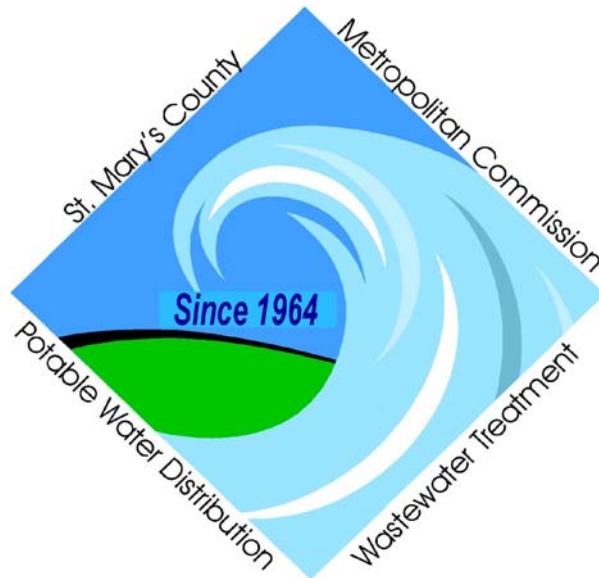


# CHAPTER 1

## GENERAL



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# CHAPTER 1

## GENERAL

<b>1.1</b>	<b>Introduction</b>	<b>1</b>
	<b>A. History</b>	<b>1</b>
	<b>B. Authorization</b>	<b>1</b>
	<b>C. Purpose of the Manual</b>	<b>2</b>
	<b>D. Waivers</b>	<b>2</b>
	<b>E. Abbreviations</b>	<b>2</b>
	<b>F. Definitions</b>	<b>4</b>
<b>1.2</b>	<b>Projects Defined</b>	<b>10</b>
<b>1.3</b>	<b>Project Inception</b>	<b>11</b>
<b>1.4</b>	<b>Engineering Reports</b>	<b>11</b>
<b>1.5</b>	<b>Preparation of Construction Plans</b>	<b>18</b>
<b>1.6</b>	<b>Preparation of Construction Specifications</b>	<b>23</b>
	<b>A. General</b>	<b>23</b>
	<b>B. Developer Projects</b>	<b>23</b>
	<b>C. Capital Projects</b>	<b>24</b>
<b>1.7</b>	<b>Construction Requirements</b>	<b>24</b>
	<b>A. Acquisition</b>	<b>24</b>
	<b>B. Location</b>	<b>24</b>
	<b>C. Width</b>	<b>25</b>
	<b>D. Location of Adjoining Utilities (Other than Water and Sewer)</b>	<b>25</b>
	<b>E. Permits</b>	<b>26</b>
<b>1.8</b>	<b>As-Built Requirements</b>	<b>26</b>
	<b>A. General</b>	<b>26</b>
	<b>B. Electronic Files</b>	<b>27</b>
	<b>C. Replacement Drawings</b>	<b>27</b>

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## CHAPTER 1

### GENERAL

#### 1.1 Introduction

##### A. History

St. Mary's County Metropolitan Commission (MetCom or Commission) was created by the State Legislature in 1957 as a quasi - governmental, non profit body, to supply water and sewer service to the citizens of St. Mary's County. Located in Southern Maryland, the Commission has been providing service since 1964.

MetCom is governed by a board of Commissioners consisting of seven voting members, and one non-voting member. Voting members represent Election Districts and are appointed by the Board of County Commissioners to serve three year staggered terms.

##### B. Authorization

St. Mary's County Metropolitan Commission is authorized under Section 113 of the Code of Public Local Laws of St. Mary's County as noted below.

The members of the Commission are a body politic and corporate, by the name of the "St. Mary's County Metropolitan Commission" (referred to elsewhere in this chapter as the "Commission"), with the right to use a common seal, to sue and be sued and to do any and all other corporate acts for the purpose of carrying out the provisions of this chapter, including, without limiting the generality of the foregoing, the right and power to make and enter into all contracts or agreements as the Commission determines with the federal government, the State of Maryland or any agency or instrumentality of either thereof or with any municipal corporation, county, private corporation, co-partnership, association or individual, on terms and conditions which the Commission approves, relating to the performance of the Commission's duties, the execution of its rights and powers, the use by the federal government, the state government or any federal or state agency, municipal corporation, county or private entity or individual of any water supply or sewerage system constructed or acquired by the Commission under this chapter or the services there from or the facilities thereof or the use by the Commission of any water supply or sewerage systems owned or operated other than by the Commission.

### **C. Purpose of the Manual**

The Water and Sewer Design Manual is intended to provide a summary of information, procedures, criteria and practices, which are applicable to the undertaking of public water and sewer projects within St. Mary's County. The procedural aspects presented represent current Commission practices, which to some degree may be considered fluid as these standards are in continuous evolution, subject to both administrative and legislative action at federal, state and local governmental levels. The design criteria and engineering practices set forth in this manual shall be considered firm requirements for the development of water and wastewater projects for St. Mary's County.

The engineering requirements included in this manual are intended to assist land developers and engineers with designing and building public water and wastewater facilities within St. Mary's County. Developer Projects and Capital Projects, sponsored by private Developers and the County administration, respectively, shall conform to the procedures, requirements and criteria set forth in this manual.

The manual is not intended to restrict the Designer's opportunity to create innovative, practical and economical designs for water and sewer system improvements. Rather, it is intended to assist the Designer in completing the projects efficiently and economically within the framework of design parameters established herein.

### **D. Waivers**

If the Designer for any reason finds it necessary or desirable to use procedures, standards or criteria other than those included in this manual, the Designer must apply to the Commission for a waiver of the design requirements. A request for a waiver is to be addressed to the Chief Engineer and shall, at a minimum, contain a narrative indicating the design objective and the justification for the request. Approval or denial of the waiver request will be by return letter signed by the Chief Engineer.

If the Designer does not agree with the decision by the Chief Engineer, the Designer may petition to the Metropolitan Commission's Board of Commissioners. The decision by the Board of Commissioners will be final.

### **E. Abbreviations**

AASHTO

American Association of State  
Highway & Transportation Officials

ABMA	American Bearing Manufacturers Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
ATS	Automatic Transfer Switch
AWWA	American Water Works Association
BOCA	Building Officials and Code Administrators
CAD	Computer-aided Drafting
CFR	Code of Federal Regulations
CIB	Capital Improvement Budget
COMAR	Code of Maryland
CWSP	County Comprehensive Water and Sewer Plan
DFT	Dry Film Thickness
DHC	Drop House Connection
DIP	Ductile Iron pipe
DPW&T	Department of Public Works & Transportation
ENR	Engineering News Record
FAA	Federal Aviation Administration
HDPE	High Density Polyethylene
HGL	Hydraulic Grade Line
HMI	Human Machine Interface
IBC	International Building Code
IBOCA	International Building Officials and Code Administrators
LED	Light Emitting Diode
LUGM	Land Use and Growth Management
MAA	Maryland Aviation Administration
MCC	Motor Control Center
MDE	Maryland Department of the Environment
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPSHA	Net Positive Suction Head Available
NPSHR	Net Positive Suction Head Required
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCCP	Prestressed Concrete Cylinder Pipe
PIV	Post Indicator Valve
PLC	Program Logic Controller
PLS	Professional Land Surveyor
PRV	Pressure Reducing Valves
PVC	Polyvinyl Chloride
PWA	Public Works Agreement
RCP	Reinforced Concrete Pipe
RPM	Rotations Per Minute

RTU	Remote Telemetry Unit
SCADA	Supervisory Control and Data Acquisition
SCS	Soil Conservation Service
SHA	State Highway Administration
SHC	Sewer House Connection
TS&V	Tapping Sleeve & Valve
VFD	Variable Frequency Drives
WHC	Water House Connection

## **F. Definitions**

Whenever the words defined in this section, or pronouns used in their stead occur in the contract, they shall have the meanings here given:

1. **ADDENDUM** – Written or graphic instruments issued prior to the bid opening of the Contract, which modifies or interprets the Contract Documents.
2. **APPROVED, ACCEPTABLE** - Whenever the words “approved” or “acceptable”, or words of like import are used in the drawings or specifications, it shall be understood that "Approved by or Acceptable to" the Chief Engineer is intended, unless otherwise stated.
3. **AVERAGE DAY DEMAND** - The volume of water used in the year divided by 365 days, expressed in gallons or million gallons.
4. **AVERAGE DAY RATE** - The water used during the Average Day Demand expressed in gallons per day (gpd) or million gallons per day (mgd) or divided by 1,440 minutes and expressed in gallons per minute (gpm).
5. **AVERAGE DAY FLOW RATE** – The volume of wastewater generated in a year divided by 365, expressed in gallons per day (gpd) or million gallons per day (mgd).
6. **BID** - The offer of the bidder submitted on the prescribed bid form to perform the prescribed work and to furnish the prescribed labor and materials in accordance with a set of Contract Specifications and/or Documents, for the consideration of payment at the unit and/or lump sum price stated and submitted on the prescribed forms.
7. **BID ITEM** - An item of work specifically described and for which a price, either unit or lump sum, is provided. It includes the performance of all work and furnishing of all labor, equipment and materials, described herein or described in any supplemental specifications or Special Provisions.



8. BID SECURITY - The security designated in the Bid, to be furnished by the bidder as a guarantee of good faith to enter into a Contract with the Commission, if the work of constructing the improvement is awarded to him. The Bid Security may be a bid bond or certified check.
9. BIDDER - Any individual, firm or corporation submitting a bid for the prescribed work contemplated, acting directly or through a duly authorized representative.
10. BUILDING SEWER – A sanitary sewer, which conveys wastewater, from a residential, commercial or industrial structure to the public sewer. The building sewer extends from the structure being served to the public right-of-way or easement line.
11. CELLAR ELEVATION – Cellar elevation or basement floor elevation. Abbreviated CE or BE.
12. CHANGE ORDER - A written order to the Contractor, signed by the Director of Procurement on behalf of the Owner, ordering a change in the work from that originally shown by the plans and specifications that has been found necessary. If the work is of a nature involving an adjustment of unit price, a Supplemental Agreement shall be executed. Change Orders duly signed and executed by the Contractor and Commission constitute authorized modifications of the Contract.
13. CHIEF ENGINEER - Chief Engineer of the St. Mary's County Metropolitan Commission.
14. COLLECTOR SEWER – A sanitary sewer constructed to transport wastewater to an interceptor sanitary sewer. A collector sewer is a public sewer main designed to serve one or more customers. All collector sewers shall start and end with a structure.
15. COMMISSION - The St. Mary's County Metropolitan Commission (MetCom).
16. CONSTRUCTION DRAWING – see contract drawings.
17. CONSTRUCTION EASEMENT - The area secured for temporary use and/or modification for the purpose of facilitating work to be accomplished during construction.
18. CONTRACT - The written agreement executed between the Commission and the successful bidder, covering the performance of the work and the furnishing of labor and materials, by which the Contractor is bound to

perform the work and furnish the labor and materials, and by which the Commission is obligated to compensate him therefore at the mutually established and accepted rate or price.

19. CONTRACT BOND - The approved form of security executed by the Contractor and his Surety or Sureties, guaranteeing complete execution of the Contract and all supplemental agreements and changes pertaining thereto. "Contract Bond" shall mean the same as "Performance Bond."
19. CONTRACT DOCUMENTS shall include the invitation for bids, instructions to bidders, bid contract and contract bond, specifications, supplemental specifications, all general or special provisions, general and detailed plans, and notice to proceed; also, any written change orders, written mutual understandings and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof.
20. CONTRACT DRAWINGS show the location, dimensions and sizes of the materials on the lines and slopes, at the depths with the connections and the manner in which they are to be placed as called for by the Specifications outlining the work and the materials to be provided for and placed under the contract, or in accordance with such changes as may be approved from time to time during the progress of work, as hereinafter provided.
21. CONTRACT ITEM - The obligation of the Contractor, including the performance of all work and furnishing of all labor and the materials described in the respective articles or sections of the Specifications and Contract or in the Special Provision which are made a part thereof.
22. CONTRACT TIME - The number of working days or calendar days shown in the bid, indicating the time allowed for the completion of the work contemplated in the contract and any modification thereto.
23. CONTRACTOR - The party of the second part, or the agent appointed to act for the said party, entering into the contract for the performance of the work required by it.
24. COUNTY – St. Mary’s County, Maryland.
25. DESIGN FLOW - The minimum flowrate required to satisfy the following demand and pressure conditions during a 24-hour period, expressed in gpm or mgd:

Maximum Day Demand:	35 psi minimum at curb
Peak Hour Demand:	35 psi minimum at curb

Maximum Day + Fire Flow Rate: 35 psi minimum at curb

26. DESIGN FLOW RATE – The design flow rate is the sum of the peaked average day flow rate for the service area plus an infiltration and inflow allowance.
27. DISTRIBUTION MAINS - Water mains connecting the transmission mains to the water house connections. The distribution mains provide area wide fire protection. Generally, the distribution mains will be in a grid or branched configuration.
28. DROP HOUSE CONNECTION (DHC) – A sewer house connection (SHC) that extends vertically from the collector sewer and then horizontally to the building sewer at the property line.
29. ENGINEER - The Registered Professional Engineer or a duly authorized agent thereof, contracted by the Commission to provide any engineering services that the Commission may require or authorize.
30. ENGINEERING REPORT – Report that establishes the scope of the project and identifies the key design criteria to be used and which the construction plans and specifications can be checked against.
31. ENGINEER’S COST ESTIMATE – An estimate of probable construction cost prepared by the designer based on the prepared plans and specifications.
32. ESTABLISHED GRADE - The profile grade as anticipated and approved for future construction in order to meet geometric criteria approved by established standards of construction.
33. FINAL ACCEPTANCE – That date certified by the Chief Engineer when all work contained in the Contract has been completed, including outstanding items of work that were not required by the Chief Engineer for the Certificate of Substantial Completion.
34. FIXED-PRICE ITEMS - The unit prices established and prescribed by the County to compensate for the cost of work and materials that may be necessary for the proper completion of the contract, and the quantities of which are not amenable to reliable quantitative estimation prior to the construction. The fixed-price items are shown on the bid sheets with estimated quantities, fixed price, and the estimated total cost imprinted prior to the issuance of the contract documents to bidders.

35. FORCE MAIN – A pressurized sanitary sewer that conveys wastewater from a pumping station to a higher elevation in the sewer system from which gravity flow may resume.
36. GREEN TECHNOLOGY – A method or use of materials, specifically in the construction and use of buildings, that reduce the negative impacts to the environment through the use of low energy fixtures, recycled and/or regional materials and design features.
37. INSPECTOR – The authorized representative of the Commission assigned to make detailed inspection of any or all portions of the Work or materials therefore.
38. INTERCEPTOR SEWER – A sanitary sewer used to transport wastewater from collector sewers within a drainage basin to another interceptor sewer or a treatment plant.
39. MAXIMUM DAY DEMAND - The largest volume of water used in one day during the year, expressed in gallons or million gallons.
40. MAXIMUM DAY RATE - The volume of water used during the Maximum Day Demand expressed in gallons per day (gpd) or million gallons per day (mgd) or divided by 1,440 minutes and expressed in gallons per minute (gpm).
41. NOTICE TO PROCEED - A written notice to the Contractor of the date on which the contract period begins.
42. OWNER – The entity or entities that own the property on which facilities will be placed or construction activities will occur.
43. PEAK HOUR DEMAND – The largest volume of water used in one hour during the year expressed in gallons or million gallons. The Peak Hour Demand usually occurs during Maximum Day Demand.
44. PEAK HOUR RATE - The Peak Hour Demand volume divided by 60 minutes, expressed in gpm; or multiplied by 24 hours, expressed as mgd.
45. PEAKING FACTOR – Ratio of peak flowrate to average flowrate.
46. PERPETUAL EASEMENT - The area secured and reserved by the Commission for right-of-use in constructing and maintaining proposed work and appurtenances thereto.

47. PHASING – The sequencing of work to accommodate portions of the project that may be constructed prior to beginning other sections or portions of the project.
48. PROJECT – The undertaking to be performed as provided in the Contract Documents.
49. PROVIDE – Means Furnish and Install, complete and in place.
50. ROCK – Any indurated material that requires drilling, wedging, blasting, or other methods of brute force to excavate.
51. SEWER HOUSE CONNECTION (SHC) – A sanitary sewer which conveys wastewater from a building sewer to a collector sewer. The SHC extends from the collector sewer to the public right-of-way or easement line.
52. SKETCH PLAN – Preliminary plan that identifies the limits of the project and key elements.
53. SPECIAL PROVISIONS - Special clauses supplemental to these specifications, setting forth requirements peculiar to the specific work included in the contract documents and right-of-way agreements.
54. SPECIFICATIONS - The direction, provisions and requirements contained in these Standard Specifications, together with all written agreements made and/or to be made, pertaining to the method and manner of performing the work, or to the quantities and qualities of the materials to be furnished under the contract.
55. STANDARD DETAILS – Commission details showing standard elements of construction, methods, and materials for use on Commission contracts.
56. SUB-CONTRACTOR - Any individual firm or corporation undertaking the engineering or construction of a part of the work under the terms of the Contract, by virtue of an agreement with the Contractor, who, prior to such undertaking, received the consent of the Surety and the approval of the Commission.
57. SUBSTANTIAL COMPLETION – That date as certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed in accordance with the Contract Documents so that the Project or specified part thereof can be utilized for the purposes for which it is intended.

58. SURETY - The corporate body approved by the Commission which is bound with and for the Contractor who is primarily liable and which engages to be responsible for his payment of all debts pertaining to and for his acceptable performance of the work for which he has contracted.
59. TRANSMISSION MAINS - Large diameter water mains that convey water from the supply source to the storage facilities and the distribution mains.
60. WATER HOUSE CONNECTION (WHC) - A potable water line that provides public water from a public water main to a customer for both consumptive use and on site fire protection. The WHC extends from the public water main to the public right-of-way or easement line or to the meter.
61. WORK – Any and all obligations, duties, and responsibilities necessary to the successful completion of the Project assigned to or undertaken by the Contractor under the Contract Documents, labor, materials, equipment and other incidentals and the furnishing thereof.

## **1.2 Projects Defined**

### **A. Developer Projects**

A typical developer project originates when a developer undertakes the subdivision of a parcel of land, as set forth in the County Subdivision Regulations. If the proposed development is in a properly classified area according to the County Comprehensive Water and Sewer Plan (CWSP), which designates when and what public water and/or sewage facilities are to be constructed, the development may proceed if other pertinent requirements are met. The developer will be required to underwrite the cost of construction of any public water and sewer utilities. Subsequent requirements include the preparation of some or all of the following: hydro-geologic study, feasibility or site location studies, engineering report, construction plans and specifications, right-of-way documents, tap agreements or other legal documents and the stakeout and inspection of the construction work. Normally, a developer project is represented by a signed contract between the developer and the Commission and is termed a Public Works Agreement (PWA).

St. Mary's County Department of Land Use and growth Management (LUGM) is responsible for coordinating development activities in the County. Applicants are recommended to coordinate development projects with the LUGM office and reference their website at:

[www.co.saint-marys.md.us/lugm](http://www.co.saint-marys.md.us/lugm)

Water and/or sewer improvements may be necessary and the designs shall be prepared in accordance with this Design Manual.

**B. Capital Projects**

A Capital Project may originate by any of several administrative means, but the common identifying feature distinguishing it from a developer project is that the funds for the implementation of the project are allocated by the annual update of the Capital Improvement Budget (CIB) process within the Commission. Capital projects may involve the installation, repair and/or upgrade of major elements of the water or sewer system, such as: water supply and treatment, water transmission and storage, sewer outfalls, collection, interceptors and treatment facilities.

**1.3 Project Inception**

**A. Developer Projects**

St. Mary's County Department of Land Use and Growth Management (LUGM) is responsible for coordinating development activities in the County. Applicants are recommended to coordinate development project with the LUGM office and reference their website at:

[www.co.saint-marys.md.us/lugm](http://www.co.saint-marys.md.us/lugm)

**B. Capital Projects**

Capital projects will be defined and schedules developed as part of the scope of services to be prepared for each project.

**1.4 Engineering Reports**

**A. Applicability**

The requirement for an engineering report is applicable to Developer Projects and Capital Projects alike whenever water or sewer system extensions or improvements are proposed. Any project with more than 25 EDU's or any project with a facility such as a pump station or water tank will require an engineering report. In addition, an engineering report may be required under certain circumstances not involving system extensions or improvements or for projects with less than 25 EDU's. When required by the Commission, a detailed analysis and investigation shall be performed to determine the performance of the existing system or to evaluate the impact that proposed additions or special uses will have on the system.

The report shall be prepared by a Professional Engineer (hereinafter referred to as the “Designer”), experienced in water and sewer systems who is licensed to perform such services in the State of Maryland. The report shall be signed and sealed by a Professional Engineer of the firm by whom the report is prepared.

**B. Purpose**

The engineering report is intended to be a concise presentation of all relevant project facts together with a proposal for satisfying the needs of the project. The report shall be addressed to the Chief Engineer and delivered to the designated Project Manager. The report shall be presented in an organized manner so that the Director, his staff, County officials and other interested agencies may quickly identify and comprehend all aspects of the project including, but not limited to, the purpose, scope, cost and scheduling of the project. The Designer is expected to provide the level of detail as required by the latest edition of the St. Mary’s County Comprehensive Water and Sewerage Plan.

The report shall characterize the project, which was previously described in broad and general terms, to one of finite definition, scope and content. The report is a prerequisite to undertaking the development of detailed design and construction plans. The report may also serve other purposes simultaneously so as to:

1. Provide a historical record of the engineering principles and criteria under which the project was designed and constructed.
2. Form the basis for acceptance, rejection or modification of the scope of the Met Com project.
3. Provide a basis for legislative or administrative action on scheduling or funding for publicly funded projects.
4. Provide necessary details to guide preparation of construction documents.
5. Provide a basis for correlating the project with other Commission projects.
6. Provide an analysis and a program for the operation and maintenance of any part of a facility or system.



## C. Report Content

### 1. General

Reports shall be presented in a neat and legible manner. They shall be submitted on 8½-inch x 11-inch bond paper from any standard word processor, suitable for reproduction. Brief reports may be published in letter form, properly identified and with attachments referenced in the text. Lengthy or complex reports shall be suitably bound on the left edge and shall include a cover with appropriate identification of the Designer, project name, owner and date. Unless otherwise stipulated, the Designer shall provide three (3) copies of final approved design on Developer Projects, and ten (10) copies of reports on Capital Projects. Reports shall be delivered to the Commission Project Manager.

In considering the preparation of the report on water and sewer facilities, the Designer shall perform the following tasks:

- Become familiar with existing conditions
- Consider the impact that the proposed improvements will have on the system
- Offer proposals to satisfy project needs after they have been carefully evaluated for performance and cost

The Designer shall present a concise discussion of all relevant factors that led to the report conclusions and recommendations.

It is understood that all required subject matter for reports cannot usually be determined in advance of the research and development, as is necessary to identify all potential project issues. However, through experience and practice it is recognized that there are certain categories of information which, when properly addressed, will ensure all factors are considered prior to establishing appropriate conclusions. The text of the report will usually include a discussion of some or all of the following topics as applicable:

- Location, origin, purpose and scope of project
- Existing project conditions
- Population projections and projected needs
- Design analysis including all design criteria employed
- Design computations
- Function, layout and siting requirements of proposed facilities
- All alternatives to primary proposal
- Cost estimates and comparison of alternatives including rights-of-way requirements and costs
- Required permits and approvals of other agencies

- Conclusions and recommendations
- Schedule for implementation
- Project illustrations

The addition or elimination of subject matter for the report is within the authority of the Commission, whenever the nature of the project dictates.

## 2. Design Analysis

### A. General

In developing design requirements for elements of a water or sewer system, the Designer shall refer to the St. Mary's County Metropolitan Commission Comprehensive Water and Sewerage Plan to ascertain both the extent of existing or planned facilities in the service area and their relationship to the project under consideration. One or more maps shall be prepared showing the project location and the relationship of major elements of the system. The project map(s) shall be developed based on the following criteria:

- Displayed at a scale of 1" = 600' minimum or 1" = 200' maximum.
- Include a reasonable area surrounding the project
- Show significant topographical features such as roads, railroad lines, water courses, power transmission routes, political boundaries, water pressure zone limits, drainage divides and zoning
- Show the location, size and extent of the existing system(s) being addressed in the report
- Show locations of all proposed system additions
- All design notations used as a basis for computing system loads, such as drainage area or service area limits by zoning, future extensions of pipe systems or networks, other Capital Projects and any public improvements contemplated by other governmental agencies shall be superimposed on the report map

For water and sewer facilities identified in the Comprehensive Water and Sewerage Plan, the Commission may elect to provide the Designer with specific design requirements determined as a result of previous engineering analysis. In such cases, the Designer will incorporate these requirements into the design report and will reference the letter or other documentation by which the requirements are conveyed to the Designer from the Project Manager. For example, the Commission may specify system flow rates to be used in sizing pump stations and sewer lines or water transmission main sizes based on a previous hydraulic analysis.

### **3. Design Criteria and System Layout**

All systems shall be designed based on the guidelines and criteria established by this manual. The following chapters provide relevant design information regarding system layout and construction plan requirements for each respective system component:

- Chapter 2: Water Mains
- Chapter 3: Water Pumping Stations, Well Houses and Water Tower Design
- Chapter 4: Sewer Mains
- Chapter 5: Wastewater Pumping Station Design

For facilities that require pumping, a detailed analysis shall be performed on the following topics:

- Pump size and power requirements balanced by economical pipe sizes
- Existing and future pumping capacity requirements
- Capacity to upgrade
- Surge control
- Secondary emergency power requirements
- Alarms
- SCADA

### **4. Wastewater Pretreatment Requirements**

In cases where the engineering report provides for the design of sewer facilities for a specific non-domestic user of the sewer system, the report must address wastewater pretreatment requirements, as required by the Commission. Pretreatment requirements are established during site development plan review or during building permit review. Pretreatment facilities are required if the quality of the wastewater to be discharged would be detrimental to the Commission's conveyance or treatment systems. Pretreatment facilities must conform to applicable State and Local design requirements.

### **5. Design Computations**

Design computations shall be developed for all features of the proposed system and shall be in sufficient detail to enable the Commission to make an expeditious review of the methods and criteria employed and the corresponding results obtained. In particular, see Chapter 2, "Water Mains" for water demand and hydraulic calculations and Chapter 4, "Sewer Mains"

for wastewater flow calculations. Design computations shall be submitted with the report.

## 6. **Design Life of Facilities**

Design of system components will ordinarily be performed on the basis of the affected area being fully populated in accordance with population density determined from zoning. The Designer shall examine operating conditions using existing population and other intermediate population levels to ensure the satisfactory operation of the system throughout the design life of the system. The full development potential is determined based on a complete zoning analysis of the service area as described previously in "Design Analysis". In determining whether or not a facility should be initially constructed to meet 20-year or full development demands, the following issues shall be addressed in the engineering analysis of the proposed project:

- a. Present worth analysis comparing the cost of phased implementation (construction of parallel mains, incremental pump station expansion, etc.) with the cost of a facility initially providing capacity for full development. For the purpose of economic analysis, full development is to be projected for a 40-year period.
- b. System hydraulics considering such factors as differences in pump or pipe sizes required for 20-year and full development flows, head losses, retention time, etc.
- c. System limitations considering the advisability of having parallel facilities to provide for limited flow capacity during maintenance or repair periods.
- d. Construction limitations considering the difficulties involved with constructing parallel facilities after initial construction is complete.
- e. System design life considering the useful life of the facility. Pump stations shall be designed for 20 years; collector mains for 40 years and interceptor mains for 100 years.

## 7. **Alignment Issues**

Water and sewer lines are generally extended within public right-of-ways wherever feasible. This is because most properties to be served by these utilities have frontage on public roads, facilitating direct connections to the public water and sewer system by consumers. Fire hydrants are also located alongside roadways to permit direct access by emergency equipment. As proposed systems increase in complexity, other factors such as topography,

economy of sizing, construction costs, power requirements for pumping, maintenance considerations and conflicts with other utilities must be considered during design. The Designer shall evaluate alternative designs that provide a design with overall lowest cost and least impact on natural and manmade features. The Designer's report shall include life cycle cost comparisons for all alternatives considered.

## **8. Construction Cost Estimates**

The cost of all facilities addressed in the report shall be tabulated in a clear and concise manner and shall be derived from recognized sources. The Cost Estimate shall be based on the Metcom Standard of Itemized Construction Cost included in the Appendix. If the item is not listed then the Estimate shall be based on current bid, estimates shall be based on current bid prices for comparable work in the locale of the project with consideration of soil conditions, water table, etc., and shall reflect quotations from suppliers of equipment and materials whenever appropriate. The cost estimates shall be in the form and format as directed by the Commission.

Whenever alternative solutions involve different types of facilities such as a gravity system versus a pumped system, cost comparisons are more truly representative when analyzed to include capital, operation and maintenance costs on a life cycle basis, using reasonable interest rates. Current construction costs shall be adjusted and projected to the planned construction year as indicated in the project schedule with consideration of the effects of current inflation rates. The factors used in these projections shall be clearly stated.

## **9. Project Schedule**

A project schedule shall be prepared by the Designer and included in the report. For Developer Projects, the schedule may be statements in the text of the letter report describing the Developer's estimate as to when the various phases of the development will be ready to accommodate the water and sewer construction program and the target date for completing the development and for occupancy. For Capital Projects, the Designer shall prepare a schedule in bar graph form displaying the best estimate of when the major elements of the project will be initiated and completed. As appropriate to a given project, the schedule shall include the following time considerations and tasks:

- Preliminary Design Period
- 50% for pipeline design and 60% for pumping station designs
- Review by the Commission
- Geotechnical and Corrosion Control Reports
- Rights-of-Way, Easement and/or Property Documentation
- Final Design (95% Complete)
- Final Commission Review & Approval

- Obtaining Permits
- Advertising and Bidding
- Award of Construction Contract
- Material Availability/Delivery
- Construction Period
- Other Special Items Affecting Schedules

The project schedule shall indicate the critical path, including required completion date and target dates for each phase, which must be met in order to achieve the schedule. In addition, any procedure, which can advance the completion date, such as pre-purchase of materials and equipment and a division of the project into two or more construction contracts, shall be identified.

## **10. Illustrations**

An engineering report is considerably enhanced by the inclusion of maps, graphs, diagrams and charts to illustrate and amplify issues presented in the text. Schematic drawings showing arrangements of site development, piping, appurtenances, special structures and the like, will help to convey what the Designer is considering and will tend to expedite the review and approval process as well as providing a firm basis for proceeding with the construction plans.

### **1.5 Preparation of Construction Plans**

#### **A. General**

Contract documents for construction projects in St. Mary’s County are commonly comprised of construction plans and the construction specifications. Taken together, these documents form the basis for the construction contract between the owner and contractor. Contract documents are prepared by the Design Engineer, who is responsible for a complete description of all work to be performed, in accordance with the Standard Specifications. The Design Engineer remains responsible for adequately designing, detailing, and specifying through the Special Provisions and Specifications, all contract-specific materials and methods of construction not described in the Standard Specifications.

#### **B. Purpose**

1. The primary purpose of construction plans is to show the size, horizontal and vertical location and type of materials and structures to be installed as part of a water or sewer system. The construction plans must be developed in sufficient detail to depict the improvements and their spatial relationship with both existing conditions and planned future improvements.

2. This section sets forth requirements for information to be placed on construction plans. When completed according to Commission standards and properly implemented in construction, the original plans for water and sewer facilities form a permanent record of the completed work and the materials employed on the project. When modified with as-built notations, the plans provide a comprehensive and accurate statement as to where the facilities are located, the materials used and their relationship to other important improvements.
3. In order for the Commission to provide necessary maintenance activities, including emergency repairs, etc., it is necessary that the plans are clearly drawn, can be accurately scaled and show all information necessary to be included as a permanent record. In addition, water and sewer plans are utilized in many other record-keeping activities by the Commission that requires standardized accurate information. One of the most common uses of record drawings, other than for repair information, is for remodeling portions of the system. In these cases, the record drawings may be used for the re-evaluation of design capacities in the light of changed conditions after the original project was completed.
4. Construction plans shall clearly designate the facilities or portions of the facilities that are proposed to be privately maintained by the Developer or other agencies. The plans shall provide all information, if known, as to who is to be contacted in the event of an emergency, complete with name, address and telephone number(s) of individual(s), firm(s), partnership(s), etc., who are responsible for maintenance of the private system. If not known at the time of plan preparation, this information shall be provided on the construction permit.

### **C. Drafting and Graphic Standards**

General – All plans shall meet the St. Mary's County Department of Public Works & Transportation (DPW&T) format guidelines as shown on the DPW&T website ([www.co.saint-marys.md.us/dpw](http://www.co.saint-marys.md.us/dpw)). If not shown on the website, or if the following is more stringent, the following shall be used:

#### **1. Sheet Size, Borders and Materials**

All water and sewer construction projects shall be prepared on 24-inch x 36-inch drafting paper. Borders shall be ½-inch on all sides with the exception of the left side, which shall be 1 ½ inches, with standard title block. All drafting and lettering shall be performed directly on the original plans and no

reproductions, rub-on or adhesive materials shall be used. Minimal hand drafting shall be limited to minor revisions.

## 2. Computer-aided Drafting (CAD)

All requirements of this section, "Drafting and Graphic Standards," shall be met. Plotters used for CAD shall be equipped with technical ballpoint pens, standard drafting pens or an electronic printer device.

## 3. Scale

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Water and sewer plans should be drawn on a scale of 1" = 50'; the scale may be increased or decreased depending on the complexity of the site at the approval of the Commission. Water and sewer profiles are typically drawn to accompany the plan layout and shall be shown below the applicable plan layout on each sheet. For Developer Projects, the complete layout of the piping system may be shown in the plan view drawing. Profiles shall then be shown on a separate sheet and cross-referenced to the appropriate plan. Profiles shall be drawn to a horizontal scale of 1" = 50' and a vertical scale of 1" = 5'.

## 4. Symbols and Abbreviations

Symbols and abbreviations shall be clearly defined in a legend on the title sheet or for a project involving multiple disciplines, such as mechanical, electrical, structural and architectural, on the first sheet of each discipline in which they are used. If symbols fail to convey the required information clearly, they shall not be used.

## 5. Lettering

Vertical lettering shall be used throughout. Lettering shall be uniform, neat in appearance, free of stylization and large enough to be read when reduced for County use. Lettering for titles, sub-titles and notes placed on the drawings shall be the size as shown in the "General Drafting Standards" in the Appendix. All notes, descriptions, etc. shall be minimum No. 4 (4/32-inch) in size and shall be either all upper case or all lower case. Proper names only shall be capitalized. Construction notes shall not be placed in shaded areas. Crowding of notes into a small space shall be avoided. Leaders shall be used to identify the object to which each note refers. All lettering in the same contract shall be of the same style.

## 6. Vicinity and Location Maps and Initial Drawing

The first sheet of all projects shall include a location map at 1-inch = 600 feet and a vicinity map at 1-inch = 2000 feet or as appropriate if the scope of the project warrant different scaling. When a set of contract plans contain only



one or two sheets, the vicinity map shall be placed at the upper right portion of the first plan sheet in a space measuring 8½-inches vertically by 11-inches horizontally. If the vicinity map cannot fit in the 8½ x 11-inch space or whenever there are 3 or more sheets to the contract, then the first sheet shall be designed as a title sheet with the vicinity map centered on the plan.

For Capital Projects, the vicinity map shall, in addition to the above, show the contract number, the location, size and adjacent existing water and sewer facilities and proposed facilities.

Provide under the vicinity map an informational block containing the following: number of lots and parcels serviced, number of water house connections, number of sewer house connections, use of buildings/structures, drainage area, treatment plant service area. An EDU tabulation shall be included under the informational block.

In addition to the vicinity map, the initial plan shall show the contract title, contract number and capital project number. The initial plan shall also include a tabulation of materials with columns for bid quantity, as-built quantity and material/supplier. If the project is divided into two or more contracts, each associated contract shall be identified on the vicinity map. Likewise, the plan coverage of each sheet of the construction plans shall be shown on the vicinity map with its corresponding sheet number for ready reference. For projects with more than three plans (total), a complete sheet index shall also be provided on the title sheet indicating the data shown on each sheet.

When space permits, the first plan of a set shall also show the General Notes pertaining to the contract. If the notes cannot be placed on the initial sheet, a note shall be included on the initial sheet indicating on which sheet the General Notes appear.

A note shall be included in the General Notes stating that the manipulation of valves by any party other than representatives of the Commission is prohibited.

The LUGM number shall be on all sheets.

## 7. Information Required on Each Construction Plan

The purpose of the contract plans is to portray graphically to the review agencies, project engineer and contractor the nature and extent of the proposed work and the conditions under which the work is to be performed. All information that can best be shown by plans and their accompanying dimensions and notes should be shown on the contract plans or appropriate reference to the Commission's Standard Details made where applicable. Lengthy written descriptions or requirements regarding the work are best

included in the specifications, and therefore, shall not be repeated on the plans.

Each sheet shall have a title block along the lower right border of the sheet. The title block shall show the project name, sheet title, contract number, scale, 600-scale reference map number and block numbers, date, sheet number and signature blocks for the DPW&T and/or the LUGM as well as a signature block for Health Department (if necessary) and Soil Conservation District. Sheets shall be numbered sequentially 1 through X, where X is the total number of sheets in the contract.

The professional engineer's seal, original signature and registration number belonging to the Designer responsible for the design, registered in the State of Maryland, shall be shown on the title block of the first sheet and each finished sheet of the set of plans. The date on which seal and signature were affixed to the plans shall be shown in the same location on all the sheets. The Designer's seal, signature, registration number and date of signature shall also be shown on the first page of the project specifications.

The cover sheet shall have a revision box in the title block. The revision box shall be as shown on the "Standard Reference Plan" in the Appendix A. The revision box shall document all revisions after the Designer's seal and signature has been affixed to the plan.

A tabulation of benchmark descriptions, elevations and northing and easting coordinates shall be shown on the cover sheet for a minimum of two benchmarks.

Each plan sheet and location map shall have a north arrow, and each plan sheet shall be in the Maryland State Plane. Plan sheets shall be oriented so that the north arrow points toward the top or toward the right side of the sheet, or toward the upper right quadrant of the sheet.

The limits of the contract shall be clearly shown on all plans.

All plans in the same contract shall be cross-referenced by ascending numbers. Match lines shall be used when data continues on an additional sheet or sheets. Data shall be cut off at the match line.

## 8. Checklists

The Designer shall fully complete the "Preliminary Plan" and "Final Construction Plans" checklist(s) for each sewer and water project, as applicable. The Designer shall verify that all information detailed on the checklist is shown on the plans. The appropriate checklist shall be completed

and attached to each set of plans submitted for review. This shall apply to all Capital Projects as well as Developer Projects. The checklist is available from the MetCom website.

8/9/10 9. Certifications

- a. An owner's certification must be included on plans for water and sewer only. This certification shall be as follows:

*"I hereby certify that all construction will be in accordance with the St. Mary's County Metropolitan Commission's Design Manual and these plans as approved.*

*Signature\_\_\_\_\_ Date\_\_\_\_\_."*

- b. Effective July 1, 2007, a Maryland Professional Engineer must include a Professional Certification when signing and sealing plans and drawings. This additional certification is intended to promote awareness among Maryland professional engineers of the status of their engineers' license and reduce the occurrences of practicing engineering with an expired license. Include the certification below to documents signed and sealed by a Maryland Professional Engineer.

The title block, certification, seal and signature shall appear close to each other. The certification shall be as follows:

*"Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. \_\_\_\_\_, Expiration Date: \_\_\_\_\_."*

## 1.6 Preparation of Construction Specifications

### A. General

The Commission's standard specifications have been developed for Capital projects and for Developer sewer pump stations, wells and water towers. The specifications may be different for a Capital project than for a Developer project.

### B. Developer Projects

Developer projects, by their nature, are funded privately. Therefore, the contractual requirements between the Developer and the Developer's contractor are independent of the technical specification requirements of interest to MetCom. Developer projects shall use MetCom's standard technical specifications. Developer prepared specifications are required to be submitted with final construction plans only.

The Designer shall submit three completed copies of the bound specifications. The final specification shall have the Designer's Professional Engineer's seal, signature, date of signature and certification on the title page.

## **C. Capital Projects**

Non-standard specifications, special provisions, proposal form, contract and bond forms and other designated items, when required by the Commission, shall be developed by the Designer specifically for each project and shall be published in booklet form. A draft of the project specifications for Capital projects shall be submitted with each plan submittal for review by the Commission.

Upon completion of the construction plans for water and sewer projects, the Designer is required to provide the necessary non-standard specifications to accompany the plans. At this stage of the project, the Designer should be able to finalize most of the non-standard portions of the specification with the possible exception of items relating to permits or easement commitments. When all details of the specifications are completed, the Designer shall submit the stipulated number of copies of the complete and bound specifications for Capital projects. The final specification shall have the Designer's Professional Engineer's seal, signature, date of signature and certification on the title page.

The Standard Specifications format is to be used in the preparation of the non-standard specification sections.

## **1.7 Construction Requirements**

### **A. Acquisition**

For Developer Projects, the Developer shall be responsible for acquiring all right-of-way and easements required for the work proposed. The Developer, or his designee, shall prepare all applications to SHA and MDE and submit to MetCom for signature prior to submitting to SHA and/or MDE.

For Capital Projects, the Commission will acquire the right-of-way and easements.

### **B. Location**

Right-of-way locations shall be regulated, in general, by the location of the utility for which they are being provided. However, before establishing the location of utilities for which right-of-way will be necessary, the design engineer shall consider the property owners' interests in positioning the right-of-way. Undue splitting and angling across property shall be avoided. Right-of-way location shall be fixed by surveys.

Drainage and utility easement may not be located concurrent with landscape buffer yards, forest retention areas or ingress and egress easements unless prior approval is obtained from the Commission.

Private water and sewer services which cross lot lines shall be located within a private drainage and utility easement. Such easements shall be shown on the construction drawings and shall be noted as private drainage and utility easements.

**C. Width**

The width of the right-of-way and easements shall be sufficient to allow proper access and maintenance of the utility for which it is provided. Right-of-way and easements widths must be provided as follows:

1. Sanitary sewers, force mains, and water mains shall be centered within a minimum twenty-foot (20') wide easement. Utilities located adjacent and parallel to lot lines shall be centered within a thirty-foot (30') wide easement.
2. Centerline of utilities shall be no less than ten feet (10') from the edge of right-of-way line.
3. Multiple utility installation – a minimum of an extra five foot (5') width for each additional utility shall be added to the required utility width.
4. Landscaping

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Generally, planting of trees within 20 feet of water and sewer facilities will not be allowed within right-of-ways, drainage easements and utility easements which contain water and sewer utilities. Ornamental shrubs may be approved within the above restrictions as determined by the Commission.

**D. Location of Adjoining Utilities (Other than Water and Sewer)**

The Commission will review and approve design drawings of utilities, other than water and sewer utilities, when any portion of the proposed utility is within five feet of an existing or proposed water/sewer utility. The horizontal clearance between the proposed utility and existing/future water and sewer utilities will be evaluated on a case-by-case basis by the Commission. In general, the following shall be provided:

1. Minimum vertical clearance (outside of pipe to outside of pipe) from water mains, water house connections, sanitary sewers and sewer house connections shall be one (1) foot.
2. Minimum horizontal clearance (outside pipe to outside pipe) parallel to water mains and sanitary sewers shall be five (5) feet.

3. Open trenching will not be allowed within eight (8) feet behind fire hydrants and water main bends. Directional drilling behind fire hydrants or water main bends shall extend a minimum of five (5) feet beyond such facilities.
4. Limits of utility vaults shall be horizontally located a minimum of five (5) feet from any water or sewer facility. Electric transformers shall be a minimum of ten (10) feet from any water or sewer main.

**E. Permits**

1. Developer Projects

The Developer is responsible for the preparation and submission of all required County, State and Federal permits and the cost thereof. All such permits shall be obtained from the applicable agency prior to construction.

2. Capital Projects

For Capital Projects, the scope of work will identify which permits are the responsibility of the Designer and which are the responsibility of the Commission.

**F. Executed Public Works Utility Agreement**

The Public Works Agreement, covering the financial aspects of public construction in the proposed development must be executed before the construction process can commence.

**G. Construction Permits**

All construction permits shall be acquired before the construction process can commence.

**1.8 As-Built Requirements**

**A. General**

8/9/10 After the water and sewer plans have been signed by the Commission, the original water and sewer plans and all prints thereof become the property of St. Mary's County Metropolitan Commission. During construction, the Contractor and the Commission's inspector, acting together, will maintain a set of as-built or redlined prints of the water and sewer plans. Following construction, the original water and sewer plans shall be revised to reflect the as-built conditions in accordance with the current As-Built Requirements, along with flow test results from all new fire hydrants. The flow testing must be coordinated with MetCom's Operations Department. See the Appendix or our website for MetCom As-Built Requirements.

**B. Electronic Files**

All plans shall be prepared in electronic format, therefore, in addition to the modifications to the original water and sewer plans, the Commission will require that the electronic files be modified to reflect the as-built conditions and delivered to the Commission.

**C. Replacement Drawings**

Plans bearing original signatures and dates of approval are important for the Commission's historical records. However, there may be rare instances where extensive modifications to a plan may render the plan illegible. In order to insure that the plans are clear and legible for operation and maintenance purposes, the Commission may require that a completely new plan with modifications be developed for the as-built plan. The plan shall be noted as "**AS-BUILT REPLACEMENT SHEET**" above the title block on the lower right-hand corner of the plan and dated and shall be included along with the original plan.

END OF CHAPTER 1

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