the Authority's Engineering Department Director. Under no circumstances will the minimum storage be less than 2x the minimum requirement in the VDH Waterworks Regulations.

All submitted calculations shall be signed, sealed, and dated by a Professional Engineer or Class B Land Surveyor licensed in the Commonwealth of Virginia, and shall meet the requirements of these Standards, the VDH Waterworks Regulations and DEQ Sewage Collection and Treatment (SCAT) Regulations. In the event of any conflict among applicable standards, specifications or regulations, the more stringent standard, specification or regulation shall apply.

c. Easements and Property

1. Permanent Water and/or Sewer Easements, and Fee Simple Conveyances

Permanent water and/or sewer easements shall be provided for all water and sewer lines and appurtenances. Where water and/or sewer lines are installed within a publicly-dedicated right-of-way due to space limitations, additional permanent easement width shall be provided to designate a minimum 20 feet of working space centered over the pipeline. All easements shall expressly provide for the right of ingress and egress in the recorded deed. Easements shall be provided up to and including the water meter and/or sewer cleanout.

When public fire hydrants and other appurtenances are installed on private property, a permanent easement shall be provided 10 feet around the feature on all sides.

The minimum permanent easement width shall be 15 or 20 feet dependent upon location of easement on the property. A total of 20 feet of working space, centered on the pipe, shall be provided over water or sewer lines (5 feet may be in dedicated road right-of-way) with an exclusive easement area of 10 feet of width centered on the pipeline. Joint permanent easements combining both water and sewer mains within a single permanent easement shall be a minimum of 30 feet in width; a minimum of 10 feet shall be the required distance between the mains (measured from edge to edge of pipes) with a minimum of an additional 10 feet required from the centerline of each main to the permanent easement boundary. The 10 foot wide exclusive area over each pipe shall be maintained for each pipe. In instances where the pipeline installation exceeds 15 feet in depth, an easement 30 feet wide shall be provided with 10 feet of exclusive area.

No buildings, facilities, or structures shall be located on the surface of the land within a permanent easement area. No other utilities, including telephone, cable, fiber optic, gas, electric and industrial pipes shall be constructed parallel to water and sewer utilities within the 10 foot wide exclusive easement area. No water shall be impounded within the permanent easement area without the prior written approval of the Authority.

If easements are not being conveyed as part of the Augusta County Deed of Dedication, Subdivision and Easement, the Authority will prepare and provide the Deed of Easement. The Professional Service Firm/Owner shall provide the plat clearly showing the easements to be conveyed.

Land for dedicated facilities for public uses and purposes, such as booster stations, pump stations, tanks, etc., shall be conveyed in fee simple to the Authority by deed by general warranty and with English covenants of title. The property dedicated for such

public use and purpose shall be conveyed at no cost to the Authority. For water storage tanks, minimum lot size shall be one acre of usable space. The lot shall be configured to allow for a second tank of equal size to be added to the site at the proper elevation. For water booster and sewer pump stations, minimum lots size shall be 0.3 acres with a minimum front lot line of 75 feet unless otherwise approved. For sewer pumping stations a 100-foot buffer around the station shall be provided where no structures will be located unless otherwise approved (ref. Virginia Sewage Collection and Treatment Regulations - 9VAC25-790-120.D.1). Other facilities, such as treatment facilities, will be addressed on a case-by-case basis as maintenance of operations or other buffer requirements in accordance with the VDH Waterworks Regulations or DEQ SCAT Regulations may apply.

2. Temporary Construction Easements

Temporary construction easements shall be required where necessary to allow the Authority and/or a contractor sufficient area to construct the utility while working safely and in compliance with OSHA/VOSH Regulations.

3. Permission to Access Private Property

Owners of private property shall be required to grant to the Authority continuing permission for regular inspection by the Authority of all water and sewer mains and sub-mains which are located on private property, which mains and sub-mains either connect to or are intended to be connected to public water and sanitary sewerage facilities under the control of the Authority. Such facilities on private property shall remain privately-owned and maintained by and at the expense of the property owner. Provision of such access and the continued maintenance of such facilities on private property, in accordance with policies, procedures, rules and regulations of the Authority. Execution of a special agreement to ensure access and maintenance shall be a condition of project approval.

4. Augusta County Deed of Dedication, Subdivision and Easement and Recorded Plats

Deeds and plats must be submitted prior to project acceptance. If a plat is required by the County or Authority, a copy of the recorded plat in accordance with County requirements shall be submitted to the Authority along with proof of record. Easements shall be in accordance with the Authority's Template Deed of Easement.

5. Dedicated Lots

A lot shall be dedicated to the Authority for public use and purposes for all necessary facilities and appurtenances including, but not limited to, pump stations, booster stations, and tanks. In addition to meeting all Augusta County zoning requirements, these lots shall be of a size that permits future construction of a replacement facility, while maintaining operation of the existing facility. A deed and plat shall be recorded and provided to the Authority showing the lot dedicated to the Authority.

d. Separation of Utilities

1. Separation of water and sewer lines shall be in accordance with Section 02080 Utility Pipe and Materials of the Construction Specifications under Section C of these Standards.

2. Separation of water and sewer lines from electric, fiber optic, gas lines and other privately-owned public utilities shall be in accordance with utility company requirements and state law. A minimum separation distance from Authority utilities shall be 5 feet horizontally and 2 feet vertically unless otherwise approved by the Authority's Engineering Department.

3. Water and sewer mains shall be a minimum of 20 feet from structures, including but not limited to buildings, columns and signs. Horizontal separation of water and sewer lines from other structures such as storm sewer, sidewalks, and curbing shall be a minimum of 5 feet where possible to reduce future maintenance costs.

e. Existing Services and Disruption of Service

Existing water and sewer services shall be maintained throughout construction. The Professional Services Firm and Construction Contractor shall anticipate any requirements for bypass pumping and/or temporary waterlines and show such requirements on the plans. The requirements shall include a written sequence of events to properly plan for service disruptions (location of valves to close, manholes to plug, bypass pump sizes, order of work to complete, etc.). Any valves required to isolate a section of waterline shall be included on the plans and properly labeled. Any work requiring that services be disrupted to existing customers shall only be performed in close coordination with an Authority Engineering Technician and shall be planned well in advance (based on the service area affected) in order to allow proper notice. Large planned disruptions may be required to be performed during off-peak times or during nights/weekends. When a disruption of service is proposed, the following notes shall be included on the plans:

1. The sequence of the disruption of service shall be discussed at the pre-construction meeting.

2. Any scheduled disruption of service shall be scheduled Tuesday – Thursday beginning at 9:00 am and not to extend beyond 5:00 pm. The contractor may request a deviance from this time frame. Nighttime work will be avoided if possible. Any work performed at night presents a safety issue and lack of manpower to the Authority in the event an emergency arises due to the work being performed. Nighttime work will be considered as a last resort.

3. At a time when the contractor, owner, developer or the Authority believes that a disruption of service is within 15 working days, discussion will begin for the requirements to schedule a shutdown of the system.

4. A materials inventory will be reviewed jointly by the contractor and the Authority. Prior to the service interruption, all materials required for the work shall be on site and readily available for use.

5. All required testing shall be successfully completed prior to the service interruption being scheduled.

6. The contractor, owner or developer shall provide the Authority a written notice 10 working days in advance of the requested day to perform the system shutdown. Additional days for the notification may be required based on the service area affected and will be discussed at the pre-construction meeting.

7. After receiving the written notification, the Authority's Engineering Department will begin coordination with any applicable Authority departments to schedule the interruption.

8. The contractor may be required to have additional personnel on site to perform the work in a timely manner.

9. Once an agreeable date and time have been decided, all testing has been successfully completed, all required materials are on site, the amount of personnel on site has been agreed to and the written notice has been received, the Authority will provide all customers being affected a notice detailing the day and time the work is scheduled for.

10. After customer notices have been delivered, if the work is cancelled or re-scheduled due to contractor delays, a new date/time will need to be agreed to prior to the work being re-scheduled. Notices will need to be provided to the customer being affected detailing the new date/time.

f. Plan Sheet Preparation & Drafting Standards

1. General

Plans shall be of sufficient detail and scale to accurately indicate all pertinent design and construction details for a comprehensive interpretation of the work to be performed. If plans are deemed to be illegible or incomplete by the Authority, plans will be returned with a request to revise and resubmit plans satisfactory for review.

a. Water and sewer lines - show the location of all water and sewer line appurtenances and accessories and accurate plan and profile design drawings for the proposed lines.

b. Water and sewerage facilities such as water storage tanks or pumping equipment, sewage pumping stations, or other like equipment - provide detailed plans and specifications on design, equipment, materials, and construction of such facilities.

2. Engineering and Plan Requirements for Safety

All project designs shall incorporate safety components in accordance with the Occupational, Safety, and Health Administration (OSHA), the Virginia Department of Labor and Industry (DOLI), Virginia Occupational Safety and Health (VOSH), and/or the requirements of the Authority policies for employee safety and the Authority's List of Approved Products. These requirements shall

include, but not be limited to, personnel safety railings, ladders, fall protection and personnel anchor systems, personnel recovery devices, ventilation systems, arc-flash studies and electrical box labeling, electrical safety matting, personal protective equipment boxes with contents applicable to the facility hazards, eye wash units, safety showers, fire extinguishers/suppression systems, proper placards/labels/lighting applicable to the facility hazards, break panels with lock-out/tag-out capability, fencing, and emergency/security lighting. All equipment specified shall meet OSHA and ANSI standards applicable to the identified hazard. Every effort shall be made to engineer out safety hazards requiring special equipment or procedures for operation and maintenance.

3. Specific Plan Sheet Requirements

a. Plan sheets shall measure either 22 inch x 34 inch or 24 inch x 36 inch and be oriented in landscape view.

b. All plan submittals must include a cover sheet. The front sheet shall include the bulleted items below. A second sheet may be added if all of the following items will not fit legibly onto the cover sheet. Please also refer to the Submittal Checklist which can be found at www.acsawater.com.

- Project name
- Vicinity Map (Provide adequate detail to permit Authority Staff to easily locate the site in the field – including existing and proposed roadways.)
- Index of sheets
- Standard notes as applicable (may be included on sheet 2 if necessary)
- Legend (may be included on sheet 2 if necessary)
- Original seal, signature, and date of the licensed Professional Engineer or Class B Surveyor. Following sheets shall bear the copy of such seal.
- Names, addresses, and telephone numbers of the owner or developer and engineer.
- Horizontal and vertical coordinate systems shall be clearly defined.
- Table of estimated quantities
  - Line sizes and lengths
  - Number of manholes and total vertical depth
  - Number of hydrants
  - Number, type, and sizes of valves
  - Number of meter boxes and cleanouts
  - Number of blowoff assemblies
  - Number of air relief assemblies

- Standard Notes and Requirements:

i. All work shall be subject to inspection by Authority inspectors. **The contractor shall notify the Engineering Department at 540-245-5670 at least 48 hours prior to the start of any water and sewer utility work.** Failure to comply or properly notify may result in additional work by the Contractor in order to permit the necessary inspection and /or disconnection from the system.

All mainline taps, valve operation, opening of hydrants, manhole coring, etc. shall be done by Authority Personnel or with the Authority Inspectors present.

ii. The contractor shall be familiar with Authority OPPM *Policy 10.6 Plan Review and Project Acceptances for Water and Sewer Services*. **This policy contains specific requirements that must be met before the Authority will provide water and/or sanitary sewer service**.

iii. For Dedicated Facilities such as tanks, pump stations, booster stations, etc., the Authority will require the following (design/construction):

- That all safety devices, equipment, and any specialized personal protective equipment needed for the facility are included/provided with the project design and construction.

- Evaluation of all proposed devices, equipment, and specialized personal protective equipment against the Approved Products List and/or policy requirements. Climbing safety systems must be certified by a Qualified Engineer at the expense of the contractor/owner/developer.

- The requirements under Section 01110 – General Requirements pertaining to submittals shall apply to all safety equipment.

The contractor shall be required to provide facilities for safe access to the work by Authority employees, as needed.

iv. The contractor is ultimately responsible for all job site safety and assurance that all requirements of the Occupational Safety and Health Administration (OSHA), Department of Labor and Industry (DOLI), and the current Building Code are maintained. However, in the event that an Authority Engineering Technician observes conditions that could endanger life/limb of any person on the job, the technician will immediately notify the job site superintendent/foreman and the Authority Engineering and Administration Offices. If a jobsite safety issue is confirmed by the superintendent/foreman/Authority and the situation continues the Authority may contact OSHA.

On-site Authority staff will require a preconstruction safety plan be submitted for review at least 48 hours prior to any work involving Authority owned facilities requiring confined space entry and/or working at heights in excess of 6 feet for new construction and at heights in excess of 4 feet for maintenance of existing facilities. The plan must be prepared by a competent person, as defined by OSHA/DOLI, and the employees performing the work must have proper training. Additionally, the contractor shall provide a plan prepared by an engineer or competent person (in accordance with OSHA requirements) for any trenching activities requiring engineered shoring, or where other hazards such as trenching with water accumulation or trenching where adjoining building/structures are endangered by the excavation.

v. All existing utilities adjacent to the proposed work may not be as shown on the plans and where shown, are only approximately located. The contractor shall contact Miss Utility at 811 or 800-522-7001 to have underground utilities marked in accordance with Virginia's underground utility damage prevention act.

vi. All materials and construction shall comply with the most current version of these Design and Construction Standards.

vii. All water and sewer pipes shall have a minimum of 3.5 feet of cover measured from the top of pipe unless otherwise approved. This includes all fire hydrant lines and service laterals.

viii. A minimum vertical separation of 3.5 feet is required between water line and storm sewer culverts. When the 3.5 foot minimum separation cannot be achieved and where freezing is a possibility the water line shall be encased in concrete and insulated as approved by the Authority. Concrete encasement and insulation shall extend a minimum of 5 feet beyond the centerline of the culvert in both directions or 5 feet beyond ends of culvert when parallel.

ix. Contractor shall provide certification that proper compaction has been obtained for all fill material under water and sewer lines and appurtenances in accordance with the Construction Standards. Additional compaction certification may be required for all backfill material placed over waterlines and sewer lines and appurtenances as deemed necessary by the Authority where poor soil conditions are identified. This certification shall be signed by a professional geologist or engineer and state the exact area to which the certification applies. Testing shall be in accordance with the Design and Construction Standards. Testing shall be performed at the contractor's expense.

x. Valves on dead-end lines shall be restrained in accordance with applicable standard details.

xi. Water lines shall not be placed within 30 horizontal feet of existing or proposed sanitary drain fields and septic tanks. Water or sewer lines shall not be placed within 30 horizontal feet of existing or proposed underground storage tanks.

xii. Joint restraint shall be provided for all bends, tees, dead end lines, and stubouts, in accordance with the applicable standard details.

xiii. When located in VDOT rights-of-way fire hydrants and all other appurtenances shall be located behind the ditch line.

xiv. Contractor shall maintain water and sewer service to all existing customers throughout construction. This may require temporary lines, connections, and/or pumping.

c. One plan view may be shown for all proposed utilities as the scale and level of detail allows. A separate profile for each proposed utility shall be prepared with reference to other existing and proposed utilities and other features as necessary.

d. As a minimum the plan view shall show all items as listed on the Augusta County Submittal Checklist located at www.acsawater.com.

e. Water Tanks, Water Booster and Sewer Pump Stations

- Drawings for water tanks, water booster and sewer pump stations shall be prepared and submitted in accordance with Authority specifications.

- Drawings and specifications shall be of such quality and contain sufficient details so that no misunderstanding may reasonably arise as to the extent of the work to be performed, the materials to be used, the equipment to be installed or the quality of the workmanship.

- Drawings for water tanks, water booster and sewer pump stations shall include a site plan drawn to a scale of not less than 1" equals 20' and shall contain existing and proposed contours on a two-foot contour interval. The boundaries of the site shall be clearly shown on the site plan and shall be permanently monumented in the field prior to completion of construction.

- Detail drawings for water tanks, water booster and sewer pump stations shall be drawn on a scale of not less than 1/4" equals 1'. Drawings required to clarify construction details shall be drawn on an appropriately larger scale.

g. Record Plans

Record drawings shall be in accordance with Section 01110 - General Requirements of the Construction Specifications.

h. Casing Pipe

Steel casing pipe shall be provided for all road crossings, both bored and open cut, and for all railroad crossings. Casings shall be provided for all new road construction with mainline water and sewer crossings at the discretion of the Authority. If the Authority determines a casing is not required for a sanitary sewer crossing, the sewer pipe shall be PVC C900 pipe, thickness Class DR-18 from manhole to manhole across the roadway. Steel casing may also be required for other special conditions as required by the Authority. Steel casing for road crossings shall be in accordance with applicable standard details. Steel casing for railroad crossings shall be in accordance with the railroad permit for the applicable railroad company. Casing pipe shall be sized in accordance with the Construction Specifications Section 02080 – Utility Pipe and Materials 2.1.8.