

ANNE ARUNDEL COUNTY

Master Plan for Water Supply and Sewerage Systems

2022



Master Plan for Water Supply and Sewerage Systems

As Adopted by the Anne Arundel County Council Bill No. 53-22,
June 6, 2022, Effective: July 19, 2022

Anne Arundel County, Maryland

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Certificate of Conformance

This document has been reviewed and found to be consistent with the General Development Plan of Anne Arundel County and all other applicable adopted land use plans in accordance with § 1-303 of the Land Use Article of the Annotated Code of Maryland and was prepared in accordance with COMAR 26.03.01.04.




Stephen Kaii-Ziegler, AICP
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April 19, 2022

Date

Engineer's Statement of Certification

This is to certify that sections of the 2022 update to the Anne Arundel County Master Plan for Water Supply and Sewerage Systems covering engineering aspects of water and sewerage projects have been prepared and reviewed for adequacy by a registered professional engineer licensed in the State of Maryland.



Beth E. O'Connell, P.E.
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4/19/22

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Abbreviations and Acronyms

AACC	Anne Arundel Community College
AACO	Anne Arundel County
AWWA	American Water Works Association
BAT	Best Available Technology
BNR	Biological Nutrient Reduction
BOD	Biochemical Oxygen Demand
BOE	Board of Education
BPS	Booster Pump Station
BWI	Baltimore-Washington Airport
CCFM	Cross County Force Main
CD	Calendar Days
CIP	Capital Improvement Program/capital improvement project
CIPP	Cured In Place Pipe
CMOM	Capacity, Management, Operation, and Maintenance
COMAR	Code of Maryland Regulations
CPF	Consolidated Property File
CSP	Comprehensive Sewer Strategic Plan
CWA	Federal Clean Water Act
CWS	Community Water System
DPW	Department of Public Works (Anne Arundel County)
DRRA	Development Rights and Responsibilities Agreement
DU	Dwelling Unit
DU/AC	Dwelling Units Per Acre
EDU	Equivalent Dwelling Unit
ENR	Enhanced Nutrient Removal
EPA	United States Environmental Protection Agency
EPF	Environmental Protection Fee
EPS	Extended Period Simulations
ET	Elevated Tank
EWT	Elevated Water Tank
EWST	Elevated Water Storage Tank
EXCEL	Excellence in Cost Effective Leadership
FAA	Federal Aviation Administration
FFA	Front Foot Assessment
FFE	First Floor Elevation
FM	Force Main
GDP	General Development Plan
GPD	Gallons Per Day
GRS	Groundwater Remediation System
GST	Ground Storage Tank
HDPE	High-Density Polyethylene Pipe
I/I	Infiltration/Inflow
IR	Integrated Report
LPA	Lower Patapsco Aquifer

LTM	Long Term Monitoring
KW	Kilowatts
MAA	Maryland Aviation Administration
MBR	Membrane Bioreactor
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDE	Maryland Department of the Environment
MES	Maryland Environmental Services
MG	Million Gallons
MGD	Million Gallons Per Day
mg/l	Milligrams Per Liter
MGS	Maryland Geological Survey
NCSS	National Cooperative Soil Survey
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSA	National Security Agency
NTNC	Non-Transient Non Community Water System
O&M	Operations And Maintenance
OFE	Overflow Elevations
OPZ	Office of Planning and Zoning (Anne Arundel County)
OSDS	On-Site Disposal System
OSHA	United States Occupational Safety and Health Administration
PDWP	Public Drinking Water Program
PFA	Priority Funding Area
POET	Point Of Entry Treatment System
POTW	Publicly Owned Treatment Works
PS	Pumping Station
psi	Pounds Per Square Inch
PUD	Planned Unit Development
RAS	Return Activated Sludge
RED	Required Extension Distance
RI/FS	Remedial Investigation / Feasibility Study
ROW	Right-Of-Way
SCADA	Supervisory Control and Data Acquisition
SCW	Self-Contained Well
SER	Systems Evaluation and Rehabilitation
SHA	State Highway Administration
SPS	Sewer Pump Station
SSA	Sewer Service Area
SSO	Sanitary Sewer Overflow
SWAMP	Sewer and Water Allocation Management and Planning System
SWAP	Source Water Assessment Program
SWM	Stormwater Management
SWPP	Source Water Protection Plan
TAZ	Transportation Analysis Zone
TMDL	Total Maximum Daily Load

TN	Total Nitrogen
TNCWS	Transient Non-Community Water System
TP	Total Phosphorus
TSS	Total Suspended Solids
TT	Treatment Technique
UPA	Upper Patapsco Aquifer
USDA	United States Department of Agriculture
USNA	United States Naval Academy
VOC	Volatile Organic Compound
WHPA	Wellhead Protection Area
WPP	Wellhead Protection Program
WPZ	Water Pressure Zone
WQS	Water Quality Standards
WRF	Water Reclamation Facility
WSP	Comprehensive Water Strategic Plan
WSSC	Wetlands of Special State Concern
WTP	Water Treatment Plant
WWFPS	Wastewater Flow Projection System
WWTP	Wastewater Treatment Plant

Introduction

Anne Arundel County's Master Plan for Water Supply and Sewerage Systems has evolved over the past 50 years as an important policy plan for the provision of water and wastewater service to County residents, managing and directing development to appropriate and suitable areas and helping to achieve the County's conservation and resource management goals.

The County began its sewer and water operations under the direction of the Anne Arundel County Sanitary Commission in 1922. In July 1965, Anne Arundel County became a Charter Government with the election of a County Executive and a seven member County Council. With this new government, the responsibilities of providing water and wastewater facilities shifted from the Sanitary Commission to the Department of Public Works and the Planning staff. It was in 1966 that the County had in place its first Master Plan for Water Supply and Sewerage Systems (Water and Sewer Master Plan or WSMP). Since its original adoption by the County Council in 1966 by Bill No. 6-68, the WSMP has had major updates and revisions to reflect changes in land use, population, environmental laws and policies, and relevant State and County laws; and revisions to water and sewer strategic plans as follows:

- 1969 – Adopted by County Council by Bill No. 95-69,
- 1971 – Adopted by County Council by Bill No. 79-71,
- 1974 – Adopted by County Council by Bill No. 25-74,
- 1976 – Adopted by County Council by Bill No. 139-76,
- 1984 – Adopted by County Council by Bill No. 25-84,
- 1990 – Adopted by County Council by Bill No. 20-90,
- 1992 – Adopted by County Council by Bill No. 32-92,
- 1993 – Adopted by County Council by Bill No. 62-93,
- 1996 – Adopted by County Council by Bill No. 92-95,
- 1999 – Adopted by County Council by Bill No. 72-99,
- 2006 – Adopted by County Council by Bill No. 98-05,
- 2007 – Adopted by County Council by Bill No. 84-07,
- 2013 – Adopted by County Council by Bill No. 11-13, and
- 2017 – Adopted by County Council by Bill No. 76-17.

When the WSMP of 1966 was adopted, 86% of the County's land area was planned to be served by public water and sewer services. With revisions to the County's General Development Plan in 1978, the total service area narrowed to 58% of the County's land area. Additional State and County laws and policies over the years have limited the service area to approximately 50% of the County's land area where it remains today.

As Anne Arundel County has grown over the years, the WSMP has proven to be an important and effective document, addressing and implementing the goals and policies of the County's General Development Plan, documenting existing water resources and wastewater treatment capacities, identifying needed mechanisms to meet future demand and guiding development within the County by setting the criteria for which public and private water and sewer services are provided.

This 2022 update to the WSMP reflects the land use policies of Plan2040, the County's most recently updated General Development Plan that was adopted in May, 2021. This update to the WSMP reflects the most recent data for population, land use, flow projections, non-County water systems, water quality problem areas, financial data and other data. As planning policies increasingly focus on protection of water

resources, the focus of public utility planning will continue to shift toward enhanced treatment, established TMDL requirements, and watershed planning.

1 Goals, Policies and Procedures

1.1 Goals and Policies

Title 9, Subtitle 5, of the Environment Article of the Annotated Code of Maryland requires each County to develop water supply and sewerage systems in accordance with a County Master Plan which specifies the extent, adequacy, sizing, staging, and other characteristics of such facilities so that they are in compliance with State laws relating to air pollution, water pollution, environmental protection and land use. It further specifies that the extension and expansion of such water supply and sewerage systems shall be consistent with the County's General Development Plan (GDP) and adopted Land Use Plan. The County's current Land Use Plan is shown in Figure 1-1.

The State's Economic Growth, Resource Protection and Planning Act was enacted in 1992 and amended in 2000 and 2009. This legislation established statewide visions for planning, growth and resource protection. In 1997, the State enacted legislation known as the Smart Growth and Neighborhood Conservation Initiatives. This legislation created several programs to promote growth management and neighborhood conservation and directed State funding for infrastructure to Priority Funding Areas (PFAs). The County established PFAs to indicate areas where existing and planned infrastructure would support planned development (Figure 1-2). PFAs consist of existing employment areas, land designated for industrial development on or before July 1, 1997, existing communities that have public sewer or public water that are developed at two dwellings per acre or greater, and areas that are zoned (Figure 1-3) or designated on the Land Use Plan for residential development at 3.5 dwellings per acre or greater that are in the existing or planned service category for public sewer. These are areas where significant infrastructure investment has taken place and continued investment is warranted.

The County's Priority Funding Area relates closely to the areas shown on the Water and Sewer Master Plan for existing and planned service. Areas that are designated as PFAs comprise 95% of the existing, planned sewer service, and other categories in the County, and 92% of the existing, planned water service, and other categories.

In 2006, the State passed new legislation requiring local jurisdictions to include a Water Resources Element in their comprehensive land use plans. The purpose of which is to ensure that future local comprehensive plans "reflect the opportunities and limitations of local and regional water resources." It is from the guidance of the above-mentioned legislation that Anne Arundel County updated their General Development Plan with the aid and assistance of many citizens to prepare Plan2040. It contains a Water Resources Element that assesses current and projected capacities and deficiencies in water supply systems, wastewater treatment plants, and stormwater management facilities and also assesses development impacts on receiving waters based on the County's proposed Land Use Plan. In addition, Plan2040 includes an expanded list of Development Policy Areas that provide a framework for implementing the goals and policies in the GDP. The Plan defines Development Policy Areas that are based primarily on the built environment, historical development patterns, rural and agricultural areas, PFAs, revitalization goals, natural resources and the location of public sewer and water facilities. These policy areas include Rural and Agricultural, Peninsula, Neighborhood Preservation, Critical Corridor, Critical Economic and Town Center. Two policy area overlays include Transit-Oriented and Village Center and Targeted Development, Redevelopment, and Revitalization Policy Areas which are further broken down into Critical Economic, Town Centers, Village Center Overlay and Transit-Oriented Overlay areas.

Figure 1-1 Plan2040 Land Use Plan

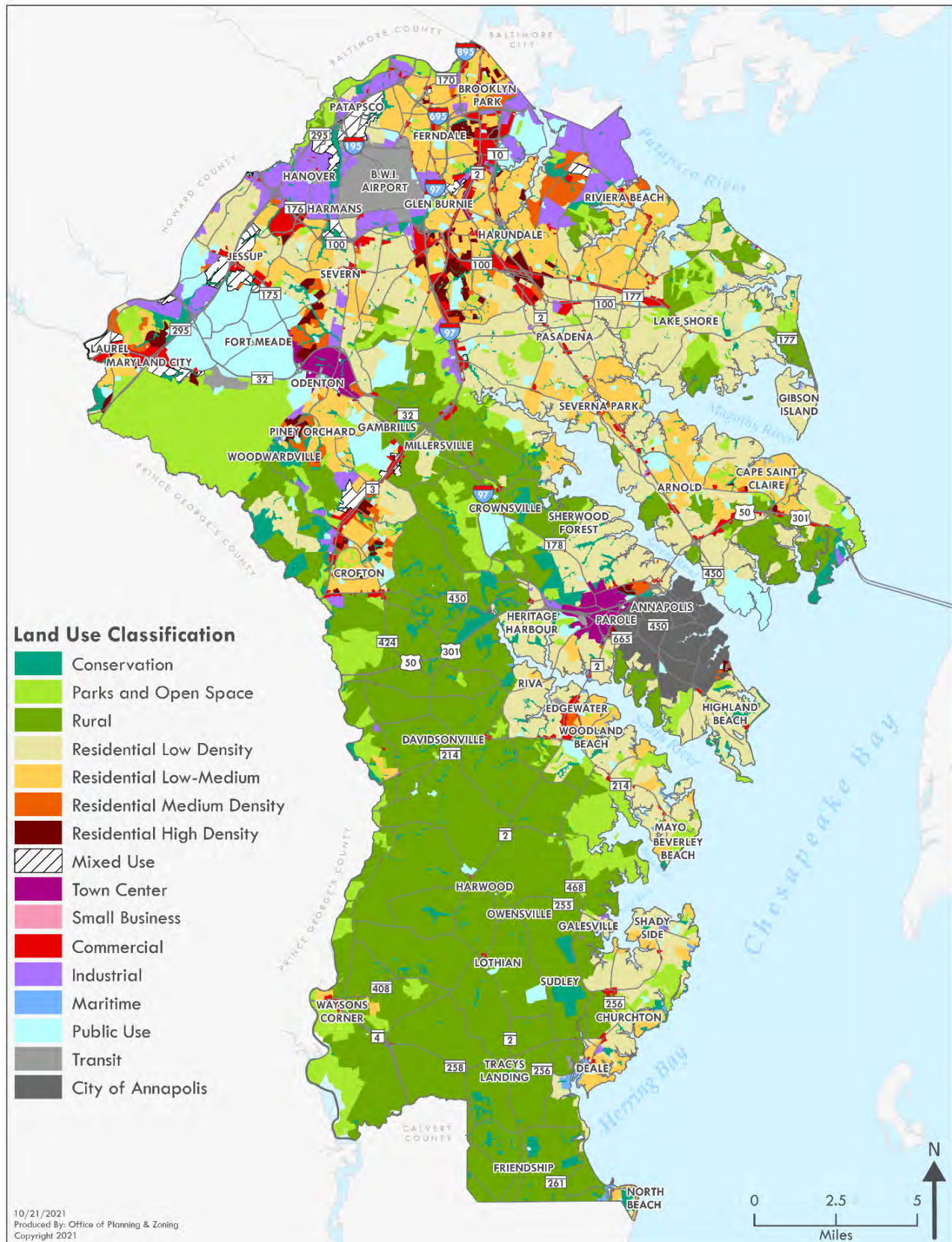


Figure 1-2 Priority Funding Areas

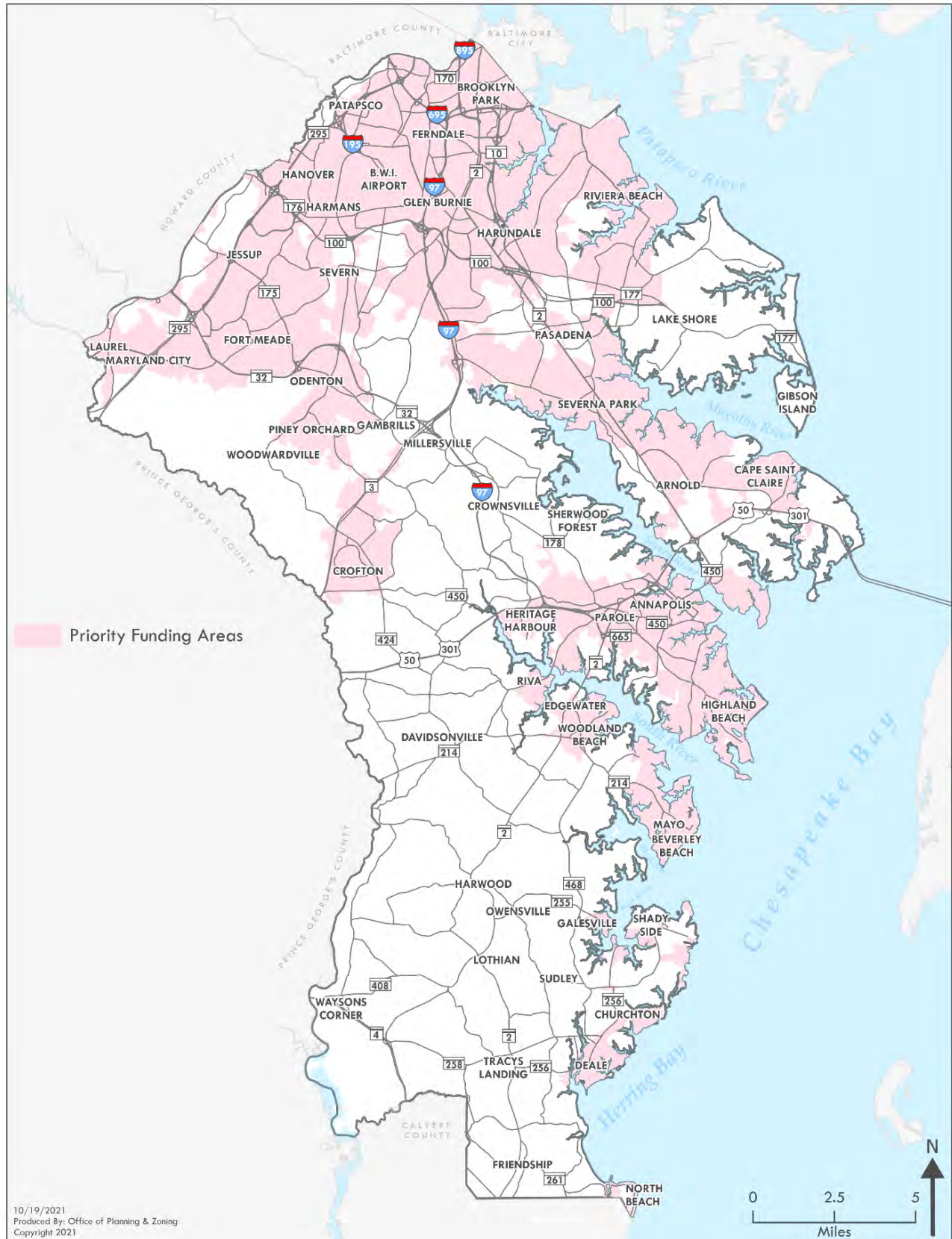
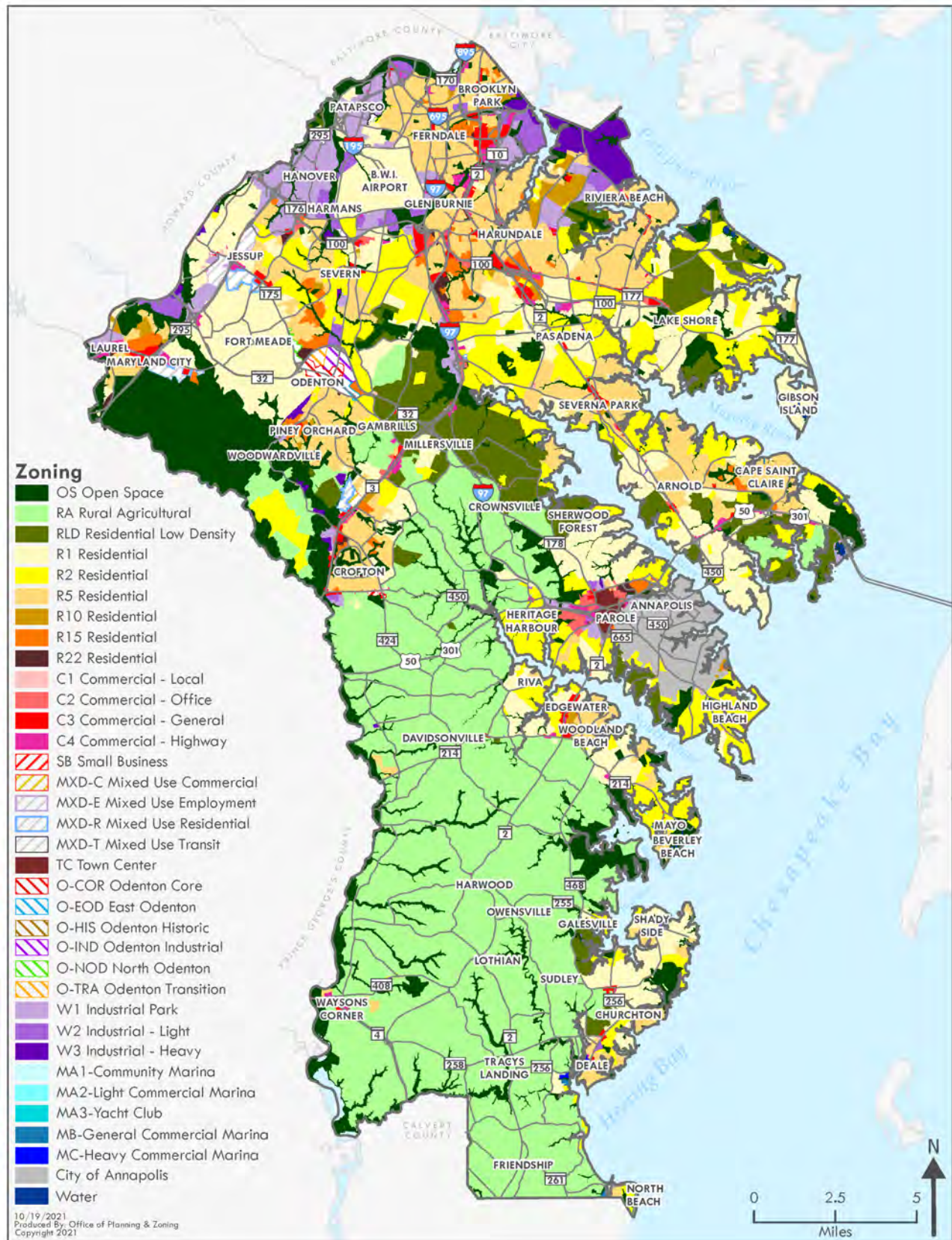


Figure 1-3 Existing Zoning



In 2012, the State passed the Sustainable Growth and Agricultural Preservation Act which limits development rights on large-lot residential development for the purpose of reducing nitrogen pollution into the Chesapeake Bay and other waterways. The Act was codified in §§ 9-206 and 9-110 of the Environment Article; and Title 1, Subtitle 5 and §5-104 of the Land Use Article of the Annotated Code of Maryland. The Act does not apply to commercial and industrial property. Per the State requirements, the County developed Growth Tiers (Figure 1-4) which identify where major and minor residential subdivisions can occur and what type of sewerage system will serve them based on the County's Water and Sewer Master Plan adopted sewer service categories as well as other criteria. The original Growth Tiers Map was officially certified in July 2013 by the Planning and Zoning Officer. In accordance with State Law, the Growth Tiers Map has been included in Plan2040 and has been updated consistent with the governing criteria listed in Section 1.3E. The governing criteria for delineating the Growth Tiers are established in the State law as follows:

Tier I	Areas served by public sewer systems (Existing Sewer Service Category in the Water and Sewer Master Plan), and areas within a designated Targeted Development, Redevelopment, or Revitalization Area (Growth Areas).
Tier IA	Areas served by public sewer systems (Existing Sewer Service Category in the Water and Sewer Master Plan), and areas located outside of a designated Targeted Development, Redevelopment, or Revitalization Area (Growth Areas).
Tier II	Areas planned to be served by public sewer systems (Planned or Future Sewer Service Category in the Water and Sewer Master Plan), and areas in a locally designated growth area within a designated Targeted Development, Redevelopment, or Revitalization Area (Growth Areas).
Tier IIA	Areas planned to be served by public sewer systems (Planned or Future Sewer Service Category in the Water and Sewer Master Plan), and areas located outside of a designated Targeted Development, Redevelopment, or Revitalization Area (Growth Areas).
Tier III	Areas not planned for public sewer service (No Public Sewer Service Category in the Water and Sewer Master Plan), and areas that are generally planned and zoned for large lot or rural residential uses.
Tier IV	Areas generally planned and zoned for land, agricultural or resource protection or preservation and are dominated by agricultural lands, forest lands, or other natural areas; or are rural legacy areas, priority preservation areas, or areas subject to covenants, restrictions, conditions or conservation easements for the benefit of, or held by a State agency or a local jurisdiction for the purpose of conserving natural resources or agricultural land.

1.1.1 Goals and Policies of the Plan2040 General Development Plan

Plan2040 provides a vision for the future that "will support our communities and demonstrate environmental stewardship. Residents will have access to more reliable transportation choices including mass transit, biking, walking, and improved roadways. Improved water, sewer, and septic systems and stormwater runoff controls will improve quality of life and water quality."

The goals and policies from Plan2040 that are relevant to water and sewer planning are as follows:

Goal NE4: Improve and protect water quality by reducing impacts from stormwater runoff, wastewater discharge, and septic systems.

Policy NE4.3: Reduce total nutrient loads from onsite septic systems and small community-based systems (also known as "minor systems").

Policy NE4.6: Provide the highest level of economically achievable wastewater treatment at all County Water Reclamation Facilities in order to reduce pollutant loads to water bodies.

Goal NE5: Ensure the safe and adequate supply of groundwater resources and wastewater treatment services for current and future generations.

Policy NE5.1: Encourage water conservation and protection of the County's groundwater resources.

Policy NE5.2: Ensure adequate capacity at the County's Water Reclamation Facilities to treat existing and projected wastewater flows outlined in the Master Plan for Water Supply and Sewerage Systems.

Policy NE5.3: Develop a long-term public water and sewer infrastructure replacement program.

Goal BE2: Preserve the agricultural and rural character of the County's Rural and Agricultural Policy Area.

Policy BE2.1: Maintain limited development patterns compatible with and intrinsic to the rural parts of the County by using the Rural and Agricultural land use designation as the primary planning mechanism for preserving the character of the County's Rural and Agricultural Policy Area. Limit development to rural densities beyond the boundary of County's public sewer service area.

Figure 1-4 Plan2040 Development Policy Areas

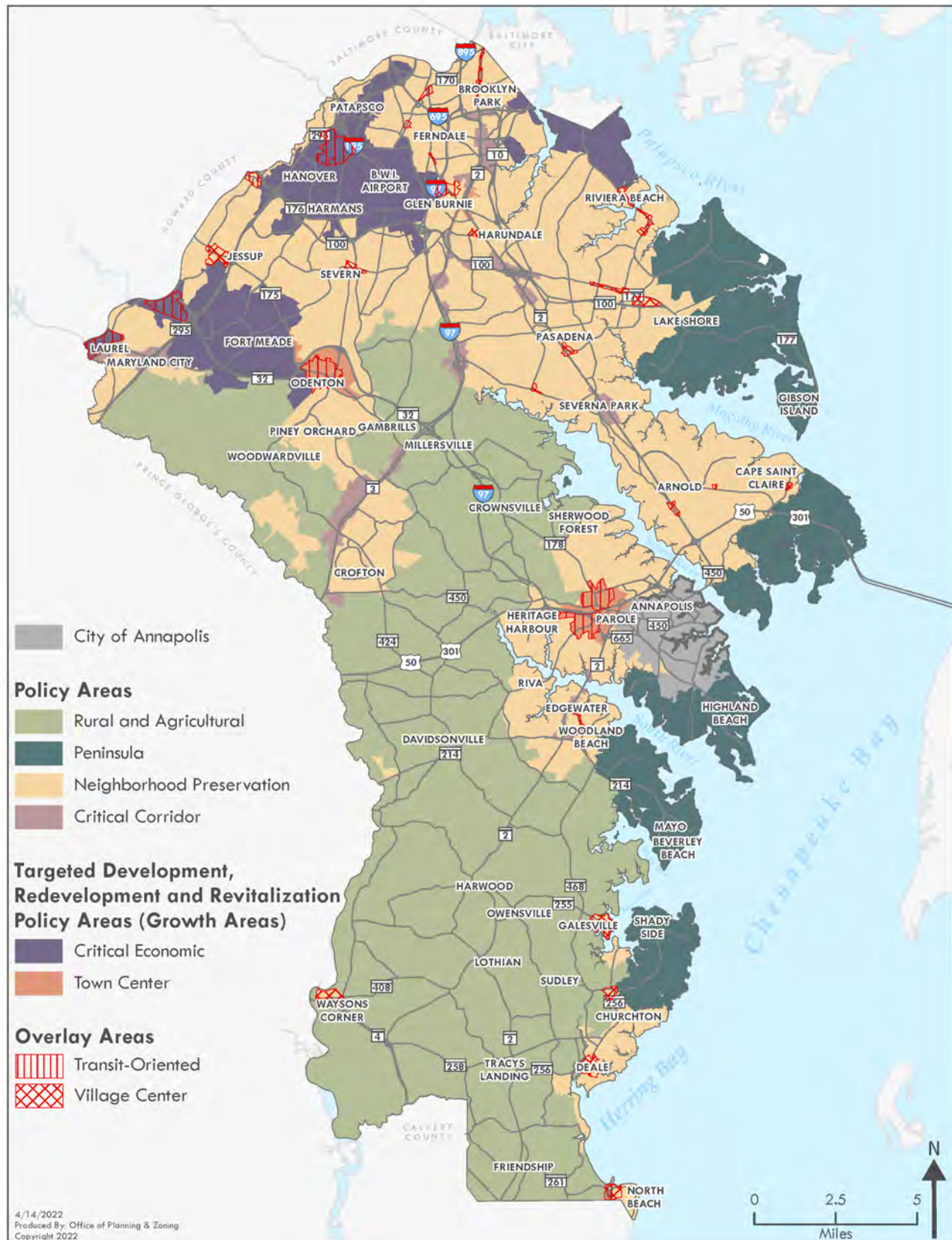
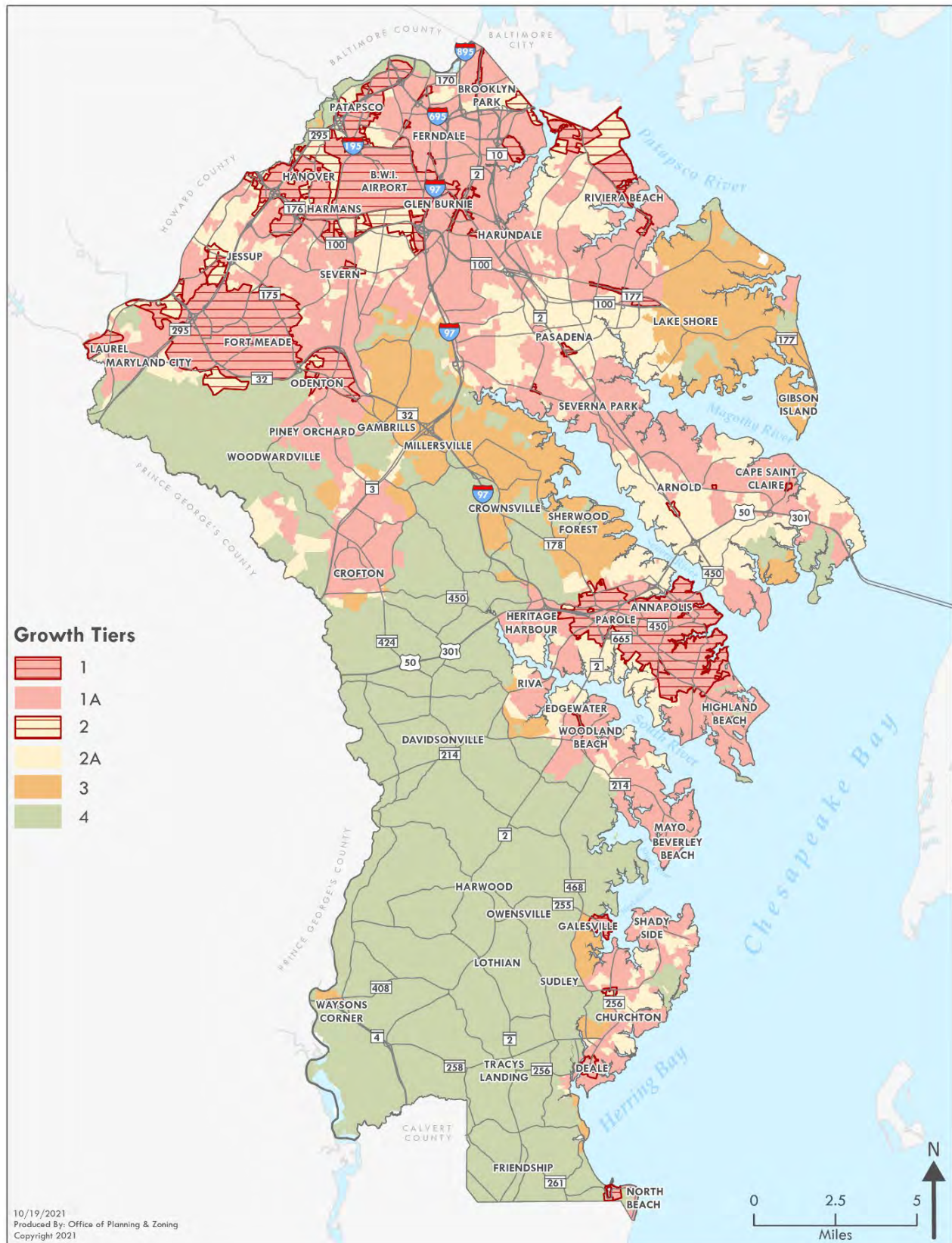


Figure 1-5 Growth Tiers



1.1.2 Goals and Policies of the Water and Sewer Master Plan

The goals of the County's Water and Sewer Master Plan are consistent with the County's GDP and are as follows:

- A. Ensure a sufficient supply of water will be collected, treated and delivered to areas programmed for service in the Master Plan.
- B. Ensure wastewater will be collected from all areas programmed for service in the Master Plan and delivered to points best suited for waste treatment and disposal or reuse.
- C. Both water and sewer services shall be monitored and maintained in a manner that strives to maximize the public health, safety and welfare for all while minimizing environmental impacts.
- D. Incorporate sound water and sewer planning principles and balanced land use initiatives to achieve desired land management practices, water quality protection, and partnered financial support.

The policies that guide water and sewer planning in the County are as follows:

- A. Existing development, with septic or water supply problems, shall be given a high priority for receiving public water and sewer service upon successful petitioning requests, if within the service areas for the request. Those areas outside the service area boundaries that experience septic or well problems that cannot be remedied on-site will be supported for cluster treatment or community systems as appropriate.
- B. Service to any new developments and extensions of existing systems shall be given only to those being planned, programmed and built in accordance with County policies and ordinances.
- C. The extension of water and sewer systems shall be based on achieving planned densities adopted in the General Development Plan.
- D. Private individual and community water systems and wastewater disposal systems shall be allowed only where they conform to the General Development Plan, the Master Plan for Water and Sewer and to standard County design specifications. Private individual and community wastewater disposal systems shall not exacerbate degradation to surface or ground waters. Private systems constructed within a Capital Facilities or Planned Service Area are considered temporary, and connection to public service must occur once the programmed facilities are in place. Further, the private individual or community facilities must be removed from service permanently, in accordance with Section 1.2.1.C.
- E. In accordance with subdivision design standards and requirements, a privately operated sewage collection and treatment system must have the approval of the Department of Health, the Maryland Department of the Environment, and the Department of Public Works. An applicant must obtain approval from said agencies prior to obtaining a permit to construct. In addition, these systems must be managed by a MDE approved controlling authority.
- F. The County may convert private community water supply and sewerage systems to public systems in order to protect human health and the environment.
- G. A high priority shall be given to actions aimed at preventing pollution of watercourses in the County.
- H. The County, in cooperation with the State, will protect and conserve its existing groundwater resources.
- I. The potential environmental impact from utility line extensions through environmentally sensitive areas will be a primary factor in determining the extension and location of lines.

- J. The County will promote water conservation to protect the water supply and minimize sewerage flows.
- K. Adequate aquifer recharge areas will be preserved. Acceptable protection methods will include, but not be limited to, the siting of parks, use of open space zoning, and managing stormwater in order to ensure an adequate supply of groundwater.
- L. Public water and sewer systems may be extended to areas not programmed for construction in any service category to abate or prevent a health emergency as determined in writing by the County Health Officer. Only the immediate health emergency area is to be served. Such extension is not to be construed as a modification of the General Development Plan or character of the area being served, or of the areas adjacent to any conveyance line required to serve the affected health emergency area.
- M. Applications to connect or extend existing water systems shall meet the required domestic pressure and fire flow criteria as outlined in Appendix A.
- N. Public utilities shall be planned in advance of need and provided, where possible and consistent with the General Development Plan, in industrial areas and other non-residential areas for the diversified economic development of the County.
- O. Although forecasted system demands have been based on reasonable engineering judgment, they do not represent the impact of prolonged environmental extremities such as lack of rainfall and/or record temperatures. In this event, the Department of Public Works will manage, as need be, available resources to accommodate system demands.
- P. Sewerage from a sewer service area shall not be conveyed into another sewer service area for purposes of treatment. Because infrastructure are designed for the drainage areas they serve, sending additional flow to them can cause the infrastructure to exceed capacity and require unplanned upgrades. Gravity flow is strongly encouraged wherever possible to minimize the need to pump flows which significantly increases operation costs. Service Area boundary lines are shown on the official Master Plan for Sewer maps at the scale of 1" = 2000'. If during the planning, design and/or construction at one of the County's Water Reclamation Facilities (WRF), a proposed development requests permission to temporarily pump over established boundary lines from one sewer service area to another, the Office of Planning and Zoning in collaboration with the Department of Public Works, may grant permission under the following guidelines:
 - a. Adequate capacity in the existing adjoining service area must be demonstrated and allocating this capacity will not jeopardize any allocation for development in this area or otherwise adversely affect another property's capability to connect.
 - b. The developer will be required to construct the necessary infrastructure for the later transfer of flow back to the original service area.
 - c. All established utility charges and any existing or future service system expansion charges that may arise from the expansion of the WRF will be paid by the developer.
 - d. The developer will be responsible for costs and charges associated with the temporary pump over and ultimate transfer back to the service area.
- Q. Water and sewer conveyance systems may traverse or be located in areas designated in this Master Plan as Future or No Public Service; however, they shall not be available for connection to properties in the Future or No Public Service Area.
- R. Non-conventional on-site sewage disposal systems must be approved by the Anne Arundel County Department of Health.

- S. The County will maintain close cooperative working relationships with the City of Annapolis, Baltimore City, Baltimore County, Howard County, Calvert County and other surrounding counties, state and federal agencies, so that regional water and sewer problems can be solved equitably and efficiently.
- T. In the event that any word, phrase, clause, sentence, paragraph, section, or part in or of this Master Plan for Water and Sewerage, or the application thereof to any person or circumstances, is judicially determined to be invalid, then the remaining provisions and the application of such provisions to other persons or circumstances shall not be affected. The remaining provisions of the Master Plan without the word, phrase, clause, sentence, paragraph, section or part in or of the Master Plan, or the application thereof, declared invalid, would have been adopted and approved.
- U. In accordance with § 9-503 of the Environment Article of the Annotated Code of Maryland, the Water and Sewer Master Plan shall be reviewed at least every three (3) years. If any amendment or revision is necessitated by this review, such will be forwarded to the Maryland Department of the Environment, plus other applicable County and State agencies. The interim amendment process is described in Section 1.6. The object of the triennial review is to comprehensively update the Master Plan to ensure that it is as current and accurate as possible. With each review, the Master Plan is subject to change in order to support the adopted General Development Plan and other relevant plans.
- V. Permanent changes in the boundary between two adjacent Sewer Service Areas shall be made by amendment to the Water and Sewer Master Plan.
- W. Permanent changes in the boundary between two adjacent Water Pressure Zones can be granted by administrative approval and do not require an amendment to the Master Plan, as long as the affected areas of change are in the Existing Service, Capital Facilities, or Planned Service categories.
- X. Changes from a No Public Service or a Future Service category to a Planned Service category in either a Water Pressure Zone or a Sewer Service Area shall be made by an amendment to the Water and Sewer Master Plan.
- Y. When State funding is requested for any extension of public water or sewer systems outside of the County's certified Priority Funding Area (PFA), the County must submit a request for a PFA Exception or a Determination of Extraordinary Circumstance to the State Smart Growth Coordinating Committee and / or the State Board of Public Works, in accordance with the Annotated Code of Maryland, State Finance and Procurement Article Title 5, Subtitle 7B.

1.2 Water and Sewerage Systems Applications

Procedures for filing and processing water supply and sewerage systems applications have been established as follows.

1.2.1 Private Water and Sewerage Systems

Applicants seeking private individual water supply and sewerage systems shall make application through the County Department of Health. Construction of such facilities shall meet the standards established by the Department. The Department of Health may review and process waiver requests to the Anne Arundel Private Sewage Disposal and Well Code and the Code of Maryland Regulations 26.04.02.

A. Private Industrial, Commercial And Institutional Systems

- i. An industrial, commercial, or institutional development may be located in an area not served by public sewer, provided that a private individual or multi-use system is used for the disposal of human bodily waste. Construction of such systems shall meet the standards established by the Department of Health. A mechanism for disposing of all other wastes generated by the facility must be reviewed by both the Office of Planning and Zoning and the Department of Inspections and Permits, and subsequently approved by the Department of Health, before a building permit may be issued.
- ii. For septic systems having a treatment capacity in excess of 5,000 gallons per day, the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works shall review the request for compliance with the goals and policies of the Water and Sewer Master Plan prior to approval from the Department of Health and the Maryland Department of the Environment. Upon the approval of a subdivision plan or site development plan or a building permit utilizing a septic system with discharges greater than 5,000 gallons per day, the Master Plan table and map shall be amended administratively to note its location and maximum discharge permit.
- iii. If such request is within the provisions of Sections 1.2.2.F and/or 1.3C, public water and/ or sewer must be extended in accordance with all provisions of this document and the codes and regulations of Anne Arundel County.

B. Private Community Systems

- i. Where a private community water treatment facility or sewage treatment facility is granted administrative approval by the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works, either in conjunction with a subdivision plan or site development plan or a building permit, the Water and Sewer Master Plan shall be amended administratively to denote the said facility.
- ii. Private community water and sewerage systems may be permitted in the Planned, Future, or No Public Service Area categories. However, residential community systems are only permitted in the Planned sewer service category when outside of the Required Extension Distance and only for minor subdivisions. All private community sewerage systems and individual wells and septic systems shall be considered interim when constructed or once located in a Capital Facilities or Planned Service Area.
- iii. As a condition to the approval of such systems, the applicant or their successor or assignee shall be required to discontinue their use when public systems become available and shall pay any necessary charges and assessments in accordance with Article 13, Title 5 of the Anne Arundel County Code. Provisions shall be made in the arrangement and design of such privately owned system(s) to permit connection to the public systems in the most economical and

convenient manner from both a capital and long term operation and maintenance cost perspective.

- iv. Private community water and sewage systems shall be permitted to expand in areas where public facilities are not programmed for construction within the Future and No Public Service categories as set forth in the Master Plan, if the system is to provide service solely to existing development where there is a health emergency as defined and so stated in writing by the County Department of Health, and only provided such installation meets all requirements of the appropriate County and State agencies. In the event of a health emergency, any expansion shall not authorize an increase in size, or intensification of the development being served. Among other requirements, approval of private systems shall satisfy the following two conditions:
 - a. A private system turned over to the County may be cost free.
 - b. All facility design must be approved by the Department of Public Works and must strictly adhere to the County Design Manual, Standard Specifications and Details.

C. Private Individual Systems

- i. An individual water supply or individual sewerage system shall not be permitted to be installed where an adequate community or public water or sewerage facility is available. If an existing community or public water or sewerage facility is inadequate, or is not available, an individual water and sewerage system may be used. Individual water supply and sewerage systems may be permitted to be installed in any portion of the County except where otherwise prohibited provided that:
 - a. Such systems are found by the local Department of Health to be adequate, safe and in compliance with pertinent State and local regulations.
 - b. Permits for such systems installed where public facilities will be available in a Capital Facilities or Planned Service Area shall bear a notice regarding the interim nature of the permit and further state that the connection to the new public system shall be made at the property owner's expense after such system becomes available, in accordance with Article 13 of the County Code, and that the owner shall permanently disconnect and abandon the individual system in accordance with the Department of Health specifications.
 - c. If interim systems are used, provisions shall be made to locate such systems so as to permit connection to the public facilities in the most economical and convenient manner.
 - d. Where a subdivision approval or any site development plan provides for the use of private individual water supply and/or sewerage system, in a Capital Facilities or Planned Service Area, the applicant and owner shall be informed of the interim nature of such systems. The applicant or ultimate owner shall be required to discontinue using the system and to connect to the programmed public facilities at their expense, in accordance with Article 13 of the County Code, once public water main or sanitary sewer is complete and ready for the delivery of water or the reception of wastewater. The applicant shall ensure that all property owners within the subdivision are informed that a connection to the public system is required at such time as it becomes available.
 - e. If the County Health Officer finds that an interim individual water supply or individual sewerage system constitutes a nuisance or menace to health or safety, the Health Officer shall notify the Director of Public Works, who shall require immediate connection to the public water main or sanitary sewer. If any person fails to connect, the Department of Public Works shall make the same and charge the property owner for the cost thereof.

- f. The property owner of any existing private individual or multi-use water or sewerage system which experiences failure to the extent of being declared a health problem by the County Department of Health or the Maryland Department of the Environment shall be required to provide any necessary improvements to resolve the problem to the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works in conformance with all policies and design criteria of the State of Maryland and Anne Arundel County. Any increase in the physical capacity over that of the existing system that is in the Future or No Public Service Area, however, shall not authorize expansion or intensification of the development being served unless the requirements of the Groundwater Protection Plan (Appendix D) have been met.

1.2.2 Public Water and Sewer Service Extensions

Applicants seeking public water supply and sewerage systems for new development shall make application through the Office of Planning and Zoning for the extension of such facilities. Construction of such facilities shall meet the standards established by the Department of Public Works. The applicant shall obtain the necessary construction permits from the Maryland Department of the Environment and/or the Water Resources Administration as required.

- A. Water service can be extended to any proposed development from a public system, provided there is a sufficient uncommitted capacity in the treatment facility and transmission lines for extending service to the proposed development, and the development is located within the Existing or Planned Service Area categories. The developer shall extend public water utilities along the entire front footage of and/or through, the developer's property, within a public easement or right-of-way, as determined necessary by the Office of Planning and Zoning, Department of Inspections and Permits, and the Department of Public Works.
- B. Sewer service can be extended to any proposed development from a public system, provided the existing uncommitted capacity of the treatment facility and interceptor lines is adequate for extending service to the proposed development and provided the proposed development is located within the area shown to receive service in the Existing or Planned Service Area categories. The developer shall extend public sewer utilities along the entire front footage of and/or through, the developer's property, within a public easement or right-of-way, as determined necessary by the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works.
- C. As required, the developer shall be responsible for any extensions required prior to a scheduled capital facility project, as indicated by the Master Plan. Where a proposed development is located within an area programmed to receive service in the Existing, Planned, and/or Future Service category, infrastructure of sufficient capacity to serve the area upstream of the development shall be provided by the developer. The area upstream of the development will be determined by the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works from a pre-sketch or site development plan submittal. These upstream areas will include those areas lying within the Existing and Planned Service Area categories, and all other areas within the Future Service Area category as determined by the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works, to the extent of reasonable needs for all major infrastructure extensions and upgrades, and at a minimum, conform to the requirements for extension as specified in 1.3C below. The design of the facilities shall be submitted to the Office of Planning and Zoning, the Department of Inspections and Permits, and

the Department of Public Works for approval. The developer shall pay all necessary charges and assessments in accordance with Article 13, Title 5 of the Anne Arundel County Code, and also may be eligible for credits to these charges in accordance with that Article and Department of Public Works implementation policies.

- D. Areas designated in the Future and No Public Service Area categories may be considered for an amendment change to the Planned Service Area category provided the existing growth conditions warrant such a change. These conditions may be the proximity to existing water or sewer lines, appropriate zoning, availability of utility supply or reception, environmental health concerns, or long range planning initiatives. The County shall consider the construction of capped lines (i.e. dry systems) for future use when public facilities become available.
- E. Public water and sewerage systems may be extended to areas not programmed for service to abate a health emergency as determined in writing by the County Health Officer. Only the immediate health emergency area is to be served in this case. Such extension is not to be construed as a modification of the General Development Plan, zoning, or character of the area being served, or of the areas adjacent to any conveyance line required to serve the affected health emergency area. In the event of a health emergency declaration by the County Health Officer, the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works reserve the right to review the surrounding areas and request the extension serving the health emergency area be built to accommodate future connections if the emergency area is within the sewer service area or water pressure zone.
- F. If a parcel or minor subdivision is located within an identified water quality problem area as declared by the Department of Health, public water utilities shall be extended by the developer if the public water utility is within three hundred (300) feet of the parcel(s). Such extension will follow the guidelines and regulations as established by the Office of Planning and Zoning and the Departments of Public Works, Health and Inspections and Permits. Major subdivisions and all commercial, industrial and institutional development shall meet the requirements as set forth in Section 1.3C.
- G. Bay Restoration (Septic) Funds may be used as permitted by State law to provide funding that supports connection of existing households and businesses to public sewer where the sewer connection is consistent with the General Development Plan and the Water and Sewer Master Plan.

1.3 Requirements for Subdivision and Site Development Plan Applications

- A. Procedures have been established for filing and processing subdivision and site development plan applications, which incorporate requirements for lot size based on the availability of water and sewer service. Prior to the submission of any plat for the subdivision or re-subdivision of land in Anne Arundel County, exclusive of the City of Annapolis, the applicant should consult with the Office of Planning and Zoning and the Department of Inspections and Permits to become aware of existing and proposed conditions related to water and sewer availability in the neighborhood where the subdivision is proposed. The subdivision process, detailed in Article 17 of the County Code, generally consists of a sketch plan and a Final Plan.
- B. Pursuant to the requirements of the Article 17 of the Anne Arundel County Code, provisions shall be made for an adequate water supply and sewerage system for all proposed development.

- i. Adequate public water and sewerage systems may be extended into Resource Conservation Areas of the critical area, if such extensions are necessary to connect to existing systems or to protect the public health, safety and welfare.
 - ii. The extension of adequate water and sewerage systems through Resource Conservation Areas of the critical area shall not relieve the proposed development from compliance with the Resource Conservation Area requirements.
- C. Wherever adequate public water and sewage facilities exist within the Required Extension Distance (RED) zone of any proposed development, public water and sewerage systems shall be extended to the development provided:
- i. The proposed development lies within the Service Area in which the available water and sewerage system is located.
 - ii. The area programmed for construction is within the Existing, Capital Facilities or Planned Service Area category, as set forth in the Master Plan.
 - iii. The site improvement would generate a waste stream flow as scheduled:

Residential ¹ (GPD)	RED ² zone	Com/Ind/Inst. ³ (GPD)
0 thru 250	50 feet	
251 thru 999	150 feet	
1,000 thru 2,500	500 feet	1 to 2,500
2,501 thru 5,000	1,000 feet	2,501 to 5,000
5,001 thru 10,000	1,500 feet	5,001 to 10,000
Greater than 10,000	2,000 feet	Greater than 10,000

- 1. *Flows to be determined using the Anne Arundel County Design Manual.*
- 2. *The Required Extension Distance shall be measured as the shortest straight-line distance between the existing utility line connection point and the nearest point of the property to be connected.*
- 3. *Flows to be determined using the MDE design manual "Wastewater Flows for Use in Designing On-site Sewage Systems."*

- iv. The developer shall extend both public water and public sewer utilities along the entire front footage of, and/or through, the developer's property, within a public easement or right-of-way, as determined necessary by the Office of Planning and Zoning, the Department of Inspections and Permits, and the Department of Public Works.
 - v. The County Health Officer shall require approval blocks on the final subdivision plats.
 - vi. If a proposed subdivision located within the Planned Service Area is to be developed with individual septic systems, those systems shall be sized to County Department of Health standards based upon the maximum time period of twenty (20) years, and be subject to all provisions as set forth in Section 1.2.1C, Private Individual Systems.
- D. See Section 1.2.2F for public water extensions that are within an identified water quality problem area.

- E. Any proposed residential subdivision must be in accordance with § 9-206 of the Environment Article of the State Code as follows:

Growth Tier	Development Requirement
Tier 1, Tier 1A	Major and minor subdivisions are permitted All new subdivisions must connect to public sewer systems
Tier 2, Tier 2A	Major subdivisions are permitted and must connect to public sewer systems Minor subdivisions are permitted and may connect to public sewer systems or utilize on-site septic systems Minor subdivisions using on-site septic systems area considered interim and must connect to public sewer when available
Tier 3	Major and minor subdivisions are permitted and must utilize on-site septic systems or private community systems Major subdivisions must be reviewed and recommended for approval by the Planning Advisory Board Public sewer systems are not available
Tier 4	Major subdivisions are not permitted Minor subdivisions are permitted and must utilize on-site septic systems Public sewer systems are not available

1.4 Requirements for Building Permit Applications

Building permit procedures have been established as follows:

- A. An application for a building permit must be filed prior to the start of any new construction or alterations and for all repairs involving structural replacement. Separate permits are required for plumbing and/or electrical work, and such work must be done under the supervision of a licensed master plumber and licensed master electrician, respectively. An application for a building permit must be filed by the owner, or authorized agent, with the Anne Arundel County Permit Center on forms supplied by that Department.
- B. Except for very minor repair work, all building permit applications require the concurrence of the Office of Planning and Zoning, the Department of Inspections and Permits, the Department of Public Works and the County Department of Health. For commercial structures and certain others, the County Fire Department must also provide approval. When the permit is on property abutting a State maintained road, approval is also required from the State Highway Administration. Construction within a four-mile radius of the Baltimore-Washington International Airport requires approval of the Airport Zoning Board. As each department approves the application, it is returned to the Permit Center, which issues the permit when all approvals are received.
- C. Where zoning and/or site complications exist, there can be extensive delays before the deficiency is corrected. If the deficiency requires a zoning special exception, and/or variance, the owner must go through the procedure of application and public hearing. Where public water and sewerage do not exist, the County Department of Health must physically test construction sites to assure that an adequate water supply and sufficient sewage disposal are possible. All proposed on-site surface or sub-surface discharge systems that exceed 2,500 GPD must be reviewed by the Office of Planning and Zoning. Submittal will require the nature of use(s) and content of expected discharge(s). Under certain conditions, the Development Division of the Office of Planning and Zoning will schedule a plan review meeting with issuance of a written list of corrections and/or use restrictions to the applicant. Any use restrictions that are imposed shall be noted to the Department of Health for future permit approvals and health/environmental monitoring purposes.

- D. After a building permit is issued, inspection will be made periodically in conformance with the Anne Arundel County Code. Upon satisfactory completion of construction, an occupancy permit will be issued. No use of the structure can be made prior to the issuance of the occupancy permit under penalty of the law.

1.5 Petitions for Public Service Extensions

The petition process for extension of public water and/or public sewer services to an individual and / or community is as follows:

- A. An individual or group of property owners may petition for the extension of water and/or sewer service to their property.
- B. Four requirements must be fulfilled to receive service:
 - i. The community must be located in an area designated for service, and found to be in compliance with the General Development Plan and the policies of the Master Plan for Water Supply and Sewerage Systems from the Office of Planning and Zoning,
 - ii. A majority of property owners within the petition area must be in favor of paying the assessment related to the extension of public services for the petition area,
 - iii. The project must be financially sustaining, and
 - iv. The Department of Public Works must then designate service to the community as a capital project in the Capital Program.
- C. To obtain public water and/or public wastewater service, a majority of the affected property owners must petition for service. The petition will support a defined area from where service exists to the proposed final property to receive service.
- D. Petitions can be obtained and are to be submitted to the Anne Arundel County Department of Public Works, Financial Services Division.
 - i. Once received, the petition(s) will be reviewed for valid signatures of all owners of the property.
 - ii. Validated petitions will be forwarded within the Department of Public Works to the Bureau of Engineering. The petition will also be forwarded to the Office of Planning and Zoning, Long Range Planning Division, to validate its compliance with the Master Plan for Water Supply and Sewerage Systems and the General Development Plan. Recommendations from the Office of Planning and Zoning will be considered prior to the request for a Schematic Design Report. A Schematic Design Report will then be prepared showing the technical feasibility to serve the petition area and a cost analysis of the various alternatives.
 - iii. The Financial Services division and the Bureau of Engineering will determine the preliminary project costs and the assessment rates required to make the project self-sustaining.
 - iv. The Department of Public Works, Financial Services shall provide an assessment rate ballot to the owners of the properties within the petition area. If the owners of a majority of the properties within the petition area vote in favor of paying the rate of assessment sufficient to make the project self-sustaining, the project may move forward to final engineering, design, and construction. If a majority of the property owners do not vote in favor of paying the assessment rate, the project shall be canceled.
 - v. If the total project cost is greater than \$250,000, prior to going to construction, a capital project must be requested in the Department of Public Works' Capital Project Budget and Program.
 - vi. If the petition is for service in a Future or No Public Service Area within a Sewer Service Area or Water Pressure Zone, and it is financially supported by the petitioning property owners,

then a request for an amendment to change the Master Plan will be submitted by the Office of Planning and Zoning at the next cycle (see Section 1.6.A below for cycle schedule) in accordance with the Master Plan policies. The request to exceed the FFA limits, if applicable, will be addressed simultaneously.

1.6 Interim Master Plan Amendment Requests

While the Master Plan for Water Supply and Sewerage Systems is updated on a comprehensive basis every three years, interim amendments may be considered semi-annually. The review and approval process for individual applications for changes to the Master Plan is outlined below.

- A. A request for amendment to the County Master Plan for Water Supply and Sewerage Systems of a property (amendment request) must be filed with the Long Range Planning Section of the Office of Planning and Zoning by either the legal owner of such property, or by their legally authorized representative. Each such request shall be filed by January 1 for Cycle I, and by July 1 for Cycle II of each year and shall include an explanation of the reasons why, in the requester's opinion, the amendment sought should be made, set forth in sufficient detail to properly advise the County authorities required to review the request. Requests must be submitted using the official application form available from the Office of Planning and Zoning and on the County website at aacounty.org.
- B. With exception of those amendment requests excepted under the procedure set forth in item 1.6F, copies of all amendment requests accepted for filing by the Office of Planning and Zoning shall be transmitted to the Department of Public Works and the County Department of Health for review and comment.
- C. During each Cycle, the Department of Public Works and the County Department of Health shall review the requests and each shall submit a report to the Office of Planning and Zoning containing at least the following information:
 - i. The technical feasibility of each request,
 - ii. Recommendations on each request, and
 - iii. Supporting data for the recommendations.
- D. After the Office of Planning and Zoning receives the information from the above-mentioned Departments the Coordinator shall prepare for submission to the Planning Advisory Board a report thereon containing at least the following information:
 - i. Maps showing properties under request and the amendment sought therefore: such maps may also identify groups of such properties located close to each other and show other indications of the inter-relation of requests with respect to planning considerations;
 - ii. Recommendations on the requests;
 - iii. Supporting data for the recommendations, including any pertinent data and comments or recommendations submitted by other interested parties of County agencies.
- E. During each Cycle, the Planning Advisory Board shall:
 - i. Hold a meeting to review the amendment requests.
 - ii. Submit to the County Executive a report on all the amendment requests submitted during the preceding period except those exempted under item 1.6F and 1.6G, such report to contain the Planning Advisory Board's recommendations on such requests, appropriate maps, and supporting data.

- F. In any case where the Planning and Zoning Officer, Director of Public Works and the County Health Officer certify to the County Executive that early action upon an amendment request is required in the public interest or because of emergency, such request shall be exempted from the regular time frame and shall be processed through Section 1.5, Petitions for Public Service Extensions, in a timely manner.
- G. The Planning and Zoning Officer may also amend or correct in the text or on the maps minor omissions or errors of fact administratively between non-filing periods. The minor omissions or errors include: misspelled words, incorrect punctuation, utility lines, point data, and areas which are in the W-I and S-I time period category and are not reflected on the maps and when the data on the maps conflict with the data in the text or vice versa. Such changes shall be coordinated with the Department of Public Works. Copies of all amendments and/or corrections made under this section shall be submitted to the County Executive, County Council, Department of Public Works, County Department of Health and the Maryland State Department of the Environment. The Master copies shall be kept on file within the Office of Planning and Zoning for record.
- H. Upon approval of the current fiscal year Capital Improvement Program (CIP), the Master Plan of Water Supply and Sewerage Systems shall be amended automatically to include all projects included in the adopted budget. After each County Fiscal Year Budget is completed and adopted, the official Water and Sewer Master Plan Maps may be corrected to show each new Capital Facilities project or change to an existing Capital Facilities project. These changes will be forwarded to the appropriate State agencies and County officials. Once a Capital Facilities project is completed, the proper existing symbols and designations will be indicated and the appropriate Master Plan document pages will be updated to reflect the current information.
- I. Upon the report of the Planning Advisory Board, the County Executive shall review their recommendations and may submit the proposed amendment to the County Master Plan for Water Supply and Sewerage Systems to County Council for their action.
- J. Any proposed amendment submitted to the County Council must be reviewed by the Office of Planning and Zoning, the Department of Public Works, and other appropriate agencies for consistency with the General Development Plan and supplemental plans, the Master Plan for Water Supply and Sewerage Systems, the Critical Areas Program, and for technical feasibility

1.7 Master Plan Revision

Step 1. Preparation - A comprehensive update to the Master Plan shall be completed every three (3) years. Additional revisions of the Master Plan may be made as the need arises, by Council amendment.

Step 2. Review - Before the triennial revision is introduced to the Council, it shall be reviewed by the appropriate County agencies, reviewed and provided an advisory recommendation by the Planning Advisory Board, and reviewed in preliminary form by the appropriate State agencies. In addition, the cities of Annapolis and Highland Beach, and all Federal and State institutions in the County, shall be given an opportunity to be heard.

Step 3. Introduction - The Master Plan shall be introduced to the County Council at least 14 days before the day scheduled for the public hearing.

Step 4. Hearing - A public hearing shall be held on the triennial revision or any amendments to the Master Plan. The Maryland Department of the Environment shall receive prior notice of all public hearings on the Master Plan, revisions, or amendments.

Step 5. Adoption - The Master Plan shall be adopted by ordinance by the County Council.

Step 6. Final Format - After adoption, the Master Plan shall be prepared in final format.

Step 7. Final Submission - Four (4) copies of the Master Plan in its final form shall be submitted to the Maryland Department of the Environment for review; one (1) copy to be forwarded to the Maryland Department of Natural Resources, and one (1) copy to be forwarded to the Maryland Department of Planning.

Step 8. State Approval - The State of Maryland, Department of the Environment shall, within sixty (60) days after the date of being received, approve or disapprove in part, the final submitted County Master Plan, its amendments or revisions.

The Office of Planning and Zoning and Department of Public Works may annually update the Water and Sewer Master Plan Maps, without County Council or State agency approval, for the purpose of updating Planned Service or Capital Facilities areas that have connected to public water or sewer since adoption of the current Master Plan and including such areas in the Existing Service Category.

1.8 Organization

Responsibilities related to water and sewerage planning in the County are shared primarily between four County agencies.

The Office of Planning and Zoning has the responsibility for developing the General Development Plan that provides the basic information for residential, industrial, and commercial growth. This Office is also responsible for preparing the Water and Sewer Master Plan, including the amendments and revisions thereto.

The Bureau of Environmental Health, within the Department of Health, controls and authorizes the installation of private individual water supply and septic systems and also investigates sources of pollution.

The Department of Public Works, with information from the above agencies and other sources, is responsible for the design, administration, construction and operation of the required water and sewerage facilities, in conformance with the Water and Sewer Master Plan. The Department of Public Works furnishes technical assistance to the Office of Planning and Zoning in the preparation of the Water and Sewer Master Plan.

The Department of Inspections and Permits also provides technical assistance to the Office of Planning and Zoning in preparation of the Water and Sewer Master Plan and is responsible for the engineering review of permits and development applications.

Management of Water and Sewer Facilities

Office of Planning and Zoning	<ul style="list-style-type: none"> • Prepares General Development Plan. • Manages Comprehensive Zoning. • Guides Best Land Management Practices towards the goals of the County's Master Plans. • Prepares Master Plan for Water and Sewer. • Reviews and manages Subdivision and Land Development requests.
Department of Public Works	<ul style="list-style-type: none"> • Manages design, construction, operations and fiscal administration of the public water and sewer facilities. • Provides technical assistance to the Office of Planning and Zoning for Subdivision and Land Development reviews. • Provides facilities planning support to the Office of Planning and Zoning in the preparation of the Master Plan for Water and Sewer.
Department of Health	<ul style="list-style-type: none"> • Authorizes the installation of private water and wastewater systems and manages installation data. • Provides plan review assistance to the Office of Planning and Zoning for Subdivision and Land Development reviews. • Provides planning support to the Office of Planning and Zoning in the preparation of the Master Plan for Water and Sewer
Department of Inspections and Permits	<ul style="list-style-type: none"> • Provides technical assistance to the Office of Planning and Zoning for Subdivision and Land Development reviews. • Provides engineering review of permits and development applications.

1.9 Definitions

Existing or Under Construction (W-1, S-1) - Public water or sewer service is assumed to be existing if it is in operation or under construction (notice to proceed with the construction contract has been issued) and will be placed in operation immediately after construction is completed. Development within the category must be consistent with the appropriate land use controls and zoning regulations.

Capital Facilities Area (W-2, S-2) - Capital facilities are scheduled for implementation within the next six years (0 to 6 years) and are possible within the framework of the six-year Capital Program, subject to annual budgeting, neighborhood petitions, determination of health emergencies and negotiating of Utility and Public Works agreements. Development within this category must be consistent with the appropriate land use controls and zoning regulations.

Planned Service Area (W-3, S-3) - Areas planned for public water and/or sewer service. These include both currently developed areas as well as areas planned for new growth in accordance with the General Development Plan. New development is required to connect to public utilities unless located beyond the

Required Extension Distance established in this Master Plan. Water and sewer facilities are depicted on the Master Plan, and are provided by both the private sector and the County in areas designated for planned service.

Future Service Area (W-4, S-4) - Areas planned for public water and/or sewer service and where public utilities cannot easily be extended without major public or private expenditures, such as additional pump stations or other facilities. Requested public water or sewer extensions in this category will require an amendment approved by the County Council to change to the Planned Service category prior to development.

The Existing, Capital Facilities, Planned and Future Service areas are consistent with the County's planned growth areas as defined by the Peninsula, Neighborhood Preservation, Critical Corridor, Critical Economic and Town Center Development Policy Areas in the General Development Plan.

Other Service – Those areas that have water or sewer service provided by a public or private entity other than Anne Arundel County.

Existing-Annapolis – Areas served or planned to be served by public water and/or sewer service by the City of Annapolis.

No Public Service Area (W-5, S-5) - These areas are served by individual septic and well systems or community systems under permit by Maryland Department of Environment. These are areas of planned low-density growth for which public facilities are not planned. These may also include preservation lands or lands protected by easement or other development restrictions that are located within a public water or sewer service area.

Service Area - That area served by, or potentially served by, a system of sanitary sewers connected to a treatment plant, or a water distribution system under the control of a single unit or agency.

Maps - The Master Plan includes separately the official map series of all County water and sewer systems at a scale of 1 inch = 2,000 feet. The Master Plan also includes many other support maps with the plan document.

Community Sewerage System - Any system, whether publicly or privately owned, serving two or more individual lots for the collection and disposal of sewage or industrial wastes of a liquid nature, including various devices for the treatment of such sewage and industrial wastes.

Community Water Supply System - A source of water and a distribution system, including treatment and storage facilities, whether publicly or privately owned, serving two or more individual lots.

Multi-Use Sewerage System - A single system serving a single lot whether owned or operated by an individual or group of individuals under private or collective ownership and serving a group of individuals for the collection and disposal of sewage or industrial wastes of a liquid nature, including various devices for the treatment of sewage and industrial wastes having a treatment capacity in excess of 5,000 GPD.

Multi-Use Water Supply System - A single system of piping, pumps, tanks or other facilities utilizing a source of ground or surface water to supply a group of individuals on a single lot and having a supply capacity in excess of 5,000 GPD.

Non-Point Source - Pollution originating from land runoff where no specific outfall can be identified.

Individual Water Supply System - A single system of piping, pumps, tanks or other facilities utilizing a source of ground or surface water to supply only a single lot.

Individual Sewerage System - A single system of sewers and piping, treatment tanks or other facilities serving only a single lot and disposing of sewage or individual wastes of a liquid nature, in whole or in part, on or in the soil of the property, into any waters of this State or by other methods.

Controlling Authority – A unit of government, a body public and corporate, or an intercounty agency authorized by the State, County or a municipal corporation to provide for the management, operation and maintenance of a community sewerage system, shared facility or multi-use system.

1.10 Governing Codes and Regulations

The goals and policies of this Master Plan (see Section 1.1.2) are implemented through various ordinances, laws, codes, documents, maps and standards by the Anne Arundel County Government. These plans and controls are designed to achieve orderly development and to ensure the physical, social and economic health of the community. The controls which pertain to water and sewer development are listed below by administrative activity:

- A. Planning and Zoning:
 - i. Anne Arundel County Code, *Article 17 (Subdivision and Development)*
 - ii. Anne Arundel County Code, *Article 18 (Zoning)*
 - iii. General Development Plan and supplemental plans
 - iv. Official Zoning Maps
 - v. Master Plan for Water Supply and Sewerage Systems
- B. Public Works:
 - i. Anne Arundel County Code, *Article 13 (Public Works)*
 - ii. Anne Arundel County, Standard Specifications and Standard Details for Construction
 - iii. Anne Arundel County, Department of Public Works, Design Guidance for Water and Wastewater Facilities, Sewage Pumping Stations and Grinder Pumps
- C. Health Protection:
 - i. Anne Arundel County Code, *Article 13 (Public Works), Article 15 (Construction and Property Maintenance Codes)*
 - ii. Code of Maryland Regulations, COMAR 26.04.02 - 26.04.04, Regulation of Water Supply, Sewage Disposal and Solid Waste
- D. Fire Protection:
 - i. Anne Arundel County Code, *Article 12 (Public Safety)*
 - ii. Anne Arundel County Code, *Article 15, Title 3 (Fire Prevention Code)*
- E. Inspections and Permits:
 - i. Anne Arundel County Code, *Article 15, Title 2 (Construction Codes)*
 - ii. Anne Arundel County Code, *Article 16, Title 2 (Grading and Sediment Control)*

2 Background Information

2.1 Natural Features

Certain geographical and environmental factors are considered in planning water and sewer facilities including drainage patterns, soils, aquifers and surface waters and their associated floodplains and wetlands. These features help determine viable water and sewer transmission patterns and percolation characteristics.

2.1.1 Physiography, Topology and Drainage Characteristics

Anne Arundel County lies within the center of Maryland. It is bounded on the north by Baltimore City and the Patapsco River and on the east by the Chesapeake Bay. Howard County lies northwest while the Patuxent River forms the western boundary, opposite Prince George's County. Calvert County is due south. The County's land area is approximately 265,000 acres, or 414 square miles, including the City of Annapolis. The shoreline of Anne Arundel County is highly irregular and one of the County's most distinguishing and greatest assets. The many large and small rivers, creeks and coves form approximately 508 miles of shoreline, an attractant for many plant and animal species.

Anne Arundel County is in the mid-Atlantic Coastal Plain, east of the Fall Line. Its surface varies from flat to steeply rolling, with elevations from sea level along the Chesapeake Bay to about 300 feet above sea level in the northwest, near the Baltimore-Washington Parkway (Figure 2-1). There are thirteen distinct watersheds within the County, the boundaries of which are shown in Figure 2-2. For planning and study purposes, the Lower Patuxent and the Middle Patuxent watersheds are often combined. Five tidal sub-estuaries running from the County's interior to the Chesapeake Bay cut the eastern portion of the County into a series of peninsulas. The northern portion of the County, generally north of the Magothy River and the head of the Severn River, is flat to gently rolling terrain, with some steep slopes along rivers and creeks. In a line running south from the headwaters of the Severn to the southern boundary of the County near Herring Bay is a nearly continuous area of steeply rolling terrain, with the steepest slopes along the Severn and South Rivers and along many of the smaller streams in the southern portion of the County. The peninsulas in the south are quite flat, while in the north there are somewhat higher elevations and more varied topography, again with steep slopes along the rivers and creeks. The land along the Patuxent and Little Patuxent Rivers is flat in the north and moderately rolling in the south, with a number of sharp valleys incised by the small streams running westward into the Patuxent.

Wetlands occur in floodplains and in the headwater areas of streams. According to Maryland Department of Natural Resources and U.S. Fish and Wildlife Service, National Wetlands Inventory data, there are over 21,000 acres of wetlands in the County. The largest concentrations are located along the Patuxent River and in the Shady Side and Deale area (see Figure 2-1). There are certain wetlands that are classified as rare, threatened and endangered species or have unique habitats that receive special attention. These wetlands are called Wetlands of Special State Concern (WSSC) and are identified and regulated by the Maryland Department of the Environment. For more information, visit the State's website at <http://www.dnr.state.md.us/>.

Protection of these natural features is of great importance to water quality. The County participates in programs such as the Chesapeake Bay Critical Areas Program and has regulations such as forest conservation and stream and wetland buffering to help provide this protection. The forest conservation ordinance was modified in 2019 to revise the exceptions to forest conservation requirements, to establish "special priority retention areas" and to increase the forest conservation thresholds and fee-in-lieu payments.

Figure 2-1 Topography and Wetlands

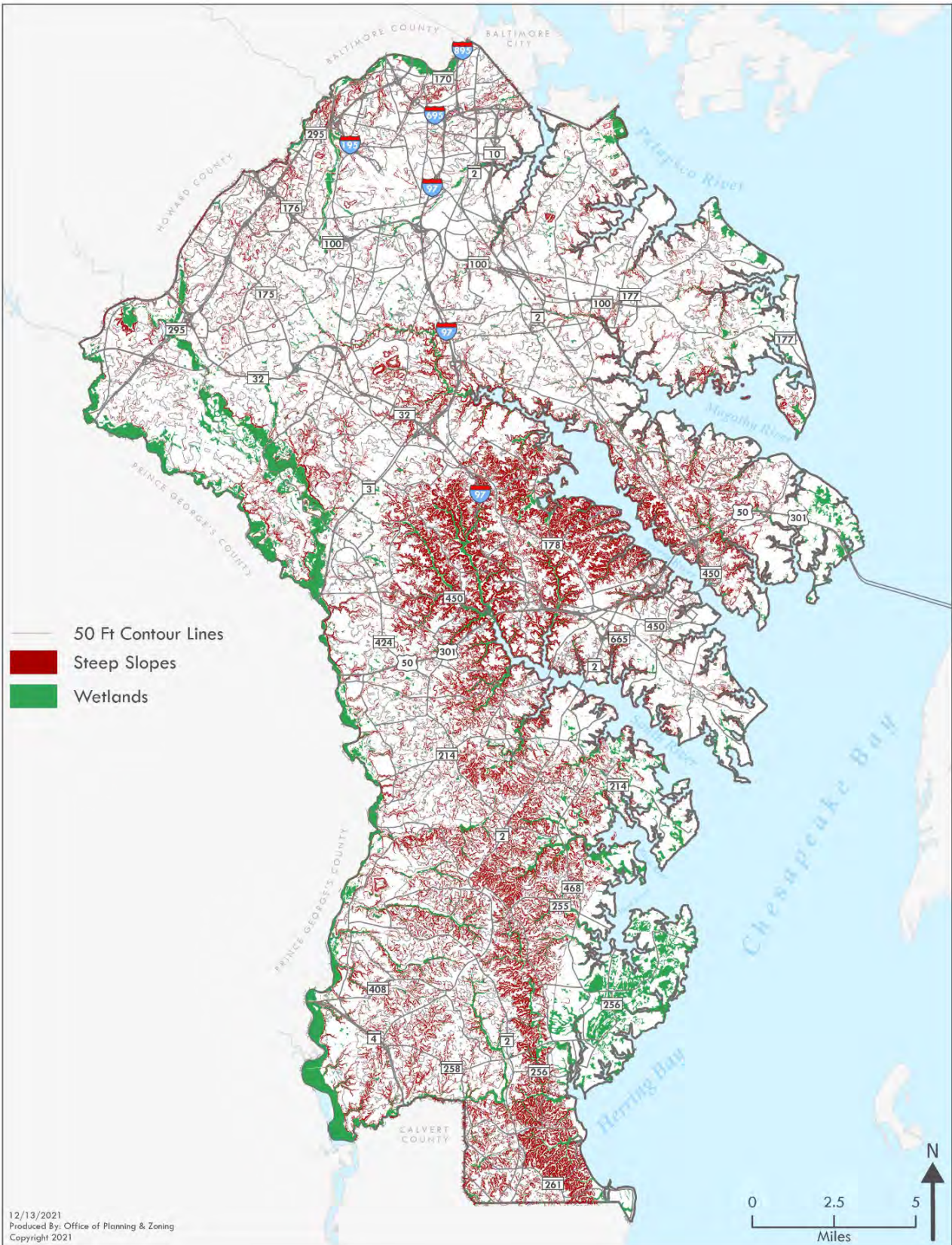


Figure 2-2 Watersheds



2.1.2 Land Cover

The Anne Arundel County 2020 land cover data indicates that residential areas encompass approximately 29% of the County while commercial and industrial areas represent 5% and 1% respectively (see Figure 2-3). Approximately 6% of the land area is crops and pastures, primarily located in the southern part of the County. Another 5% of the County is open space other than woodlands and wetlands. Woodlands comprise approximately 32% of the County. These coastal plain forest sites include a variety of terrain from flat wet areas to steep slopes and upland drought areas.

The largest tracts of woodland are found in the southern and western portions of the County, particularly along the Patuxent, South and West Rivers; and to a lesser extent in the headwater regions of the Magothy and Severn Rivers.

The original forests of Anne Arundel County have been severely altered by tree harvesting, and little, if any, virgin stands remain. Many of the currently wooded areas were cleared at one time for farming or have been cut over several times. Hardwoods are the dominant species in the County. The oaks dominate the better-drained soils and make up a large portion of the hardwoods on the wet soils. Yellow poplar, sweetgum, dogwood and beech are other hardwoods common in the County. Virginia pine has invaded the abandoned farm fields and cut over areas, particularly on the well-drained sandy soils. There are minor stands of pitch pine and shortleaf pine, but these are neither extensive nor pure.

2.1.3 Soils

The most current soil survey data is a product of the National Cooperative Soil Survey (NCSS) (a joint effort of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and other Federal agencies, State agencies and local partnerships). The soil survey data identifies specific soil types and their limitations. Soil types are important in determining whether septic systems can be used. Soils that are well drained are considered conducive for septic systems whereas soils that are characterized as poorly drained are not favorable for septic systems and often have seasonally high water tables.

Soil survey data for Anne Arundel County is now available in a digital format and is posted to the Web Soil Survey, at <http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state>.

The following descriptions of the soils, grouped by their drainage class (see Table 2-1) comprise the County's landscape (see Figure 2-4). Drainage class (natural) refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Eight classes of natural soil drainage are recognized for the County: Very Poorly Drained (2%), Poorly Drained (7%), Somewhat Poorly Drained (2%), Moderately Well Drained (12%), Well Drained (57%), Somewhat Excessively Drained (5%), Excessively Drained (2%), and Subaqueous (less than 1%). The remainder of the land (13%) is not classified by drainage class as it is water or urban land.

Figure 2-3 Land Cover (2020)

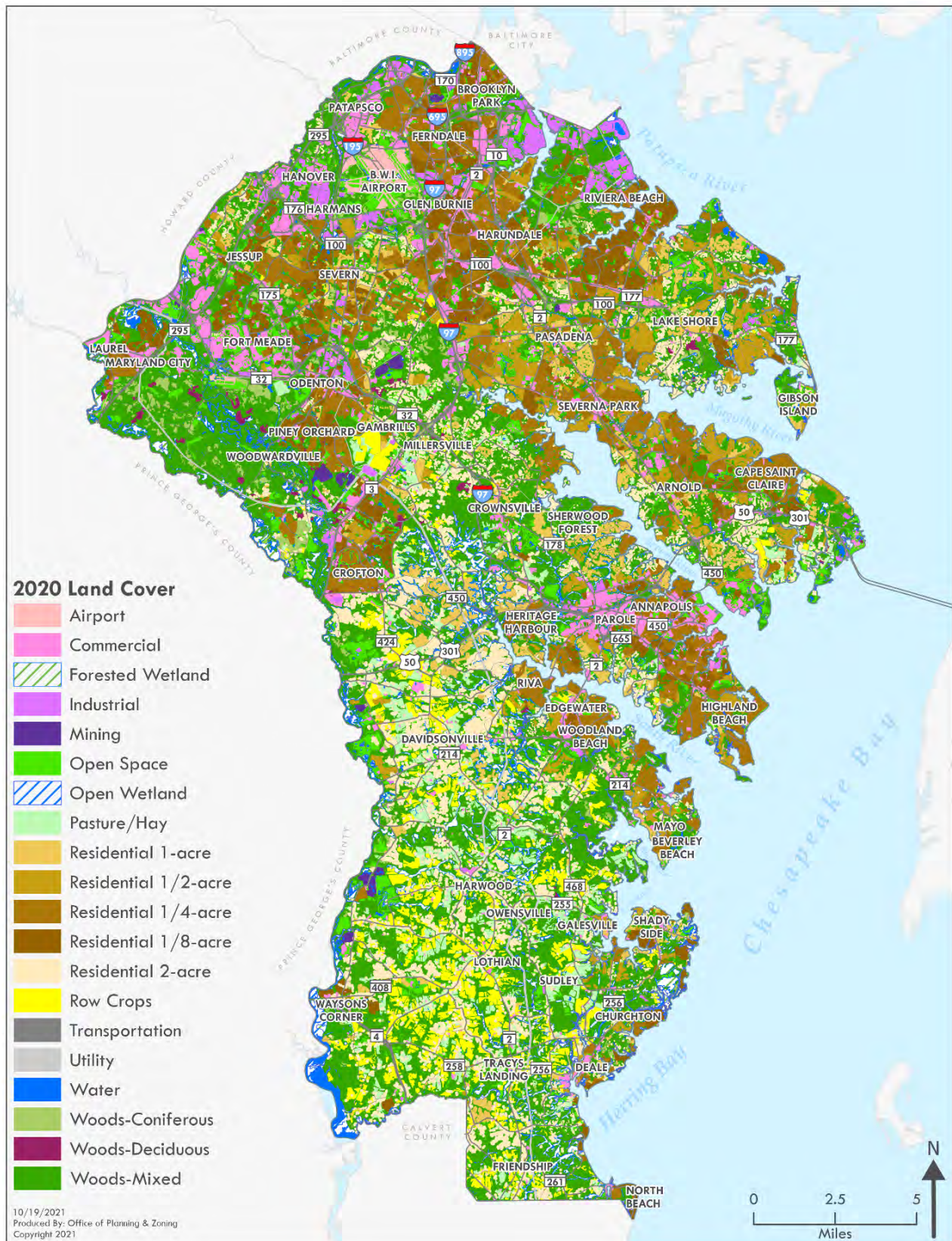
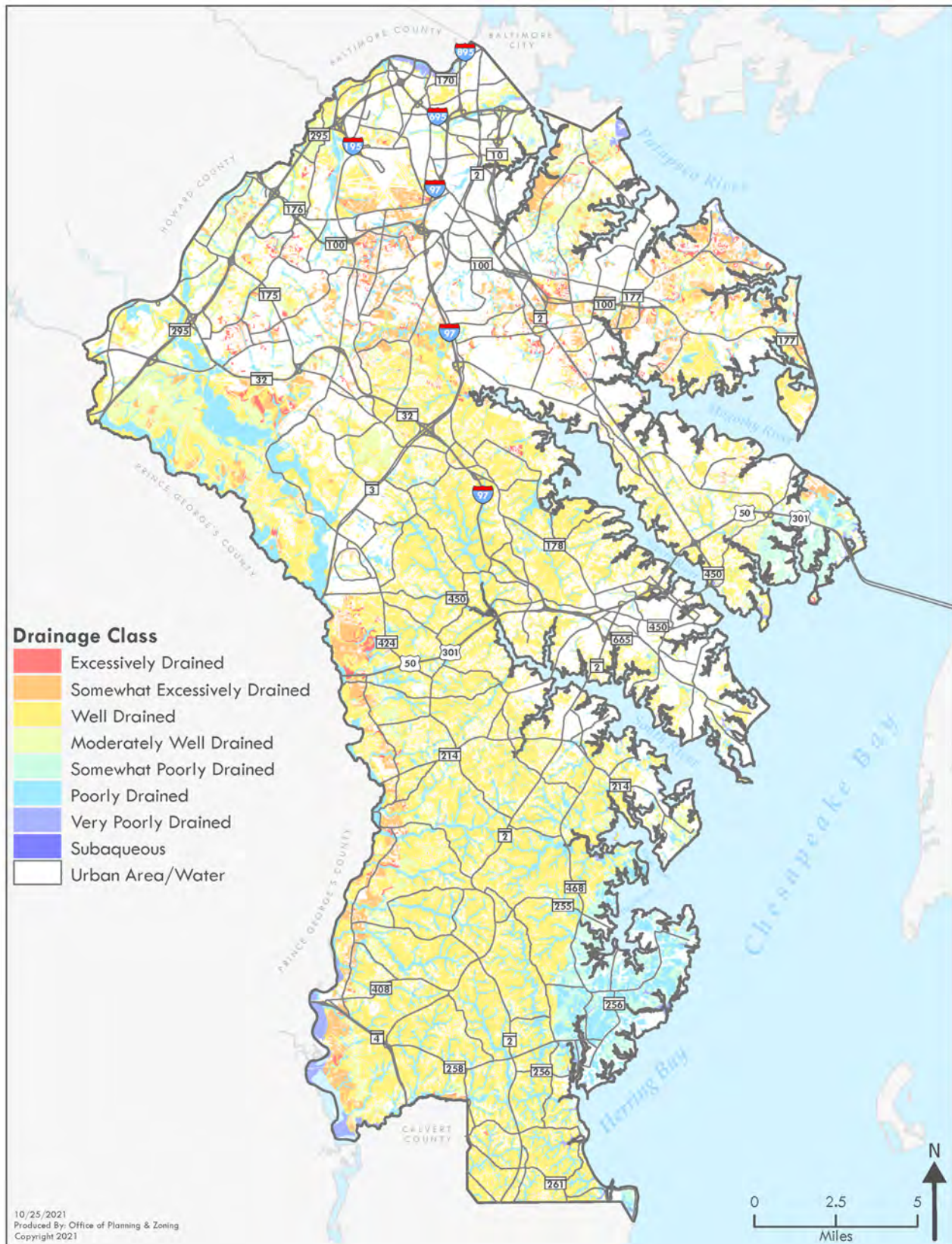


Table 2-1 Anne Arundel County Soils

Drainage Class	Hydrologic Soil Group	Soil Types	Location
Subaqueous	D	Contees Wharf silty clay loam, Dutchman Point sand, Fox Creek mucky loam, Muddy Creek silt loam, Rhode River fine sandy loam, Sellman silty clay loam, Sand Point fine sand	Shallow, permanently flooded areas centered in and around the Rhode River inlet, south of the Mayo Peninsula.
Very Poorly Drained	D	Mispollion, Transquaking, Nanticoke and Mannington	Tidally flooded areas on level slopes of 0 to 1% along the coastal shoreline of the County
Poorly Drained	B/D, C/D, D	Colemantown Fine Sandy Loam, Colemantown Silt Loam, Colemantown-Urban Land Complex, Fallsington Sandy Loam, Fallsington-Urban Land Complex, Shadyoak-Elkton Complex, Shadyoak Elkton Urban Land Complex, Shrewsbury Loam, Widewater and Issue soils and the Zekiah and Issue	On nearly level slopes of 0-5% along streams within the County
Somewhat Poorly Drained	C	Adelphia-Holmdel-Urban Land Complex, Cumberstone-Mattapex Complex, Cumberstone-Mattapex-Urban Land Complex, Deale-Shadyoak-Urban Land Complex and Deale-Shadyoak Complex	On nearly level slopes of 0-10% in the Deale-Shadyside area south of the Rhode River, the Rose Haven area, the Broadneck area in the vicinity of the Chesapeake Bay Bridge, adjoining Mill and Whitehall Creeks and the Crofton area
Moderately Well Drained	A, B, C	Adelphia-Holmdel complex, Alloway-Sassafras Complex, Alloway-Sassafras-Urban Land Complex, Codorus and Hatboro, Dodon Very Fine Sandy Loam, Donlonton-Urban Land Complex, Donlonton Fine Sandy Loam, Mattapex Silt Loam, Mattapex-Butlertown Complex, Mattapex-Butlertown Urban Land Complex, Pepperbox Loamy Sand, Pepperbox-Urban Land Complex, Russett Fine Sandy Loam, Russett-Alloway-Hambrook Complex, Russett-Alloway-Urban Land Complex, Russett-Urban Land Complex, Woodstown Sandy Loam and Woodstown-Urban Land Complex	Northernmost part of the County and are on nearly level to strongly sloping ground (0 to 15 %)
Well Drained	B, C	Annapolis Loamy Sand, Annapolis Fine Sandy Loam, Annapolis-Urban Land Complex, Chillum Loam, Chillum-Urban Land Complex, Collington-Wist Complex, Collington-Urban Land Complex, Collington and Annapolis soils, Collington, Wist and Westphalia soils, Comus and Codorus soils, Downer-Hammonton Complex, Downer-Hammonton-Urban Land Complex, Downer-Phalanx Complex, Howell-Annapolis Complex, Howell and Annapolis soils, Howell-Dodon Complex, Howell and Dodon soils, Marr-Dodon Complex, Marr and Dodon soils, Marr-Dodon-Urban Land Complex, Matapeake Silt Loam, Matapeake-Urban Land Complex, Matapeake and Mattapex, Pits, gravel,	Found throughout the County on flat to gently rolling slopes between 0-15%, steep slopes between 15-25%, severe slopes ranging from 25-40% and severely steep slopes between 40-80%

		Sassafras Fine Sandy Loam, Sassafras Loam, Sassafras-Hambrook Complex, Sassafras and Croom soils, Sassafras-Urban Land Complex, Tinton Loamy Sand, Tinton-Urban Land Complex, Udorthents Refuse Substratum, Udorthents Loamy, Udorthents Reclaimed Gravel Pits and the Udorthents Loamy Sulfidic Substratum	
Somewhat Excessively Drained	A	Evesboro-Galestown Urban Land Complex, Galestown Loamy Sand, Patapsco- Evesboro-Fort Mott Complex, Patapsco-Fort Mott Complex and the Patapsco-Fort Mott-Urban Land Complex	Found on relatively flat slopes between 0–15% along the Patuxent River and north of Fort Meade and also some which are found on slopes between 15-25%
Excessively Drained	A	Evesboro-Galestown Urban Land Complex, Evesboro and Galestown soils.	Found on relatively flat slopes between 0-15% along the Patuxent River in the southwestern portion of the County and in the northern part of the County south of the Baltimore Washington International Thurgood Marshall Airport between Fort George G. Meade and the Patapsco River

Figure 2-4 Soils



2.1.4 Aquifers

Groundwater is the principle source of fresh water supply for Anne Arundel County. The Patuxent, Patapsco, Magothy and Aquia are the aquifers from which the groundwater is withdrawn. Figure 2-5 depicts these aquifer outcrop areas.

Studies by the Maryland Geological Survey (MGS), *Groundwater Supplies in Anne Arundel County*, Bul. 26, 1962, indicate the geologic and climatic conditions favor the availability of groundwater in the County. Subsequent investigations substantiate these conclusions. However, if the rate at which the groundwater is pumped exceeds the rate of replacement by precipitation or recharge by stream flow, a problem of brackish water intrusion may occur along the shoreline in shallow parts of the aquifers. Most of the waters in the Chesapeake Bay and its tributaries contain chloride concentrations of 5,000 to 10,000 parts per million (ppm), which is about one-third to one-half that of ocean water.

Potentiometric Surface Maps of Selected Confined Aquifers in Southern Maryland and Maryland's Eastern Shore, 2019 (Open File Report 20-02-01) is the most recent study conducted by the U.S. Geological Survey (in cooperation with the Power Plant Assessment Program of the Maryland Department of Natural Resources and the Maryland Geological Survey) that assesses the regional effects of groundwater withdrawals on water levels in the Aquia, Magothy, Upper Patapsco, Lower Patapsco and Patuxent aquifers. The water-level measurements were made during the fall season of 2019 and represent groundwater levels and withdrawal amounts at an instant in time. The study concludes that in each aquifer the water levels tend to be higher in wells closer to outcrop areas where most of the aquifer recharge occurs, and lower in the fully confined portions where the larger withdrawals tend to occur. The withdrawal data can be used to assist in determining the sustainability of the aquifer system.

The Patuxent formation, the oldest unconsolidated deposit, ranges between 100 and 300 feet thick and consists of sand, gravel, and variegated clay. It is also the deepest aquifer dipping toward the southeast at a rate of 85 to 90 feet per mile. It outcrops in bands several miles wide roughly parallel to the Fall Line along Anne Arundel County's western and northwestern boundary. The recharge area in Anne Arundel County consists of approximately 10 square miles of a 120 square-mile total outcrop area. Scientific Investigations Report 2012-5165 states that water levels in the Patuxent Aquifer ranged from 168 feet above sea level to 135 feet below sea level. The report also states that withdrawal rates from the Patuxent decreased from over 21 million gallons per day (MGD) in 1990 to 13 MGD in 2010 due in part to reduced water use at Fort Meade and decreased withdrawals from well fields at Crofton Meadows as well as the City of Bowie in Prince George's County. The MGS indicates as much as 16 MGD could be withdrawn from the Patuxent aquifer in Anne Arundel County.

The Patapsco formation consists of sand and variegated clay deposits with some thin lenses of iron-cemented sandstone. The thickness of the aquifer ranges between 200 and 300 feet. The outcrop area of 85 square miles extends across the northern end of the County; another 55 square miles of outcrop area is in Prince George's County. According to the Scientific Investigations Report 2012-5165, water levels in the upper Patapsco aquifer ranged from 120 feet above sea level to 110 feet below sea level in 2011 and declined by as much as 47 feet between 1990 and 2011. Water levels in the lower Patapsco aquifer ranged from 106 feet above sea level to 198 feet below sea level in 2011 and declined by as much as 71 feet between 1990 and 2011. Groundwater withdrawals from the Patapsco aquifers increased from 29 MGD in 1990 to over 40 MGD in 2010. The MGS study indicates that approximately 64 MGD could be withdrawn from the Patapsco aquifer in Anne Arundel County.

The Effects of Projected (2086) Groundwater Withdrawals on Management Water Levels and Domestic Wells in Anne Arundel County, Maryland Report (Open-File Report No. 17-02-01) assessed the potential

effects of projected increases in groundwater withdrawals from the Upper Patapsco, Lower Patapsco, and Patuxent aquifer systems. The report states that total average-day build-out withdrawals will increase by 2.7, 12.1, and 1.4 million gallons per day over current permitted allocations in the Upper Patapsco, Lower Patapsco, and Patuxent aquifer systems respectively. To determine if the increased withdrawals are sustainable (do not fall below the 80-percent management level) and to assess the potential effects on water levels and domestic-well operation, a groundwater flow model simulation was run. The model is a revised version of a previously developed model used for water supply planning in Anne Arundel County. The model was updated and re-calibrated using more recent water level and pumpage data. Model simulations indicate that projected withdrawals will not cause water levels to fall below the 80-percent management level in all well fields with the exception of the Upper Patapsco aquifer system at Severndale. Sufficient supply capacity is available in the Lower Patapsco aquifer system at Severndale, however, to shift the Upper Patapsco withdrawals (0.4 million gallons per day by 2086) to the Lower Patapsco.

The Aquia formation, the uppermost aquifer, consists of glauconitic quartz sand with a few clay layers and provides much of the water for Anne Arundel County south of Davidsonville and Annapolis. The formation has an average thickness in the County of 120 feet and dips southeastward 15 to 20 feet per mile. The total area of the Aquia outcrop is 65 square miles through the central portion of the County in a wide band that extends from the western areas of Davidsonville through the Parole area to the southern shore of the Magothy River. Another 45 square miles of recharge area is located in Prince George's County. The outcrop areas provide recharge for the aquifers whose major source of water is precipitation either directly in the County recharge areas, seepage from adjacent confining beds, or by flow from outcroppings in other jurisdictions. Some infiltration may also occur from area streams. According to the Scientific Investigations Report 2012-5165, water levels in the Aquia aquifer range from 50 feet above sea level to 157 feet below sea level in 2011 and declined by as much as 112 feet between 1982 and 2011. Groundwater withdrawals have increased from about 5.0 MGD in 1982 to over 15.0 MGD in 2010.

The principal source of water in the Annapolis area is the Magothy formation. The formation consists of beds of gray sand and gravel inter-bedded with thin layers of black clay. The formation has an average thickness of 175 feet. The aquifer is recharged where it crops out, an area of approximately 70 square miles in Anne Arundel County and another 8 square miles in Prince George's County. Scientific Investigations Report 2012-5165 states that water levels in the Magothy aquifer range from 88 feet above sea level to 79 feet below sea level in 2011 and declined by as much as 85 feet between 1975 and 2011. Water withdrawal from the Magothy aquifer increased from about 7.0 MGD in 1975 to nearly 9.0 MGD in 2010. In 1974, the Maryland State Department of Natural Resources indicated that the Magothy aquifer is capable of yielding 60.0 MGD in the Annapolis area. However, the amount of water withdrawn must be properly managed to prevent the possibility of brackish water from the Chesapeake Bay or its tributaries from being induced into the aquifer.

Deposits of marine or estuarine terrace materials of Pleistocene age occur in Anne Arundel County along the Bay and Patuxent River. These deposits may be 50 feet thick. In addition to the artesian aquifers described in preceding paragraphs, unconfined aquifers, or water-table aquifers are formed in the shallow sediments. Historically, dug wells were common in these sandy deposits where there is a sufficiently high water table.

The recharge areas of the major aquifers also may provide a water source for shallow wells in Anne Arundel County. While the water-table aquifers may provide a significant quantity of water in some areas, they may be more susceptible to contamination. Confined aquifers such as these are separated from the ground surface by relatively impervious layers of silt, clay and rock. They have long-term storage capability and are

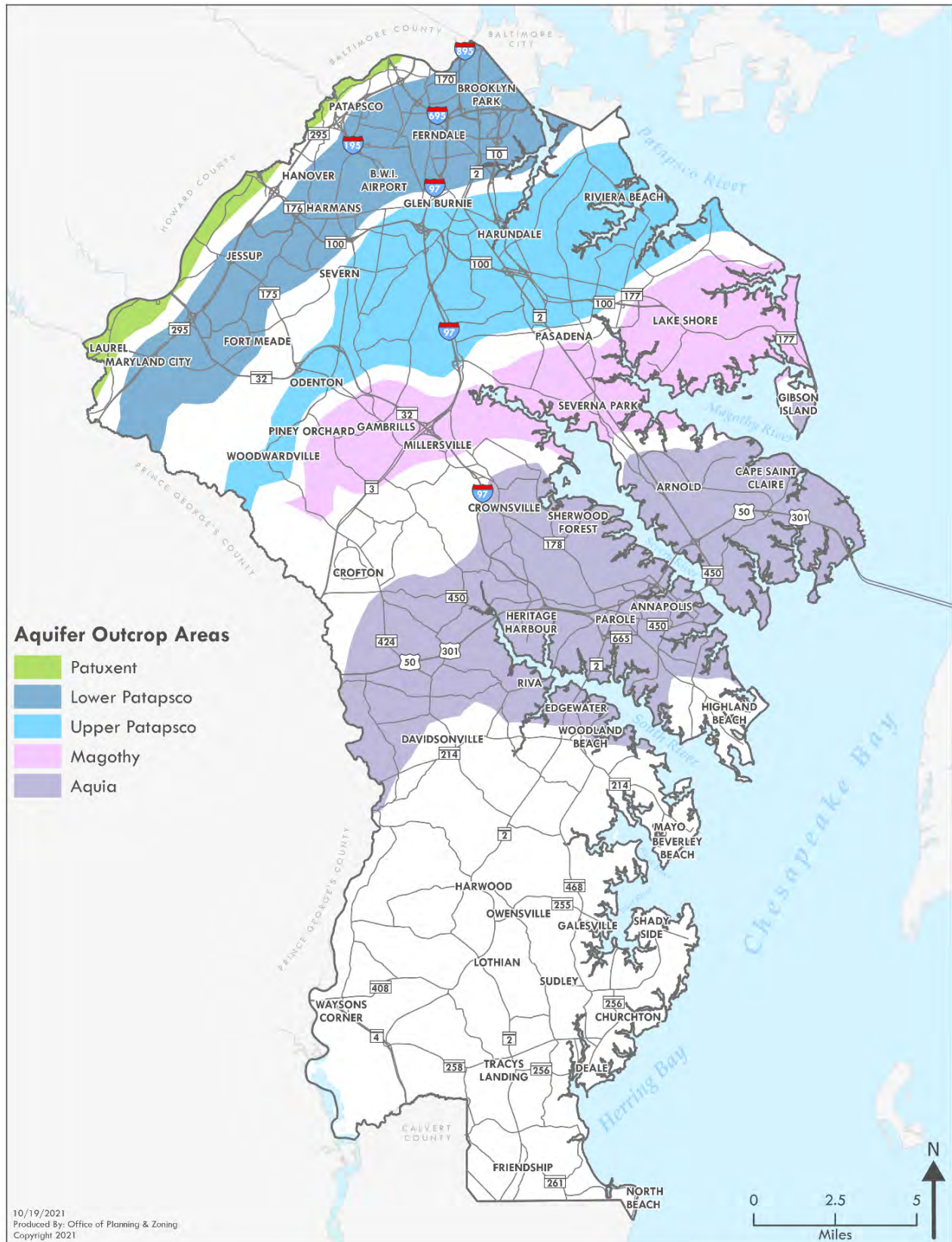
not directly influenced by precipitation and climate changes. However, they are influenced by withdrawal by farmers, homeowners, and others.

More detailed descriptions of the aquifers and confining units as well as graphic depictions of the hydraulic properties, aquifer altitudes and cross sections can be obtained in Open File Report No. 12- 02-20 *Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework* compiled by the Maryland Geologic Survey and the U. S. Geologic Survey, with funding support from the Maryland Department of the Environment in 2013. This report can be accessed at <http://www.mgs.md.gov/publications/reports.html>.

2.2 Ground Water Quality

The County facilities use water from deep wells in the Patapsco, Patuxent and Aquia aquifers as a water supply source. No Federal or State standards have been established for raw ground water (in the ground). There are standards that apply to a public drinking water system, but these standards are applied to either water in the distribution system or finished (treated) water at the point-of-entry to the distribution system, rather than at the source. However, there are regulations concerning discharge of pollutants to ground water. The Water and Science Administration in the Maryland Department of the Environment is responsible for the regulation of these discharges.

Figure 2-5 Aquifer Outcrop Areas



2.2.1 Wellhead Protection Studies

The Federal government requires each State to conduct assessments for the susceptibility of public drinking water sources to various contaminants. Source Water Assessments have been completed for all of the County's facilities. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination.

The wells serving the County's facilities pump water from confined and semi-confined aquifers. The confined aquifers are well protected from activity on the land surface because the confining layers provide a barrier for water movement from the surface into the aquifer. A contaminant at the surface could impact the water supply by direct injection into the aquifer from within the wellhead protection area (WHPA) via poorly constructed wells, abandoned wells, and underground injection wells drilled into the aquifer.

The most recent source water assessment for Anne Arundel County was completed in 2013 by S.S. Papadopoulos & Associates and Chesapeake Environmental Management. The 2013 report, entitled Source Water Protection Plan (SWPP) for the Glen Burnie, Maryland Public Water System, addresses the unconfined and semi-confined wells in the Glen Burnie area previously reviewed in the 2003 Wellhead Protection Plan (WPP). Similar to the 2003 WPP, the 2013 SWPP includes a review of previous source water assessment and protection reports, updated source water assessment area delineations, existing provisions to protect groundwater and recommendations for source water protection with a proposed implementation schedule. The 2013 SWPP was initiated and funded by the Maryland Department of the Environment (MDE) and the final report can be found on their website (www.mde.maryland.gov).

The Source Water Assessment for the Severndale and Arnold Plant Wells in Anne Arundel County, MD was conducted in 2005 by MDE. No potential sources of contamination were identified within the WHPA for the Arnold and Severndale plant wells that serve the Glen Burnie-Broadneck Water Systems.

The only potential contamination threat to aquifers is unused wells or improperly constructed wells located within the WHPA. It is recommended that these wells be abandoned per State well construction regulations.

The Source Water Assessment for the Community Water Systems using Confined Aquifers in Anne Arundel County, MD was conducted in 2004 by MDE. It assessed the water supply systems for Crofton-Odenton, Gibson Island, Herrington Harbour (Rose Haven), and Herald Harbor. The study of these community water supplies determined that they were not susceptible to contaminants originating at the land surface. Unused wells or improperly constructed wells may provide a pathway for contaminants in the upper aquifer to reach deeper confined aquifers. It is suggested that the proper abandonment of unused wells is needed to protect the drinking water sources.

The County undertook a study in 1991 in conjunction with the Maryland Geological Survey (MGS) of the Department of Natural Resources and the Public Drinking Water Program (PDWP) of MDE to determine qualitative zones of aquifer vulnerability through ground-water flow and particle tracking. The study area focused on the area surrounding the northern County public supply wells that draw on the Lower Patapsco aquifer that have identified known sites of surface and sub-surface contamination.

The well fields studied were: the three (3) major well fields - Dorsey, Harundale and Sawmill - and six individual production wells located at Philip Drive, Crain Highway, Elvaton Road, Quarterfield Road, Glendale Avenue and Thelma Avenue.

The results of the study produced the following:

- a. An aquifer vulnerability map depicting four (4) qualitative degrees of aquifer vulnerability to potential contamination,
- b. A set of maps depicting a 1-year, 10-year and 20-year zone of transport along with the zones of contribution (recharge), and
- c. A written report detailing methodology and findings.

The major findings indicated:

- a. The overall water quality of the Lower Patapsco aquifer is good, although some contaminants have been determined at several sites.
- b. The water produced from the aquifer in 1991 was water that entered the ground after 1945.
- c. Particle tracking from known contaminant sites posed no threats to the production wells currently in use, as most contamination sites are down-gradient of the production wells. Releases from contamination sites up-gradient of the Glendale and Sawmill wells would, without remediation, pose a threat; however, the Sawmill wells have been abandoned, and the Glendale wells are out of service and are in design for decommissioning and well abandonment.
- d. Particle tracking indicated that the time for groundwater to flow from land surface to the wellhead at the 1990 extraction appropriation rates range from less than 10 years to as long as 60 years, depending on the location of the well.

Developing more detailed data and the ability to perform broader analyses on the Wellhead Protection initiatives, the County contracted URS Corporation in 2001 to study the Glen Burnie and Annapolis well sites. The study is comprised of two component parts. The first is the source water area assessment and the second component is a framework for developing proper land management tools for groundwater protection. The Wellhead Protection Plan for the Glen Burnie Study Area, Broad Creek Pressure Zone, and City of Annapolis Study Area was completed in June 2003 by URS Corporation. The confined aquifer wells in the Annapolis area were assessed as having low susceptibility to contaminants originating at the land surface due to the protected nature of confined aquifers. The confined wells in the Glen Burnie area were found to have a moderate susceptibility to contaminants due to naturally occurring radionuclides and a high percentage of industrial, commercial, and institutional land uses. The semi-confined well's (Glen Burnie area) susceptibility to contaminants ranged from low to high (four low, two moderate, and two high). The moderate rankings were the result of naturally occurring radionuclides and a high density of potential contamination sources. The high rankings came from naturally occurring radionuclides, anthropogenic contaminants (i.e., resulting from influence of human beings on nature), contamination source density, and land use. Many recommendations are presented that include, proper land use and zoning considered around the County wellheads, development of a County Wellhead Protection Fund, and education of best land management practices to those existing homeowners and businesses within the closest and thus, highest range of susceptibility for point source contamination.

2.3 Surface Water Quality Standards

Water quality standards and criteria for surface waters are designed to protect and enhance beneficial uses, which include fishing, boating, swimming, scenic enjoyment, habitats for aquatic life and waterfowl, and use as a public water supply. Standards have been established for the State's waters, which protect them for all of these uses. The State water quality standards consist of the designated uses of the waters involved and the water quality criteria for the waters based upon these uses.

Designated use classifications have been established for water contact recreation and aquatic life (Use I), shellfish harvesting (Use II), natural trout (Use III), and recreational trout (Use IV). Every waterway in the County is at least Use I. Designated water use classifications for County waterways can also be found in Code of Maryland Regulations 26.08.02.08.

Water quality standards specific to each of the designated uses have been established and are listed in the Code of Maryland Regulations 26.08.02.03 - Surface Water Quality Criteria. The water quality criteria for Toxic Substances may also be referenced in this section of Maryland State Code.

2.4 Shellfish Waters

The Maryland Department of the Environment (MDE) is responsible for regulating the production and storage of shellfish obtained from any waters of the State. It has the authority to restrict the use of any area for catching or storing shellfish if investigations indicate that the waters are polluted to the extent there is a hazard to public health. MDE evaluates water quality in Use II waters for compliance with water quality standards for shellfish harvesting. Based on this research, MDE has designated portions of these waters as restricted, conditionally approved, or approved. In those waters classified as restricted, no shellfish harvesting is permitted. Those waters classified as conditionally approved are closed to shellfish harvesting for a period of three days after rain events of one inch or more over a 24-hour duration. There are no restrictions on shellfish harvesting in the approved waters.

MDE publishes a map summarizing current shellfish harvesting closure areas. The map and a detailed description of the location of the restricted and conditionally approved shellfish waters are available by visiting the MDE web site at <https://mde.maryland.gov/programs/water/FishandShellfish/Pages/index.aspx>.

2.5 Population and Land Use

2.5.1 Population

The total population of Anne Arundel County including the City of Annapolis in the 2020 Census was 592,695 persons (Table 2-2). A projected population of approximately 694,235 is expected by the year 2050. Historically, Anne Arundel County developed largely as a suburb of Baltimore City. Residential and commercial expansion extended southward along the County's major highways toward the waterfront. In recent years however, the County has been experiencing significant growth pressures from the Washington D.C. Metropolitan Area. Based on the 2020 Census, Anne Arundel County became the fourth largest in population within the State of Maryland, surpassing Baltimore City and representing 9.5 percent of the State's total population. Only Montgomery, Prince George's and Baltimore Counties have greater resident populations.

The annual rate of population growth in the County has overall been declining since it peaked at 8.29% in 1956. However, in absolute numbers the County's growth has remained one of the highest of the jurisdictions in Maryland. The components of population change are births, deaths and net migrations. According to the U.S. Census Bureau, the County's population increased by 294,653 persons between 1970 and 2020. This represents a 98.9 percent increase or an average annual increase of 1.98 percent. Between 1990 and 2020, the average annual increase for the 30-year period was 1.29 percent. The growth rate in Anne Arundel County continues to decline, during the period from 2010 to 2020 the rate of population growth declined to its lowest level since 1910, to 8.79% for the ten year period or an average 0.88 percent annually. The dramatic slowdown can be attributed to a combination of factors such as the lingering effects from the economic downturn that began in 2007 and Millennials delaying the start of families. It is projected that the County will experience a net increase of 101,540 persons, representing a 17.1 percent increase in total population for the thirty year period between 2020 and 2050. This is a significant increase

from the previous population projections for the County, which is consistent with the significant population growth the County has been experiencing the past few years and is reflected in the 2020 Census data in Table 2-2.

Table 2-2 Population and Household Trends and Forecasts, 2000-2050

Year	Total Households	Average Household Size	Population in Households	Group Quarters Population	Total Population	Change from Previous Period	Percent Change from Previous Period
2020	219,971	2.626	577,752	14,943	592,695	29,668	5.27%
2025	228,528	2.656	606,915	14,772	621,687	28,992	4.89%
2030	236,781	2.668	631,645	14,569	646,214	24,527	3.94%
2035	244,935	2.653	649,763	14,451	664,214	18,000	2.79%
2040	251,583	2.636	663,290	14,134	677,424	13,210	1.99%
2045	256,061	2.629	673,245	13,874	687,119	9,695	1.43%
2050	260,349	2.614	680,460	13,775	694,235	7,116	1.04%

Source: U.S. Census Bureau, 2020, Draft Round 10 Projections for the Baltimore Metropolitan Council Cooperative Forecasting Group (2025-2050)

2.5.2 Land Use

The existing land-use pattern in Anne Arundel County reflects several of the historic stages of the County's growth and development:

- The rural areas of South County's long-established settlements along the Chesapeake Bay shore;
- Suburban and exurban development in the interior and along transportation routes;
- The older, more densely populated suburbs of North County;
- Port-oriented industrial development; and
- Industrial and residential expansion in the Fort Meade-BWI area in the western part of the County.

A general description of the County's existing land use indicates a variety of development types, ages, qualities and conditions, and also demonstrates the close inter-relationship between living places and working places, between land use and transportation. Two notable features of the existing land-use pattern are its low-density, and the amount of natural areas. Figure 2-6 is a general map showing the existing land use in the County.

Existing land use acreages are shown in Table 2-3 below while the breakdown of undeveloped land in the Existing, Planned, or Future service categories by sewer service area and water pressure zone are given in Table 2-4. Table 2-5 lists the acreages of the Plan2040 GDP planned land use and existing zoning within the County.

Table 2-3 Existing Land Use Acreage 2020

Land Use Category	Acreage	Percent of Total
Single-Family Residential	80,458	30.4
Townhouse Residential	2,145	0.8
Multi-Family Residential	1,563	0.6
Office / Retail / Commercial / Mixed-Use	6,728	2.5
Industrial	7,093	2.7
Marina	664	0.3
Institutional	16,909	6.4
Agriculture	40,532	15.3
Recreation	7,290	2.8
Natural Resources and Passive Park Lands	42,883	16.2
Undeveloped	22,025	8.3
Transportation / Utility	31,450	11.9
City (City of Annapolis and Highland Beach)	4,928	1.9

Source: Anne Arundel County Office of Planning and Zoning, 2020.

Table 2-4 Undeveloped Land by Sewer Service Area and Water Pressure Zone

Sewer Service Area	Vacant Land* (acres)	Water Pressure Zone	Vacant Land* (acres)
Annapolis	617	Airport Square	1,500
Baltimore City	2,315	City of Annapolis	18
Bodkin Pt.-Pinehurst	8	Broad Creek	596
Broadneck	1,507	Broadneck	963
Broadwater	1,229	Brooklyn Park (North)	14
Cox Creek	2,745	Crofton	233
Fort George Meade	3	Fort George Meade	1
Maryland City	1,029	Gibson Island	30
Mayo-Glebe Heights	278	Glen Burnie High	1,379
Patuxent	1,098	Glen Burnie Low	2,485
Piney Orchard	5	Herald Harbor	68
Rose Haven	32	Heritage Harbor Sub-WPZ	27
Total	10,865	Jessup	679
		Kings Heights / Odenton	868
		Maryland City	764
		Millersville Sub-WPZ	3
		Rose Haven	4
		Total	9,631

*Amount of undeveloped land in the Existing, Planned, and Future Service categories

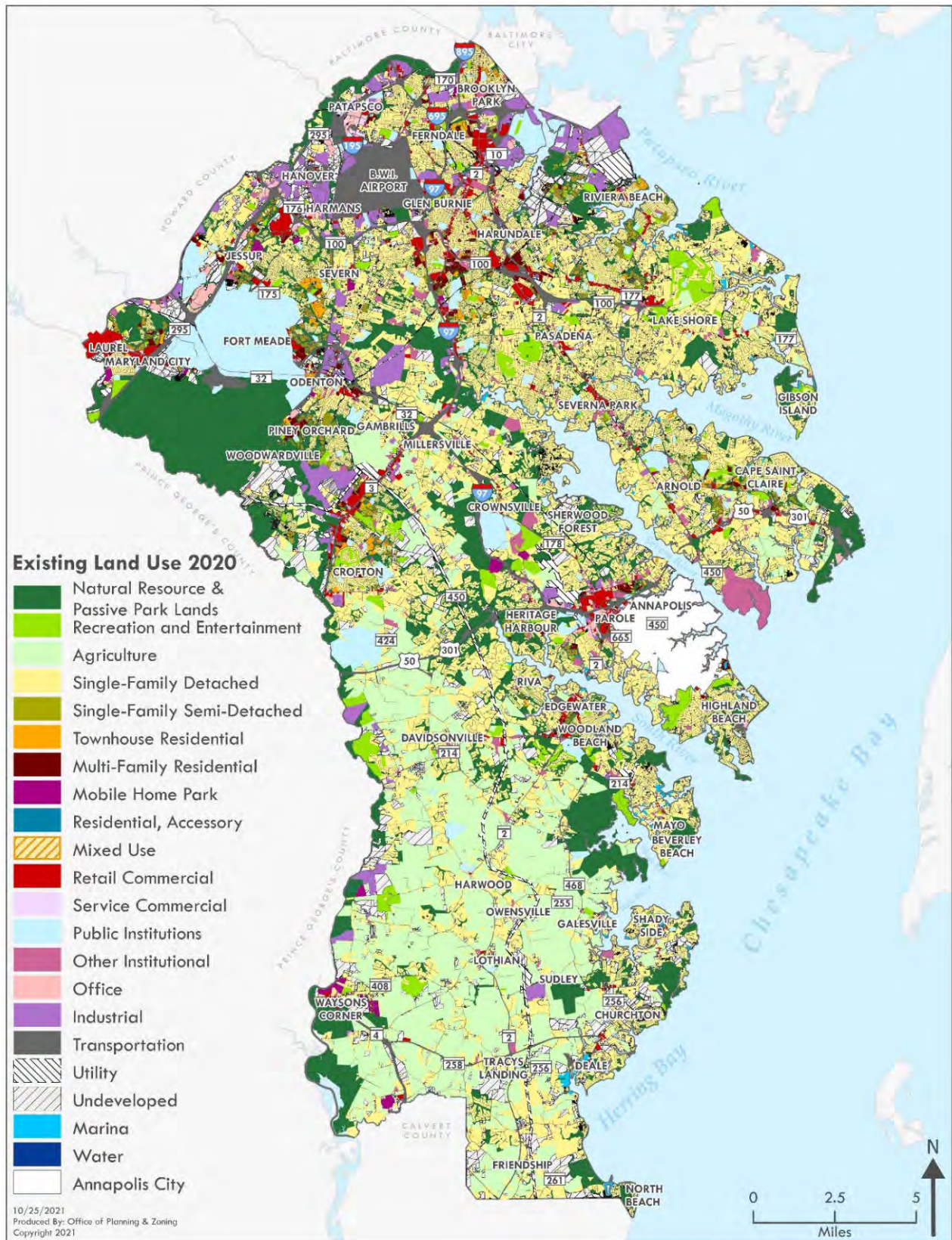
Table 2-5 Acreages of Planned Land Use and Existing Zoning

Plan2040 GDP Land Use	Acreage	Percent of Total Acreage	Existing Zoning 2021	Acreage	Percent of Total Acreage
Conservation	11,211	4.7	OS, Water	37,126	14
Parks and Open Space	29,525	12.3			
Rural	84,313	35.1	RA, RLD	95,940	36
Low Density Residential	44,899	18.7	R1, R2	66,336	25
Low-Medium Density Residential	22,479	9.4	R5	31,050	12
Medium Density Residential	2,900	1.2	R10	1,786	1
High Density Residential	2,425	1.0	R15, R22	3,791	1
Mixed Use	3,056	1.3	MXD-C, MXD-E, MXD-R, MXD-T	1,574	1
Commercial / Small Business	5,091	2.1	C1, C2, C3, C4, SB, TC	7,893	3
Town Center	1,877	0.8	TC	560	0
Industrial	8,283	3.4	W1, W2, W3	12,725	5
Maritime	616	0.3	MA1, MA2, MA3, MB, MC	552	0
City of Annapolis	4,897	2.0	CITY	4,894	2
Public Use	15,038	6.3			
Transit	3,631	1.5			

Plan2040 established Development Policy Areas for the County which broadly identify where development and redevelopment are encouraged, as well as areas where preservation of rural or suburban character and natural features are prioritized. The Development Policy Areas provide a logical and predictable framework for implementing the goals, policies, and implementing strategies in Plan2040 and provide a mechanism for making cost-effective investments in public facilities and services. Plan2040 has adopted goals and policies that directs growth to areas that are served by public sewer and water and are located within the Peninsula, Neighborhood Preservation, Critical Economic, Critical Corridor and Town Center Policy Areas. The Critical Economic Town Center as well as Transit-Oriented and Village Center Overlay Policy Areas are the County's Targeted Development, Redevelopment and Revitalization areas where development and redevelopment are focused and encouraged to relieve growth pressure from other areas of the County, and to utilize existing infrastructure (sewer, water, roads, transit) while aiming to minimize distances between services, work and home.

The upcoming Region Plans will build on the Small Area Plans that were prepared between 1998 and 2004. The Region Plans will further refine the land use plan for each community with particular focus on the Targeted Development, Redevelopment, and Revitalization Areas. With the primary goal to direct growth away from areas not served by water and sewer, preservation of the County's rural heritage, and the commitment to the restoration of its streams and rivers and protection of the Chesapeake Bay, the County will seek a balance between development and preservation. See Figure 1-1 that depicts the County's planned land use adopted in Plan2040 and Figure 1-3 for current zoning in the County.

Figure 2-6 Existing Land Use (2021)



3 Water Supply Systems

3.1 General Information

The County's water system is divided into 12 pressure zones or service areas, each with a distinct hydraulic grade based on the ground elevations within that zone. Eight of the 12 zones are interconnected, which enables the County to transfer water between these zones as needed. There are also two sub-pressure zones that are entirely within and served by a single larger pressure zone. (See Section 3.6 for a more detailed description of each pressure zone.) The remaining land not contained in one of the 12 pressure zones is either served by the City of Annapolis, Fort Meade or is designated as Rural. The boundaries of these pressure zones are shown on the adopted Master Plan Maps of the Water System W-1 through W-12 and also on Figure 3-1.

The County has developed a plan for all significant aspects of its water supply and distribution system for current and future users. The planning process ensures that there will be an adequate supply of the highest quality water to meet the demands of its customers. The plan has enabled the County to optimize groundwater utilization as well as evaluate the potential for Aquifer Storage and Recovery or additional water purchase from the City of Baltimore to meet forecasted interim and long-term demands.

The Water Strategic Plan is a detailed engineering study of the County's water supply system and is updated approximately every 10 years. The plan includes water demand projections, and the evaluation of system performance under existing and proposed future conditions using hydraulic modeling.

Recommendations for capital improvements and a proposed capital improvement schedule, with cost estimates and an implementation time frame is also included in the plan. PSC Engineers and Consultants, Inc. completed a study in 1989 which was the basis for the County's water master plan. O'Brien & Gere Engineers completed an update to the Water Strategic Plan in 2003. The most recent Plan was completed in April 2016 by Malcolm Pirnie/Arcadis.

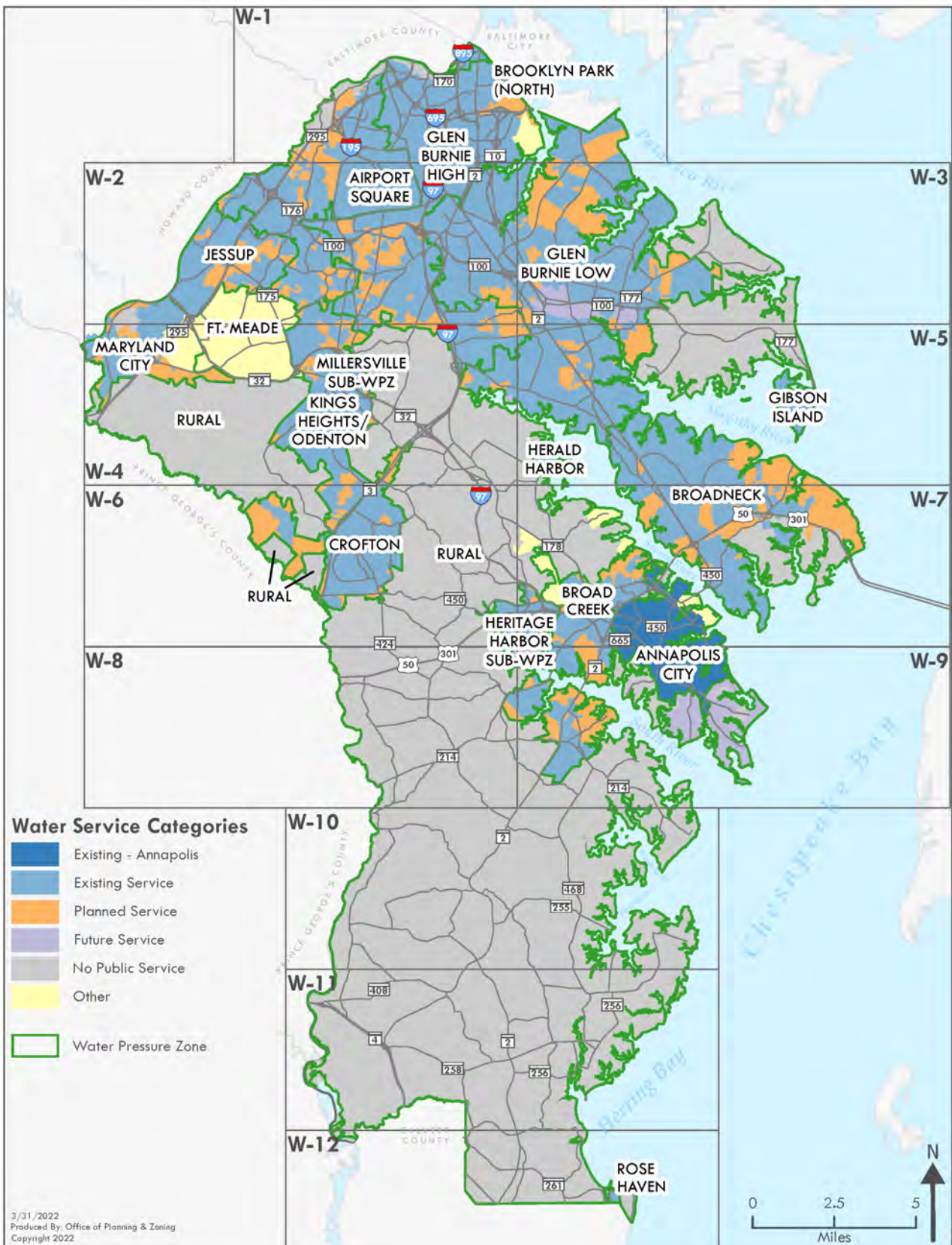
In 2020, the County produced approximately 33.1 million gallons per day (MGD) (average day) and 47.4 MGD (max day) from groundwater sources and did not purchase any water from Baltimore City. The County does not currently have an agreement in place to purchase water from Baltimore City, but can do so on an emergency basis. Anne Arundel County has a limited amount of funds available in the budget for purchase of emergency water from Baltimore City if required. The City of Baltimore is currently in negotiations with surrounding jurisdictions for new agreements to establish water usage demands and pricing. Additional details about the Baltimore City water system are available on their website or by contacting the City of Baltimore, Department of Public Works, Bureau of Water and Wastewater.

3.2 Future Demand Projections

3.2.1 Introduction

Facility planning in the County is done in accordance with the needs identified in the Water Strategic Plan. These needs are based on demand projections developed by consolidating planning criteria from the Department of Public Works (DPW) and the Office of Planning and Zoning (OPZ). The DPW and OPZ in conjunction with Malcolm Pirnie/Arcadis developed new demand projections for the 2016 Comprehensive Water Strategic Plan (2016 WSP). These demands were calculated for the planning period (2012 to 2030) and for buildout conditions.

Figure 3-1 Water Pressure Zones and Service Categories

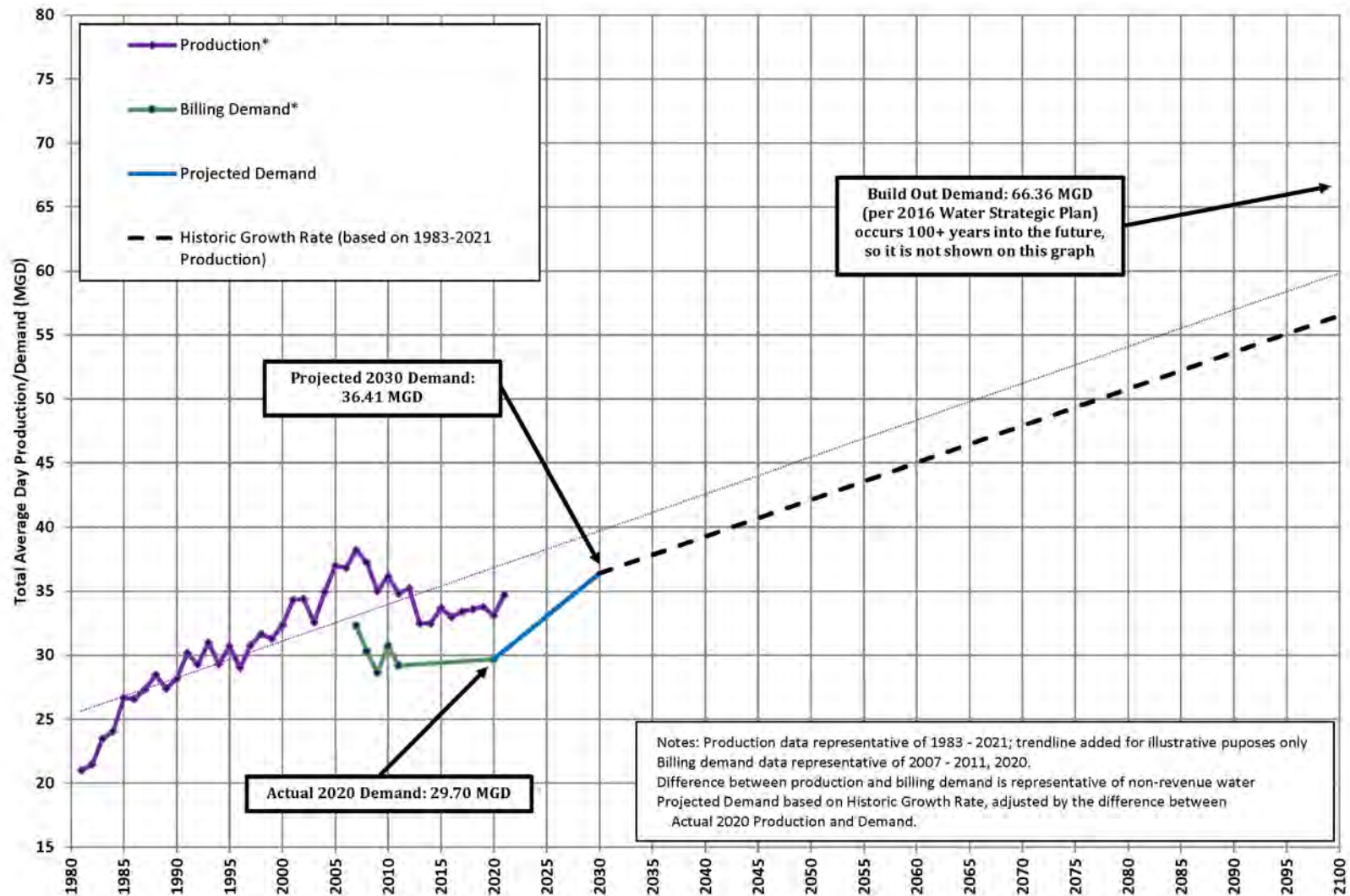


3.2.2 Approach to Demand Projections

The 2016 WSP used a combination of zoning, population and employment growth forecasting, and current development to create detailed demand projections. The methodology incorporated flow factors by zoning (Appendix A), service area categories (Existing, Planned, Future, etc.) and Transportation Analysis Zones (TAZ) development forecasting. Water billing data was used to create baseline demands and also to develop per capita water demands based on zoning type. The 2020 projections include baseline demands, allocated flows from current development, and additional flows from projected population and employment growth based on service area timing categories. Demands for 2030, included the 2020 projections and additional flows from projected population and employment development based on service area timing categories. Buildout demands were based on zoning and flow factors from Appendix A. For a more detailed review of the demand projection methodology see Chapter 3 and Appendix B of the 2016 WSP. The projected future demands were assigned at a parcel level and applied to the WaterGEMs hydraulic model for analysis for baseline, 2020, 2030, and buildout scenarios in order to determine future infrastructure needs.

Historic water production from the years 1983 through 2021 is shown in purple on Figure 3-2. A linear projection of this data was used to establish a historical production growth rate. The projected 2030 demand and projected future growth (black dashed line) was established by adjusting the historical production growth rate by the difference between actual production and demand for the year 2020. Based on this information, buildout is estimated to occur 100+ years in the future and is therefore not shown on Figure 3-2.

Figure 3-2 Average Day Demand Projection (Historic System Production, Demands and Future Growth)



3.2.3 Results of Demand Projections

Overall calculated demand projections for the year 2020 and Buildout from the 2016 WSP are given in Table 3-1. The demand projections for 2020 and Buildout from the 2003 Comprehensive Water Strategic Plan (2003 WSP) by O'Brien and Gere, as well as actual 2020 demands, are shown for comparison purposes.

Comparing the 2020 Average Day demand projections, the 2020 projection from the 2016 WSP was approximately 25% less than what was projected in the 2003 WSP. This reduction could be due to a number of factors including a slower than anticipated growth in the County, use of water conserving fixtures in new construction, but also differences in methodology between the two reports. The 2016 WSP methodology for projecting the 2020 demands focused heavily on allocated demands and current billing data rather than on historic growth trends. As noted in Section 3.1, the actual average day production for 2020 was 33.1 MGD. Average Day buildout demands are within 5% of each other. This was due to the use of similar methodology to estimate buildout as well as using similar flow factors.

There is a large difference in the Max Day factors between the two studies. As part of the 2016 WSP, peaking factors for Max Day were revised based on recent production data as well as changes to the system infrastructure. Since the 2003 WSP, there have been several capital improvement projects that increase the interconnection of multiple pressure zones in the system. These include two separate 36-inch transmissions mains that send water from Arnold WTP and Crofton Meadows WTP to the northern part of the system. The 2016 WSP analyzed the historic production data and determined that the Maximum Day demands are now less localized and therefore the factors are not as high in the interconnected pressure zones. The maximum day factors for the Pressure Zones are presented in Table 3-2. The 2016 WSP did not revise the peak hour factors for the system. The average day and maximum day projections for each pressure zone are presented in Table 3-2 for 2025, 2030, 2035 and Buildout. Table 3-3 shows the total population and household projections for each pressure zone.

Table 3-1 Comparison of Water Demand Projections from the 2003 and 2016 Comprehensive Water Strategic Plans

Demand Period	Average Day (MGD)			Maximum Day (MGD)		
	2003 WSP	2016 WSP	2020 Actual	2003 WSP	2016 WSP	2020 Actual
Comprehensive Water Strategic Plan						
Interim Scenario (Year 2020)	47.7	36.47	33.1	90.7	59.3	47.4
Build-out Scenario (estimated at 2043 for 2003 WSP, 2087 for 2016 WSP)	64.6	66.36	-	123.9	108.4	-

Sources: 2003 WSP, 2016 WSP, Production Data

Table 3-2 Annual Average and Maximum Day Demand Projections

	Projected Average Day Demand (MGD)					
Water Pressure Zone	2010 ¹	2020 ¹	2025 ²	2030 ³	2035 ³	Buildout ⁴
Airport Square	3.39	2.94	3.27	3.60	3.75	5.82
Broad Creek	2.30	2.12	2.36	2.60	2.70	5.93
Broadneck/Glen Burnie Low	12.30	11.86	13.20	14.53	15.11	24.45
Brooklyn Park	0.50	0.15	0.17	0.18	0.19	0.66
Crofton	1.80	1.75	1.95	2.14	2.23	2.92
Gibson Island	0.08	0.08	0.09	0.10	0.10	0.18
Glen Burnie High	4.48	4.72	5.25	5.78	6.01	10.22
Herald Harbor	0.13	0.13	0.14	0.16	0.17	0.28
Jessup	1.40	2.04	2.27	2.50	2.60	3.99
Maryland City	1.24	1.13	1.26	1.38	1.44	3.46
Kings Heights / Odenton	2.77	2.76	3.07	3.38	3.52	8.37
Rose Haven	0.03	0.03	0.03	0.04	0.04	0.08
Total	30.42	29.71	33.06	36.41	37.85	66.36

	Projected Maximum Day Demand (MGD)¹					
Water Pressure Zone	Max Day Factor ⁵	2020	2025	2030	2035	Buildout
Airport Square	1.6	4.70	5.23	5.76	5.99	9.60
Broad Creek	1.8	3.82	4.25	4.68	4.86	11.00
Broadneck/Glen Burnie Low	1.6	18.98	21.12	23.26	24.18	39.00
Brooklyn Park	1.6	0.24	0.27	0.29	0.31	1.20
Crofton	1.6	2.80	3.12	3.43	3.57	3.90
Gibson Island	3.0	0.24	0.27	0.29	0.31	0.53
Glen Burnie High	1.6	7.55	8.40	9.26	9.62	16.30
Herald Harbor	2.0	0.26	0.29	0.32	0.33	0.56
Jessup	1.6	3.26	3.63	4.00	4.16	6.30
Maryland City	1.6	1.81	2.01	2.22	2.30	5.60
Kings Heights / Odenton	1.6	4.42	4.91	5.41	5.63	14.20
Rose Haven	2.5	0.08	0.08	0.09	0.10	0.19
Total		48.15	53.58	59.01	61.34	108.40

Notes: 1. Years 2010 and 2020 reflect actual demand data from water billing records. Year 2010 was the baseline for the 2016 WSP. 2. Year 2025 was calculated by linear interpolation between actual 2020 demands and projected 2030 demands. 3. Totals for years 2030 and 2035 are projected demands from Figure 3-2. 4. Buildout demand projections are from the 2016 WSP. 5. The Maximum Day Flow Factors were calculated as part of the 2016 WSP.

Table 3-3 Population and Household Projections, 2020-2050

POPULATION							
WATER PRESSURE ZONE	2020	2025	2030	2035	2040	2045	2050
Airport Square	21,541	23,489	25,928	28,986	31,595	33,212	33,898
Broad Creek	44,044	45,442	46,588	47,088	47,333	47,494	47,719
Broadneck/Glen Burnie Low	191,980	200,125	206,124	210,677	214,260	216,560	218,073
Brooklyn Park (North)	3,457	3,580	3,689	3,768	3,862	3,944	4,013
Crofton	29,200	30,813	32,379	33,683	34,543	35,246	35,718
Gibson Island	329	335	339	345	350	356	362
Glen Burnie High	76,759	80,161	82,836	84,607	85,797	86,758	87,472
Herald Harbor	2,017	2,079	2,137	2,192	2,239	2,281	2,322
Jessup	19,364	23,103	26,241	28,106	28,770	29,328	29,732
Kings Heights/Odenton	51,873	55,985	59,424	61,080	62,529	63,565	64,463
Maryland City	19,160	20,628	22,049	22,864	23,479	23,892	24,193
Rose Haven	294	310	320	339	352	360	366
Ft. Meade (Private)	9,318	9,501	9,682	9,817	9,889	9,951	10,012
City of Annapolis*	43,046	44,284	45,522	46,760	47,998	49,236	50,646
Rural	80,313	81,852	82,956	83,902	84,428	84,936	85,246
COUNTY TOTAL	592,695	621,687	646,214	664,214	677,424	687,119	694,235
HOUSEHOLDS							
WATER PRESSURE ZONE	2020	2025	2030	2035	2040	2045	2050
Airport Square	8,361	9,117	10,064	11,635	13,203	13,879	14,486
Broad Creek	18,995	19,722	20,195	20,738	21,279	21,556	21,771
Broadneck/Glen Burnie Low	69,000	70,787	72,606	74,471	75,995	77,127	78,234
Brooklyn Park (North)	1,091	1,130	1,160	1,175	1,203	1,239	1,271
Crofton	10,246	10,518	10,753	11,186	11,572	11,828	12,068
Gibson Island	197	198	200	202	205	209	213
Glen Burnie High	27,008	27,902	28,795	29,715	30,475	31,056	31,632
Herald Harbor	887	889	891	893	897	900	904
Jessup	7,176	8,562	9,725	10,516	10,843	11,052	11,254
Kings Heights/Odenton	20,952	22,313	23,702	24,671	25,356	25,776	26,200
Maryland City	7,054	7,694	8,296	8,634	8,735	8,810	8,881
Rose Haven	195	196	197	198	203	208	211
Ft. Meade (Private)	2,325	2,330	2,333	2,339	2,345	2,360	2,374
Annapolis City*	17,391	17,727	18,062	18,398	18,733	19,069	19,396
Rural	29,093	29,443	29,802	30,164	30,539	30,992	31,454
COUNTY TOTAL	219,971	228,528	236,781	244,935	251,583	256,061	260,349

Source: Draft Round 10 Projections for the Baltimore Metropolitan Council Cooperative Forecasting Group (2020-2050)

*City of Annapolis Source: BAE Urban Economics, June 2021

3.3 Groundwater Sources and Appropriations

3.3.1 Hydrology of Anne Arundel County

Anne Arundel County is underlain by a wedge-shaped mass of stratified unconsolidated sedimentary deposits, the Coastal Plain sediments, which dip and thicken to the southeast. The wedge thickens from about 50 feet in the northwestern part of the County to as much as 1,800 feet below ground level in the southeastern part of the County. It consists of layers of sand, silt, clay, and gravel and overlies much older consolidated bedrock, which has little or no water supply potential for the County.

The water-bearing aquifers, which overlay bedrock, are from oldest to youngest, the Patuxent, Lower Patapsco, Upper Patapsco, Magothy and Aquia. The four deepest aquifers are the sources of water supply for most of Anne Arundel County. The Aquia aquifer is an important source of water supply for more isolated areas in the central and southern parts of the County. The water bearing capacity of these aquifers varies from place to place due to a number of factors, chiefly the aquifer transmissivity. Transmissivity is a natural property of the aquifer that is dependent on the composition and thickness of the aquifer. As transmissivity increases, the ability of the aquifer to transmit water increases and the effect of water withdrawals on local surface water levels decreases. For more information on historical pumpage from these aquifers in Anne Arundel and other surrounding counties, refer to the Maryland Geological Survey (MGS) website at www.mgs.md.gov/groundwater.

3.3.2 Existing and Future Groundwater Potential

The County's existing well fields and water supply wells are summarized in Table 3-4. Future potential well fields are summarized in Table 3-5. The approximate locations of the existing and future potential well fields are shown on Figure 3-3.

The location and withdrawal potential of future well fields is based on a 2007 study by MGS related to available groundwater withdrawal from the Upper Patapsco, Lower Patapsco and Patuxent aquifers in the County. This study found that there was an almost unlimited supply to the south and east sides of the County, with a very limited supply to the north and west. Based on a review of this study, the 2016 WSP recommends that any major investment in new supply sources be made only within the east or southern portions of the County.

Table 3-6 includes both the existing and future potential well fields for the County, with a total future max day groundwater withdrawal of 108.5 MGD under buildout conditions. Note that the total for the existing facilities in Table 3-6 is limited to the existing treatment capacity of the facility even though the total existing well production capability, shown in Table 3-4, may be greater. Optimizing the use of existing and potential County supply wells will minimize reliance on the Baltimore City Central Water System. Any deficiencies between future demands and the County's ability to develop new well fields in the southern part of the County shall be met by evaluating other potential supply options, including Aquifer Storage and Recovery as well as purchase of water from the City of Baltimore.

Table 3-4 Existing Well Fields

Pressure Zone	Existing Well Field (Fig. 3-3)	Facility Name	Number of Production Wells (Well No.)	Aquifer ⁽¹⁾	Permit Annual Avg. (MGD)	Permit Monthly Max. (MGD)	Total Well (MGD)	Best Well Out (MGD)	Groundwater Appropriation Permit #	GAP Expiration Date
Broad Creek (210 zone)	1	Broad Creek WTP	3 (1, 2, 3)	Upat	1.4	2.0	3.3	2.0	AA1968G006 (08)	7/2022
		Broad Creek WTP	2 (4, 5)	Lpat	3.6	5.0	6.3	2.9	AA1986G070 (06)	7/2022
		Facility & Zone Total:	5		5.0	7.0	9.7	4.9		
Broadneck (220 zone)	2	Arnold WTP	5 (1, 2, 3, 6,10)	Upat	3.5	3.8	6.3	4.8	AA1982G036 (07)	10/2022
		Arnold WTP	3 (4,5,8)	Lpat	8.0	8.3	6.3	2.9	AA1987G069 (03)	10/2022
		Arnold WTP	2 (7,9)	Ptxn	4.5	4.8	4.8	2.2	AA2005G020 (01)	10/2022
		Facility and Zone Total:	10		16.0	16.9	17.4	9.9		
Crofton/KH-Odenton (290/330 zone)	4	Crofton Meadows WTP	6 (1,2, 3,7 9,10)	Ptxn	8.0	9.2	11.5	8.2	AA1972G005 (07)	10/2022
		Crofton Meadows WTP	5 (4,5 6, 8,11)	Lpat	6.8	10.0	8.9	6.6	AA1972G105 (04)	10/2022
		Facility & Zone Total:	11		14.8	19.2	20.4	14.8		
Gibson Island (156 zone)	5	Gibson Island WTP	2 (1, 3)	Upat	0.1	0.5	1.0	0.5	AA1971G034 (05)	4/2026
Glen Burnie Low (220 zone)	6	Severndale WTP	5 (4, 5, 6, 7, 8)	Lpat	7.0	8.0	8.5	5.9	AA1953G008 (08)	10/2022
		Severndale WTP	1 (3)	Upat	0.5	0.5	0.4	0.0	AA1953G108 (04)	10/2022
		Severndale WTP	1 (9)	Ptxn	1.6	2.4	2.4	0.0	AA1953G208 (03)	10/2022
		Facility Total:	7		9.1	10.9	11.3	5.9		
	7	Phillip Drive SCW ⁽²⁾	1	Lpat	0.9	1.0	0.9	0.0	AA1982G042 (02)	10/2022
	8	Harundale WTP ⁽³⁾	4 (1, 2, 3, 4)	Lpat	2.2	2.6	2.7	1.7	AA1982G037 (05)	10/2022
	10	Elvaton SCW ⁽³⁾	1	Lpat	0.9	1.0	0.8	0.0	AA1982G039 (04)	10/2022
		Zone Total:	13		13.0	15.5	15.8	7.7		
Glen Burnie High (295 zone)	11	Telegraph Road SCW	1	Lpat	1.0	1.1	0.8	0.0	AA1981G026 (05)	10/2022
	12	Stevenson Road SCW	1	Lpat	0.8	0.9	0.8	0.0	AA1981G025 (04)	10/2022
	13	Dorsey Road WTP	7 (2,18-23)	Ptxn	4.8	5.7	5.5	4.5	AA1969G019 (07)	10/2022
		Zone Total:	9		6.6	7.7	7.2	4.5		

Pressure Zone	Existing Well Field (Fig. 3-3)	Facility Name	Number of Production Wells (Well No.)	Aquifer ⁽¹⁾	Permit Annual Avg. (MGD)	Permit Monthly Max. (MGD)	Total Well (MGD)	Best Well Out (MGD)	Groundwater Appropriation Permit #	GAP Expiration Date
Herald Harbor (240 zone)	14	Herald Harbor WTP	2 (1, 2)	Lpat	0.16	0.26	1	0.5	AA1982G031 (03)	7/2029
Rose Haven (120 zone)	15	Rose Haven WTP	2 (1,2)	Aquia	0.07	0.135	0.576	0.288	AA1948G001 (05)	7/2027
		WELL TOTALS:	54		55.8	67.2	72.9	42.9		

Notes:

(1) Patuxent (Ptxn); Lower Patapsco (Lpat); Upper Patapsco (Upat)

(2) Existing facilities currently out of service

(3) Standby facility

Table 3-5 Future Potential Well Fields

Pressure Zones	Well Field (Fig. 3-3)	Well Field Name	Potential Average Day Withdrawal ⁽¹⁾ (MGD)				
			Ptxn	Lpat	Upat	Aquia	Total
Broad Creek (210 zone)	A	Broad Creek	0.9	3.3	2.7		6.9
Broadneck (220 zone)	B	Arnold		10.1	7.5		17.5
Crofton (290 zone)	C	Crofton Meadows	6.0	11.5			17.5
Gibson Island (160 zone)	5	Gibson Island			0.2		0.2
Glen Burnie Low (220 zone)	6	Severndale		4.0	0.4		4.4
Herald Harbor (240 zone)	14	Herald Harbor		0.3			0.3
Rose Haven (120 zone)	15	Rose Haven				0.1	0.1
Multiple Zones (via future Millersville WTP)	D	Crownsville (remote)	12.0	8.0			20.0
TOTAL			18.9	37.2	10.8	0.1	66.9

Notes: (1) Based on the 2016 Comprehensive Water Strategic Plan's review of the MGS 2007 study related to available ground water withdrawals in Anne Arundel County under buildout conditions.

Figure 3-3 Existing and Potential Well Fields

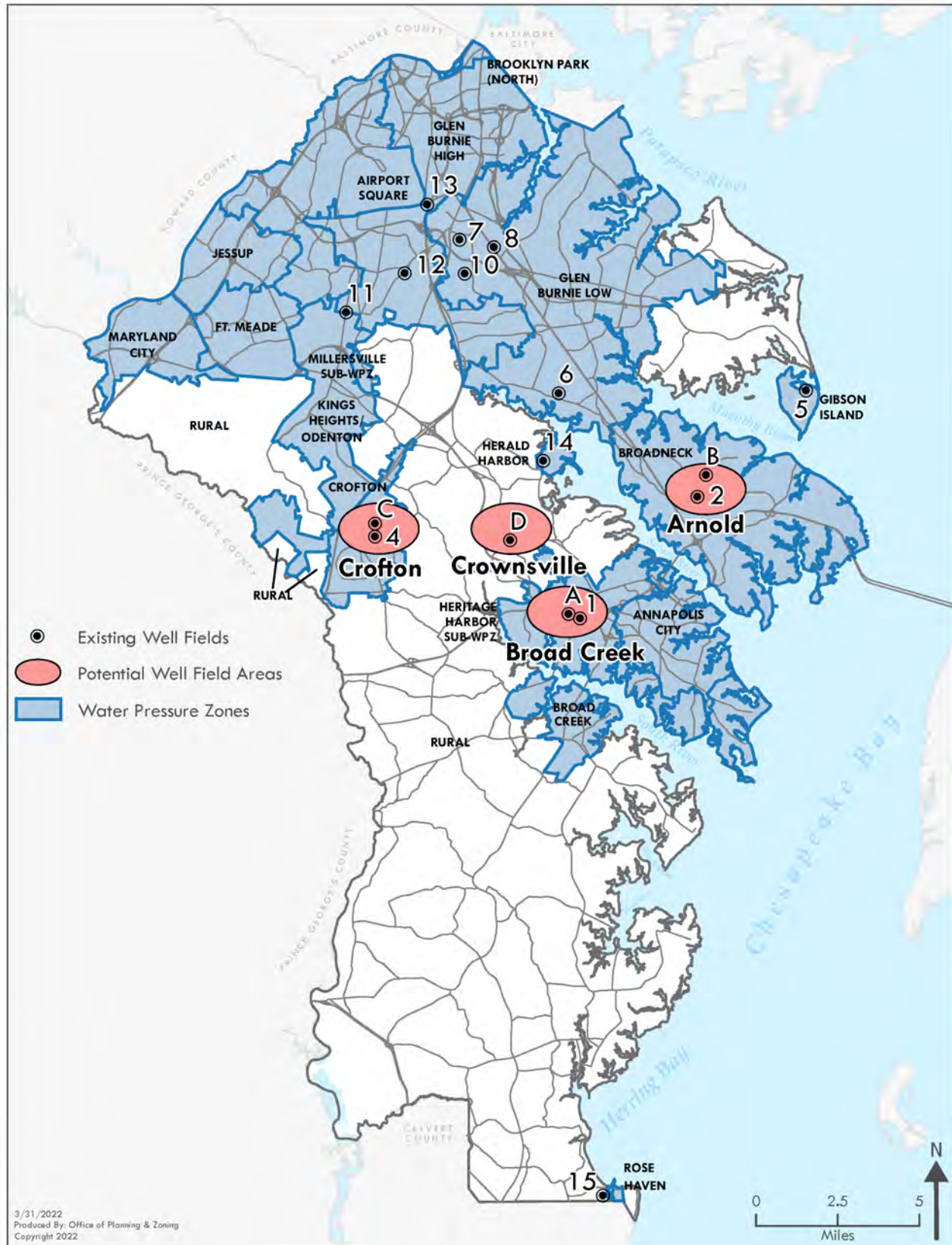


Table 3-6 Maximum Day Groundwater Supply (Existing and Future Potential)

Pressure Zone	Facility Name	Existing Max. Day Capacity at WTP		Future Max. Day Withdrawal (Required at Buildout)	
		Existing Well Field (Fig 3-3)	(MGD)	Future Well Field (Fig 3-3)	Max Day (Avg x Peaking Factor*) (MGD)
Broad Creek 210	Broad Creek II WTP	1	8.0	A	11.0
	Broad Creek I WTP ⁽¹⁾		2.9		
Broadneck 220	Arnold WTP	2	16.0	B	28.0
Crofton 290	Crofton Meadows II WTP	4	15.0	C	28.0
	Crofton Meadows I WTP ⁽¹⁾		4.2		
Multiple Zones	Millersville WTP (future)			D	32.0
Gibson Island 160 ⁽³⁾	Gibson Island	5	0.3		0.6
Glen Burnie Low 220	Severndale WTP	6	8.0		8.0
	Phillip Drive SCW ⁽²⁾	7	0.0		
	Harundale WTP ⁽¹⁾	8	2.1		
	Elvaton Road SCW ⁽¹⁾	10	0.9		
Glen Burnie High 295	Telegraph Road SCW	11	1.0		
	Stevenson Road SCW	12	0.6		
	Dorsey Road WTP	13	3.5		
Herald Harbor 240	Herald Harbor WTP	14	0.6		0.6
Rose Haven 120	Rose Haven WTP	15	0.3		0.3
TOTAL ⁽⁴⁾			63.3		108.5

* A peaking factor of 1.6 was used for all zones except Gibson Island (3.0), Herald Harbor (2.0) and Rose Haven (2.5)

Notes: (1) Standby facility. (2) Facility is out of service. (3) Existing total well of 1.0 is greater than future max day withdrawal at buildout of 0.6. Therefore, a future well field is not included for this zone on Figure 3-3. (4) Total existing capacity is limited by the WTP capacity, which may be less than the total existing well capacity.

3.3.3 Groundwater Studies

MGS completed a Countywide groundwater study in 2007, which was used to verify the future groundwater potential estimates presented in Table 3-6. The updated groundwater model can be used to complete the following objectives:

- A. Update current and projected pumpage rates for "other users" within and outside the County as well as County projections.
- B. Using computer optimization, develop optimum well withdrawal rates and select future sites that can reduce draw down in the aquifers in order to comply with the 80% management level required by the Maryland Department of the Environment (MDE).
- C. Evaluate changes in water budget as recharge from outcrop areas increases to supply greater pumpage demands.
- D. Incorporate and verify results from previous well allocation studies that have been conducted for select plant expansions (i.e. Arnold, Crofton, and others).

3.3.4 Groundwater Appropriation Permits

Projections for safe groundwater withdrawal in Anne Arundel County are based on a hydraulic model used by the MDE. Rates and quantity of proposed withdrawal are designed to utilize the most productive portions of the aquifers and avoid saltwater intrusion. The maximum day groundwater withdrawals considered in the hydraulic model for existing and future well fields are listed in Table 3-6. MDE issues groundwater appropriations permits by aquifer with limits on annual average day and maximum monthly withdrawal rates as shown in Table 3-4. For this reason, multiple permits may be required at a single production facility depending on the number of aquifers being utilized.

3.3.5 Groundwater Level Monitoring Program

For groundwater management and monitoring purposes, a network of observation wells in major aquifers has been installed in coordination and agreement with the MDE and MGS and has been monitored since the early 1990s. A report is submitted annually by MGS entitled, Hydrographs and Tables Showing Groundwater Level Records for Selected Observation Wells in Anne Arundel County and Hydrographs Showing Surface-water Flow in Sawmill Creek. The most recent report can be found on MGS's website at www.mgs.md.gov/groundwater.

3.3.6 Land Subsidence Monitoring

In 1996, MGS completed a study of land subsidence within Anne Arundel County titled, Monitoring for Land Subsidence in the Arnold, Broad Creek, and Crofton Meadows Well Fields of Anne Arundel County (Mack). The study led to the design of an early detection system for land subsidence. Precision benchmarks at sites considered most susceptible to land subsidence were established along with a schedule of monitoring the benchmarks to detect any changes over time. It has been determined that current water extraction is of no threat to any land subsidence at this time. As future withdrawals increase, the established monitoring system will detect subsidence in time to allow the Department of Public Works to redistribute pumpage to alternative well-fields before any structural damage to surface infrastructure might occur.

3.3.7 Wellhead Protection Program

In its continual effort to promote safe management of the land surface around public wells, the Public Drinking Water Program of the MDE has developed a model ordinance as a tool for local governments to use to protect their water supplies. The model ordinance provides an overlay-zoning district that restricts the kind of development that can occur within a wellhead protection district. The State recognizes that due to unique conditions within different local jurisdictions, additional or fewer safeguards may be needed than

those proposed in the model. Significant work has already been done in collaboration with the State to identify potential contaminant sources in the County and to perform a hydro-geological study of the County. This work has established the groundwork for the County to pursue a wellhead protection program using the State's model ordinance as a guideline. See Chapter 2 Section 2.2, Ground Water Quality, for more information.

In addition to the wellhead protection program conducted in cooperation with the State, the County Department of Health currently maintains a Groundwater Protection Plan (for private water supplies), which documents and summarizes Health Department policies and programs regarding on-site sewage disposal systems and the protection of groundwater where public sewer is not available. The plan and policies are outlined in Appendix D.

3.4 Summary of Inter-Jurisdictional Water Agreements

The County has entered into several different agreements in order to ensure supplemental water sources are available in times of need and to provide water to large customers.

3.4.1 Supplemental Source Agreements:

- A. Baltimore City (First Zone) - The agreement signed November 17, 1971, by representatives of Baltimore City and Anne Arundel County, provides for the purchase of water from the City's First Zone, which originates at the Montebello WTP. The agreement allows Anne Arundel County to receive up to 17.5 MGD of maximum day flow. These allowances are based on contributions to prior capital project construction costs; however, the City of Baltimore is currently pursuing new agreements with adjacent jurisdictions to establish new terms for the future purchase of water.
- B. Baltimore City (Second Zone) - The agreement signed October 22, 1969, by representatives of Baltimore City, Baltimore, Howard and Anne Arundel Counties, provides for the purchase of water from the City's Second Zone, which originates at the Ashburton WTP. The agreement allows Anne Arundel County to receive 10.0 MGD during average day conditions and 15.0 MGD during maximum day conditions. These allowances are based on contributions to prior capital project construction costs; however, the City of Baltimore is currently pursuing new agreements with adjacent jurisdictions to establish new terms for the future purchase of water.

3.4.2 Customers

- A. State of Maryland - Jessup Correctional Facility - UA #92065 was executed by the State, County, MES, and the State Board of Public Works on April 9, 1992. The County agreed to expand service to meet increased water demands at the State's prison complex. This entailed the construction of the Nursery Road Booster Pump Station (BPS) and the Montevideo BPS. It also enabled the County to provide a maximum of 2.1 MGD at standard County rates. The State paid for construction in lieu of capital connection fees.
- B. State of Maryland - Agreement with MAA, effective June 27, 2013 to describe the way additional water capital facility connections fees will be calculated each year. An extension of the agreement expires on June 30, 2023.

3.5 Strategic Planning and Water System Optimization

The following sections detail how the DPW is continually analyzing and optimizing water system operations and infrastructure to ensure a safe, reliable, and cost-effective source of public drinking water for existing and future customers. In an effort to reduce operations and maintenance (O&M) costs, the County is continually focused on ways to standardize equipment, consolidate facilities, and optimize pressure zone boundaries. Distribution and transmission system piping and pump station facilities financed by the

development community or the County's Utility Enterprise Fund are reviewed with optimization and reduction of O&M costs in mind. Facilities are planned with the potential future service area taken into consideration as well as implementation of project phasing to service the existing, interim and future conditions.

3.5.1 Hydraulic Modeling

Through the mid-1990s, the County utilized a water model that resided within a more comprehensive allocation program called the Sewer and Water Allocation Management and Planning System (SWAMP). The SWAMP system was developed in the 1980's, and it enabled the County to assign demands at nodes throughout the water distribution system at different commitment levels. These commitment levels are related to the various stages of review for subdivision projects. As a result, simulations can be performed to include all existing demands and any variation of projects that are permitted, allocated, in sketch and concept review phases. For more information regarding SWAMP see Appendix B.

In the late 1990s, the Planning Section within the Bureau of Engineering updated the water model to WaterCAD, an advanced graphical hydraulic model that is capable of performing extended period simulations (EPS). This update included extensive field testing to verify physical characteristics of the water distribution system such as pipe friction factors (C-factors), master meter accuracies, closed valves and potential unaccounted for water. Although separate models were originally created for each pressure zone, the individual models have now been consolidated into a single Countywide model. As new capital projects and development projects are completed, the water models are updated on a routine basis. The water model is calibrated based on fire flow tests. Existing demands are updated based on current water billing data using the average of the eight most recent billing cycles. This update process ensures that the model more closely reflects actual conditions.

3.5.2 Strategic Planning

The Planning Section within the Department of Public Works initiates and develops water strategic planning for infrastructure expansion pertaining to all aspects of its water supply and distribution system to meet existing and future demands. In 1989, PSC Engineers completed a detailed engineering study which established the basis for the County's Water Master Plan throughout the 1990s. In 1999, Wallace, Montgomery & Associates completed a regional strategic plan to address low-pressure problems and major development projects in the mid-west portion of the County. In 2003, O'Brien & Gere Engineers completed a comprehensive water strategic plan, which incorporated findings from the 1989 and 1999 studies and evaluated the water system for 2010 and build-out conditions. In 2016, Malcom Pirnie/Arcadis completed a new comprehensive water strategic plan that looked to further optimize the system by both improving efficiency and providing redundancy where required.

The 2016 Comprehensive Water Strategic Plan

The 2016 Comprehensive Water Strategic Plan (2016 WSP) included detailed demand projections, a review of max day peaking factors for the system, storage gap analysis, an analysis of available groundwater supply, facility assessments, model validation, and hydraulic modeling using both steady state and extended period simulation. The 2016 WSP developed baseline (existing 2010 demands), 2020, 2030 and buildout water demands for the County based on zoning projections. Using the countywide hydraulic model for the baseline demands, the study identified existing areas with high pipe velocities and head losses as well as areas with minimum system pressures and where local fire flow improvements were recommended. The model was then used to analyze for the interim (2020 and 2030) and buildout periods. The analysis resulted in the sizing and siting of future system facilities including major transmission mains, pumping stations, water treatment facilities and storage facilities. For the buildout scenario, emphasis was

placed on reducing reliance on the Baltimore City supply. The resulting recommended capital improvement projects (CIPs) were then used to develop a long term capital water development plan. Particular large-scale CIPs were phased over several years based on demand projections and capital budget limitations. The County Water Master Plan Maps, W-1 through W-12, incorporate the findings of the strategic plan study as well as the ongoing CIP program.

3.5.3 Water System Optimization

3.5.3.1 Water Treatment Plants

The 2016 WSP identified the production facility infrastructure necessary for meeting expected growth while optimizing the use of potential County groundwater sources. The 2016 WSP also identified locations throughout the County that were suitable for centralizing water production facilities in relation to where adequate groundwater resources are anticipated. The 2016 WSP continued the efforts of the previous plans, providing greater reliability, building greater system flexibility by improving movement of water throughout the system, focusing plant expansions in areas with greater groundwater supply with the goal of reducing reliance on Baltimore City. As a result of the study, the County will focus on the development of several existing production facilities and a new proposed Millersville WTP to handle additional buildout demands as described in Table 3-7. The major focus in the near term will be on the following three major production facilities:

- a) Broad Creek II expansion (4.0 to 8.0 MGD), has recently been completed
- b) Crofton Meadows II expansion (15.0 to 20.0 MGD), currently in schematic design
- c) Arnold expansion (16.0 to 20.0 MGD), planned for 2030

In addition to these three expansions, the following facilities may be taken offline based on water demands, condition of the facility, availability of ground water supply, and the availability to purchase Baltimore City water supply:

- a) Dorsey WTP taken offline and converted to a BPS
- b) Harundale WTP
- c) Self-Contained Wells

Beyond 2030, the following expansions and one new facility are proposed. These improvements will be completed based on projected buildout demands, availability of ground water supply and need to reduce reliance on the City:

- a) Crofton Meadows II expansion (20.0 to 28.0 MGD)
- b) Arnold WTP expansion (20.0 to 28.0 MGD)
- c) Broad Creek II expansion (8.0 to 11.0 MGD)
- d) New Millersville WTP (32.0 MGD)

At buildout conditions, excess flow from Crofton Meadows II and Arnold would be conveyed by transmission mains to the northern portions of the County to meet maximum day demands. The new Millersville WTP should be on-line before Crofton Meadows II and Arnold reach their buildout capacity. See Section 3.5.3.1.11 for suggested phases of construction for the Millersville WTP. Groundwater well and pumping capacities for each of the following water treatment plants is summarized in Table 3-4.

3.5.3.1.1 Arnold

The Arnold Water Treatment Plant (WTP) is located in the Broadneck 220 Zone. The Arnold facility has a 3.0 MG ground storage tank. Treatment provided includes aeration, pre-chlorination, chemical addition,

coagulation, sedimentation, fluoridation, disinfection and filtration. Iron sludge is sent to the sanitary sewer.

The plant was expanded in 2013 to 16 MGD. In conjunction with the Arnold expansion, a major 36- inch transmission main was constructed to convey water to the Glen Burnie Low Zone as discussed in section 3.5.3.2. Based on the baseline projections from the 2016 WSP, Arnold WTP will be able to supply the Glen Burnie Low Zone at 13.6 MGD (average day) and 11.6 MGD (max day).

For buildout conditions, the 2016 WSP proposes to expand the Arnold WTP to 28.0 MGD, again sending excess flow to Glen Burnie Low Zone as needed, up to 18.7 MGD (max day). The Amberley WTP, located near the Arnold WTP, has not been in service since 1994. A Capital project to decommission and demolish the Amberley WTP and the associated wells is in the schematic design phase.

3.5.3.1.2 *Crofton Meadows*

The Crofton Meadows facility is located in the Crofton 290 Zone. The Crofton Meadows I WTP was constructed in 1973 with a treatment capacity of 4.2 MGD. In 1996, the Crofton Meadows II WTP was constructed with a treatment capacity of 5.0 MGD, with provisions at the site to expand to 30 MGD. The plant was expanded to its current capacity of 15.0 MGD in 2011. Crofton Meadows I is currently offline and scheduled to be abandoned. Treatment provided includes aeration, pre- chlorination, chemical addition, coagulation, sedimentation, filtration, fluoridation, and disinfection. Iron sludge is sent to the sanitary sewer.

The 2016 WSP proposed incremental expansions of the Crofton Meadows II WTP with an ultimate capacity of 28 MGD at buildout. A Capital project to expand the Crofton Meadows II WTP from 15.0 to 20.0 MGD has been initiated and is currently in the schematic design phase. Ultimately, the Crofton Meadows II WTP is a major supply source for the following zones: Crofton (290), Kings Heights/Odenton (330), and via the Disney Road BPS, Maryland City (369), Jessup (400), Airport Square (350), and potentially Fort Meade Private (288/391). Anne Arundel County may provide Fort Meade with emergency backup water connections, provided as mutual aid in the extreme event of a temporary loss of water supply.

3.5.3.1.3 *Broad Creek (Annapolis)*

The Broad Creek facility is located in the Broad Creek 210 Zone. The Broad Creek I WTP was originally constructed in 1967 and upgraded in 1983. Current treatment capacity is approximately 2.1 MGD. The Broad Creek II WTP was built in 1989 with a treatment capacity of 4.0 MGD in order to meet the incumbent growth in the Parole Town Center and the South River Colony subdivision. The Broad Creek I and II WTPs have a combined treatment capacity of approximately 6.1 MGD, with Broad Creek I used to meet peak demands throughout the year. With the completion of the Broad Creek II expansion from 4.0 to 8.0 MGD, Broad Creek I will be used for redundancy for the pressure zone if needed. For buildout conditions, the 2016 WSP proposes to expand the Broad Creek II WTP to 11.0 MGD. Treatment provided includes aeration, pre-chlorination, chemical addition, coagulation, sedimentation, filtration, fluoridation, and disinfection. Sludge is sent to the sanitary sewer.

3.5.3.1.4 *Severndale*

The Severndale WTP is located in the Glen Burnie Low 220 Zone. The facility is located off of Benfield Road along Southway in the community of Severndale. The original plant was constructed in 1961 at 3.5 MGD and was expanded to 7.0 MGD in 1969. In 1992, the plant was expanded again to its current capacity of 8.0 MGD along with a new high lift pumping station. There are no plans to expand the treatment beyond 8.0 MGD under buildout demands. Transmission mains were constructed between the plant and Ritchie Highway to optimize production capability of the expanded plant. Treatment provided includes aeration,

pre-chlorination, chemical addition, filtration, fluoridation, and disinfection. Sludge is sent to the sanitary sewer.

3.5.3.1.5 *Dorsey*

The Dorsey WTP is located in the Glen Burnie High 295 Zone. The facility has a current treatment capacity of approximately 3.5 MGD and a high lift pumping capacity of 8.0 MGD. Up to 3.3 MGD is fed from the Glen Burnie Low (220 Zone) to the Dorsey clear well via a 16-inch main so that a total maximum day supply of 6.8 MGD can be supplied to the Glen Burnie High (295 Zone). Current treatment provided includes aeration, pre-chlorination, chemical addition, sedimentation, filtration, fluoridation, and disinfection. Sludge is sent to the sanitary sewer.

Per the 2016 WSP, Dorsey WTP will be taken offline and converted to purely a BPS to send water from the Glen Burnie Low (220) zone to both the Glen Burnie High (295) and Airport Square (350) Zones. Additional piping infrastructure (East-West Transmission Main) must be completed first prior to converting the WTP to solely a BPS.

3.5.3.1.6 *Harundale*

The Harundale WTP is located in the Glen Burnie Low 220 Zone. The facility was originally constructed in 1947 and has a treatment capacity of 2.2 MGD. Treatment currently consists of aeration, pre-chlorination, chemical addition, sedimentation, filtration, fluoridation, and disinfection. The Harundale WTP was upgraded in 1996 and 1998. The plant is considered to be in good condition and is a stand-by facility.

3.5.3.1.7 *Gibson Island*

The Gibson Island WTP is located in the Gibson Island 160 Zone. The facility has a current treatment capacity of 0.3 MGD. An upgrade of the treatment plant was completed in 2013. As the County is no longer providing water to the Gibson Island golf course, the overall demand in Gibson Island has decreased significantly. Per the 2016 WSP, buildout demands will require an expansion of the plant by 0.3 MGD. Treatment provided includes aeration, pre-chlorination, chemical addition, sedimentation, fluoridation, disinfection and filtration.

3.5.3.1.8 *Herald Harbor*

The Herald Harbor WTP is located in the Herald Harbor 240 Zone. The facility has a current treatment capacity of 0.58 MGD. The treatment facility was upgraded with a new package floc, sedimentation, gravity, and filtration plant within the existing building. A second backwash decant tank was also installed. Treatment provided includes aeration, pre-chlorination, chemical addition, sedimentation, fluoridation, disinfection and filtration.

Table 3-7 Proposed New Facilities and Expansion Schedule

Water Supply Demands (MGD)	2010 ¹	2015 ¹	2020 ¹	2025 ²	2030 ³	2035 ³	Buildout ⁴
Maximum Day Demand (system-wide)	58.85	56.14	48.15	53.58	59.01	61.34	108.40
Maximum Day Demand (independent zones)	6.95	6.32	4.40	4.89	5.38	5.60	12.30
Maximum Day Demands (combined zones)	51.90	49.82	43.75	48.69	55.74	55.74	96.10
Water Supply Source	Capacity (MGD)						
Broadneck 220							
Arnold WTP	8	16	16	16	20	20	28
<i>Zone Total</i>	8	16	16	16	20	20	28
Glen Burnie Low – 220							
Harundale WTP	2.2	2.2	2.2	2.2			
Severndale WTP	8	8	8	8	8	8	8
Elvaton Road SCW	0.8	0.8	0.8	0.8			
Glendale SCW	0.6						
<i>Zone Total</i>	11.6	11	11	11	8	8	8
Glen Burnie High – 295							
Millersville WTP (Future)							32
Dorsey Road WTP	3.3	3.3	3.3	3.3	3.3	3.3	
Stevenson Road SCW	0.9	0.9	0.9				
<i>Zone Total</i>	4.2	4.2	4.2	3.3	3.3	3.3	32
Crofton 290 / Kings Heights Odenton 330							
Crofton Meadows II WTP	15	15	15	20	20	20	28
Airport Square 350							
Telegraph Road SCW	1	1	1				
<i>Zone Total</i>	16	16	16	20	20	20	28
<i>Total Capacity for Combined Zones</i>	39.8	47.2	47.2	50.3	51.3	51.3	96
Additional Supply Needed⁵	9.6	2.8	0	0	2.3	4.4	0
Independent Pressure Zones							
Broad Creek WTP	4	4	8	8	8	8	11
Gibson Island WTP	0.3	0.3	0.3	0.3	0.3	0.3	0.6
Herald Harbor WTP	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Rose Haven WTP	0.25	0.25	0.25	0.25	0.25	0.25	0.25
<i>Total Capacity for Independent Zones</i>	5.15	5.15	9.15	9.15	9.15	9.15	12.45

Notes: 1. 2010, 2015 and 2020 Based on Actual Annual Production and Water Purchases from Baltimore City with Max Day Factors applied. 2. 2025 Interpolated using Actual 2020 and Projected 2030 Demands. 3. 2030 and 2035. Projected Demands from Figure 3-2. 4. Buildout Demand Projection and Water. Supply Source information from 2016 Water Strategic Plan. 5. See Section 3.3.2 for information regarding the County's evaluation of alternative supply sources.

Supply Capacity Brought Online

Supply Capacity Taken Offline

3.5.3.1.9 *Rose Haven*

The Rose Haven WTP is in the Rose Haven 130 Zone. The facility has a current treatment capacity of 0.25 MGD with a projected buildout demand of 0.19 MGD. Treatment consists of chlorination and fluoridation.

3.5.3.1.10 *Self-Contained Wells*

The County currently operates two self-contained wells (SCWs), Telegraph Road and Stevenson Road. These SCWs are both located in the Glen Burnie High 295 Zone and the treatment provided at both locations includes disinfection and fluoridation. Permits continue to be maintained at some of the "out of service" facilities, in the event that they are reactivated in the future.

Table 3-8 Status of Self Contained Wells

Self-Contained Well	Pressure Zone	Capacity (MGD)	Out of Service Due to Radium Level	Comments
Glendale	220	0.79	Yes	To Be Demolished
Elvaton Road	220	0.86	No	Stand-by facility
Phillip Drive	220	0.86	Yes	Out of Service
Stevenson Road	295	0.64	No	
Telegraph Road	295	0.96	No	

3.5.3.1.11 *Millersville WTP (Future/Buildout)*

The 2016 WSP demonstrated that maximum day demands could be met through 2030 using the existing treatment plants with expansion and the existing connections to Baltimore City. However, under buildout demands, additional supply is needed, particularly if water from Baltimore City is no longer used to supplement the County's water supply. The 2016 WSP recommended building a centralized 32.0 MGD Millersville WTP to provide supply for the increased demands at buildout. Prior to construction of the new Millersville WTP, it is recommended that full expansion of Arnold WTP be completed. The expansion of this plant will delay the need for Millersville WTP, because excess supply from Arnold WTP can be conveyed to Glen Burnie High through the Dorsey BPS. Secondly, it is envisioned that the Crofton Meadows II WTP would also be fully expanded before the new Millersville WTP would be required.

While the new treatment plant will need to expand to 32.0 MGD at buildout, in practice the plant would likely be constructed in multiple phases as the demand in the County increases. The project will also require multiple transmission projects connecting the new plant to the distribution system. These projects would likely be phased to allow for progressive expansion of the treatment plant. Additional information on the transmission main projects can be found under Section 3.5.3.2 Transmission System. Since this project will not be needed until buildout, phasing of the plant construction and associated transmission mains will be subject to the rate and location of demand growth, regulatory requirements, and supply conditions in the future.

The construction of a new Millersville WTP and associated transmission mains will be a significant undertaking for the County in terms of both cost and construction scheduling. Prior to start-up and after future expansions of the plant, several large transmission mains will need to be built to bring raw water to the new plant and to discharge water into the distribution system. The permitting, design, and construction of the new plant itself could also potentially take several years to complete. The following presents a potential construction sequence of the Millersville WTP improvements, which will ultimately be based on

the location and rate of demand growth and the decision to reduce withdrawals from Baltimore City connection points.

Phase I: Construct the Millersville WTP with treatment capacity sufficient to treat localized wellfield withdrawals (approximately 10.0 MGD); leaving adequate space for future expansions. The withdrawals from this location may be limited due to the surrounding wellfields. The available production from this location will need to be verified at a future date closer to anticipated construction.

Phase II: Construct a single raw water pipeline from Crownsville wellfield to Millersville WTP and expand Millersville WTP to treat approximately 24.0 MGD. The primary driver for initial plant construction will be the Glen Burnie High and Low demands as well as the amount of withdrawals from Baltimore City. If both the demand in Glen Burnie Low increases, and supply from Baltimore City into the Glen Burnie High Zone is reduced, the resulting demand will drive this additional expansion of Millersville. Furthermore, growth in Airport Square and the reduction or elimination of the Nursery Road connection will also drive this expansion.

Phase III: Expand the well fields and construct a second raw water pipeline. Expand Millersville WTP to approximately 32.0 MGD. The need for this expansion will be driven by demands in Kings Heights, Jessup, Maryland City, and Airport Square.

3.5.3.2 Transmission System

North-South Transmission Main

The 1989 and 2003 strategic plans focused development of two main arteries for conveying water from Crofton to Glen Burnie and from Arnold to Glen Burnie. These two north-south arteries allow additional supply from groundwater sources to be conveyed from the southern pressure zones to the northern pressure zones, reducing dependency on Baltimore City. Proposed East-West distribution mains in the 220, 295, and 350 Zones will further increase the hydraulic linkage within the system allowing water to more freely move from the Crofton Meadows and Arnold to the northern pressure zones.

Arnold to Glen Burnie Transmission Main

The Arnold to Glen Burnie transmission system includes approximately 57,000 feet of 36-inch water main that begins at the Arnold WTP and continues along College Parkway to Ritchie Highway. The alignment continues north along the Ritchie Highway corridor to Mountain Road where it terminates with a connection to an existing 30-inch main. This transmission main allows the 16.0 MGD Arnold WTP to convey up to approximately 13.6 MGD (average day) and 11.6 MGD (max day) to the Glen Burnie Low 220 Zone based on projected demands from the 2016 WSP.

Crofton Meadows Transmission Mains (Fort Meade Private/Jessup/Maryland City/Glen Burnie High/Airport Square)

The Crofton Meadows to Disney Road transmission system includes 53,000 feet of 36-inch water main from the Crofton Meadows II WTP to Disney Road BPS, 5,000 feet of 30-inch water main along Disney Road from the BPS to MD Route 175 and 2,000 feet of 24-inch water main along MD Route 175 from Disney Road to Rockenbach Road. With the completion of these projects, the Crofton Meadows II WTP now supplies water to the northern and western zones of the County. The 2016 WSP proposed that a large transmission main be constructed along MD 32 to MD 198 from the 36-inch Disney Road transmission main. The project would provide a redundant supply to the Maryland City 369 Zone from the Crofton Meadows II

WTP. CIP project W801600 has been initiated for this effort. This CIP project consists of approximately 22,000 feet of 24-inch water transmission main from MD 175, along MD 32 towards MD 198 in the Maryland City 369 Zone. In order to boost water pressure from the Crofton Meadows II WTP (330 pumps) the proposed Laurel Heights BPS would need to be constructed in the Maryland City (369 Zone).

East West Transmission Main

With the completion of the 36-inch transmission main from Arnold to Glen Burnie Low, there is additional capacity in the Glen Burnie Low 220 zone. However, there are limitations in the system for moving supply from this zone to the Airport Square and Glen Burnie High Zones. Dorsey Road BPS is centrally located to send flow to these zones; however, it is hampered in its ability to pump due to limitations on the suction side. Operating Dorsey WTP as a BPS creates a large demand in the northwest corner of the Glen Burnie Low pressure zone. High velocities and head losses result in this area due to the limited transmission available. Water will drain from the Crain Highway and Old Mill tanks in order to send water to Dorsey.

The 2016 WSP recommended constructing transmission mains to help improve the transmission of water from the Glen Burnie 220 zone to the Glen Burnie High 295 and Airport Square 350 zones by 2030. The proposed transmission mains also improve efficiency of the system and promote more regular fill drain cycles in the elevated tanks. The proposed improvements include:

- a) 24-inch transmission main from the Arnold to Glen Burnie Low 36-inch transmission main near its intersection with MD Route 100, crossing MD Route 2 near the Elvaton ET connecting to the proposed 30- inch transmission main below.
- b) 30-inch transmission main along MD Route 100 between Elvaton Road and Crain Highway, then south along Crain Highway toward Crain Highway ET.
- c) 36-inch transmission main from Crain Highway ET to Dorsey Road BPS, approximately 11,000 feet.
- d) Construction of 7.0 MGD BPS at Dorsey Road to boost to the Airport Square 350 zone and a 24-inch transmission main to send this flow to Airport Square zone, approximately 22,000 feet.

Broad Creek to Annapolis Neck Transmission Main

The 2016 WSP proposed that a 20-inch transmission main be constructed from the Broad Creek area to the Annapolis Neck area beyond the 2030 time frame.

Millersville WTP (Future) Transmission Mains

The proposed Millersville WTP at buildout will require multiple transmission mains to connect the new plant to the distribution system. The construction of these transmission mains will be a significant undertaking for the County in terms of both cost and construction scheduling. These mains are required to bring raw water to the new plant and to discharge water into the distribution system.

Raw Water Mains: As discussed in Section 3.3.2, the groundwater supply in the Southern and Eastern parts of the County is more plentiful than in the Northern section of the County. This is the main reason for running the raw water mains to the Millersville WTP from the Crownsville wellfield. However, in an effort to limit the expansion of the pressure zones into unserved areas, only raw water mains, not distribution mains, will be constructed between the Millersville WTP and the Crownsville area.

Transmission Mains: There are several large transmission mains required to distribute flow from the Millersville WTP. These transmission mains will form the spine of the distribution network and should be phased in based on demands. There are four main transmission mains that send flow from Millersville.

Glen Burnie High South Main: Construct a 48-inch main to supply the southern area of Glen Burnie High pressure zone. The need for this project (and the initial plant construction) will be driven by the growth in Glen Burnie High and Glen Burnie Low pressure zones. However, as demand increases in the Glen Burnie Low pressure zone, less water will be available in the zone to supply the Glen Burnie High pressure zone via the Dorsey BPS, driving the need for an additional supply.

Airport Square/Glen Burnie High North Main: These proposed improvements require that the Glen Burnie High South Main be constructed. The 20-inch transmission main will be constructed from the Dorsey Road BPS area to the Glen Burnie High North area. This improvement also requires additional modifications to the Dorsey Road BPS to boost flow from Millersville WTP to the Airport Square pressure zone. Growth in the Glen Burnie High, Glen Burnie Low and Airport Square pressure zones, will drive the need for the plant expansion and these projects which will provide transmission from the plant to the distribution system. This will provide a direct conduit from the Millersville WTP to the northern area of Glen Burnie High pressure zone and the Dorsey BPS.

Kings Heights/Jessup/Maryland City Main: Construct a 24-inch main from Millersville WTP to the Disney Road BPS 36-inch transmission main that also feeds the proposed Laurel Heights BPS. This expansion may be driven by the demand growth in any of the zones supplied by the pump stations (Airport Square, Jessup, Maryland City) or by the growth of Kings Heights itself. Additionally, the main will provide redundancy to these pressure zones as well.

Glen Burnie Low Main: Construct a 30-inch main from the Millersville WTP to the Glen Burnie Low pressure zone. Demand will exceed supply in this pressure zone by 3.0 MGD at buildout if no connection is made. There are also potential low pressure areas along the Glen Burnie High/Low border during peak hours at buildout without additional supply. The connection would also provide recommended redundancy to the zone.

3.5.3.3 Aquifer Storage and Recovery

In order to meet future peak demands and provide additional storage during periods of increased need, the County is evaluating Aquifer Storage and Recovery (ASR). The program will include a pilot and potential full-scale implementation of an Aquifer Storage and Recovery (ASR) well program. ASR wells will be designed and located to provide system resiliency and address deficiencies during certain operational scenarios such as peak demands and emergency storage. Proposed well locations will be based on a preliminary optimization that includes a number of factors, such as proximity to the existing water distribution system and the ability to reduce deficits. ASR well operation will also be designed for trimming peak demands during high demand periods of the year. This program will take several years to develop before full ASR well system operation. Incremental benefits will be realized after each well in the program is brought on-line. A critical challenge for the program will be meeting regulatory needs and concerns.

3.6 Water Pressure Zone Descriptions

As the County's water distribution system has developed, interconnections have been constructed that essentially connect all served areas, excluding Broad Creek, Gibson Island, Herald Harbor and Rose Haven. Therefore, although water may be produced at a specific point, it is widely distributed throughout the County. The water pressure zones, sub-zones and the City of Annapolis are listed in Table 3-9. For each pressure zone, storage tank overflow elevations (OFE) and the County design criteria for the maximum first floor elevation (FFE) are also included. Table 3-10 lists the existing and future required water system storage tanks by pressure zone, along with the capacity and proposed year of construction, based on future demand projections.

Table 3-9 Anne Arundel County Water Pressure Zones

Water Pressure Zones	OFE* (feet)	Max FFE* (feet)	Water Pressure Sub-Zones	Gradient (feet)	Max FFE* (feet)	Major Private Systems within Pressure Zones ¹
Airport Square	350	230				The Provinces; Lake Village
Broad Creek	210	90	Heritage Harbor	285	150	
Broadneck / Glen Burnie Low	220	100				
Brooklyn Park North ²	210	90				
Crofton	290	170				
Gibson Island	160	40				
Glen Burnie High	295	175				
Herald Harbor	240	120				
Jessup	400	280				The Provinces
Kings Heights/ Odenton	330	210	Millersville	360	240	Pioneer City; Still Meadows; Fort Meade ³
Maryland City	369	250				Fort Meade ³
Rose Haven	130	10				
City of Annapolis - not served by County	173	--				

Notes: * OFE = Overflow Elevation; FFE = First Floor Elevation (recommended). 1. Major private systems considered greater than 0.1 MGD 2. Currently supplied by the Glen Burnie High PZ, but can be supplied by Baltimore City if necessary. 3. The Fort Meade Private Water System is located between the Maryland City 369 Zone and the Kings Heights/Odenton 330 Zone. This system is divided into a north 391 Zone and a south 288 Zone

Table 3-10 Water System Storage Facilities

Water Pressure Zone / Facility	200 ft Map	Existing Capacity (MG)	Proposed Capacity (MG)	Proposed Year to Construct ¹	Total Capacity At Build-Out (MG)
Airport Square 350 Zone					
Arundel Mills ET	F7	2.00			2.00
Disney Road ET	G9	2.00			2.00
Andover ET			1.00	2030+	1.00
Ridge Road ET			2.00	2030+	2.00
<i>Total for Zone</i>					7.00
Broad Creek 210 Zone					
Broad Creek ET	Q20	0.50			⁴
Broad Creek II WTP GST	Q20	3.00			3.00
Central Avenue ET	P24	0.75			0.75
Generals Highway ET	Q19	2.00			2.00
Annapolis Neck ET			1.00	2030+	1.00
<i>Total for Zone</i>					6.75
Heritage Harbor (Subzone of Broad Creek)					
Heritage Harbor HPT	P20	0.012			⁴
Heritage Harbor ET			1.00	2024	1.00
<i>Total for Subzone</i>					1.00
Broadneck 220 Zone					
Amberly ET ²	V17	0.50			⁴
Arnold ET	T16	1.00			1.00
Arnold WTP GST	U16	3.00			3.00
Belvedere SP ²	T14	0.10			⁴
Anne Arundel Community College ET			1.00	2030+	1.00
Cape Saint Claire ET			2.00	2030+	2.00
<i>Total for Zone</i>					7.00
Glen Burnie Low 220 Zone					
Crain Highway ET	L8	1.00			1.00
Jacobsville ET	R9	2.00			2.00
Jumpers Hole ET	O12	1.00			1.00
Old Mill ET	M9	1.00			1.00
Severndale WTP GST	P13	3.00			3.00
Elvaton ET	O10	2.00			2.00
Fort Smallwood Road ET	S9	2.00			2.00
Freetown ET			2.00	2030+	2.00
<i>Total for Zone</i>					14.00
Crofton 290 Zone					
Crofton Meadows II WTP GST	J17	2 @1.50			3.00
Crofton Meadows ET	J17	1.00			1.00

Water Pressure Zone / Facility	200 ft Map	Existing Capacity (MG)	Proposed Capacity (MG)	Proposed Year to Construct ¹	Total Capacity At Build-Out (MG)
Crofton Sphere ET	J19	0.50			0.50
<i>Total for Zone</i>					4.50
Gibson Island 156 Zone					
Gibson Island GST	W13	0.23			0.23
<i>Total for Zone</i>					0.23
Glen Burnie High 295 Zone					
Bay Meadow ET ²	N5	0.50			⁴
Ferndale SP	L5	0.50			⁴
Hammonds Lane GST	M3	1.50			1.50
Linthicum ET	K4	1.50			1.50
Millersville ET	M11	2.00			2.00
Shipleys ET	H7	2.00			2.00
Belle Grove ET			2.00	2025	2.00
Millersville WTP GST			TBD	2030+	³
<i>Total for Zone</i>					9.00
Herald Harbor 240 Zone					
Herald Harbor ET	O15	0.50			0.50
<i>Total for Zone</i>					0.50
Jessup 400 Zone					
Jessup ET	F7	2.00			2.00
<i>Total for Zone</i>					2.00
Kings Heights / Odenton 330 Zone					
Kings Heights ET	I13	1.00			1.00
Piney Orchard ET	H13	2.00			2.00
Waugh Chapel ET	I16	2.00			2.00
Two Rivers ET	F16	1.00			1.00
Kings Heights II ET			1.00	2030+	1.00
<i>Total for Zone</i>					7.00
Millersville BPS (Subzone of 330)					
Millersville HPT	I12	0.008			.0008
Maryland City 369 Zone					
Maryland City ET	B12	1.50			⁴
Bacontown ET			2.00	2025	2.00
Maryland City ET (Replacement)			2.00	2030+	2.00
<i>Total for Zone</i>					4.00
Rose Haven 130 Zone					
Rose Haven ET	R39	0.25			0.25
<i>Total for Zone</i>					0.25

Notes: 1. Proposed construction years to be re-evaluated in the next Strategic Plan. 2. Tank is submerged (below hydraulic grade of zone) and is therefore out of service. 3. Tank size to be determined. 4. Tank to be replaced or abandoned. Legend: BPS = Booster Pump Station, ET = Elevated Tank, GST = Ground Storage Tank, HPT = Hydropneumatic Tank, SP = Standpipe, WTP = Water Treatment Plant

3.6.1 Airport Square 350 Water Pressure Zone

3.6.1.1 General Description

The Airport Square 350 water pressure zone is situated in the northwestern portion of the County and encompasses approximately 12,516 acres of land. The area currently served within the 350 pressure zone is generally bounded by Aviation Boulevard to the east; Howard and Baltimore Counties to the west; Baltimore County to the north; along Dorsey Road and then meandering south along the 295, 330, and 400 pressure zones. The zone includes the Baltimore Washington Thurgood Marshall International Airport (BWI), the community of Hanover, Arundel Mills Mall, and portions of Jessup and Severn including the residential communities of Dorchester, the Provinces and Meade Village.

The topography of the area varies from elevation 0 to 264 feet, while piping elevations range from 13 to 257 feet indicating those elevations currently served. Static pressures generally range from 150 psi to over 50 psi. According to the County's design criteria, the highest ground elevation that can be served from the 350 Zone is 230 feet without providing supplemental means of pressure.

3.6.1.2 Projected Population Growth and Demands

The population is projected to increase by 4,387 people over the 2016 WSP planning period as shown in Table 3-3. According to the County's GDP Land Use Plan, industrial uses are planned around BWI and the remaining areas are planned primarily for low- to medium-density residential uses.

As shown in Table 3-2, the average and maximum day demands in the Airport Square 350 Zone were projected at 5.82 MGD and 9.6 MGD, respectively, at buildout in the 2016 WSP. See Table 3-2 for demand projections for this pressure zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.1.3 Groundwater Pumping and Water Treatment Facilities

There is no water production capability within the 350 pressure zone. Typically, water servicing the zone is received from the Glen Burnie High 295 Zone via the Harmans BPS located at the intersection of Dorsey Road and Ridge Road and the Kings Heights/Odenton 330 Zone via the Disney Road BPS. Although not currently used, the County also has two "temporary" BPSs on Aviation Boulevard and Andover Road which can be used if needed to further supplement the water supply to the 350 Zone from the 295 Zone. In an emergency, water can also be provided by the City of Baltimore via a connection at the Nursery Road BPS on Hammonds Ferry Road. (The source within Baltimore City is the Ashburton WTP Second Zone, which supplies a reservoir that operates at a maximum hydraulic gradient elevation of 355 feet).

3.6.1.4 Storage and Distribution Facilities

The transmission and distribution system in the 350 Zone consists of approximately 93 miles of pipelines that range in diameter from 6 to 36 inches. There are two 2.0 MG elevated tanks in this zone, the Arundel Mills ET on Race Road and the Disney Road ET. With the completion of the Disney Road BPS in 2015, the 330 zone pumps at the expanded Crofton Meadows WTP now supply the southern region of the Airport Square 350 Zone at the Disney Road BPS. Water from the 350 Zone can also be boosted to the Jessup ET (400 Zone) by the Montevideo BPS.

3.6.1.5 Strategic Plan for Infrastructure and Capital Improvements

The primary challenge for this zone will be the lack of supply to the pressure zone. Currently the zone is supplied by Harmans BPS and Disney BPS, with Nursery Road available if needed. As the County continues to minimize the use of supply from Baltimore, an alternate source of water in the northern region of the zone will eventually be necessary as well as associated transmission to convey flow where it is needed. A

list of the current water capital projects can be found in Table 3-18 at the end of this chapter. More detailed information regarding the individual projects listed below can be found in the 2016 WSP.

2020/2030 Improvement Projects:

- a) Construct approximately 3,400 feet of 12-inch diameter pipe in the Hanover Road corridor, resulting in improved fire flow and water quality by eliminating existing dead ends at Corporate Center Drive and near the intersection of Ridge and Hanover Roads.
- b) Construct transmission and BPS improvements to convey water from the Glen Burnie Low Zone to the Airport Square Zone. These projects include providing additional transmission to Dorsey, constructing a new larger suction line, adding a discharge line from Dorsey to tie into the Airport Square, and either retrofitting or constructing a new Dorsey BPS.

Buildout Improvement Projects:

- a) Construct upgrades to the Dorsey BPS to convey water directly from the proposed future Millersville WTP to Airport Square Zone.
- b) Construct 3.0 MG of additional storage as required for the Airport Square pressure zone at build-out. Two future elevated tanks are shown on the maps: 2.0 MG Ridge Road Tank, proposed near Ridge Road and Corporate Center Drive, and a 1.0 MG Andover Tank, near the Andover Recreational Area along Andover Road.
- c) Construct approximately 1,000 feet of 12-inch pipe that will connect two dead end pipes on Magellan Road and Ridge Road. This pipe will increase transmission capacity from the Disney Road BPS to the northern part of the pressure zone.

3.6.2 Broad Creek 210 Water Pressure Zone

3.6.2.1 General Description

The Broad Creek 210 water pressure zone is situated in the central portion of the County surrounding the City of Annapolis and encompasses over 13,403 acres of land, not including the City of Annapolis. The area currently served within the 210 pressure zone is generally bounded by the City of Annapolis to the east, South Haven Road and St. George Barber Road at Riva Road to the west, Defense Highway and Bestgate Road to the north and South River Colony to the south. Figure 3-1 shows the 210 Zone in relation to the other pressure zones.

The topography of the area varies from elevation 0 to 156 feet, while piping elevations range from 2 to 144 feet indicating the elevations served within the zone. Static pressures generally range from 85 psi to 35 psi. Overflow elevation of the elevated storage tank is currently 210 feet with a low water elevation equal to 170 feet. According to County design criteria, the highest ground elevation that can be served from the 210 Zone is 90 feet without providing supplemental means of pressure. There are areas with elevations exceeding 90 feet located along Bestgate Road, Severn Grove Road, the Rolling Knolls area, and South River Colony, some of which require individual booster pumps. Much of the Heritage Harbor peninsula is also above the 90 feet elevation so this "sub-zone" operates at a 270 feet gradient by means of the Heritage Harbor Water BPS and hydro-pneumatic tank.

3.6.2.2 Projected Population Growth and Demands

The population in the Broad Creek Zone is projected to increase by 2,544 people over the 2016 WSP planning period as shown in Table 3-3. Planned growth will occur primarily in the Parole Town Center Growth Management Area (PGMA). The PGMA is designated as Town Center on the GDP Land Use Map, which includes commercial, office and high density residential uses. The Annapolis Town Center at Parole, a mixed-use development of condominiums, retail and office uses, is near completion. Additional commercial development and redevelopment is planned along MD 2 in Edgewater, along Riva Road and generally in the Parole Town Center. Small amounts of infill development will occur throughout the remaining areas of the pressure zone planned for low- and low-medium density uses.

As shown in Table 3-2, the average and maximum day demands in the Broad Creek 210 Zone are projected at 5.93 MGD and 11.0 MGD, respectively, at buildout, as calculated for the 2016 Strategic Plan. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.2.3 Groundwater Pumping and Water Treatment Facilities

The Broad Creek I and II WTPs provide water to the 210 pressure zone and are located along Harry S. Truman Parkway adjacent to MD 50. A total of five groundwater wells supply either plant, which combined, have a treatment capacity of 10.88 MGD. The Broad Creek I WTP is a stand-by facility that can be used, as needed, to meet peak demands throughout the year. Treatment capacity of the Broad Creek II WTP is rated at 8.0 MGD. Treatment provided includes aeration, pre-chlorination, chemical addition, coagulation sedimentation, fluoridation, disinfection and filtration. See Section 3.5.3.1.3 for more details on the Broad Creek WTPs.

3.6.2.4 Storage and Distribution Facilities

The transmission and distribution system in the 210 Zone consists of approximately 121 miles of pipelines that range in diameter from 6 to 20-inch. Existing storage and distribution facilities in the zone include the Heritage Harbor Water BPS and 12,000 gallon hydro-pneumatic tank, the Central Avenue 0.75 MG elevated tank, the Broad Creek 0.5 MG elevated tank, the 2 MG Generals Highway ET and 3.0 MG of ground storage at the Broad Creek II WTP. See Table 3-10 for more information on existing and future required storage tanks for this zone.

3.6.2.5 Strategic Plan for Infrastructure and Capital Improvements

Minimal transmission main improvements are proposed for Broad Creek in the near term. The improvements are proposed to increase fire flow capacity and provide adequate storage for the pressure zone. The 2016 WSP projects that the maximum day demand will nearly double from baseline conditions at buildout. This will result in a significant need for increased transmission in the future. A list of the current water capital projects can be found in Table 3-18 at the end of this chapter. More detailed information regarding the individual projects listed below can be found in the 2016 WSP.

2020/2030 Improvement Projects:

- a) Construct 500 feet of 8-inch main in Annapolis Landing and 1,500 feet of 8-inch main in Rolling Knolls, connecting two dead-ends in both cases, to improve available fire flows in the area.
- b) Construct a 1-MG elevated tank to provide adequate storage to the Heritage Harbor subzone. It is currently proposed that this tank be located at the existing Broad Creek Tank Site, as it is expected to be taken out of service in the future.
- c) Construct pump improvements within the Broad Creek WTP to pump directly to the Heritage Harbor hydraulic gradient from the WTP, rather than using the Heritage Harbor BPS.

- d) Construct 2,000 feet of new 8-inch transmission main from the plant to serve Broad Creek 210 customers west of the plant. This would allow the 16-inch transmission line headed to Heritage Harbor to be converted to the 270 gradient.
- e) Construct approximately 200 feet of 36-inch pipe parallel to the existing Broad Creek WTP discharge main, reducing discharge restrictions and to provide adequate capacity for the future planned expansion of the Broad Creek WTP to 11.0 MGD.

Buildout Improvement Projects:

- a) Construct a 16-inch main along Mayo Road to complete the loop between MD Route 3 and Central Avenue.
- b) Construct 4,000 feet of 20-inch transmission main parallel to existing transmission mains north of MD Route 665 (along Solomons Island Road and Forest Drive and connecting to Riva Road) to provide sufficient capacity to convey flow from the future expanded plant to serve the increased demands in the northern part of the zone and the Annapolis Neck region.
- c) Construct 26,000 feet of 20-inch transmission main that will connect the Annapolis Neck area to the primary Broad Creek service area. The line will run through Annapolis, but is not expected to be connected to the Annapolis City distribution system.
- d) Construct a 1-MG Annapolis Neck tank to provide fire flow storage and redundancy if this isolated region is served in the future.
- e) Construct 19,000 feet of 16-inch pipe and 4,000 feet of 20-inch pipe from the Broad Creek WTP, along Harry Truman and MD Route 2 south to Mayo Road, to increase the overall transmission in the pressure zone. The size, length and priority of this project will be driven by the rate of demand growth in the area in the future.
- f) Expand the Broad Creek WTP to provide a total supply of 11.0 MGD in order to adequately supply buildout demand in this pressure zone.

3.6.3 Broadneck/Glen Burnie Low 220 Water Pressure Zone

3.6.3.1 General Description

The Broadneck/Glen Burnie Low 220 water pressure zone is the largest pressure zone within the County's public water system. It encompasses approximately 46,548 acres of land and extends from Pasadena to the Broadneck peninsula. The Broadneck and Glen Burnie areas of the overall 220 pressure zone are described below. Figure 3-1 shows the Broadneck/Glen Burnie 220 Zone in relation to the other pressure zones.

Broadneck 220 Zone (General Description)

The Broadneck 220 water pressure zone is situated in the eastern central portion of the County. Division valves located at Old County Road and Round Bay Road separate the Broadneck 220 Zone from the Glen Burnie Low 220 Zone. The Broadneck Zone is generally described as the Broadneck peninsula south of Cypress Creek. It includes the communities of Arnold and Cape Saint Claire as well as the Anne Arundel Community College's main campus and the David Taylor Naval Research Center.

The topography of the area varies from elevation 2 to 155 feet, while piping elevations range from 3 to 148 feet indicating those elevations served within the zone. Static pressures generally range from 85 psi to 30 psi. Overflow elevation of the elevated storage tank is 220 feet. According to the County's design criteria, the highest ground elevation that can be served from the Broadneck 220 Zone is 100 feet without providing supplemental means of pressure. There are areas with elevations exceeding 100 feet located

throughout the pressure zone. The 2016 WSP includes some piping improvements for improved fire flow and transmission throughout the zone.

Glen Burnie Low 220 Zone (General Description)

The Glen Burnie Low water pressure zone is situated in the north central portion of the County. The pressure zone is generally bounded by Cypress Creek to the south, the Severn River and MD 3 to the west, Lake Shore to the east and Baltimore City to the north. It includes the communities of Severna Park, Pasadena, Harundale and the Glen Burnie Town Center.

The topography of the area varies from elevation 0 to 167 feet, while piping elevations range from 4 to 136 feet indicating those elevations served within the zone. Static pressures generally range from 95 psi to 40 psi. Overflow elevation of the elevated storage tank is 220 feet. According to the County's design criteria, the highest ground elevation that can be served from the 220 Zone is 100 without providing supplemental means of pressure.

3.6.3.2 Projected Population Growth and Demands

Population within the Broadneck/Glen Burnie Low Zone is projected to increase by 14,144 people over the 2016 WSP planning period as shown in Table 3-3. The majority of land within the pressure zone is planned for low to low-medium residential use, with some rural land use densities planned in the southern portions of the Broadneck peninsula. Higher density residential uses are planned in the Harundale area and in Glen Burnie. Industrial uses are designated along Marley Neck Boulevard and Fort Smallwood Road. In addition, two large residential developments, Tanyard Cove and Tanyard Springs, are near completion in the Marley Neck area. Additional infill development will occur along Solley Road in Pasadena and in Severna Park and Broadneck. New industrial and office uses may develop in the Marley Neck area. Redevelopment and commercial revitalization are planned in the Glen Burnie Town Center, the Riviera Beach business district along Fort Smallwood Road, the Mountain Road business corridor, the Sun Valley/Jumpers Hole Road commercial area in Pasadena and in the Severna Park business area along Ritchie Highway.

As shown in Table 3-2, the average and maximum day demands for the combined Broadneck/Glen Burnie 220 zone are projected at 24.45 MGD and 39.0 MGD, respectively, at buildout in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.3.3 Groundwater Pumping and Water Treatment Facilities

Broadneck 220 Zone (Groundwater and Treatment)

There is one water treatment plant in the Broadneck 220 pressure zone. The Arnold WTP, located along Jones Station Road, has a rated plant capacity of 16.0 MGD. Treatment provided includes aeration, pre-chlorination, chemical addition, coagulation, sedimentation, fluoridation, disinfection and filtration.

The old Amberley WTP, located along St. Margaret's Road and MD 50, has been out of service for many years and is scheduled for demolition.

Glen Burnie Low 220 Zone (Groundwater and Treatment)

There are two water treatment plants serving the Glen Burnie Low 220 pressure zone: the Severndale WTP and the Harundale WTP. The Severndale WTP is located near Benfield Road along Southway in the community of Severndale. The plant has a rated treatment capacity of 8.0 MGD. Treatment provided includes aeration, pre-chlorination, chemical addition, sedimentation, fluoridation, disinfection and filtration.

The Harundale WTP, located at the end of East Way in Harundale has a rated treatment capacity of 2.1 MGD; however, due to high radiation levels, production is limited to one quarter per year which cuts this capacity by 75%. Treatment provided includes aeration, pre-chlorination, chemical addition, sedimentation, disinfection and fluoridation.

There are three SCWs in the Glen Burnie Low 220 Zone, but they are not currently in service. The Elvaton SCW, located on Elvaton Road near Wende Way in Glen Burnie, is a standby facility and has a rated capacity of 0.86 MGD. Due to high radiation levels, production is limited to one quarter per year which cuts this capacity by 75%. The Glendale SCW, located between Delaware and Bunch Avenues in Glen Burnie, is no longer used and is scheduled for demolition. The Phillip Drive SCW, located in Glen Burnie is out of service.

3.6.3.4 Storage and Distribution Facilities

Broadneck 220 Zone (Storage and Distribution)

Existing water storage and distribution facilities of the zone include the Arnold 1.0 MG elevated tank, the Arnold 3.0 MG ground storage tank and approximately 154 miles of water mains ranging in size from 6 to 36 inches. The 0.5 Amberley elevated tank and the 0.10 MG Belvedere standpipe are also located in the Broadneck zone, but they are out of service. The Arnold 3.0 MG ground storage tank is located at the Arnold WTP, and the Arnold elevated tank is located next to Arnold Elementary School off of Church Road. See Table 3-10 for more information on the existing storage tanks for this zone.

Glen Burnie Low 220 Zone (Storage and Distribution)

Existing water storage and distribution facilities of the zone include the Fort Smallwood BPS, and the six elevated tanks: Jacobsville, Elvaton and the newly constructed Ft. Smallwood 2.0 MG elevated tanks and Crain Highway, Old Mill and Jumpers Hole 1.0 MG elevated tanks. The Severndale WTP has a 3.0 MG ground storage tank. The distribution system network includes approximately 488 miles of pipelines that range in diameter from 6 to 54 inches. See Table 3-10 for more information on the existing storage tanks for this zone.

Additionally there are five active flow transfer points that receive/dischARGE flow from/to other zones:

- a) Although not currently used, the County has the ability to receive water from Baltimore City (Zone 1) via a connection at Fort Smallwood Road near the County/City border. Flow received from the City would be pumped through the Fort Smallwood BPS into the Glen Burnie Low 220 Zone. The BPS has historically been controlled by water levels in the Crain Highway or the Jacobsville Elevated Tanks.
- b) Under normal operating conditions, up to 3.3 MGD (normally 2.0 MGD) is sent to the Dorsey Road WTP from the 220 Zone via a 16-inch main by throttling a control valve at the Dorsey plant. Conversely, flow can be sent to the 220 Zone from the Dorsey plant via the same 16-inch main.
- c) The Shipley's BPS conveys approximately 1.7 MGD from the 220 Zone to Millersville ET in the 295 Zone.
- d) The Old Mill BPS / Control Valve can transfer water between the 295 and 220 zones as needed to meet demands.
- e) Quarterfield BPS, located near the intersection of Quarterfield Road and Pamela Drive, conveys approximately 1.8 MGD from the 220 Zone to the 295 Zone.

3.6.3.5 Strategic Plan for Infrastructure and Capital Improvements

Broadneck 220 Zone (Strategic Plan)

The Broadneck zone has several dead ends and small isolated sections which result in areas of low pressure and less than desirable fire flow conditions. As development occurs in these areas, private developers will be required to create loops and minimize unnecessary dead end mains. The County recently completed the first phase of a CIP project (W8012) creating a 12-inch loop along Old Mill Bottom Road and east along St. Margarets Road to Amberley. With the next phase of this project, a second 12 inch loop along St. Margarets Road, west of Old Mill Bottom Road will be completed. These loops will provide redundancy and improve pressure and fire flow for the St. Margarets area. The following additional improvements are also recommended.

2020/2030 Improvement Projects:

- a) Construct 3,000 feet of 12-inch pipe, completing the 12-inch loop along Baltimore Annapolis Boulevard, north of Joyce Lane and west of Ritchie Highway, to improve available fire flow in the area.
- b) Replace approximately 100 feet of 8-inch pipe with 12-inch pipe at the intersection of Moore Road and Taylor Avenue, for improved fire flow in the area.
- c) Construct 4,000 feet of 12-inch main to provide needed transmission and redundancy and to eliminate existing dead ends along St. Margaret's Road, west of Old Mill Bottom Road.

Buildout Improvement Projects:

- a) Expand the Arnold WTP to supply a total of 28.0 MGD, to meet future demand at buildout.
- b) Construct a 2 MG Cape St. Claire Tank to meet future demands.
- c) Construct 12,000 feet of 24-inch pipe, 2,800 feet of 20-inch pipe, 900 feet of 16-inch pipe, and 2,000 feet of 12-inch pipe along Jones Station, Bay Dale, Broadneck Road and College Parkway. These projects will increase transmission capacity east and west of the Arnold WTP and will provide additional transmission to and from the future Cape St. Claire ET.
- d) Construct 3,000 feet of 20-inch diameter pipe parallel to existing transmission mains along Church Road and Baltimore-Annapolis Boulevard to reduce high velocities/ headlosses in the area.
- e) Construct 5,000 feet of 16-inch diameter pipe along College Parkway to increase transmission capacity to the northern area of the Broadneck zone and to facilitate flow to/from the proposed Anne Arundel Community College (AACC) Tank.
- f) Construct a 1.0 MG elevated storage tank at AACC to provide additional storage in the zone.
- g) Construct 8,000 feet of 12-inch diameter pipe, to complete a 12-inch loop and to provide increased transmission through an area that is currently served by private wells but may be served by the County in the future.

Glen Burnie Low 220 Zone (Strategic Plan)

In general, the improvements proposed in the Glen Burnie Low pressure zone have the common goal of increasing the overall transmission in the zone. This is accomplished by primarily providing the transmission necessary to convey water from East to West and from the South to North, which will minimize reliance on Baltimore City supply and create the backbone of the distribution system to facilitate the movement of water from existing and future County-supplied sources.

2020/2030 Improvement Projects:

- a) Construct 400 feet of 6-inch diameter pipe, completing the loop between Point Somerset Lane and Ridge Road, to improve available fire flow in the Point Somerset community.
- b) Construct 600 feet of 6-inch pipe, creating a loop between the existing dead ends at Butternut and Windfern Courts, to improve fire flow in the Shipleys Choice community.
- c) Construct 16,000 feet of 24-inch transmission main interconnecting the Elvaton, Old Mill, and Crain Highway Tanks, which will allow the tanks to float together based on the hydraulic grade in the pressure zone.
- d) Construct a 400-foot section of 16-inch diameter pipe and associated valves that will provide increased transmission from Severndale WTP to the eastern region of Glen Burnie Low. This project would provide the ability to isolate the existing east-west piping from the existing 36-inch transmission main from Arnold WTP to the northern portion of the zone. A CIP project has been initiated for this project and is currently in the Contract Documents phase.
- e) Expand Shipley's Choice BPS pumping capacity to 2.0 MGD. This will provide a more stable system pressure and Millersville Tank operations once the Old Mill BPS/PRV is taken out of service.
- f) Construct 4,000 feet of 24-inch and 7,000 feet of 36-inch diameter piping beginning near Crain Highway and Hospital Drive and continuing along Old Stage Road up to the Dorsey WTP. The main is proposed to increase transmission capacity up to Dorsey where it will be pumped to additional zones.
- g) Construct 300 feet of 20-inch pipe, 400 feet of 24-inch pipe, and 4,500 feet of 30-inch pipe to interconnect the above noted 24-inch (c), 36-inch (f) transmission mains which will convey water from the Severndale area to Dorsey.
- h) Expand Arnold WTP to supply 20.0 MGD.
- i) Construct 200 feet of 24-inch transmission main required in order to convey adequate flow from the expanded Arnold plant to the Glen Burnie Low pressure zone.

Buildout Improvement Projects:

- a) Construct 12,000 feet of 24-inch transmission main along Ritchie Highway to provide additional transmission from Arnold to the northwest area of the Glen Burnie Low pressure zone. The project is recommended as demand in the zone increases and production from the Arnold WTP is maximized under buildout conditions.
- b) Construct 15,000 feet of 30-inch transmission main to connect the Glen Burnie Low zone directly to the proposed Millersville WTP.
- c) Construct a 2.0 MG tank located near the corner of Freetown Road and Spencer Road.
- d) Construct 8,000 feet of 20-inch main to run along Mountain Road, to address high headloss and velocity modeled under future conditions. This main is proposed to connect into the 36-inch Arnold transmission main that runs along Long Hill Road and terminates at the existing 30-inch main on Mountain Road east of Solley Road.

See Table 3-10 for more information on the existing and future required storage tanks. Table 3-18 at the end of this chapter lists the current water capital projects.

3.6.4 Brooklyn Park North (210) Water Pressure Zone

3.6.4.1 General Description

The Brooklyn Park system was previously divided into two pressure zones, North and South. The former Brooklyn Park South zone, south of Orchard Avenue has been incorporated into the Glen Burnie High water pressure zone. The Brooklyn Park North Zone is approximately 269 acres and is located in the northern portion of the County, bordering Baltimore City to the north and east and Orchard Avenue to the South. Figure 3-1 shows the Brooklyn Park Zone in relation to the other pressure zones.

Brooklyn Park North has ground elevations ranging from just 0 to 112 feet with pipe elevations ranging from 9 to 106 feet. The distribution system includes approximately 8 miles of pipelines that range in diameter from 4 to 20 inches. There are no storage facilities in the Brooklyn Park system. Brooklyn Park North is served by the Glen Burnie High pressure zone via four pressure reducing valves along the southern boundary. Although the County has not purchased water from Baltimore City for several years, there are still four meter locations along the border between the City and County. These connections have been maintained for emergency use. The meter locations are listed below:

- a) Levin Road Master Meter - 20-inch City-to-County supply from the Baltimore City second pressure zone can feed the Glen Burnie High 295 Zone.
- b) Second Avenue Master Meter - 12-inch City-to-County supply from the Baltimore City first pressure zone can feed the Brooklyn Park North Zone.
- c) Townsend Avenue Master Meter - 12-inch County-to-City supply can feed water from the Glen Burnie High Zone to the City Second Pressure Zone.
- d) Sixth Street Master Meter - 12-inch County-to-City supply can feed water from the Glen Burnie High Zone to the City second pressure zone.

3.6.4.2 Projected Population Growth and Demands

Population in the Brooklyn Park Zone is projected to increase by 232 people over the 2016 WSP planning period as shown in Table 3-3. Most of the land is developed, primarily with medium-density residential uses. Commercial uses are concentrated along the Ritchie Highway corridor. Most of the new growth will come from redevelopment and infill-development.

As shown in Table 3-2, the average and maximum day demands in the Brooklyn Park Zone are projected at 0.66 MGD and 1.20 MGD, respectively, at build-out. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.4.3 Strategic Plan for Infrastructure and Capital Improvements

The 2016 WSP recommended system improvements that would allow the Brooklyn Park pressure zones to be supplied by the Glen Burnie High Pressure Zone rather than by Baltimore City. The former Brooklyn Park South zone has been fully incorporated into the Glen Burnie High zone. The County has installed four pressure reducing valves (PRV) on the eastern portion of the boundary between the Brooklyn Park North and Glen Burnie High Zones. These PRVs now allow the Brooklyn Park North zone to also be supplied by the Glen Burnie High zone. The County also completed a capital project to install a PRV near Belle Grove Road and 10th Avenue. This provides an additional connection to the Glen Burnie High Zone on the west side of the Brooklyn Park North Zone.

3.6.5 Crofton 290 Water Pressure Zone

3.6.5.1 General Description

The Crofton 290 water pressure zone is situated in the west-central portion of the County. The area currently served within the 290 pressure zone is generally bounded by MD 3 to the west-northwest, Underwood Road to the east and MD 450 to the south. The area encompasses approximately 4,398 acres of land and consists primarily of the community of Crofton. Figure 3-1 shows the 290 Zone in relation to the other pressure zones.

The MD Route 3 corridor, north of Riedel Road, is also within the Crofton 290 zone. As this area is developed in the future, a 16-inch main will be required along MD Route 3 to ensure there is adequate fire flow at the northern edge of the pressure zone.

The topography of the area varies from elevation 28 to 203 feet, while pipe elevations range from 36 to 178 feet indicating those elevations served within the zone. Static pressures range from 100 psi to 50 psi. The overflow elevation of the elevated storage tanks is currently 290 feet with a low water elevation equal to 255 feet. According to the County's design criteria, the highest ground elevation that can be served from the 290 Zone is 170 without providing supplemental means of pressure.

3.6.5.2 Projected Population Growth and Demands

Population in the Crofton Zone is projected to increase by 3,179 people over the 2016 WSP planning period as shown in Table 3-3. Much of the pressure zone is developed with a mix of low-, low-medium, medium and high-density residential land uses. In addition, there are commercial and industrial uses along the MD Route 3 corridor. New development that will occur in the northern part of the pressure zone is planned for commercial and medium-density residential.

As shown in Table 3-2, the average and maximum day demands in the Crofton Zone are projected at 2.92 MGD and 3.9 MGD, respectively, at buildout in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.5.3 Groundwater Pumping and Water Treatment Facilities

There are two water treatment plants in the 290 pressure zone; the Crofton Meadows I and II WTP. Both WTP are located on the same site on Riedel Road near Chelmsford Drive. The Crofton Meadows I WTP is currently offline and scheduled to be abandoned. Total treatment capacity of the Crofton Meadows II WTP is 15.0 MGD. For a detailed description of the Crofton Meadows facilities, see Section 3.5.3.1.2.

3.6.5.4 Storage and Distribution Facilities

Existing water storage and distribution facilities of the zone include the 1 MG Crofton Meadows ET, two 1.5 MG ground storage tanks (3.0 MG total, which are shared with the 330 Zone), and the 0.5 MG Crofton Sphere. The distribution system consists of a 85-mile network of water mains that range in diameter from 6 to 42 inches. See Table 3-10 for more information on the existing storage tanks for this zone.

3.6.5.5 Strategic Plan for Infrastructure and Capital Improvements

The Crofton Meadows II WTP has provisions at the site to expand to 30.0 MGD, although per the 2016 WSP only 28.0 MGD is required for buildout. The Crofton Meadows II WTP would then be able to supply the following zones during maximum day conditions: Crofton (290), Kings Heights/Odenton (330), Maryland City (369), Jessup (400), and Airport Square (350) as needed. This expansion plan is consistent with the County's efforts to increase connectivity across pressure zones, increase reliability, consolidate facilities, and reduce reliance on Baltimore City. For a detailed description and strategic plan for the Crofton Meadows facilities, see Section 3.5.3.1.2.

The total volume of storage geographically located in the 290 Zone is 4.5 MG. However one of the two 1.5 MG ground storage tanks at the Crofton Meadows facility is theoretically allocated for the Kings Heights/Odenton 330 Zone even though the two ground storage tanks are hydraulically connected. For this reason, the theoretical storage capacity in the 290 Zone is 3.0 MG including the 0.5 MG Crofton Sphere, one 1.5 MG ground storage tank, and the existing 1.0 MG Crofton ET. The Waugh Chapel ET was constructed in the Kings Heights/Odenton Zone. The tank is located on Evergreen Road, west of MD Route 3 in Gambrills. With an overflow elevation of 330 feet, this ET will supply both the 290 and the 330 pressure zones. The tank will be connected hydraulically to the Crofton 290 zone via a pressure reducing valve planned near the intersection of MD Route 3 and Conway Road on Transportation Boulevard. See Table 3-10 for more information on the existing and future required storage tanks for this zone. For a list of water capital projects, see Table 3-18 at the end of this chapter.

3.6.6 Gibson Island 160 Water Pressure Zone

3.6.6.1 General Description

The Gibson Island 160 water pressure zone is situated in the east-central portion of the County at the mouth of the Magothy River. The area currently served within the 160 pressure zone is generally confined to Gibson Island and encompasses approximately 927 acres of land. Figure 3-1 shows the 160 Zone in relation to the other pressure zones. Gibson Island is primarily a residential community. However, the community includes a golf course and marina facilities which contribute to the overall water demand.

The topography of the area varies from elevation 0 to 132 feet, while piping elevations range from 5 to 128 feet indicating those elevations served within the zone. Static pressures generally range from 67 psi to 12 psi. The overflow elevation of the elevated storage tank is currently 160 feet. According to the County's design criteria, the highest ground elevation that can be served from the 160 Zone is 40 without providing supplemental means of pressure. Areas above elevation 40 will require individual booster pumps to ensure adequate domestic pressure is provided.

3.6.6.2 Projected Population Growth and Demands

The population growth and demand in the Gibson Island pressure zone is relatively stable. The area is developed with low density residential uses and while there is some infill development potential, additional new growth is not anticipated.

As shown in Table 3-2, the average and maximum day demands in the Gibson Island Zone are projected at 0.18 MGD and 0.53 MGD, respectively, at build-out in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.6.3 Groundwater Pumping and Water Treatment Facilities

The Gibson Island WTP provides water to the 160 zone and is located on Banbury Road. The current treatment capacity is 0.30 MGD.

3.6.6.4 Storage and Distribution Facilities

Existing water storage and distribution facilities of the zone include the Gibson Island 0.23 MGD ground storage tank and a distribution system network of approximately 9 miles of pipelines that range in diameter from 4 inch to 8 inch. See Table 3-10 for more information on the existing storage tank in this zone.

3.6.6.5 Strategic Plan for Infrastructure and Capital Improvements

The 2016 WSP indicates that there are no transmission deficiencies in the Gibson Island system under future conditions. However, the current plant's pumping and treatment capacity will require a 0.3 MGD

expansion under the buildout conditions. For a list of water capital projects, see Table 3-18 at the end of this chapter.

3.6.7 Glen Burnie High 295 Water Pressure Zone

3.6.7.1 General Description

The 295 water pressure zone is situated in the north central portion of the County and is partitioned into three distinct areas, two of which are centered around the Dorsey WTP. The northeast partition is generally bounded by Baltimore City to the east, the 350 Zone to the west, Baltimore County to the north and the 220 pressure zone to the south. The southwest partition is generally bounded by MD 3 and the 220 Zone to the east, the 350 Zone to the west, Dorsey Road and the 350 Zone to the north, and the Severn Run Environmental Area to the south. The southeast partition is generally bounded by Chalet Drive and Foxwell Road to the east, MD Route 3 to the west, Old Mill Road to the north and Benfield Boulevard to the south. Figure 3-1 shows the 295 Zone in relation to the other pressure zones. The Glen Burnie High pressure zone contains approximately 18,757 acres of land. It includes portions of the Linthicum, Ferndale, Glen Burnie, Severn and Millersville communities.

The topography of the area varies from elevation 10 to 250 feet, while piping elevations range from 5 to 202 feet indicating those elevations currently served. Static pressures range from 125 psi to 24 psi. The overflow elevation of the elevated storage tanks is currently 295 feet with a low water elevation equal to 260 feet. According to the County's design criteria, the highest ground elevation that can be served from the 295 Zone is 175 without providing supplemental means of pressure.

3.6.7.2 Projected Population Growth and Demands

Population in the Glen Burnie High Zone is projected to increase by 5,164 people over the 2016 WSP planning period as shown in Table 3-3. According to the County's GDP Land Use Plan, this pressure zone is planned for medium density residential use in the greater Glen Burnie area and for low- and low-medium density residential uses in the Severn area south of MD 100. Commercial uses and redevelopment are planned along the Ritchie Highway, Crain Highway and Quarterfield Road corridors.

As shown in Table 3-2, the average and maximum day demands in the Glen Burnie High Zone are projected at 10.22 MGD and 16.3 MGD, respectively, at build-out in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.7.3 Groundwater Pumping and Water Treatment Facilities

The Dorsey Road WTP provides water to the 295 pressure zone and is located along Dorsey Road adjacent to I-97. Currently six wells provide raw water to the plant, which has a treatment capacity of approximately 3.5 MGD. The plant also receives up to 3.3 MGD (normally 2.5 MGD) from the Glen Burnie Low Zone (220 Zone) for redistribution into the 295 Zone. This is received in the plant's clear well and is, therefore, mixed with the treated raw water supply. See Section 3.5.3.1.5 for a detailed description of the Dorsey WTP.

There are two SCWs that serve the 295 Zone, Stevenson Road SCW and Telegraph Road SCW. The SCWs provide chemical addition, disinfection and fluoridation. Rated capacities of the Stevenson Road and Telegraph Road SCWs are 0.64 MGD and 0.96 MGD respectively. See Section 3.5.3.1.10 for more details on the SCWs in the County water system.

3.6.7.4 Storage and Distribution Facilities

The distribution system in the 295 zone consists of approximately 287 miles of water mains that range in size from 6 to 36 inches and the following BPS: Hammonds Lane BPS (City Zone 2), Ordnance Road BPS (City Zone 1), Shipley's Choice BPS, Harmans BPS and Quarterfield Road BPS. There are 4 elevated tanks in

this zone, the 2.0 MG Millersville, the 2.0 MG Shipley's ET, 2.0 MG Elvaton ET, and the 1.5 MG Linthicum ET. See Table 3-10 for more information on the existing storage tanks for this zone.

There are eight flow transfer locations for the 295 Zone (excluding division valve locations):

- a) Under normal operating conditions, up to 3.3 MGD (normally 2.5 MGD) is sent to the Dorsey Road WTP from the 220 Zone via a 16-inch main by throttling a control valve at the Dorsey plant. Conversely, flow can be sent to the 220 Zone from the Dorsey plant via the same 16-inch main during emergency situations.
- b) The Shipley's BPS conveys approximately 1.7 MGD from the 220 Zone to Millersville ET in the 295 Zone. The booster station consists of one 800-gpm pump and one 1250- gpm pump.
- c) The Old Mill BPS conveys water from the 220 zone to the 295 zone. There is also a control valve outside of this station that can transfer water from the 295 Zone to the 220 zone, if needed.
- d) The Harmans BPS conveys approximately 0.7 to 3.0 MGD from the 295 Zone to the Arundel Mills ET in the 350 Zone (higher flow rates tend to lower the level of the Shipley's ET).
- e) The 20-inch Hammonds Lane connection from Baltimore City's Second Zone. Typically, the Hammonds Lane BPS is not operated due to the hydraulic gradient difference between the City Zone 2 (350 feet +/-) and the County (295 feet +/-).
- f) The 20-inch Ordnance Road connection from Baltimore City's First Zone.
- g) The Telegraph Road BPS is not currently in use. However, water can be transferred from the 330 zone to the 295 zone via a control valve outside of the station, depending on the demands in the area. The Telegraph Road SCW currently pumps directly to the 295 zone. Although this connection is not currently in use, it is available in the event of an emergency.
- h) The Quarterfield temporary BPS, located near the Quarterfield Road and Pamela Drive intersection, conveys approximately 1.8 MGD from the 220 Zone to the 295 Zone.

3.6.7.5 Strategic Plan for Infrastructure and Capital Improvements

The near term improvements proposed for the Glen Burnie High pressure zone are to increase transmission and fire flow capacity. Additional improvements will be required in buildout to provide adequate transmission from the proposed Millersville WTP. A list of the current water capital projects can be found in Table 3-18 at the end of this chapter. More detailed information regarding the individual projects listed below can be found in the 2016 WSP.

2020/2030 Improvement Projects:

- a) Construct 2,000 feet of 12-inch to increase fire flow transmission capacity to the northeast portion of the Glen Burnie High zone.
- b) Construct 400 feet of 8-inch pipe to complete a loop between W Hatton Court and Governor Johnson Boulevard for improved fire flow in the area.
- c) Construct 5,000 feet of 16-inch diameter pipe proposed to complete a loop between the existing 16-inch pipe on Donaldson Avenue and the existing 30-inch pipe at Telegraph Road. The 16-inch main will increase transmission to/from the Shipley's Tank, eliminate dead ends improving water quality in the near term, and be necessary for transmission of water from the proposed Millersville WTP in the long term.

- d) Construct a 2.0 MG elevated tank off of Belle Grove Road in Glen Burnie.
- e) Upgrade the existing Shipley's Choice BPS from 1.0 to 2.0 MGD.

Buildout Improvement Projects:

- a) Construct 8,000 feet of 12-inch pipe to increase transmission in the southeastern region of the zone to maintain system pressures in this area and tank levels in the Millersville Tank.
- b) Construct the proposed Millersville WTP (32.0 MGD), raw water conveyance to the proposed plant and a network of transmission mains from the plant to directly supply Glen Burnie High, Glen Burnie Low, and Kings Heights. Refer to the 2016 WSP for additional details regarding size, length and proposed alignment.
- c) Construct 14,000 feet of 20-inch transmission main from the Dorsey BPS to Hammonds Ferry Road along Aviation Boulevard. The main will increase transmission to the northern region of the zone, eliminating the potential bottleneck near Dorsey, maintain system pressures in the north, and assist with refilling the Linthicum and the proposed Belle Grove elevated tanks.
- d) Construct 10,000 feet of 12-inch main to complete a loop along the eastern border of the zone.
- e) Construct 7,000 feet of 12-inch main, along the existing 12-inch main on Baltimore-Annapolis Boulevard to increase transmission capacity to the northern region of the Glen Burnie High pressure zone and to facilitate better turnover in the Linthicum and proposed Belle Grove elevated tanks.
- f) Construct 1,000 feet of 8-inch transmission main to improve fire flow and maintain adequate pressure in the local area for build-out.

3.6.8 Herald Harbor 240 Water Pressure Zone

3.6.8.1 General Description

The Herald Harbor 240 water pressure zone is situated in the central portion of the County along the south bank of the Severn River. The area currently served within the 240 pressure zone is generally confined to the Herald Harbor community, encompassing approximately 529 acres. Figure 3-1 shows the 240 Zone in relation to the other pressure zones.

Topography of the area varies from elevation 0 to 166 feet, while piping elevations range from 1 to 165 feet, indicating those elevations served within the zone. Static pressures generally range from 100 psi to 35 psi. The overflow elevation of the elevated storage tank is currently 240 feet with a low water elevation equal to 211 feet. According to the County's design criteria, the highest ground elevation that can be served from the 240 Zone is 120 without providing supplemental means of pressure.

3.6.8.2 Projected Population Growth and Demands

The population in the Herald Harbor Zone is relatively stable with little projected growth (approximately 120 people) over the 2016 WSP planning period as shown in Table 3-3. The area is planned for low density residential with some infill development potential.

As shown in Table 3-2, the average and maximum day demands in the Herald Harbor Zone are projected at 0.28 MGD and 0.56 MGD, respectively, at build-out in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.8.3 Groundwater Pumping and Water Treatment Facilities

The Herald Harbor WTP provides water to the 240 pressure zone and is located on Mountain Road. The current treatment capacity is 0.50 MGD.

3.6.8.4 Storage and Distribution Facilities

Existing system facilities of the zone include the Herald Harbor 0.5 MG elevated tank, with an overflow elevation of 240 feet, and a distribution system network of approximately 13 miles of pipelines that range in diameter from 4 to 12 inches.

3.6.8.5 Strategic Plan for Infrastructure and Capital Improvements

No capital improvement projects are planned for this zone.

3.6.9 Jessup 400 Water Pressure Zone

3.6.9.1 General Description

The Jessup 400 water pressure zone is situated in the western portion of the County and contains approximately 4,688 acres of land. The area currently served within the 400 pressure zone is generally bounded by Baltimore-Washington Parkway (Route 295) to the east, Howard County to the west, Montevideo Road to Clark Road along the north and Fort Meade to the south. It encompasses the community of Jessup and also includes the National Business Park employment center, Arundel Preserve, Parkside, Shipley Homestead and Shannon's Glen mixed-use developments, and the Maryland House of Corrections. Figure 3-1 shows the 400 Zone in relation to the other pressure zones.

The topography of the area varies from 30 to 320 feet in elevation, while piping elevations range from 142 to 312 feet indicating those elevations served in the zone. Static pressures range from 160 psi to 35 psi. The overflow elevation of the elevated storage tank is currently 400 feet with a low water elevation equal to 365 feet. According to the County's design criteria, the highest ground elevation that can be served from the 400 Zone is 280 without providing supplemental means of pressure. There are areas with elevations exceeding 280 that are located within the northeast quadrant of the Route 295 and MD 175 intersection. If this area is developed in the future, the gradient will have to be increased to approximately 440 feet by means of a regional BPS or individual booster pumps.

The former Ridge Forest Sub Pressure Zone has been incorporated into the Jessup 400 Zone. The Ridge Forest BPS is offline but can be used as a backup facility if needed.

The Provinces private water system exists partially within the Jessup 400 Zone and the Airport Square 350 Zone. Currently, there is no plan to take over the Provinces system, but with the Disney Road BPS and the 16-inch transmission main along Ridge Road now in service, the County would be in a good position to take over this system if the community were to petition the County for service. See Section 3.6.9.5 for more details.

3.6.9.2 Projected Population Growth and Demands

Population in the Jessup Zone is projected to increase by 6,877 people over the 2016 WSP planning period as shown in Table 3-3. Much of this new growth will occur with the planned mixed-use developments that include Shannon's Glen, Arundel Preserve and Parkside as well as new development and redevelopment along MD 175.

As shown in Table 3-2, the average and maximum day demands in the Jessup Zone are projected at 3.99 MGD and 6.3 MGD, respectively, at buildout (2087), as calculated for the 2016 Water Strategic Plan. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.9.3 Groundwater Pumping and Water Treatment Facilities

There is no water production capability within the 400 pressure zone. All water servicing the zone is received from the Crofton Meadow WTP via the Kings Heights/Odenton 330 Zone and the Disney Road BPS or from the adjacent 350 pressure zone via the Montevideo Water BPS.

3.6.9.4 Storage and Distribution Facilities

Existing water system facilities of the zone include the Disney Road BPS, the Montevideo Water BPS and the 2.0 MG Jessup ET. (Although the Arundel Mills ET is geographically located within the 400 Zone boundary, it is hydraulically connected to the 350 pressure zone.) The Jessup distribution system consists of approximately 46 miles of water mains that range in diameter from 6 to 20 inches. A single 30-inch main crossing the Baltimore/Washington Parkway (Route 295) along Wright Road provides suction for the Montevideo BPS. From there, water is boosted from the 350 Zone to the Jessup ET (400 Zone) which conveys water south to the Maryland City (369 Zone) through a 20-inch main and a control valve at MD 32. The Disney Road BPS is fed from a 36-inch main that sends flow from the Crofton Meadows II WTP. From the Disney Road BPS, flow is sent along a 30-inch transmission main on Disney Road, then from a 24-inch along Annapolis Road to the Jessup 400 Zone. The Maryland House of Corrections is the largest user in this pressure zone. See Table 3-10 for more information on the existing storage tanks for this zone.

3.6.9.5 Strategic Plan for Infrastructure and Capital Improvements

The Disney Road BPS provides the majority of the supply to the Jessup ET using the Crofton Meadows WTP for its source thereby providing redundancy and reducing reliance on the City of Baltimore. To convey water from the Disney Road BPS to the Jessup Zone, approximately 2,250 feet of transmission main, from Disney Road to Rockenbach Road, was completed. The MD Route 175 to MD Route 295 has also been completed with the portion of the 24-inch main that crosses MD Route 295 being constructed as part of the developer-funded Arundel Preserve Water Extension Project.

Below are the proposed improvements from the 2016 WSP:

2020/2030 Improvement Projects:

- a) Proposed 3,000 feet of 12-inch diameter piping proposed to address inadequate transmission in the National Business Park. This improvement requires the MD City control valve to be relocated or the proposed pipe alignment to be extended to tie-in upstream of the existing control valve.
- b) Proposed 10,000 feet of 16-inch diameter transmission main along Ridge Road to provide adequate transmission for the Provinces system in the event the County is petitioned for service. Currently, there are no plans to take over the Provinces private water system.

Buildout Improvement Projects:

- a) Proposed 3,000 feet of 20-inch diameter transmission main along Jessup Road and Brock Bridge Road to provide additional transmission to reduce headloss and velocities in the area of the existing Jessup tank.

The storage analysis conducted for the 2016 WSP for the 400 Zone did not reveal any storage deficits through build-out conditions. See Table 3-10 for more information on the existing storage tanks for this zone. See Table 3-18 at the end of this chapter for a list of water capital projects.

3.6.10 King Heights/Odenton 330 Water Pressure Zone

3.6.10.1 General Description

The Kings Heights/Odenton 330 water pressure zone is located in the central portion of the County and contains approximately 9,955 acres. The zone is situated between Fort Meade and the Patuxent Wildlife Refuge to the west, Gambrills to the east and Crofton to the south. It includes the Odenton Town Center, the Village at Waugh Chapel, the Piney Orchard and Seven Oaks Planned Unit Developments and the Two Rivers residential development.

The topography of the area varies from elevation 32 to 246 feet, while piping elevations range from 16 to 237 feet indicating those elevations that are served within the zone. Static pressures range from 110 psi to 45 psi. The overflow elevation of the elevated storage tank is currently 330 feet with a low water elevation equal to 295 feet. According to the County's design criteria, the highest ground elevation that can be served from the 330 Zone is 210 without providing supplemental means of pressure. There are areas with elevations exceeding 210 that are located northeast of MD 32 adjacent to the Millersville Landfill, including the Bridlewood or Sappington Hill subdivision. To increase pressures to these areas, the County constructed the Millersville BPS, effectively creating the Millersville 360 sub-zone.

3.6.10.2 Projected Population Growth and Demands

Population within the Kings Heights/Odenton Zone is projected to increase by 7,551 people over the 2016 WSP planning period as shown in Table 3-3. Planned growth in the area will be concentrated along MD 175, the Two Rivers development and within the Odenton Town Center, which will include a mix of high-density residential, office, retail and civic uses. The Piney Orchard and Seven Oaks communities are near completion.

As shown in Table 3-2, the average and maximum day demands in the Kings Heights/Odenton Zone are projected at 8.37 MGD and 14.2 MGD, respectively, at buildout (2087), as calculated in the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.10.3 Groundwater Pumping and Water Treatment Facilities

The Crofton Meadows II WTP, located in the 290 Zone, supplies water to the 330 Zone via the existing 36-inch transmission main from the Crofton Meadows II WTP. The transmission main continues north and west connecting the Crofton Meadows WTP to Disney Road BPS which serves the 350, and 400 Zones.

3.6.10.4 Storage and Distribution Facilities

Existing water storage and distribution facilities of the zone include the Millersville BPS, the Telegraph Road BPS, the 2.0 MG Piney Orchard and Waugh Chapel ET, the 1.0 MG Kings Heights and Two Rivers ET. In addition, the Crofton Meadows II WTP has 3.0 MG of ground storage which is shared with the Crofton 290 Zone. See Table 3-10 for more information on the existing storage tanks for this zone. The distribution system consists of approximately 156 miles of water mains that range in diameter from 6 to 36 inches. The County constructed the Millersville BPS to increase pressures to the Bridlewood and Sappington Hill areas near the Millersville Landfill. The Millersville sub-zone operates at a gradient of 360 feet.

3.6.10.5 Strategic Plan for Infrastructure and Capital Improvements Transmission Mains

The Crofton Meadows to Disney Road transmission system includes 53,000 feet of 36-inch water main from the Crofton Meadows II WTP to Disney Road BPS. The transmission main feeds the Kings Heights/Odenton Zone as well as the 350, and 369 zones via the Disney Road BPS.

Additional transmission mains and system improvements will be required in buildout as well, when Crofton Meadows II WTP is proposed to be fully expanded to 28.0 MGD. For a list of water capital projects, see Table 3-18 at the end of this chapter.

2020/2030 Improvement Projects:

- a) Expand Crofton Meadows II WTP to supply 20.0 MGD. The increase in capacity will be driven by local demands as well as the need for sufficient supply to the Disney Road BPS which will convey water from Kings Heights/Odenton pressure zone to Jessup.

The proposed Laurel Heights BPS will also be supplied by the Crofton Meadows II WTP. The expansion of Crofton Meadows II will be necessary to effectively make use of these BPS while reducing reliance on Baltimore supply in the future

- b) Construct 4,000 feet of 16-inch main to provide additional parallel transmission near the existing Piney Orchard Tank. The proposed main will reduce headloss and velocity in the local piping and help maintain tank levels once both the Disney Road BPS and Laurel Heights BPS are brought online.
- c) Construct 3,000 feet of 12-inch main to address high velocity and headlosses observed in the model under future conditions. Pipe parallels existing 12-inch along Chapel Gate Drive and Greyswood Road.
- d) Construct 2,000 feet of 12-inch main to complete a loop from the current dead-end on Annapolis Road south of Llewellyn Avenue, and the dead-end at the end of Berger Street. The proposed main would complete the loop, improving fire flow and local pressure.

Buildout Improvement Projects:

- a) Construct approximately 8 miles of 24-inch transmission piping to connect from the new Millersville plant to the existing large transmission mains along Annapolis Avenue. This will supplement the flow provided by Crofton Meadows II for the King Heights/ Odenton pressure zone, as well as provide additional supply to the suction line for the Laurel Heights and Disney Road BPS. See Section 3.5.3.2 for more information on Millersville WTP Transmission Mains.
- b) Construct 10,000 feet of 16-inch main from Two Rivers to the primary Kings Heights distribution system. This main will provide better fire flow and improve water quality, as well as provide redundancy for the Two Rivers area.
- c) Construct 5,000 feet of 12-inch mains running along Chapelgate Drive and Bruce Avenue. The projects are proposed to connect into the existing 12-inch main in Bruce Avenue at St. Andrews Lane, and continue down Chapel Gate Drive to Greyswood Road where it can connect to the proposed 12-inch water line in Chapel Gate Drive above. The projects will reduce headloss in the area and provide increased transmission from/to the proposed Kings Heights II Elevated Tank
- d) Construct Kings Heights II 1.0 MG elevated tank to be located near Bruce Avenue and Queen Anne Avenue.

- e) Expand Crofton Meadows II WTP to supply 28.0 MGD.

3.6.11 Maryland City 369 Water Pressure Zone

3.6.11.1 General Description

The Maryland City 369 water pressure zone is situated in the western portion of the County. The area served within the 369 pressure zone is generally bounded by Baltimore-Washington Expressway (Route 295) to the east, Howard County to the west, MD Route 32 to the north and the Patuxent River to the south. The pressure zone consists of approximately 4,746 acres of land and includes the communities of Maryland City and Russett as well as the Laurel Race Track and the MD Route 198 commercial corridor. Figure 3-1 shows the 369 Zone in relation to the other pressure zones.

The topography of the area varies from 105 to 305 feet, while piping elevations range from 115 to 300 feet indicating those elevations served within the zone. Static pressures generally range from 100 psi to 30 psi. The overflow elevation of the elevated storage tank is currently 369 feet with a low water elevation equal to 339 feet. According to the County's design criteria, the highest ground elevation that can be served from the 369 Zone is 250 without providing supplemental means of pressure.

3.6.11.2 Projected Population Growth and Demands

Population within the Maryland City Zone is projected to increase by 2,889 people over the 2016 WSP planning period as shown in Table 3-3. Residential areas in the pressure zone are primarily developed. Growth will occur east of the BW Parkway along MD Route 198, where the Arundel Gateway mixed use development is planned. The Laurel Race Track may be redeveloped to include retail uses and possibly a hotel, and revitalization or redevelopment may occur on commercial properties along MD Route 198.

As shown in Table 3-2, the average and maximum day demands in the Maryland City Zone are projected at 3.46 MGD and 5.6 MGD, respectively, at buildout (2087), as calculated for the 2016 WSP. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2.

3.6.11.3 Groundwater Pumping and Water Treatment Facilities

There are no water production capabilities within the 369 pressure zone. All water servicing the zone is received from the adjacent 400 pressure zone via a control valve along Brock Bridge Road at MD Route 32. Therefore, two main supply sources provide water to the 369 pressure zone: (1) Crofton Meadow II WTP, and (2) water from Airport Square 350 Zone. The County is currently evaluating the Maryland City area for a temporary secondary water supply and treatment system until additional conveyance improvements are completed.

3.6.11.4 Storage and Distribution Facilities

Existing water storage and distribution system facilities in the zone include: the Maryland City 1.5 MG elevated tank and a control vault at MD Route 32 (at the 400 pressure zone boundary). The distribution system consists of approximately 44 miles of water mains that range in diameter from 6 to 20 inches. See Table 3-10 for more information on the existing storage tank for this zone.

3.6.11.5 Strategic Plan for Infrastructure and Capital Improvements

The 369 Zone is served by a single 20-inch main from the Jessup 400 Zone. To improve redundancy to zone, the 2016 WSP recommended a 20-inch transmission main, along MD Route 32, (CIP project W8016) to interconnect the 36-inch transmission main from Odenton to Disney Road to the 369 Zone via the proposed 4.0 MGD Laurel Heights BPS. This station would boost water from the 330 feet (Kings Heights/Odenton Zone) to 369 feet (Maryland City Zone).

2020/2030 Improvement Projects:

- a) Laurel Heights BPS has a proposed capacity of 4.0 MGD and will convey water from Kings Heights directly into Maryland City. The project provides needed redundancy to the single connection at the Maryland City Control Valve. The BPS will be connected to Kings Heights via a proposed 22,000-foot 24-inch transmission main. The transmission main downstream of the pump station has already been installed as part of the Arundel Gateway project.
- b) Construct a 20-inch main to connect the 20-inch main funded by the Arundel Gateway Project into the Maryland City transmission main network via the existing 2,000 foot section of 20-inch transmission main along Red Clay Road.
- c) Construct new 2.0 MG Bacontown Tank and transmission main (CIP project W7996).

Buildout Improvement Projects:

- a) Expand the proposed Laurel Heights BPS by an additional 1.0 MGD in order to supply the additional demands.
- b) Construct 3,000 feet of 20-inch piping which will provide increased transmission to the Bacontown tank to facilitate tank refilling required with the increased buildout demand in the area.

The storage analysis conducted in the 2016 WSP for the Maryland City 369 Zone indicated the following storage deficit: 0.1 MG at present, 0.7 MG at 2020 and 1.9 MG at build-out. To satisfy the storage requirement, a 2.0 MG elevated tank is recommended at the Bacontown subdivision where high elevations exist. See Table 3-10 for more information on the existing and future required storage tanks for this zone. See Table 3-18 at the end of this chapter for a list of water capital projects.

3.6.12 Rose Haven 130 Water Pressure Zone***3.6.12.1 General Description***

The Rose Haven 130 water pressure zone is approximately 103 acres situated in South County. It is located on the southeastern tip of the County, on the Chesapeake Bay, just north of the Calvert County boundary line. The pressure zone is primarily developed with single-family dwellings of low-medium density and maritime uses. Figure 3-1 shows the 130 Zone in relation to the other pressure zones.

The topography of the area varies from elevation 0 to 16 feet with pipe elevations of 4 to 12 feet. Static pressures range from 52 psi to 49 psi. The overflow elevation of the elevated storage tank is 130 feet. According to the County's design criteria, the highest ground elevation that can be served from the 130 Zone is 10 without providing supplemental means of pressure.

3.6.12.2 Projected Population Growth and Demands

No significant increase in population or water demand is anticipated within Rose Haven.

As shown in Table 3-2, average and maximum day build-out demands in the Rose Haven Zone are projected at 0.08 MGD and 0.19 MGD, respectively. See Table 3-2 for demand projections for this zone for the planning period. For more details on demand projection methodology, see Section 3.2

3.6.12.3 Groundwater Pumping and Water Treatment Facilities

The Rose Haven WTP provides water to the 130 pressure zone and is located at the southern end of Albany Avenue. It has a treatment capacity of 0.25 MG.

3.6.12.4 Storage and Distribution Facilities

The water storage and distribution facilities includes a 0.25 MG elevated tank, with overflow elevation of 130 feet, and a distribution system includes 3 miles of pipelines that range in diameter from 6 to 12 inches.

3.6.12.5 Strategic Plan for Infrastructure and Capital Improvements

No capital improvement projects are planned for this zone at this time.

3.6.13 Annapolis City 173 Water Pressure Zone**3.6.13.1 General Description**

The Annapolis City 173 water pressure zone is situated in the central portion of the County and serves the City of Annapolis. The area currently served within this pressure zone includes all customers served by the City of Annapolis, which includes City residents and businesses and also extends outside the City limits to supply areas within the County including parts of Loretta Heights to the west, Lindamoor and Dreams Landing north of Weems Creek, and the Chesapeake Harbor complex to the southeast.

The water system serving the City of Annapolis is not owned or maintained by the County, however, MDE requires that the County's Water and Sewer Master Plan include the City.

3.6.13.2 Projected Population Growth and Demands

Population within the 173 Zone is projected to increase by 2,476 people over the 2016 WSP planning period as shown in Table 3-3. Though the City of Annapolis is primarily developed, the assumption of a slowing growth rate due to the built out nature of the City is being challenged by the recent infill and redevelopment activity seen in the City's housing. The past five years have seen an increase in the number of townhomes on redevelopment sites, for example. In the coming years, the City will continue to face an acute shortage of affordable housing options and will be looking at ways of incentivizing the creation of additional multifamily units. Some of these units will be accommodated within existing underutilized building stock, while other units will be created through targeted infill redevelopment. Though the population had continued to increase, through 2018, the average water demand stayed fairly steady. This trend was likely a result of several factors including the increased conservation due to increases in usage rates and the increasing use of low-flow toilets and other water saving fixtures. In 2019, the demand began to increase and the expectation is that with increases in population going forward there will be a proportional increase in flow. The projected water demands for this zone from 2020 to 2050 are shown below in Table 3-11.

Table 3-11 City Of Annapolis Water Demand Projections

Year	Average Daily Flow (MGD)	Maximum Daily Flow (MGD)	Peak Hourly Flow (MGD)
2020	3.7	5.3	6.5
2025	3.8	6.5	9.0
2030	3.9	6.5	9.0
2035	4.0	6.5	9.0
2040	4.1	6.5	9.0
2045	4.1	6.5	9.0
2050	4.1	6.5	9.0

3.6.13.3 Groundwater Pumping and Water Treatment Facilities

The Annapolis Water Treatment Plant (WTP) provides water to the City's 173 pressure zone and is located along MD 450 just east of I-97 within Anne Arundel County limits. In 2017, the City completed the construction of a new 8.0 MGD WTP adjacent to the old facility. Groundwater drawn from eight deep wells located near the water treatment plant supply the City's water system. Water is pumped from three Coastal Plain aquifers – the Magothy, Upper Patapsco, and Lower Patapsco aquifers.

Treatment consists mainly of iron removal via injection of chemicals that cause the iron and other minerals in the raw water to coagulate and settle out, followed by filtration and chlorination/ fluoridation.

3.6.13.4 Storage and Distribution Facilities

The existing water system facilities of the zone include four distribution pumps at the WTP, five elevated tanks with overflow elevation 173, and approximately 140 miles of water mains that range in size up to 24-inch. The elevated tanks include a standpipe on Jefferson Street, an elevated tank on the Naval Academy Stadium site, two elevated tanks at the intersection of Janwal Street and Barbud Lane and an elevated tank on Edgewood Road at the site of the Back Creek Nature Park. The combined total volume of the water tanks is 5.5 MG, though usable volume is approximately 4.2 MG. The storage volume and type of these storage tanks are shown in Table 3-12.

Table 3-12 City of Annapolis Water Distribution System Storage Tank Types and Effective Volumes

Storage Tank Name	Storage Tank Type	Storage Tank Usable Volume (MG)
Bembe	Elevated multi-column	1.00
Farragut	Elevated spheroid	0.50
Janwall #1	Elevated multi-column	0.50
Janwall #2	Elevated composite	1.50
Jefferson	Standpipe	0.73
TOTAL	-	4.23

In addition, the Water Treatment Plant has two 1.0 MG finished water storage tanks (usable with backup power). As part of the new WTP, the City completed a new Supervisory Control and Data Acquisition (SCADA) system for the distribution tanks that communicates data, including tank levels that allow control of the WTP distribution pumps, back to the WTP.

3.6.13.5 Strategic Plan for Infrastructure and Capital Improvements

In the past, the City completed a Water and Sewer Systems Study and hydraulic models that provide a basis for assessing the capacity and hydraulic deficiencies in the water distribution and sewer collection systems. In recent years, in order to obtain a more comprehensive understanding of water and sewer assets, the City completed a water and sewer system desktop evaluation project using the principals of asset management. The City of Annapolis Water and Sewer System Evaluation Comprehensive Analysis Plan has allowed for the improved prioritization of investments based on risk analysis (as a function of likelihood and consequence of asset failure). This plan has been used to inform the City of Annapolis Water and Sewer System Ten-Year Plan. The FY21 capital projects include Water Tank Rehabilitation, which is funded with operating funds and includes major painting and other miscellaneous rehabilitation and Water Distribution Rehabilitation.

The City of Annapolis currently has two active water Capital Improvement Program (CIP) projects, as further detailed in Table 3-19. The existing model and asset management tools in place as described above, are used to prioritize the Water Distribution Rehabilitation project tasks.

3.6.13.5.1 Strategic Plan for Transferring City Water Service to County Properties

As indicated in Section 3.6.13.1, General Description, the City 173 water pressure zone currently extends outside the City limits to supply several areas within the County. These areas were originally serviced by the City since, at the time, County water service was not available or nearby. The County's distribution system in the Broad Creek 210 water pressure zone has been extended to, through or near three general areas. These areas include the Defense Highway / Oak Court area near the City Water Treatment Plant, Loretta Heights north of West Street and west of the Route 2, Solomon's Island Road / Route 50 interchange and Lindamoor and Dreams Landing north of Weems Creek. The Lindamoor area also has several properties that remain on individual wells and some of those wells require specialty treatment due to an identified contaminant in the area groundwater. Since portions of this area, as well as the Defense Highway / Oak Court area, are at high elevation, in some circumstances, the City's water pressure does not meet current standards.

It is the City's position that all three of the areas should be added to the County water service area and service of County properties transferred to the higher Broad Creek 210 pressure zone. This would increase the static pressure of properties, will allow for properties with wells to connect to public water and will simplify the water service area boundaries.

3.7 Privately Operated Facilities

There are over 530 wells in the County that are operated privately or by another non-County entity. These facilities typically maintain their own water treatment facilities. The Environmental Protection Agency and the Maryland Department of the Environment categorize these into three types:

- A. Community Water Systems (CWS) - those systems that serve the same people year-round such as homes or businesses.
- B. Non-Transient Non-Community Water Systems (NTNC) – those systems that serve the same people but not year-round such as schools.
- C. Transient Non-Community Water Systems (TNCWS) – those systems that do not consistently serve the same people such as parks, restaurants or gas stations.

The non-County community water systems and non-transient non community water systems are listed in Table 3-13. For more information on transient non-community water systems, visit EPA's website at <https://www.epa.gov/dwreginfo>.

3.7.1 Fort Meade Private Water System

The Fort Meade Private Water System includes six groundwater wells, a low-lift pumping station, a water treatment plant, two high-lift pumping stations, two booster stations, four elevated tanks, four ground storage tanks and the water distribution system. The source of water for the Fort Meade system is provided by the six groundwater wells. All of these wells are located on Fort Meade and pump water from the Patuxent Aquifer. The combined capacity of the storage tanks is approximately 3.3 MG. The Fort Meade system consists of two pressure zones: 391 Zone to the north and the 288 Zone to the south. Figure 3-1 shows the Fort Meade Private Zone in relation to the other pressure zones.

Table 3-13 Non-County Water Systems

System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
Annapolis Area Christian School	Annapolis Christian School Well	NTNC	3000	Patapsco	353
Baldwin Memorial U. M. Church / Day Care	Baldwin Child Care Center	NTNC	1500	Lower Patapsco	398
Benfield Business Park, LLC – I-97 Phase 3 Office Building	231 Najoles Road Well	NTNC	10,000	Lower Patapsco	430
Bill's North Odenton Shopping Center	Bills North - Old Well	NTNC	6000	Patapsco	118
Bill's North Odenton Shopping Center	Bills North-New Well	NTNC	6000	Patapsco	230
Boones Mobile Estates	Tennis Court Well	CWS	75000	Aquia	265
Boones Mobile Estates	Tower Well	CWS	75000	Aquia	235
Boones Mobile Estates	WWTP Well	CWS	75000	Aquia	223

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System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
Brightview Business Center	Brightview Well 1	NTNC		Patapsco	248
Cape Kids Corner	Cape Kids Corner Well	NTNC	1300	Magothy	210
Cape St. Claire Shopping Center	Cape St. Claire SC Well 1	NTNC	23700	Aquia	94
Cape St. Claire Shopping Center	Cape St. Claire SC Well 2	NTNC	23700	Aquia	96
Cape St. Claire Shopping Center	Cape St. Claire SC Well 3	NTNC	23700	Aquia	95
Cape St. Claire Shopping Center	Cape St. Claire SC Well 4	NTNC	1000	Magothy	232
Chesapeake Bay Foundation	CBF Cistern	NTNC		N/A	
Chesapeake Bay Foundation	CBF New Well	NTNC		Aquia	84
Chesapeake Complex	Bodkin Elementary Well 2	NTNC	41000	Patapsco	590
Christopher's Market	Well	NTNC		Aquia	160
City of Annapolis	Annapolis Well 2	CWS	321,000	Magothy	258
City of Annapolis	Annapolis Well 5	CWS	372,000	Magothy	248
City of Annapolis	Annapolis Well 6	CWS	341,000	Magothy	242
City of Annapolis	Annapolis Well 7	CWS	346,000	Magothy	345
City of Annapolis	Annapolis Well 10	CWS	541,000	Upper Patapsco	520
City of Annapolis	Annapolis Well 11	CWS	605,000	Upper Patapsco	495
City of Annapolis	Annapolis Well 12	CWS	494,000	Lower Patapsco	1171
City of Annapolis	Annapolis Well 14	CWS	726,000	Lower Patapsco	1093
Concourse Commercial Condo, Inc.	Concourse Comm. Condo Well	NTNC	4000	Patapsco	242
Crofton Children's Center	Crofton Children's Center Well	NTNC	1500	Magothy	152
Crownsville State Hospital	Crownsville Well 4	CWS	215000	Magothy	312
Crownsville State Hospital	Crownsville Well 5	CWS	215000	Magothy	269
Davidsonville Elementary	Davidsonville Well 2	NTNC	2900	Magothy	343
Davidsonville UMC and Crossroads Childcare	Church and Childcare Well	NTNC		Aquia	180
Deale Elementary	Deale Elementary Well 1	NTNC	6000	Aquia	204
Edgewater Elementary	Edgewater Elementary New Well	NTNC	5000	Aquia	95
Elvaton Christian Academy	Well	NTNC	200	Patapsco	96
Epping Forest	Epping Forest Well 2	CWS	42000	Patapsco	395
Epping Forest	Epping Forest Well 3	CWS	42000	Patapsco	TBD
Fleck Machine Company, Inc.	Fleck Machine Well	NTNC	300	Patuxent	255
Fort George G. Meade	Fort Meade Well 1	CWS	3300000	Patuxent	594
Fort George G. Meade	Fort Meade Well 2	CWS	3300000	Patuxent	604
Fort George G. Meade	Fort Meade Well 3	CWS	3300000	Patuxent	672
Fort George G. Meade	Fort Meade Well 4	CWS	3300000	Patuxent	692
Fort George G. Meade	Fort Meade Well 5R	CWS	3300000	Patuxent	733
Fort George G. Meade	Fort Meade Well 6	CWS	3300000	Patuxent	748

System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
Fort George G. Meade	Little Patuxent River	CWS	5200000	Little Patuxent	
Fort Smallwood Elementary	Fort Smallwood Elementary Well	NTNC	5000	Patapsco	290
Galilee Lutheran Church and Day Care	Well	NTNC		Patapsco	
Gambrills Business Park	New Well – (A + B) – Lower Patapsco	NTNC		Patapsco	230
Gambrills Business Park	TNC Well	NTNC		Patapsco	410
Grace Point Church	TBD	NTNC	1760	TBD	TBD
Greater Annapolis Veterinary Hospital	Vet Hospital Well	NTNC	1000	Magothy	230
Hartge Yacht Yard	Hartge Yacht Yard Garage Well	NTNC	1500	Aquia	170
Hartge Yacht Yard	Hartge Yacht Yard Pad Well	NTNC	1500	Aquia	115
Headquarters I / Headquarters II	HQ Well 1 (401)	NTNC	1200	Patapsco	142
Headquarters I / Headquarters II	HQ Well 2 (407)	NTNC	1200	Patapsco	157
Headquarters I / Headquarters II	HQ Well 4 (413)	NTNC	1800	Patapsco	146
Headquarters I / Headquarters II	HQ Well 5 (408 New)	NTNC	1800	Patapsco	360
Herald Harbor	Herald Harbor Well 1	CWS	160000	Patapsco	678
Herald Harbor	Herald Harbor Well 2	CWS	160000	Patapsco	716
Herrington Harbor - North	Canvas Shop Well	NTNC	7000	Aquia	220
Herrington Harbor - North	New Marina Office Well	NTNC	7000	Aquia	234
Herrington Harbor - North	Old Marina Office Well	NTNC	7000	Aquia	265
Herrington Harbor - North	Poolhouse Well	NTNC	7000	Aquia	220
Herrington Harbor - North	West Marine Well	NTNC	7000	Aquia	225
HH & P IV, LLC	Well	NTNC		Unknown	323
HH & P IV, LLC	Power Tech Well	NTNC	3000	Magothy	328
Holiday Mobile Estates, Inc.	Holiday Well 1R	CWS	125000	Patuxent	307
Holiday Mobile Estates, Inc.	Holiday Well 2R	CWS	125000	Patuxent	275
Homestead Gardens	Homestead Potable Water Well	NTNC		Aquia	225
I-97 Office Complex	Building 1110 Well	NTNC		Patapsco	380
I-97 Office Complex	Building 1111 Well	NTNC		Patapsco	284
I-97 Office Complex	Building 1120 Well	NTNC		Patapsco	357
I-97 Office Complex	Building 1121 Well	NTNC		Patapsco	347
I-97 Office Complex	Building 1127 Well	NTNC		Patapsco	343
I-97 Office Complex	Building 1131 Well	NTNC		Patapsco	328
Indian Creek Lower / Middle School	Indian Creek School New Well	NTNC	1500	Patapsco	445
Indian Creek Upper School	Well	NTNC	10000	Patapsco	409
Jemal's Bay 50 Plaza	Jemal's NTNC Well	NTNC		Magothy	345
Jemal's Bay 50 Plaza	Jemal's TNC Well	NTNC		Magothy	332
Kaufmann's Office Building	Well 1	NTNC	2400	Patapsco	349
Kids Farm - Mayo	Kids Farm - Mayo Well	NTNC	150	Aquia	91

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System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
Kids Farm, Childcare, Davidsonville	Kids Farm Well 1	NTNC	1000	Aquia	118
KinderCare Learning Center #1061	KinderCare Learning Center Well	NTNC	1800	Patuxent	362
Knollwood Manor	Knollwood Manor Well C	CWS	7500	Patapsco	260
Lake Shore Christian Academy	LSCA Church & Parsonage Well	NTNC	600	Magothy	0
Lake Shore Christian Academy	LSCA School Well	NTNC	300	Magothy	87
Lake Shore Elementary	Lake Shore Elementary New Well	NTNC	3000	Patapsco	640
Lake Village Townhomes	Lake Village Well 1	CWS	160000	Patuxent	333
Liberty Marina	Well 1	NTNC	4500	Aquia	42
Liberty Marina	Well 2	NTNC		Aquia	
Long Point Mall	Well 1	NTNC	6000	Patapsco	525
Lothian Elementary	Lothian Elementary Well	NTNC		Aquia	390
Lula G. Scott Community Center	Lula G. Scott New Well	NTNC		Aquia	186
Lyons Creek Estates	Lyons Creek Emergency Well	CWS	38000	Aquia	284
Lyons Creek Estates	Lyons Creek New Production Well	CWS	66000	Magothy	505
Maryland Environmental Service	MES HQ Well	NTNC	6000	Patapsco	420
Maryland Manor Mobile Home Park	Maryland Manor Well 2	CWS	80000	Magothy	285
Maryland Manor Mobile Home Park	Maryland Manor Well 3	CWS	80000	Magothy	297
Maryland Manor Mobile Home Park	Maryland Manor Well 4	CWS	16000	Magothy	439
Mayo Apartments	Laundromat Well	CWS	4600	Magothy	347
Mayo Apartments	New Mayo Apt Well	CWS		Aquia	70
Mayo Elementary	Mayo Elementary New Well	NTNC	4500		160
McDonald's #21058	Connected to Public	NCNC	1000		
Millersville Elementary	Millersville Elementary Well	NTNC	6000	Magothy	125
Montessori Intl. Children's House	Montessori Well (New)	NTNC	1600	Aquia	140
Mount Carmel Day Nursery	New Well	NTNC	1100	Patapsco	537
Northrop Grumman - Oceanic	New Well	NTNC	40000	Patapsco	856
Northrop Grumman - Oceanic	Northrop Grumman Well 2	NTNC	60000	Patapsco	545
Open Door Christian School	Well	NTNC		Patapsco	
Opportunity Builders, Inc.	Opportunity Builders Well	NTNC	5000	Patapsco	393
Ourisman Automotive	Honda BLD Well	NTNC	2700	Patapsco	172
Ourisman Automotive	VW BLD Well	NTNC	2700	Patapsco	268
Patuxent Mobile Estates	Patuxent MHP Well 1	CWS	40000	Magothy	335
Patuxent Mobile Estates	Patuxent MHP Well 2	CWS	40000	Magothy	400
Regency Park Assisted Living Residence	Regency Park Well	CWS	5000	Patapsco	426

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System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
Ridgeview Plaza	Ridgeview Plaza Backup Well	NTNC	18000	Patuxent	466
Ridgeview Plaza	Ridgeview Plaza Primary Well	NTNC	18000	Patuxent	530
Rio Vista Plaza Mobile Home Park	Rio Vista Plaza MHP 3	CWS	10000	Aquia	190
Rio Vista Plaza Mobile Home Park	Rio Vista Plaza MHP 4	CWS	10000	Aquia	190
Rock Bridge Academy		NTNC	1500	Patapsco	
Rose Haven	Rose Haven 1	CWS	80000	Aquia	350
Rose Haven	Rose Haven 2	CWS	80000	Aquia	353
Sandy Point State Park Marina	Well 2	NTNC	29000	Magothy	278
Sandy Point State Park Marina	Well 3	NTNC	29000	Magothy	278
Severn Water Company	Severn Water Company Well 1	CWS	560000	Patapsco	265
Severn Water Company	Severn Water Company Well 1	CWS	560000	Patapsco	220
Severna Park Children's Centre, Inc.	Severna Park Children's Centre	NTNC	1700	Patapsco	155
Shady Side Elementary	Shady Side Elementary New Well	NTNC		Aquia	310
Sherwood Forest Water Company	Sherwood Forest Well 1	CWS	100000	Magothy	175
Sherwood Forest Water Company	Sherwood Forest Well 2	CWS	100000	Magothy	154
Smithsonian Enviro. Research Center	SERC Education Center Well	NTNC		Magothy	348
Smithsonian Enviro. Research Center	SERC Main Campus Well	NTNC	1500	Aquia	70
South Shore Elementary	South Shore Elementary New Well	NTNC	4500	Patapsco	280
Southern High School	Southern High Well 2	NTNC		Magothy	495
Southern High School	Southern High Well 1	NTNC	25000	Magothy	497
Southern Middle School	Southern Middle School Well	NTNC	3500	Aquia	380
St. Andrew's School	Well 2	NTNC	8500	Aquia	125
St. Margaret's Learning Center	Church And Parish Well	NTNC		Magothy	265
Summerhill Mobile Home Park	Summerhill New Well	CWS	20000	Magothy	212
Summerhill Mobile Home Park	Summerhill Old Well	CWS	20000	Magothy	210
Sylvan Shores Services Co.	Sylvan Shores Main Well	CWS	55000	Magothy	325
Tebbston On Magothy	Tebbston On Magothy Well	CWS	3200	Magothy	142
Tender Years Child Care	Tenders Years Child Care Well	NTNC	800	Aquia	180
Trenthouse Creek	Well #1	CWS		Aquia	
Trenthouse Creek	Well #2	CWS	3500	Aquia	126
The Key School	2nd Grade/New Manse Bldg. Well	NTNC	7300	Magothy	332
The Key School	Carroll House Well	NTNC	7300	Magothy	337

System Name	Source Name	System Type	Average GPD	Aquifer Formation	Well Depth
The Key School Fusco Park	Fusco Park Well	NTNC	9400	Upper Patapsco	600
The Provinces	Provinces 1 - Cadmium Well	CWS	415000	Patuxent	540
The Provinces	Provinces 2	CWS	415000	Patuxent	556
The Provinces	Provinces 3	CWS	415000	Patuxent	526
The Summit School	Main House Well	NTNC		Aquia	150
The Summit School	Student Activity Center Well	NTNC	3500	Magothy	340
Traceys Landing Elementary	Traceys Landing Elementary	NTNC		Aquia	332
U.S. Naval Academy	USNA Well 15	CWS	1750000	Patapsco	593
U.S. Naval Academy	USNA Well 16	CWS	1750000	Patapsco	598
U.S. Naval Academy	USNA Well 17	CWS	1750000	Patapsco	693
Veterans Plaza	Veterans Plaza Well	NTNC		Magothy	125
Wayson's Mobile Court	Wayson's Well 1	CWS	57000	Aquia	157
Wayson's Mobile Court	Wayson's Well 2	CWS	57000	Aquia	153
Wayson's Mobile Court	Wayson's Well 3	CWS	57000	Aquia	156
Wayson's Mobile Court	Wayson's Well 4	CWS	57000	Aquia	124
Wee Lad & Lassie Early Learning	Wee Lad & Lassie New Well	NTNC	300	Aquia	130
Welsh's Trailer Park	Welsh's Trailer Park Well	CWS	5200	Patapsco	165
Wonder Years - Broadwater Creek Academy	Well	NTNC		Aquia	196
Wonder Years - London Towne Academy	Well 1	NTNC		Aquia	

3.8 Drinking Water Standards

3.8.1 Brief History of Federal Drinking Water Regulations

In 1974, the Safe Drinking Water Act (PL93-523) was passed. Through this Act, the Environmental Protection Agency (EPA) was required to establish national drinking water standards, which became effective June 24, 1977. Most implementation and enforcement responsibilities were given to the State. In 1986, Congress passed the Safe Drinking Water Act Amendments, which formalized the implementation process, setting definite goals and deadlines for EPA to establish additional water quality standards.

In 1996, the Safe Drinking Water Act was reauthorized. There were three major changes to this Act. First, a more realistic schedule for the establishment of new water quality standards was adopted.

Second, a requirement for certain utility owners to protect groundwater sources through "wellhead protection studies" was included. Finally, the 1996 Act required most water system owners to distribute water quality information to all of their customers through a "Consumer Confidence Report."

3.8.2 State Regulatory Agency

The Maryland Department of the Environment (MDE) has responsibility for all aspects of ground water resource management as well as the inspection of public water supply systems. This includes the issuance of permits for the appropriation of groundwater. It also includes the routine monitoring of water systems through site inspections and water quality analysis.

The Maryland Department of Health and Mental Hygiene assists MDE by performing lab analyses and managing a program to certify water quality laboratories. The Maryland Geological Survey (MGS) assists MDE by monitoring groundwater levels and pumpage trends as well as testing for certain constituents in the groundwater supply such as radionuclides.

Monitoring and testing the public water supply is a continual effort for the County. As the EPA establishes new water quality regulations and standards, MDE provides direction to the County on implementation of the federal drinking water standards. The County's Annual Drinking Water Quality Report can be found at <https://www.aacounty.org/departments/public-works/utilities/forms-and-publications/water-quality-reports/index.html>.

3.8.3 Primary and Secondary Standards

The EPA has established a set of primary and secondary drinking water standards for municipal water systems. Enforceable by law, the primary drinking water standards set limits for certain contaminants that can be found in public water systems: microorganisms, disinfection byproducts, disinfectants, organic and inorganic chemicals, and radionuclides. The maximum contaminant level (MCL) or treatment technique (TT) is given for each contaminant, which is enforceable by law. The maximum contaminant level goal (MCLG) is also defined but is not enforceable by law. In order to comply with these standards, the required sampling and analyses vary greatly, depending on the type of analyses. Some analyses are required on a daily basis for every water system, while other analyses are performed only once every three years, and only on the largest systems.

Secondary standards are unenforceable federal guidelines regarding certain substances that may affect the general quality of potable water. These standards are suggested as recommended levels that result in a generally accepted water quality. Above these levels, the taste, color, and odor generally becomes objectionable to the general public.

The EPA, in conjunction with state and local agencies and institutions, continually evaluates the primary drinking water standards to promote human health and safety. The EPA issues new water quality rules periodically, requiring the County's monitoring and testing efforts to continually evolve. EPA's current National Primary and Secondary Drinking Water Standards can be found at www.epa.gov/dwreginfo.

3.9 Water Quality Problem Areas Based On Existing Conditions

The Anne Arundel County Department of Health has identified five (5) potential groundwater problem areas within the County. These problem areas are due to saltwater intrusion, elevated radium, elevated nitrate levels, volatile organic compounds (VOC's) and elevated arsenic and cadmium levels. The County Department of Health will monitor these areas and, if petitions are submitted for service within the areas, action will be taken accordingly and in conjunction with the Office of Planning and Zoning. The five groundwater problem areas are Annapolis Neck, Gambrills Area, Northern Anne Arundel County (generally, all areas north of MD 50), Fort Meade/Odenton Area and the Annapolis/ Edgewater Peninsula.

3.9.1 Annapolis Neck - Salt Water Intrusion

New wells in this area are required to be drilled and grouted (sealed) into a confined aquifer, which is screened at a depth of no less than 270 feet and grouted to a depth of no less than 200 feet to avoid saltwater intrusion problems. The area of concern is shown in Figure 3-4.

3.9.2 Gambrills Area - Elevated Nitrate Levels

Elevated nitrate levels have been detected in some private wells in the Gambrills area near the intersection of Annapolis Road (MD 175) and Crain Highway (MD 3), just east of the Horizons Farm (the recent U.S.

Naval Academy Dairy Farm). The area of concern is shown in Figure 3-4. New wells in this area are required to be drilled and sealed into a confined aquifer below 140 feet in depth to avoid nitrate problems.

3.9.3 Northern Anne Arundel County - Elevated Radium

New and replacement wells in Northern Anne Arundel County are required to be installed to a minimum well depth and meet gross alpha and Radium 226 / 228 drinking water standards. The region within which wells are tested by the County for these parameters is shown in Figure 3-4.

A minimum well depth is determined by the Department of Health and is based on an aquifer with acceptable radionuclide concentrations. A computer model showing the distribution of radionuclide data, well depths, property elevations, and deep test wells is used to determine the minimum well depth requirements. Owners of existing private wells are encouraged to test for gross alpha particles. Where levels are found above the drinking water standards, a water treatment unit or a replacement well in a deeper aquifer is recommended. See Section 3.5.3.1.11 for more details on ongoing capital projects to reduce elevated radium in three SCWs in the Glen Burnie area.

3.9.4 Lower Patapsco Aquifer adjacent to Ft. Meade

A remedial investigation/feasibility study (RI/FS) identified three groundwater contaminant plumes within the Lower Patapsco Aquifer (LPA) that extends beyond the Ft. Meade boundary and into an area beneath the town of Odenton. The contaminants were identified as trichloroethene (TCE), tetrachloroethene (PCE) and carbon tetrachloroethene (CC14). To mitigate the impact on groundwater, a groundwater remediation system (GRS) was placed into service in March 2014. The GRS is estimated to take 25 years to restore the LPA to drinking water standards.

If a property is located within the LPA assessment area (see Figure 3-4) and public water is not available, Appendix J of the RI/FS provides remedial alternatives for:

- a) The continued use and long term monitoring (LTM) of existing potable wells within the LPA or an unknown aquifer and a point of entry treatment system (POET).
- b) A risk evaluation for replacement wells in the Upper Patapsco Aquifer (UPA) and a water treatment device for radium where levels are found above the safe drinking water standard.
- c) A property assessment for single lot and subdivision development in relation to the plumes and availability of public water.

As part of the RI/FS, the Army will perform a cost benefit analysis every 5 years for LTM and operation and maintenance (O&M) of a POET system with the cost to extend public water where a cluster of three or more properties exist within the same geographic area. Where the LTM and O&M costs exceed the cost of extending public water, the Army must develop plans to extend public water within the year LPA study assessment period. Extension of public water will follow the development of plans and will be limited to an impacted property or cluster of properties based on the cost benefit analysis.

The interim requirements for the construction of a replacement well in the UPA include the following:

- a) The well must be drilled and sealed into the Upper Patapsco aquifer at a depth no greater than 200 feet below the land surface.
- b) The annular space must be grouted from the gravel pack to the land surface and the gravel pack may not extend more than 5 feet above the well screen level.

Figure 3-4 Water Quality Problem Areas



3.9.5 Annapolis / Edgewater Peninsula – Presence of Elevated Arsenic and Cadmium

Wells drilled in this area (See Figure 3-4) may show a presence of Arsenic and Cadmium with levels that exceed the EPA maximum contaminant level (MCL). The presence of these chemicals occurs in wells drilled in the Aquia Aquifer. Any well drilled that exceeds the MCL for Arsenic must be re-drilled to a different depth. All new and replacement wells located specifically in the Saunders Point Community, must meet a minimum well depth of 300 feet. All other wells in the test area that exceed the MCL for Cadmium may be granted a Conditional Certificate of Potability with a water treatment system.

3.10 Financial

3.10.1 General

The Sanitary District of the County encompasses the whole County except for that portion that lies within the corporate limits of the City of Annapolis. The Anne Arundel County Charter assigns the responsibility for the construction and operation of water facilities in Anne Arundel County to the Department of Public Works. The Charter requires that all water facilities operated by the County be completely self-sustaining. Furthermore, the Anne Arundel County Code, Article 4, Title 10 limits the outstanding debt of the County for water and wastewater facilities to 5.6 percent of the County's assessable basis of real property, 14 percent of the County's assessable basis of personal property and 14 percent of the operating real property described in § 8-109 of the Tax-Property Article of the State Code, computed as of the first day of the then current fiscal year.

3.10.2 Charges and Assessments

In accordance with the requirements set forth in the Charter, Anne Arundel County has established charges and assessments for connections to the system that are used to pay all operating costs and debt service for the water utilities. Four principal charges have been established as described below. Table 3-14 lists the rates for water charges.

A. Connection Charges

- i. **Tap Connection Permit Fees** - The Tap Connection Permit allows property owners to hire an Anne Arundel County licensed and bonded utility contractor of their choosing to tap the County's water main and install a water connection for the property owner.
- ii. **Capital Facility Connection Charge** - This charge recovers the cost of constructing the water treatment plants, the pumping stations and the conveyance facilities other than the lateral lines. This charge must be: 1) Paid in full at the time of building permit application or connection permit application; or 2) Financed by submitting County Installment Payment Plan signed by all owners of record for the subject property; or 3) Deferred by submitting a Residential Application for Utility Deferment that has been approved by the County's Office of Finance.
- iii. **Inspection Fees** - These charges cover the cost of inspecting the tap installation and service connection and is paid when the building permit, tap connection permit or connection permit application are submitted to the County.
- iv. **Administrative Fee** - This charge covers the cost of processing the tap connection permit or connection permit

B. Utility Assessment

This assessment allows the County to recover costs incurred to construct/extend the water mains and is paid when period of deferral ends, if applicable.

C. Usage Charges

This bimonthly or quarterly charge recovers the cost of operating and maintaining the water treatment plants and other major infrastructure.

D. Environmental Protection Fee

This charge covers the cost for upgrading and rehabilitating water capital facilities and is paid bimonthly or quarterly with the user charge.

Table 3-14 Residential Water Charges

Type	Fees Effective July 1, 2021
Tap Connection Permit Application Fee	\$25.00
Tap Connection Permit Issuance Fee	\$ 234.00
Capital Facilities Connection Charge	\$ 9,351
Connection Permit Application Fee	\$ 25.00
Connection Permit Inspection Fee	\$ 30.00
Quarterly Usage Charges (7/1/21)	\$ 2.83 per 1,000 gallons
Environmental Protection Fee (7/1/21)	32.5% of the water and wastewater usage charge
Capital Facility Recoupment Fee (7/1/21)	\$ 3.46 per 1,000 gallons

Tables 3-15 and 3-16 provide financial management statistics for the Anne Arundel County Water System. Table 3-15 furnishes the status of the Debt Service Fund and Table 3-16 provides financial information for the Operating Debt Fund.

Table 3-15 Debt Service Fund – Water

Revenues	Fiscal Year 2019	Fiscal Year 2020
Investments	\$505,753	\$581,016
Front Foot Assessment fees	\$602,690	\$605,809
Capital Facility Connection fees	\$17,443,109	\$17,733,079
EPF fees	\$7,251,132	\$8,449,942
Miscellaneous	\$59,032	\$56,619
Total Revenues	\$25,861,717	\$27,426,466
Expenses	Fiscal Year 2019	Fiscal Year 2020
Principal	\$11,712,871	\$11,735,650
Interest	\$8,847,351	\$9,259,924
Pro-rata	\$265,000	\$265,000
Miscellaneous	\$45,801	\$104,328
Total Expenses	\$20,871,023	\$21,364,902
Revenue over (under) expenses	\$4,990,693	\$6,061,564

Table 3-16 Water Operating Fund – Financial Management Statistics

	Fiscal Year 2019	Fiscal Year 2020
Water Charge Revenue	\$33,736,462	\$36,015,769
Other Revenue - Water (See Schedule D Below)	\$2,340,852	\$2,303,472
Total Revenue	\$36,077,314	\$38,319,241
Water Operations & Maintenance Expense	\$37,635,741	\$35,354,603
Fees paid to Other Jurisdictions - Water	\$0	\$0
Total O&M	\$37,635,741	\$35,354,603
Total Expense	37,635,741	35,354,603
Operating income or (loss)	-\$1,558,427	\$661,166

Schedule D – Detail of Other Revenue on Table 3-16

Revenue	Fiscal Year 2019	Fiscal Year 2020
Rental Income	\$1,955,062	\$1,982,629
Reimbursement - Damages	\$32,535	\$41,986
Pro rata	\$117,400	\$111,600
Miscellaneous Recoveries	\$235,855	\$167,257
	\$2,340,852	\$2,303,472

Table 3-17 City of Annapolis Financial Management Statistics - Water

Category	Fiscal Year 2019	Fiscal Year 2020
Water Charges for Services	\$ 7,296,611	\$ 7,562,218
Capital Facility Charges	405,947	609,284
Other	413,025	299,338
TOTAL REVENUE	8,115,583	8,470,840
Personnel Expenses	2,269,472	1,933,612
Other Operating Expense	1,210,481	1,185,652
Debt Service	1,459,498	1,769,493
Depreciation	488,571	1,128,113
Administrative/Transfers	1,524,065	707,120
TOTAL EXPENSES	6,952,087	6,723,990

3.10.3 Capital Improvement Program

Anne Arundel County utilizes a six-year Capital Improvement Program for planning the necessary expansions to the water and wastewater system. All plans for major water and sewer projects financed by Anne Arundel County must be reviewed and approved by the Office of Planning and Zoning, the Planning Advisory Board, the County Council, and finally approved by the County Executive. Table 3-18 lists the current water capital improvement projects within Anne Arundel County. The City of Annapolis also utilizes a six-year Capital Improvement Program. Table 3-19 lists the current water capital improvement projects within the City of Annapolis.

Table 3-18 Water Capital Improvement Projects, Anne Arundel County

Project Name	Project Number	Detailed Description
12-inch Water Main -St Margarets/Old Mill Bottom	W801201	Design and construction of approximately 7,000 linear feet of 12-inch watermain within the 220 Service Area. The main will extend along St. Margarets Road from the Amberly WTP to the existing distribution system located east of Mill Creek and along Old Mill Bottom Road to MD Rte 50. The project will improve the pressure within the existing distribution system.
24-inch Transmission Main & 36-inch B&A Transmission Main Isolation	X7337123	Design and construction for the improvement of an interconnection between a 24" water main and 16" water main at the intersection of MD 648 and Magothy Bridge Road in the 220 Glen Burnie Low Pressure Zone. The water mains are currently interconnected via a 36" water transmission main, which due to hydraulic issues, limits the flow from the 24" into the 16".
A/E TO - Water Petitions Ph 1	Y514276	A/E services for design of extensions of public water service for customer petitions.
Amberley WTP Decommissioning	W753410	This contract will include the demolition of the Amberley Water Treatment Facility and associated wells, which have not been in service since 1994. While there are no future plans to use the facility, Operations is incurring costs to maintain the facility. Removing the structures and abandoned equipment will conserve operating budget for necessary facilities.
AMI Water Meter Program	W809100	This project will provide funds for design, construction, and implementation of Advanced Metering Infrastructure System. Initial phase of the project will include design and engineering of software architectural and system infrastructure. The project will be a multi-phase implementation project.
AMI Water Meter Program	W809101	This project will provide for professional design and engineering services necessary to prepare documents from Schematic Design through Contract Documents for implementation of the Advanced Meter Infrastructure (AMI) water meter reading program.
Arnold EWST Rehab	X787045	Rehab of Arnold EWST including correction of paint, OSHA, MDE and structural deficiencies.
Arnold Lime System Upgrade	W805501	This contract includes the design, construction, and inspection services required to upgrade the lime feed system to match the plant's 16.0 MGD capacity along with crack repair and access catwalk design. SD completed under W803328.
Arnold Prod Well # 11	W801803	This contract includes the planning, right of way acquisition, design and construction of Arnold production well #11 and well house.
Arnold Well #11 Raw Water TM (09)	W801809	This contract includes the design and construction of a raw water transmission main from the Well AR-11 site to the Arnold WTP.

Project Name	Project Number	Detailed Description
Arnold Wells 8, 9 & 10 Gen (07)	W805007	This contract includes the design and construction of a stationary emergency generator at the Arnold WTP well #s 8, 9, and 10. The generator installation includes generator set, fuel storage, transfer switches, and other accessories necessary for a complete operational system.
Arundel Mills EWST Rehab (55)	X787055	Design and Construction for the rehabilitation of the 2MG Arundel Mills EWST, which will address deficiencies identified in the WIT's inspection report dated February 2015.
Automated Meter Reading Syst (33)	X764333	This contract includes the schematic design phase for upgrading the collection of water usage data throughout the County, for the purpose of billing, conservation, planning, and enhanced customer service by employing solutions that offer automated metering infrastructure.
Balt City - Fullerton WTP	W804600	<p>Funds are requested for Anne Arundel County's share of the proposed Baltimore City Fullerton Water Treatment Plant. The facility is being planned, designed and constructed to meet regulatory requirements, demands of the water service area and to provide reliability. Funds will only be requested to cover Anne Arundel County's share of the new facility in accordance with inter-jurisdictional agreement between Baltimore City, Anne Arundel, Baltimore and Howard Counties.</p> <p>At the time of project request, Anne Arundel County's proportional share of the project has not been agreed upon. Local share could range between 4% to 10% of the total \$500 million dollar project cost.</p> <p>Future funding requests will be made in the 5 Yr Program once percentages are agreed upon by all jurisdictions.</p>
Balt City Connection PRVs	W803342	Work will include design, construction and construction management for the addition of three pressure reducing valves at locations connecting to the Baltimore City water system.
Banbury WM Extension (01)	W806001	This project is for the design, right of way acquisition, and construction of approximately 1,600 LF of new water main along Banbury Road in the Gibson Island area.
Bonnet Bolts Phase 3	X7337153	This contract will repair and replace water valve components ranging in valve sizes from 6 to 16-inches. Approximately 5,000 valves have been identified countywide for repair. Approximately 500 valves are anticipated to be replaced in phase 3 in the Crofton & Odenton Area.
Bonnet Bolts Phase 4	X7337160	Replacement of failing valve bonnet bolts and miscellaneous appurtenances on main line water valves countywide.
Bonnet Bolts Phase 5	X7337165	Rehabilitation of 500 deteriorated 6"-16" water valves in Odenton/Crofton areas.
Broad Creek 2 GST (56)	X787056	Rehabilitation of the Broad Creek II GST. It will address deficiencies in the WIT's inspection report dated April 2011.
Broad Creek Production Wells (03)	W804003	This contract includes the planning, right of way acquisition, design, and construction to provide 3 new raw water production wells to serve the planned Broad Creek WTP expansion, and installing one well house at each well site, including all power, communications, and piping necessary for completely operational wells. The Design and construction management services of this contract is under Contract W804001 Demolition of the existing Broad Creek WRF structures will be paid for under Contract S792704.

Project Name	Project Number	Detailed Description
Broad Creek Raw Water Assess (143)	X7337143	This contract is for the condition assessment and evaluation of the Raw Water Mains, in Broad Creek well field # 10 associated with wells 1, 2, 3, 4, 5 and the Broad Creek WTP, resulting in design recommendations for action items to extend the remaining useful service life.
Broad Creek Trans. Mains (04)	W804004	This contract consists of designing and constructing a raw water transmission main from each of the selected well sites to Broad Creek II WTP. See Contract W804002 for selected well sites. One transmission main to be constructed.
Broad Creek Wells 2 & 4 Gen (08)	W805008	This contract includes the design and construction of necessary improvements to support the use of a portable 500 kw generator to support the well operation. Procurement of the generator will be included with this contract.
Broad Creek WTP Expansion (01)	W804001	This contract consists of increasing the treatment capacity of the Broad Creek WTP from 4 million gallons per day to 8 million gallons per day. Includes increasing current capacity of several water treatment unit processes including sludge holding, transfer sump, clearwell, filters, clarifiers and rapid mixer, as well as miscellaneous enhancements.
Broad Creek WTP Upgrade (07)	W804007	This contract includes the planning, design, and construction to upgrade the existing process trains at the Broad Creek WTP. Work will also include modifications to the residuals handling system.
Broad Crk WTP Hypo Tank Repl.	W804009	This contract include design, construction, and inspection related to the replacement of a failed existing hypochlorite storage tank. This replacement is being done ahead of Contract W804007 (Broad Creek WTP Upgrade) to maintain redundancy.
Central Avenue EWT Rehab	X787062	Rehabilitation of the 750,000 Gallon Central Ave EWT. This contract will address deficiencies identified in WIT's inspection report dated February 2015.
Chg Against WTR Closed Proj 2 (02)	W741402	Funds are approved to allow for settlement of claims and items required in the Project Performance Phase on Water Capital Projects which have been closed out prior to the settlement of the claims. Available balances from completed projects will be the primary source of funding for this project.
Clean/Line North Severna Park (109)	X7337109	Design and construction for cleaning and lining approximately 10,890 lf of 6", 4,240 lf of 8", and 2,725 lf of 10" waterline in North Severna Park, Robinson Knolls. Inspection will be performed under X7388165 or X7388239.
CM II Exp Ph 2 - Wells (02)	W801402	This contract will provide two new water production wells, increasing the total well field capacity from 15 to 21.5 MGD.
CM II Exp Ph 2 - Wtr TM Lines (03)	W801403	This contract will provide raw water transmission lines from each of the two planned water production well sites.
CM II Structural Arch. Rehab	W801407	Safety concerns related to cracks and separations of the concrete blocks require evaluation of each structure at the WTP site. The contract will include an evaluation of all the existing buildings in the CM II WTP site and provide recommendations to address and resolve the noted concerns. Urgent work, if any, will be noted for corrective action.

Project Name	Project Number	Detailed Description
CM II WTP Emergency Generator (06)	W805006	This contract includes the design and construction of one portable generator for Crofton Meadows II wells 8/9, 10/11 with a quick connect. The generator installation includes generator sets, fuel storage, and transfer switches, and other accessories necessary for a complete operational system. The portable sets will be 550 KW for wells 8, 9, 10, and 11.
CM Portable Gen Wells 8 - 11	W805011	This contract includes design and construction of one portable generator for Crofton Meadows wells 8/9 & 10/11 with a quick connect .The generator installation includes generator sets, fuel storage, and transfer switches and other accessories necessary for a complete operational system. The size of the generator be roughly 550 kW.
Coriander Place WM Extension (01)	W805901	This project is for the design, right of way acquisition and construction of approximately 1,400 LF of water main along Coriander Place and portions of Cardamon Drive and Oregano Drive. This is for a petition project.
Coriander Pl-Gngrvllle Mnr Wtr (66)	Y514266	This contract will perform a feasibility study and design for providing water service to 15 properties along Coriander Place and a portion of Cardamon Dr. This work in being done as part of a valid petition project. Construction, & Inspection being done under W805901.
Crofton Mdws WTP Site Valves (06)	W801406	This contract includes design, construction, and inspection services for the installation of on-site yard valves at the Crofton Meadows WTP site.
Crofton Mead-12&13 Raw Wtr Ln (04)	W778604	This contract includes the installation of a large diameter raw water line from the wellhouse for wells 12/13 to the Crofton Meadows II WTP. The basis of the design contract will be "progressive award"
Crofton Meadows ET Rehab (58)	X787058	The contract is for the design and construction of the rehabilitation of the Crofton Meadows Elevated Water Tank.
Crofton Meadows II Exp Ph 2 (01)	W801401	This contract will increase the capacity of the Crofton Meadows II WTP from 15 to 20.0 MGD by adding additional sedimentation basins, filters and raw water wells. Well field will be increased from 15.0 to 20.0 MGD.
Crofton Meadows II WTP 12&13 (03)	W778603	This contract includes the acquisition of a well site and installing two raw water production wells and a well house on the site. Location: intersection of St. Stephens Church Rd and Johns Hopkins Rd. Test wells 12T and 13T were completed under contract W778606. Also, see W778604 for the raw water TM.
Crofton Sphere EWST Rehab (54)	X787054	Rehabilitation of the 500,000 Gallon Crofton Sphere EWT. This contract will address deficiencies identified in WIT's inspection report dated January 2015.

Project Name	Project Number	Detailed Description
Demo Abandoned Facilities	W753400	<p>Funds are approved, requested and programmed to demolish various facilities which are no longer in service.</p> <p>The facilities include, but are not limited to, Pines WTP; Dorsey Wells #1,3,4,11,14 and #15; Severna Park Booster Station; Ft. Smallwood BPS; Riviera Beach Standpipe; Sawmill Wells; Glen Burnie Park BPS; Thelma Ave SCW; Sawmill WTP; MD City Ind Wells 1,2,3,& 4; Quarterfield GR Storage Tank, Pasadena EWT, Marley BPS, Crofton Meadows I WTP treatment basins, Ft. Meade BPS and Glendale SCW.</p> <p>Project description amended in FY16 to include Amberly Water Treatment Plant.</p>
Demo Crofton Meadows I Basins	W753411	Funds are requested to demolish Crofton Meadows I WTP obsolete treatment basins. Work to include settling basins and mixing / flocculation tanks.
Dorsey WTP Gen & Swtchgr Repl	W805010	<p>This Contract is for the A/E design services necessary for the replacement of the 13.2-kV primary switchgear and 480-volt substation with a new 13.2-kV primary switchgear and 480-volt switchboard, and standby diesel generator for 480-volt switchboard equipped with a minimum of 24 hours of fuel storage, and associated site electrical work with switch gear replacement and stationary generator.</p> <p>BGE will own and maintain the 13.2kV:480V transformer, A/E coordinates our design with BGE requirements.</p>
Dorsey WTP Lime System Upgrd (01)	W805601	This contract includes design construction and inspection services associated with the upgrade of the existing lime feed system and associated chemical feed locations.
East / West TM Phase I (01)	W803601	Design, rights of way acquisition and construction of water transmission main that will transfer water from Arnold WTP and Crofton Meadows WTP to minimize use of Baltimore City water. Design will result in multiple phases of construction. Schedule only reflects the first subphase.
East / West TM Phase II (02)	W803602	Design, rights of way acquisition and construction of approximately 15,000 feet of 24-inch water transmission main from the intersection of Elvaton Road and Old Hospital Drive to the 20" main in Waterford Road. Design will result in multiple construction contracts.
East/West TM Phase III (04)	W803604	Design, rights of way acquisition and construction of water transmission main, control valves, and booster station that will transfer water from Crain Highway EWST to the NE corner of BWI Airport. Design will result in multiple construction contracts. Schedule reflects last anticipated phase.
Edgewater Beach Water Ext	W806401	Work on this project includes the design, right of way acquisition and construction of a water distribution system serving the Edgewater Beach Community. This will extend as part of the petition project.
EWST - Bacontown (02)	W799602	Design and Construction of a 2 million gallon elevated water storage tank and transmission main.
EWST - Cedar Tree (11)	W799611	Design and construction of a new 2 MG tank in Ferndale, MD.

Project Name	Project Number	Detailed Description
EWST Antenna Inspection Ph 5 (59)	X787059	This contract is for the continued inspection necessary for 3rd party antennae installation on County-owned EWST. Contract will be 1 year contract with 4 renewable years. Engineers Estimate is for 1 single year.
EWST Evaluation Phase D	X787060	This contract is for the inspection and evaluation of existing elevated water storage tanks, for development of priority lists for future tank rehab contracts. Contract will be 1 year contract with 5 renewable years. Engineers Estimate is for 1 single year.
EWST-Heritage Harbour (16)	W799616	Design and construction of a 1 million gallon Elevated Water Storage Tank. This tank will replace the existing Broadcreek I EWST.
EWST-Rte 3 Wtr Main Crossing (15)	W799615	Design and construction of a new pressure reducing valve vault and 12" water main crossing under MD Rte 3 in Crofton. This water main will allow the new Waugh Chapel EWST to feed water into the 290 water pressure zone.
Fire Hydrant Rehab Phase 25 (25)	W787825	This project is to remove lead paint and repaint and provide maintenance paint coats for County owned fire hydrants.
Fire Hydrant Rehab Phase 26 (26)	W787826	This project is to remove lead paint and repaint and provide maintenance paint coats to County owned fire hydrants.
Fire Hydrant Rehab-Zone 3	W787827	This project is to remove lead paint and repaint and provide maintenance paint coats to County owned fire hydrants.
Ft Smallwood / Nursery Rd (138)	X7337138	This contract includes design, construction, and inspection for the replacement of valves, vaults, and pipeline repair on the Fort Smallwood Transmission main.
Ft Smallwood Rd PRV	W803334	Work will include the design, construction, and management for the addition of a 54" pressure reducing valve in the water transmission main near the connection to the Baltimore City System.
Gatwick Rd WM Rehab (148)	X7337148	This contract will rehabilitate approximately 830 lf of watermain on Gatwick Rd in Harundale.
GB High Zone-Hammonds Ferry	W801702	This contract provides for the design, right of way acquisition, and construction of 3,170 linear feet of 12" water main along Hammond's Ferry Road from I-695 ramps to Hammond's Business Park at MD-295.
GB High Zone-Nursery Road (04)	W801704	This contract provides for the design, right of way acquisition, and construction of 2,700 linear feet of 12" water main along Nursery Road.
Gibson Island WTP Bldg Repair	W803346	The contract will include an inspection of exterior damage to an existing building and performing the necessary repairs.
Hammonds La. Bridge WM Repair (135)	X7337135	Design and construction for the repair of the 12" watermain on the Hammonds Lane I-895 Overpass which is currently broken and out of service.
Hammonds Lane Area Study (02)	W778802	This contract is to study the 295 PZ to serve the 350 and 215 PZ while still maintaining a current flow pattern.
Hammonds Lane GST (40)	X787040	Design and construction to address the deficiencies identified in previous evaluation studies.

Project Name	Project Number	Detailed Description
Hanover Rd Water Main Ext. (01)	W806101	This contract will coordinate construction of a 12-in water main with project H566701, which assumes a road design from a developer via an impact fee credit agreement, acquires R/W, and constructs the half section of the ultimate 4 lane Hanover Road between Ridge and Stoney Run Roads. The new 12-in main will be run in the acquired R/W under the proposed bike path.
Hanover Road Corridor (72)	Y514272	This contract includes design of approximately 1,400 LF of 12" water main connecting Hanover Road with Stoney Run Road. This contract is in conjunction with H566701.
Harmony Avenue Watermain Repl (120)	X7337120	Design and Construction of approx. 800 feet of replacement water main installed in 1958, replacement of 3 hydrants including associated valves, renew 7 house services: 775 Harmony Ct and 777, 776, 779, 781, 778, and 780 Harmony Avenue and install additional water main in order to loop Harmony Court to either Century Vista Drive or Wilson Road. This work is concurrent with sewer main replacement under X7388213.
Heritage Harbor WM Align Study	X764342	This contract evaluate alternatives for conducting an alignment study and cost analysis to determine the best way to loop and provide redundant service to the Heritage Harbor area.
Heritage Harbor Wtr Takeover (01)	W805701	This contract will include design, right of way acquisition, inspection, and construction for any necessary improvements required prior to takeover of an existing private water system serving approximately 106 homes. This is in response to a petition request.
Heritage Harbor Wtr Takeover (68)	Y514268	Work under this contract includes the inspection and evaluation of improvements to facilitator a takeover of the private water system at Heritage Harbor. Investigation to be done under this contract. New project W805701 has been opened for final design and construction. This contract is in response to a petition request.
Jacobsville EWT Rehab (50)	X787050	This contract is for the rehabilitation of Jacobsville EWT.
Jessup EWT Rehab (51)	X787051	This contract is for the rehabilitation of the Jessup water tank.
Large WM Corrosion Cntrl Ph I	X764344	The contract will consist of evaluation and recommendation of maintenance for County water pipelines. The purpose of the assessment is to assist the County in prioritizing pipeline and appurtenances for repair or replacement based on pipeline material, age, current condition, presence of corrosion protection, service area, and other factors. Phase 1 will focus on lines between 24" and 42".
Linthicum EWST Rehab (46)	X787046	Rehab of Linthicum EWST including correction of paint, OSHA, MDE and structural deficiencies.
Maryland City EWST Rehab	X787061	This contract is for the design and construction of the rehabilitation of the Maryland City Elevated Water Tank. Chris Murphy responded that there cannot be a 6 month shutdown of the tank and to proceed with just the structural design and finalize the SD report. Conf. call to discuss GF questions following structural design only instruction 05/28. GF finalizing SD report and preparing proposal for progressive award design work.

Project Name	Project Number	Detailed Description
MD 170 @ MD 174 WM Relocation	X800108	SHA plans to widen and improve the MD 170 at MD 174. The widening and installation of new storm drain facilities will be in conflict with several existing water and sewer mains. The length of the project is approximately one mile. This project consists of relocation of the existing utilities where adequate clearances cannot be provided. NOTE: The project will proceed according to the SHA's schedule and time table. An MOU will be needed to address the relocation of the ex. utilities, and identify County's share of costs and responsibilities.
MD 175 & 295 WM Reloc Phase 2	X800110	Work to the east of MD 295 (Phase 1) to be completed under contract X800106, SHA AA 4365371.
Mech Shop & Warehouse Storage	W803345	The scope of this contract includes the design, construction, and inspection of mezzanine storage area in the Mechanical Shop and Warehouse. The additional storage will support the ordering and storage of long-lead items. Adding LED lighting to Mechanical Shop (Warehouse already has LED interior lighting)
Millersville Bldg A Roof-Wtr	W803349	Work on this contract will include design, construction, and inspection services needed for the roof replacement in Building A of the Millersville Complex.
Millersville Bldg C Roof Repl	W803343	This project includes replacement of the existing roof on Building "C" at the Millersville DPW Complex. Work will be done in conjunction with the solar panel installation project.
Millersville LED Lighting-Wtr	W803348	Work under this contract will include the design, construction, and inspection of the replacement of the existing lighting systems at Millersville Complex Buildings A, B, and C with LED lighting systems.
New Cut WTP (01)	W804301	This contract includes the planning and right of way acquisition of a water treatment plant to serve the Glen Burnie High Zone. The New Cut WTP will serve the area water needs and the water demands created when the Dorsey Road WTP is decommissioned.
New Water Meters FY21	X742427	This project provides funding for the purchase of new water meters and associated accessories.
Nichols Rd WM Interconn (35)	W803335	This contract is for the construction of the water main interconnect between Anne Arundel County and the City of Annapolis at Nichols Road.
Nursery Rd WBS Suction Header (29)	W803329	This contract includes evaluating the apparent separation of the suction header and recommending corrective measures. Follow-on construction is included as part of this contract.
OPS Compl Solar Panels-Water	W808800	Funds are requested for the design, construction, and inspection of new photovoltaic panels at the Utility Operations Complex. Work will include solar arrays on existing building roofs, canopies over parking lots, electric vehicle charging stations, and other necessary improvements to support the system.
OPS Compl Solar Panels-Water (01)	W808801	Work includes the design, construction, and inspection of new photovoltaic panels at the Utility Operations Complex. Work will include solar arrays on existing building roofs, canopies over parking lots, electric vehicle charging stations, and other necessary improvements to support the system.

Project Name	Project Number	Detailed Description
Outdoor Sampling Stations	W803347	This contract (phase 1) will provide approx. 30/75 outdoor sampling stations at locations determined by Water Operations. Work will involve a limited amount of engineering work, and easements and R/W as required.
PFAS Assessment Study	X764340	This contract includes providing an exposure assessment for PFOA & PFOS compounds, developing a sampling protocol of current facilities, and development of a management and response plan. The scope will include evaluation of small scale treatment technologies and temporary facilities.
Ph 2 WM-Phirne, Brooklyn Park (02)	W804502	Design services and construction for various water system improvements in various locations in the Brooklyn Park and Glen Burnie areas.
Phase 4 Well Construction	W744471	Phase 4 Well Construction -Reconstruction, redevelopment, re-drilling, testing and the installation of new pumps, motors and appurtenances in certain high-capacity production wells owned and operated by the Anne Arundel County Department of Public Works.
Phase 5 Well Construction	W744472	Reconstruction, redevelopment, re-drilling, testing and the installation of new pumps, motors and appurtenances in certain high capacity production wells owned and operated by Anne Arundel County Department of Public Works.
Phase 6 Well Construction (74)	W744474	Reconstruction, redevelopment, re-drilling, testing and the installation of new pumps, motors and appurtenances in certain high capacity production wells owned and operated by Anne Arundel County Department of Public Works.
Phase I Well Construction (68)	W744468	This contract is for well redevelopment, well reconstruction and new well construction in Anne Arundel County. This contract is for one (1) year. First Year Wells: Crofton Meadows 5, Rose Haven 1, Rose Haven 2, Severndale 8, Dorsey Road 2R, Dorsey Road 20, Dorsey Road 22, Dorsey Road 23, Broad Creek 5, Dorsey Road 19
Raw Water Iron Pretreat Study	X764341	Severndale Well #9 (1800 gpm) was built 15+years ago but has remained out of service because the iron level in this well/aquifer exceeds 6 ppm. Given the high iron concentration and limited means of treatment at the plant this well capacity remains unutilized. This contract will investigate possible package treatment technologies that could be deployed at the well site for iron removal prior to reaching the head of the water treatment plant. Work will also include Dorsey Well #23.
Reece Road Water Extension	Y514275	This contract includes the design of an extension of public water to eight (8) properties along Reece Road. This is a petition project.
Rose Haven WTP Emer Generator (05)	W805005	This contract includes the design and construction of a new stationary diesel 200 kw emergency generator at the Rose Haven Water Treatment Plant. The generator installation includes generator set, fuel storage, transfer switches and other accessories necessary for a complete operational system.
Route 2 - WM Emergency	X7337167	To repair the Route 2 water main break at Admiral Cochrane.

Project Name	Project Number	Detailed Description
Routine Water Extensions	Y514200	<p>This project is for design, land acquisition and construction of minor extensions and minor projects identified by the department to the existing water system as petitioned by residents or determined necessary as an integral requirement of CIP Road Improvement that accommodate the road design and/or avoids future excavation of the new road infrastructure. It will also enable the Department of Public Works to respond to emergency situations mandated by the Maryland Department of the Environment for water service.</p> <p>Construction of major extensions (those estimated to cost more than \$250,000) are programmed and budgeted as separate capital projects.</p>
Sd Repl GB/Pasadena (125)	X7337125	This is the replacement of 2052 linear feet of 4" in Linthicum Heights, 764 linear feet of 6" in Glen Burnie West, 932 linear feet of 8" in Linthicum Heights and Glen Burnie East and abandonment of 1034 linear feet in Glen Burnie, Linthicum Heights and Pasadena.
Severndale Control Sys Upgrde (03)	W799403	Replacement of the existing Process Control System at the Severndale Water Treatment Plant and VFD replacement at Severndale WBS.
Severndale Raw Water Assess (144)	X7337144	This contract is for the condition assessment and evaluation of the raw water lines, in Severndale well field # 4 associated with production wells 3,4,5,6,7,8,9 and the Severndale WTP, resulting in design recommendations for action items to extend the remaining useful service life.
Severndale WBS Emrg Generator (01)	W805001	This contract includes the design, right-of-way acquisition, and construction of a new 900kw emergency generator at the Severndale Water Booster Station. The generator installations include generator set, fuel storage, and transfer switches necessary for a complete operational system.
Severndale WTP Filter Rehab	W808900	Remove and replace original underdrain system of the existing filters for the Water Treatment Plant.
Severndale WTP Filter Rehab (01)	W808901	Remove and replace original underdrain system and blowers for the existing filters at Severndale Water Treatment Plant and address stair deficiencies.
SHA Water Main Reloc- Rt. 175 (06)	X800106	<p>This contract includes design, construction, and inspection of the relocation of water main along Rte. 175 in order to accommodate an SHA road widening project. Work will generally be located to the east of I-295. Project may involve relocation of 1400 LF of 12", 1200 LF of 20", and 950 LF of 24" water main. MOU being created by SHA for Design fees (KCI Technologies) and Construction cost. SHA AA 4365371.</p> <p>07/14/2020 SHA finalizing rebid package. Work west of I-295 has been turned over to AACo Highways.</p> <p>SHA Rebid. Revised SHA MOU. Current processing of MOU is being held for the revisions.</p>
SHA Water Main Reloc- Rt. 177 (07)	X800107	This contract involves water system modifications to accommodate SHA road project. The SHA project may impact 36" TM along Mountain Road.
Shipley's WBS Emergency Gen	W805009	This contract includes design, construction, and inspection for the provision of a portable generator and connection at the Shipley's Choice WBS. The generator size is approximately 75 kW.

Project Name	Project Number	Detailed Description
Shipley's Wtr Main Relocation	X7337151	Shipley's Water Main Relocation
South River Bridge ARV Upgrd	X7337156	Provide a new weather rated enclosure and heat tracing system to house ARV #810 located on the MD Rt. 2 South River Bridge and keep it and the associated infrastructure from freezing; change the existing piping layout for the ARV so that it can be accessed from the bridge; install status notification or lighting to indicate proper operation and supply power for heat tracing system; evaluate and recommend best option for receiving power.
Tanyard Springs Lane WM Ext. (71)	Y514271	This contract includes the design of approximately 1,500 LF of 12" water main from the existing main at the end of Tanyard Springs Lane to Solley Road. This contract is in conjunction with H566901.
Tanyard Springs Ln WM Ext. (01)	W806201	This project is for the design, right of way acquisition, and construction of approximately 1,500 LF of 12" water main from the existing main at the end of Tanyard Springs Lane to Solley Road. This contract is in conjunction with H566901.
TM-MD Rte 32 @ Meade Phase 2 (02)	W801602	This contract consists of the design, environmental assessment, ROW acquisition, and construction of approximately 22,000 LF of 24" water main from MD 175, along MD Route 32 towards MD City (MD Route 198). Environmental Assessment will be required due to location on Ft. Meade or Department of Interior Property.
Veterans Highway WM Repair	X7337158	Removal and replacement of approximately 3 feet of damaged 8 inch HDPE WM.
Water Clean & Line FY12 (98)	X733798	Cleaning and Lining of Water Mains on Crain Highway from Georgia Avenue to Thelma Avenue.
Water Facility Painting	W803344	The scope of this contract includes the creation of a project manual that can be used to create a blanket order to accomplish the coatings rehabilitation of water facilities including booster pumping stations and treatment facilities located throughout Anne Arundel County.
Water Laterals SHA Roadways (131)	X7337131	Design and replacement of 97 water laterals located in SHA roadways. One design A/E will be used for all geographic locations.
Water Main A/E Task Ord Phs 2	X7337164	A/E services for designs related to water main rehabilitation and replacement.
Water Main A/E Task Order Phase I (137)	X7337137	A/E services for designs related to water main rehabilitation and replacement. Task order contract. To continue Task Order WM AE services, the renewal needs to be initiated at the beginning of 2021.
Water Main CMI Services Ph 3 (133)	X7337133	Provide CM/I services in support of X733700 construction. Task order contract is renewable.
Water Main CMI Services PH 4	X7337162	CM/I services via task order for FY 22-FY 27.
Water Main Stock (152)	X7337152	Purchase of water roadway valve boxes, meter vaults, meter yokes, curb stop valves, etc. to replace depleted SER inventory. Materials are used by SER and the County Roads Division for FY18-FY23

Project Name	Project Number	Detailed Description
Water Meter Bench Test Equip	W806302	This contract includes procurement of new bench testing equipment for water meters. This equipment is used to assess the accuracy of existing water meters.
Water Meter Repl/Upgrd	W806301	Work on this child project involves the purchase of replacement water meter system components including meters, radio transceivers, and associated cabling.
Water Model Calibration	X7337155	Purchase of water model calibration software license renewals from Bentley Systems, Inc.
Water Proj Planning	X764300	Funds have been approved for preliminary planning, engineering, and cost estimating for proposed future Capital Water Projects. This will be a revolving fund that will be reimbursed as the future capital projects are established and funded in the Capital Budget.
Water Ser Rep GB/Pasadena	X7337161	This contract replaces galvanized water services in Glen Burnie and Pasadena and includes replacement of all galvanized water services on SHA roadways Countywide.
Water Serv Repl Contract 2B	X7337166	This is the first renewal (of 4) of the second Task Order contract X7337157 for Water Service Replacements.
Water Service Conn. FY20	X742424	This project consists of installing service connections and meters to existing water and sewer mains for which service laterals were not originally constructed as part of the capital budget program.
Water Service Conn. FY21	X742426	This project consists of installing service connections and meters to existing water and sewer mains for which service laterals were not originally constructed as part of the capital budget program.
Water Service Repl Contract 2	X7337157	This is the second Task Order contract for Water Service Replacements.
Water Service Repl-Gln Brn 2	X7337163	Replacement of 233 galvanized water services in Glen Burnie, Severna Park, Laurel, Baltimore, and Pasadena. This is the first renewal of X7337150.
Water Strategic Plan (01)	W778801	A/E services to perform a feasibility study of requirements to allow the 295 PZ to serve the 350 and 215 PZ while optimizing current flow patterns. Potential resiting of the Hammonds Lane BPS GST also included.
Water Svc 702 Robey Lane (70)	Y514270	This contract includes the easement acquisition and extension of water service to 702 Robey Lane.
Well Production Services 2 (67)	W744467	Assessment, design, construction management/inspection and emergency support from raw water well consultant.
Well Production Services 3	W744473	Assessment, design, construction management/inspection and emergency support for raw water wells. SL in process.
Whiskey Bottom Road Interconn (01)	W805801	This project is for the design, right of way acquisition and construction of approximately 1,600 LF of new 12" water main connecting the existing water main in Whiskey Bottom Road to the Howard County Public Water System.

Project Name	Project Number	Detailed Description
WM & FH Replacement (134)	X7337134	Construction only for the replacement of 52 fire hydrants. Scope of Work includes removal and replacement of the fire hydrants, valves, leads and tees. Contract duration 270 CDs.
WM Fire Hydrant Replacement (132)	X7337132	This is a renewable contract to replace approximately 200 fire hydrants Countywide per year for a base year and four 1-year renewals. All fire hydrants being replaced are Woods Matthews hydrants for which parts are no longer accessible. The general scope of work is to replace the hydrant only, with contingent items available should valve or lead replacement be needed. CM/I will be performed under X7337137. Duration 365 CD.
WM HS Truman Blvd Invest/Repl (HST)	X7337159	Investigation of a water main in Harry S Truman Blvd and replacement.
WM Repl Winchester On Severn (124)	X7337124	This contract replaces 1041 lf of 4", 4643 lf of 6", and 1718 lf of 8" watermain in the Winchester on the Severn neighborhood of Anne Arundel County. Construction Management and Inspection will be performed under X7337100.
WM Repl. Pines on the Severn (111)	X7337111	Design and construction for replacement of approximately 158 lf of 4", 5,151 lf of 6", 3,700 lf of 8" and 1,611 lf of 12" watermain in the Pines on the Severn neighborhood and Chase Creek crossing.
WPP-Water Main Lining Invest. (26)	X764326	Replacement of 52 fire hydrants. Scope of Work includes removal and replacement of the fire hydrants, valves, leads and tees.
WSS Camera & Gate Upgrades	W800219	This project will provide security camera and gate upgrades at multiple water treatment facilities.
Wtr Serv. Repl. T.O. Contract (150)	X7337150	Task Order contract for the design of Standard Water Service Replacements. Construction will be assigned under separate contracts.
Wtr Sys. Cybersecurity Assess	X764343	This contract will evaluate the cybersecurity vulnerability of the water system. Work will include reviewing the existing system, evaluating the system against a cybersecurity risk management framework, and identifying and prioritizing recommended improvements.
Wtr Utility Benchmarking StdY	X764345	This contract will review existing operating cost data and industry standards to develop benchmarking metrics for the delivery and treatment of drinking water. The work will include an evaluation of energy usage and will identify and calculate industry standard metrics for energy use. This information will be used to develop strategies to improve energy efficiency at water facilities.

Table 3-19 Water Capital Improvement Projects, City of Annapolis

Project Title	Project Number	Description
Water Tank Rehab	71002 & 71006	This project provides for water tank painting, repairs and retrofits of valves, foundations, structures and site improvements to the water tanks used for storage of the City's water supply. Tanks are painted in a cyclic order, and periodic repairs and retrofits of the altitude valves, structures and site improvements are made to the tanks. This project also includes additional assessments to refine prioritization of the water tank projects into the future.
Water Distribution Rehab	71003 & 71005	The existing water distribution grid is aging, as is evidenced by the frequent failures. The City's Water and Sewer Comprehensive Analysis Plan was recently developed using typical asset management practices incorporating both probability and consequence of failure factors. The Plan establishes risk to every asset and outlines the priority water distribution system rehabilitation capital needs for the next 5 years. This CIP project includes design and construction of identified priority projects. The Plan also identifies additional planning work and assessment strategies necessary to refine prioritization of water distribution infrastructure upgrades into the future. Projects, planning and assessment activities are directed towards minimizing water loss per Maryland Department of the Environment Water Loss Plan.

4 Sewerage Systems

4.1 General Information

Unlike the County's water system that contains interconnections between pressure zones; eleven separate and distinct sewer service areas have been established for purposes of providing sewerage facilities to serve Anne Arundel County. The remaining land is designated as Rural. The boundaries of these service areas are shown on adopted Master Plan Maps of the Sewer System S-1 through S-12 and also on Figure 4-1. These service areas are based on topography and natural drainage areas. There are no combined sewers carrying both sewage and storm water within the public sewer service areas.

Information in this chapter includes: detailed descriptions, projected sewer demands and capacity requirements for each sewer service area; Capital Projects programmed for Wastewater; Sludge Management Strategy; and Wastewater Management Problem Areas designated by the Department of Health.

4.2 Future Flow Projections

The County currently has approximately 129,000 sewer connections and treats approximately 33.7 million gallons per day (MGD) of wastewater. Table 4-1 provides the population and housing unit forecasts through the year 2050. Table 4-2 provides a summary of the anticipated wastewater flows for each service area based upon flow projections developed with the use of the Wastewater Flow Projection System (WWFPS) Tool. For more information regarding the WWFPS, see Appendix H.

4.3 Water Reclamation Facilities (WRF)

Of the eleven sewer service areas, nine are served by public facilities operated and maintained by the Anne Arundel County Department of Public Works. These include: Cox Creek, Maryland City, Patuxent, Mayo*, Broadneck, Annapolis, Broadwater, Piney Orchard and Bodkin Point (two public operated septic systems and one mound system). Two of the remaining service areas have conveyance systems that are operated and maintained by the County but the treatment facilities are located in neighboring municipalities. These service areas include: Baltimore City (served by Patapsco Sewage Treatment Plant in Baltimore City) and Rose Haven/Holland Point (served by the Chesapeake Beach Wastewater Treatment Plant in Calvert County). Permission to transport wastewater to these facilities for treatment is governed by intra-jurisdictional agreements. Special agreements are discussed in Section 4.4 and in more detail within each appropriate sewer service area description. Table 4-3 is a list of public treatment facilities and their rated capacities. All remaining land is considered Rural and is not planned for service by public sewer facilities.

**Sewer flows for the Mayo SSA are now conveyed to the Annapolis WRF. The Mayo WRF and Glebe Heights Small Communal are being decommissioned. As requested by MDE, flows from the Mayo Regional SPS are still being tracked separately.*

Table 4-1 Population and Household Forecasts, 2020-2050

	POPULATION						
SEWER SERVICE AREA	2020	2025	2030	2035	2040	2045	2050
Baltimore City	45,612	48,737	53,211	58,334	62,981	64,707	65,538
Cox Creek	153,472	161,901	168,058	172,540	174,762	176,915	178,157
Maryland City	25,506	27,460	29,352	30,437	31,256	31,806	32,212
Patuxent	86,382	94,430	100,231	103,024	105,068	107,125	109,011
Broadneck	89,090	91,184	92,753	93,907	94,693	95,467	95,930
Annapolis	87,880	90,245	92,360	93,724	95,111	96,401	97,878
City of Annapolis*	40,246	41,484	42,722	43,960	45,198	46,436	47,846
County Portion	47,634	48,761	49,638	49,764	49,913	49,965	50,032
Mayo-Glebe Heights	8,816	9,081	9,330	9,552	9,737	9,873	9,986
Broadwater	10,890	11,383	11,842	12,185	12,440	12,640	12,818
Piney Orchard	12,433	13,120	13,787	14,302	14,667	14,979	15,180
Bodkin Pt./Pinehurst	286	290	294	298	303	308	314
Rose Haven	743	755	767	780	794	808	820
Ft. Meade (Private)	8,645	8,815	8,983	9,108	9,175	9,233	9,290
Rural	62,940	64,286	65,246	66,023	66,437	66,857	67,101
COUNTY TOTAL	592,695	621,687	646,214	664,214	677,424	687,119	694,235
	HOUSEHOLDS						
SEWER SERVICE AREA	2020	2025	2030	2035	2040	2045	2050
Baltimore City	17,847	18,789	20,450	22,619	24,621	25,296	25,621
Cox Creek	57,897	60,712	62,821	64,896	66,104	67,301	68,393
Maryland City	7,624	8,208	8,684	9,005	9,247	9,410	9,530
Patuxent	33,054	35,634	37,623	38,871	39,842	40,822	41,741
Broadneck	30,351	30,905	31,437	31,828	32,294	32,558	32,716
Annapolis	34,781	35,345	36,113	36,906	37,533	38,044	40,007
City of Annapolis*	16,541	16,877	17,212	17,548	17,883	18,219	18,546
County Portion	19,289	19,388	19,703	20,290	20,530	20,718	21,461
Mayo-Glebe Heights	3,271	3,349	3,441	3,523	3,591	3,641	3,683
Broadwater	4,610	4,706	4,856	4,997	5,102	5,184	5,257
Piney Orchard	4,821	4,992	5,246	5,442	5,581	5,700	5,776
Bodkin Pt./Pinehurst	160	162	164	166	169	172	175
Rose Haven	409	412	415	422	430	438	445
Ft. Meade (Private)	2,325	2,331	2,337	2,345	2,352	2,367	2,382
Rural	21,772	22,063	22,392	22,983	23,837	24,235	24,623
COUNTY TOTAL	219,971	228,528	236,781	244,935	251,583	256,061	260,349

Source: Draft Round 10 Projections for the Baltimore Metropolitan Council Cooperative Forecasting Group (2020-2050)

*City of Annapolis Source: BAE Urban Economics, June 2021

Figure 4-1 Sewer Service Areas and Service Categories

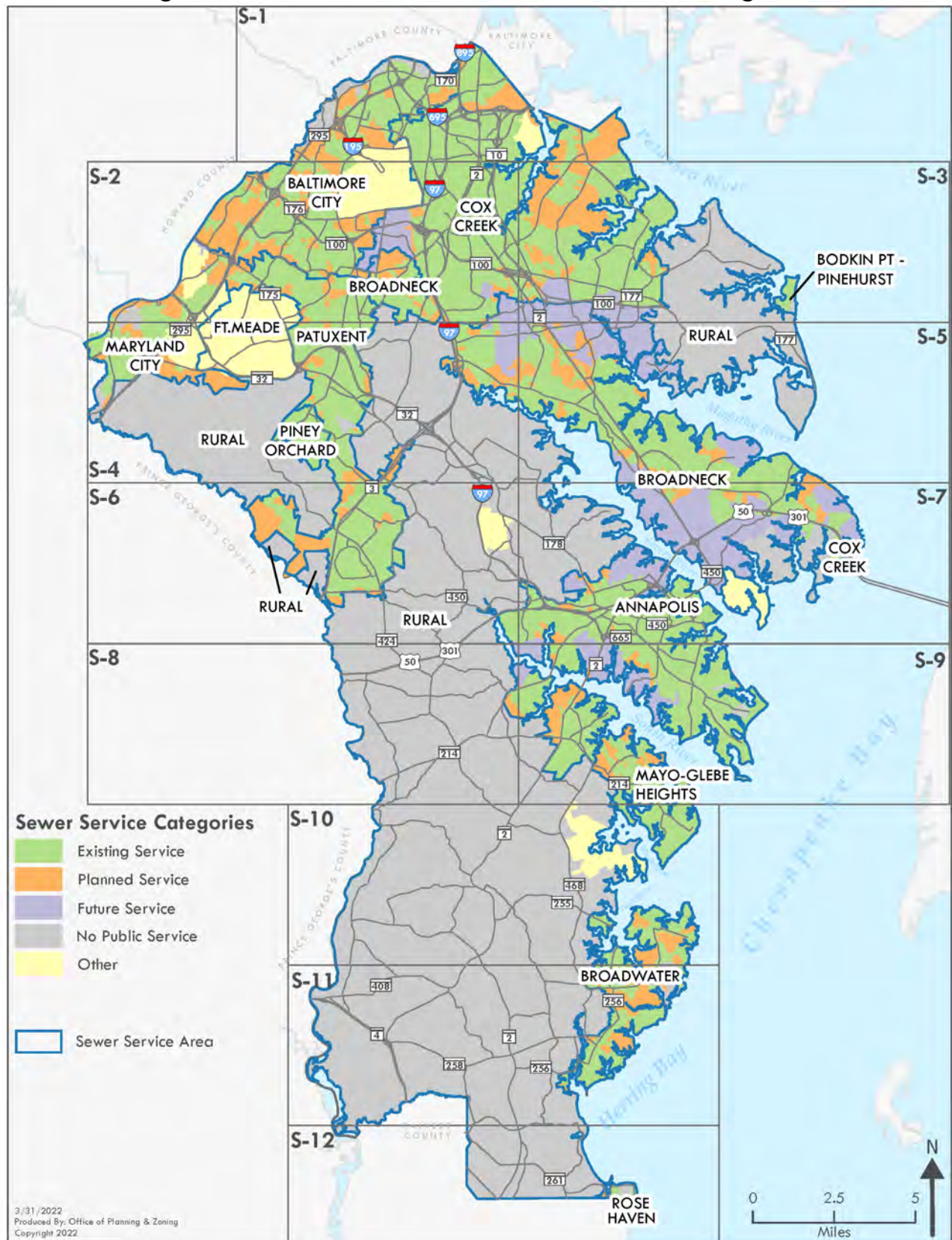


Table 4-2 Projected Sewer Flow 2020-2050

Sewer Service Area	2020 Total Flow (MGD)	Capacity (MGD)	% of Capacity	2025 Total Flow (MGD)	Capacity (MGD)	% of Capacity
Baltimore City	4.69	6.39	73.4	5.39	6.39	84.4
Cox Creek	11.34	15.00	75.6	12.01	15.00	80.1
Maryland City	1.39	3.33	41.7	1.97	3.33	59.2
Patuxent	5.77	10.50	55.0	6.44	10.5	61.3
Broadneck	4.66	8.00	58.3	5.19	8.00	64.9
Annapolis WRF Total	8.72	13.00	67.1	9.15	13.00	70.4
Annapolis: City/USNA	3.93	6.70	58.7	4.15	6.70	61.9
Annapolis: County Total	4.79	6.30	76.0	5.00	6.30	79.4
Annapolis: AA County	4.15			4.33		
Mayo Regional SPS ^c	0.64	1.14	56.1	0.67	1.14	58.8
Broadwater	1.24	2.00	62.0	1.29	2.00	64.5
Piney Orchard	0.57	1.20	47.5	0.59	1.20	49.2
Bodkin Point	a	0.007		a	0.007	
Rose Haven/Holland Point	0.10	0.14	71.4	0.10	0.14	71.6
County Treated Total	33.69			36.64		
Sewer Service Area	2030 Total Flow (MGD)	Capacity (MGD)	% of Capacity	2035 Total Flow (MGD)	Capacity (MGD)	% of Capacity
Baltimore City	5.83	6.39 ^b	91.2	6.15	6.39 ^b	96.2
Cox Creek	12.98	15.00	86.5	13.48	15.00	89.9
Maryland City	2.06	3.33	61.9	2.14	3.33	64.3
Patuxent	6.62	10.50	63.0	6.75	10.50	64.3
Broadneck	5.70	8.00	71.3	5.82	8.00	72.8
Annapolis WRF Total	9.39	13.00	72.2	9.62	13.00	74.0
Annapolis: City/USNA	4.27	6.70	63.7	4.40	6.70	65.7
Annapolis: County Total	5.12	6.30	81.3	5.22	6.30	82.9
Annapolis: AA County	4.43			4.51		
Mayo Regional SPS ^c	0.69	1.14	60.5	0.71	1.14	62.3
Broadwater	1.29	2.00	64.5	1.30	2.00	65.0

Piney Orchard	0.60	1.20	50.0	0.62	1.20	51.7
Bodkin Point	a	0.007		a	0.007	
Rose Haven/Holland Point	0.10	0.14	71.9	0.10	0.14	72.4
County Treated Total	38.64			39.73		
Sewer Service Area	2040 Total Flow (MGD)	Capacity (MGD)	% of Capacity	2045 Total Flow (MGD)	Capacity (MGD)	% of Capacity
Baltimore City	6.30	6.39 ^b	98.6	6.44	6.39 ^b	100.8
Cox Creek	13.73	15.00 ^b	91.5	13.86	15.00 ^b	92.4
Maryland City	2.18	3.33	65.5	2.25	3.33	67.6
Patuxent	6.87	10.50	65.4	6.90	10.50	65.7
Broadneck	5.92	8.00	74.0	6.02	8.00	75.3
Annapolis WRF Total	9.83	13.00	75.6	10	13.00	76.9
Annapolis: City/USNA	4.52	6.70	67.5	4.64	6.70	69.3
Annapolis: County Total	5.31	6.30	84.3	5.36	6.30	85.1
Annapolis: AA County	4.59			4.61		
Mayo Regional SPS ^c	0.72	1.14	63.2	0.75	1.14	65.8
Broadwater	1.31	2.00	65.5	1.33	2.00	66.5
Piney Orchard	0.63	1.20	52.5	0.64	1.20	53.3
Bodkin Point	a	0.007		a	0.007	
Rose Haven/Holland Point	0.10	0.14	72.6	0.10	0.14	72.8
County Treated Total:	40.47			41.00		
Sewer Service Area	2050 Total Flow (MGD)	Capacity (MGD)	% of Capacity	Build-out Flows^d (MGD)		
Baltimore City	6.58	6.39 ^b	103.0	10.00		
Cox Creek	14.00	15.00 ^b	93.3	22.57		
Maryland City	2.34	3.33	70.3	3.70		
Patuxent	6.94	10.50	66.1	13.81		
Broadneck	6.11	8.00	76.4	10.69		
Annapolis WRF Total	10.16	13.00	78.1	15.01		

Annapolis: City/USNA	4.78	6.70	71.3	5.67
Annapolis: County Total	5.40	6.30	85.7	9.34
Annapolis: AA County	4.63			8.20
Mayo Regional SPS ^c	0.77	1.14	67.1	1.14
Broadwater	1.35	2.00	67.3	2.58
Piney Orchard	0.66	1.20	55.4	0.75
Bodkin Point	a	0.007		0.09
Rose Haven/Holland Point	0.10	0.14	73.8	0.20
County Treated Total:	41.58			69.11

Source: Anne Arundel County November 2021 Allocation Report, AACO Wastewater Flow Projection Tool, and the City of Annapolis See Appendix H for more information.

Notes:

(a) Flow not metered for existing 16 homes. Future demand is not significant.

(b) These WRFs are anticipated to require an expansion, a re-rating, or an additional flow allocation to meet future flow predictions.

(c) Sewer flows for the Mayo SSA are now conveyed to the Annapolis WRF. The Mayo WRF and Glebe Heights Small Communal are being decommissioned. As requested by MDE, flows from the Mayo Regional SPS are being tracked separately in this table.

(d) Build-out flows for the County were computed assuming full development of all property in the SSA at current zoning as described in Appendix A.

The sewer demands shown for 2020 through 2050 were computed using the AACO Wastewater Flow Projection Tool. The tool uses the existing WRF Allocation Flow as a starting point and extrapolates flows into the future generally using Traffic Analysis Zone (TAZ) projections.

Table 4-3 Treatment Facilities and Rated Capacities

Treatment Facility (Owner / Operator)	Sewer Service Area	Permit Capacity in MGD (County Allotment)
Patapsco Sewerage Treatment Plant (AA Co.'s Baltimore City SSA)	Baltimore City	81.0 (6.39)
Cox Creek WRF	Cox Creek	15.0
Maryland City WRF	Maryland City	3.33
Patuxent WRF	Patuxent	10.5
Broadneck WRF	Broadneck	8.0
Annapolis WRF – Jointly Owned by Annapolis City and AA County (AA Co.'s Annapolis SSA)	Annapolis	13.0 (6.30)
Mayo Large Communal WRF Glebe Heights Small Communal WRF	Mayo / Glebe	(To be Decommissioned)
Broadwater WRF	Broadwater	2.0
Piney Orchard WRF (Piney Orchard Utility Co, LLC / MES)	Piney Orchard	1.20
Bodkin Point System (subsurface) ²	Bodkin Point	0.007
Chesapeake Beach Wastewater Treatment Plant (AA Co.'s Allotment - Calvert County)	Rose Haven / Holland Point	1.5 (0.1375)

¹ Anne Arundel County purchased Piney Orchard WRF in 2019

² County does not have a permit record for Bodkin Point System, capacity is based on number of homes connected

4.3.1 Non-County Owned and/or Operated Facilities

There are several wastewater collection and treatment systems within Anne Arundel County that are privately and / or independently owned and / or operated. Descriptions of major facilities that are operated by other public agencies are contained in the following paragraphs. The City of Annapolis is also listed in Table 4-2 and the other facilities are listed in Table 4-4. It should be noted that Anne Arundel County is not responsible for operation or maintenance of any of these collection systems or facilities. These are depicted on the Master Plans Maps S1 through S12 as the "Other" category.

Fort George G. Meade, D. C. Children's Center and NSA (Maps S-2, S-4)

Located in the western portion of the County, the United States Army installation, D. C. Children's Center and NSA are served by a wastewater collection system owned and operated by the Army Corps of Engineers. The treatment plant located on MD Route 198 at MD Route 32, has a design capacity of 4.5 MGD. This system discharges treated effluent directly into the Little Patuxent River.

City of Annapolis (Satellite System) (Maps S-7, S-9)

The City of Annapolis owns and operates a collection system within the Annapolis SSA. The system consists of a network of gravity collectors and force mains and includes 26 sewer pumping stations. The existing system serves approximately 98% of the City (with the remaining 2% planned to be served). Flows from the City of Annapolis are treated at the Annapolis WRF.

United States Naval Academy (Satellite System) (Map S-7)

Located on the southwestern shore of the Severn River in the Annapolis Sewer Service Area, the United States Naval Academy (USNA) grounds are served by a wastewater collection system owned and operated by the US Navy. Wastewater from the system is conveyed to the City of Annapolis sewer system and eventually to the Annapolis WRF through the City network of pipes. Agreements existing between the U.S. Navy, the City of Annapolis, and the County govern allocations and payments between the three jurisdictions.

United States Naval Station – Annapolis (Map S-7)

Located in the Annapolis Sewer Service Area on the opposite shore (north shore) of the Severn River from the USNA (within the Other designated area south of Broadneck SSA 5), the Naval Station is served by a collection system that conveys wastewater to a 1.0 MGD treatment facility within the boundaries of the Naval Station. This treatment facility will continue to treat the wastewater from the David Taylor Research Center under contract with the proprietors that locate there. The system discharges treated effluent directly into the Severn River. These collection and treatment systems are owned and operated by the US Navy. An upgrade to the facility to provide ENR treatment is planned.

Baltimore-Washington Airport (Maps S-1, S-2)

Baltimore-Washington Airport (BWI) is located in the Baltimore Sewer Service Area and is served by a wastewater collection system owned and operated by the Federal Aviation Administration (FAA). The collected wastewater is conveyed through Anne Arundel County to Baltimore County for treatment. Neither the collection system within the airport property, the conveyance-piping network to Baltimore County, nor the treatment of the collected wastewater is the responsibility of Anne Arundel County.

Crownsville State Hospital (Maps S-6, Map S-7)

Located within the Rural Service Area along MD Route 175 in Crownsville, wastewater generated within the boundaries of the Crownsville State Hospital is collected and treated at a subsurface discharge facility on the Hospital Grounds. Maryland Environmental Service (MES) operates and maintains the facility under contract with the State of Maryland who owns the facility.

Maryland House of Correction (Map S-2)

The Maryland House of Correction - Jessup is located in the Maryland City Sewer Service Area and is served by a wastewater collection and treatment system owned by the Maryland Department of Corrections. Wastewater generated from the site is collected and treated in a 2.0 MGD capacity wastewater treatment facility that discharges directly into Dorsey Run. Maryland Environmental Services operates and maintains the facility under contract with the State of Maryland.

Smithsonian Environmental Research Center (SERC) (Map S-10)

The SERC site is located at 647 Contees Wharf Road in Edgewater and is located in the Rural Service Area. It is served by a wastewater treatment and disposal system that is federally owned and operated. The subsurface discharge system has a 30,000 GPD capacity.

Southern High School and Other Public Facilities System (Map S-10)

Southern High School is located at 4400 Solomon's Island Road in the Rural Service Area and is served by a wastewater collection and treatment system owned by the Anne Arundel County Board of Education. The system serves Southern High School and via force mains along Solomons Island Road, also serves Southern Middle School, Lothian Elementary School and the Lothian Fire Station. The system is operated by Maryland Environmental Service.

Additional Non-County Facilities Greater than 5,000 Gallons per Day

In addition to the above facilities, other treatment facilities that have discharge to surface waters or subsurface sewage disposal systems greater than 5,000 gallons per day are listed in Table 4-4. These facilities are shown on the Master Plan Maps S-1 through S-12.

Table 4-4 Non-County Facilities with Discharges Greater Than 5,000 GPD

Sewer Service Area	Name of Facility	Tax Account Number / Location	Master Plan Map, (Grid)	Design Capacity (GPD)	Type of Discharge	Operating Agency
Baltimore City	BWI	500090221339 Elm Road	S-1, S-2 (J5)	-	Subsurface	FAA
	Holiday Mobile Estates, Inc.	400002588350 7810 Clark Road	S-2 (F8)	125,000	Surface Water	MES
Maryland City	D C Children's Center	400005951790 8400 River Road	S-4 (D11)	Part of Fort Meade	Surface	US Govt. (Fort Meade)
	Maryland House of Corrections	400090014121, 40005585793 7930 Brock Bridge Road	S-2(D8, E8, E9, D9, D10)	2,000,000	Surface	MES
	NSA	400001318800, 400000033782, 400001177100, 400090065527 Colony Seven Road	S-4 (E12)	Part of Fort Meade	Surface	US Govt. (Fort Meade)
Patuxent	Firestone Complex Route 3	400090037724, 400090038600 1106 MD Route 3 North	S-6 (I17)	5,000	Subsurface	Private
	Regency Park Assisted Living Facility	400090037421 400090233217 MD Route 3 South	S-4 (J15, K15)	7,100	Subsurface	Private
Broadneck	Arnold Station	300014813400 1450 Ritchie Highway	S-7 (T16)	5,000	Subsurface	Private
	Atria Manresa Assisted Living Facility	300019308130 85 Manresa Road	S-7 (T18, U18)	9,000	Subsurface	Private
	Cantler's Riverside Inn	344425074500, 344425074600 458 Forest Beach Road	S-7 (V18)	11,000	Holding Tank	Private

Sewer Service Area	Name of Facility	Tax Account Number / Location	Master Plan Map, (Grid)	Design Capacity (GPD)	Type of Discharge	Operating Agency
	Chartwell Country Club	318004976607 1 Chartwell Drive	S-4 (N11, N12)	8,000	Subsurface	Private
	Monumental Title Company	374807090309 60 Ritchie Highway	S-5 (R13)	5,500	Subsurface	Private
	Severn River Inn	300008003800 1933 Baltimore-Annapolis Boulevard	S-7 (U19)	5,500	Subsurface	Private
	Roadway Inn (Academy Motel)	300090004909 74 N Old Mill Bottom Road	S-7 (V17)	23,000	Subsurface	Private
	Windsor Farm Elementary	300090060655 591 Broadneck Road	S-7 (V16)	5,000	Subsurface	BOE
Annapolis	Los Chaparritos	100090038963 3029 Solomons Island Road	S-9 (P23)	6,000	Subsurface	Private
Annapolis	Evangelical Presbyterian Church & School	200002465983, 285102465985, 200002465990, 200002783110, 200002466100 710 Ridgely Avenue, 530 Wilson Road	S-7 (S18)	10,365	Subsurface	Private
	St. Andrews United Methodist School	200090040217 20 Wallace Manor Lane	S-9 (Q21)	6,000	Subsurface	Private
	United States Naval Academy	600008387650 Naval Academy Hospital	S-7 (T19)	600,000	Surface	City of Annapolis
	United States Naval Station	300031870030 North Severn Area	S-7 (V19, V20)	1,000,000	Surface	US Navy
Fort George Meade	Fort George G. Meade	400090042590 Fort Meade, MD	S-4 (E12)	4,500,000 (4.5 MGD)	Surface	US Govt.
Rural	Arlington Echo Outdoor Center	200000211413 975 Indian Landing Road	S-4 (N13)	7,500	Subsurface	Private
	Baldwin Memorial Methodist Church	200090000966 921 Generals Highway	S-4 (M14)	5,000	Subsurface	Private
	Boone's Mobile Estates, WWTP	880090003660, 880090003661, 880090003663 1091 1081 Mt. Zion Marlboro Road	S-11 (J32, J33)	87,000	Surface	Private
	Duncan's Family Campground Adventure Bound	800090005316 Sands Road	S-11 (I32)	9,000	Subsurface	Private
	Crownsville State Hospital	200011033710 1400 Generals Highway	S-6 (N17)	87,000	Subsurface	MES

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Sewer Service Area	Name of Facility	Tax Account Number / Location	Master Plan Map, (Grid)	Design Capacity (GPD)	Type of Discharge	Operating Agency
Rural	Indian Creek School	2000003610600 1130 Anne Chambers Way 1599 Crownsville Rd	S-7 (O17, O18)	7,600	Subsurface	Private
	Rockbridge Academy	200002784630 680 Evergreen Road	S-4 (N14)	8,000	Subsurface	Private
	Behavioral Health Center Knollwood Manor Nursing Home	400003330800 899 Cecil Avenue	S-4(L14)	5,000		Private
	Lake Shore Elementary	300000477220 4531 Mountain Road	S-5 (T11)	14,900	Subsurface	BOE
	Lyons Creek Mobile Home Estates	800090030137 1007 Lower Pindell Road	S-11 (J36)	70,000	Surface	Private
	Maryland Manor Mobile Home	100000564402 Sands Road	S10 (J29)	90,000	Surface	MES
	Millersville Elementary	400000093047 1601 Millersville Road	S-4 (L15, L14)	15,800	Subsurface	BOE
	Millersville KOA	400090041828 768 Cecil Avenue	S-4 (K13)	19,000	Subsurface	Private
	Old South Country Club	858090069333 699 Mt. Zion Marlboro Road	S-11 (K32)	10,000	Subsurface	Private
	Patuxent Mobile Home Park	800000107125 5380 Sands Road	S-11 (I32)	35,000	Surface	MES
	Pleasure Cove Marina	300004471915 1701 Poplar Ridge Road	S-3 (U9)	10,000	Subsurface	Private
	Renditions Golf Course	100090009208 1368 West Central Avenue	S-8 (J25)	6,610	Subsurface	Private
	Rio Vista Plaza Mobile Home Park	800001325500 5270 Sands Road	S-11 (I32)	9,000	Subsurface	Private
	Smithsonian Environmental Research Center (SERC)	100007804000 647 Contees Wharf Road	S-10 (Q27)	30,000	Subsurface	U. S. Govt.
	Southern High School and Other Public Facilities System	100000194804 4400 Solomons Island Road	S-10 (M28)	40,000	Surface	MES
	Southern Hills	100090228985, 100090228986 1380 West Central Avenue	S-8 (J24)	21,600	Subsurface	MES
	South Shore Elementary	200000214020 1376 Fairfield Loop Road	S-6 (N16)	6,200	Subsurface	BOE
	Summerhill Mobile Home Park	200011335600 1723 Crownsville Road	S-7 (O18)	19,000	Surface	Private

Sewer Service Area	Name of Facility	Tax Account Number / Location	Master Plan Map, (Grid)	Design Capacity (GPD)	Type of Discharge	Operating Agency
	Texas Roadhouse	300009939505, 300009939500 300090005986 4465 Mountain Road	S-3 (T10)	11,500	Subsurface	Private
	Waysons Mobile Home Park	800001923900, 800001924300 Mt. Zion Marlboro Road	S-11 (H32)	75,000	Surface Water	MES

4.4 Summary of Sewer Agreements

The County has entered into inter-jurisdictional agreements with surrounding municipalities as well as agreements with large developments regarding construction of infrastructure and approval of utility allocation credits. Table 4-5 is a list of the major agreements that have been made with the County. More details regarding these agreements are discussed within the appropriate sewer service area descriptions in Section 4.7.

Table 4-5 Inter-jurisdictional Agreements and Special Utility Agreements

Number	Agreements	Sewer Service Area	Effective Date	Expiration Date
Liber 0936 Folio 364	Agreement with Howard County to share the cost and equitable interest in a sewerage system in the Deep Run drainage area.	Baltimore City	March 30, 1979	N/A
N/A	Agreement to continue operation of the jointly used sewer system in the Patapsco Drainage area and also to establish methods for computation and reimbursements of costs incurred by Baltimore County (including conveyance and treatment).	Baltimore City	April 21, 1976	N/A
N/A	Agreement with Baltimore City to provide connection and receipt of flows into the City sewerage system, for transmitting, pumping and disposing of the sewage received from the Brooklyn Park sanitary subdivision.	Baltimore City	August 14, 1939 August 28, 1963	N/A
N/A	Patapsco Sewerage System Memorandum of Understanding providing clarification of all agreements between Baltimore City, Baltimore, Howard and Anne Arundel Counties.	Baltimore City	June 4, 1984	N/A
N/A	Agreement with Calvert County to allow discharge of sewage from Rose Haven/ Holland Point to be treated at the Chesapeake Wastewater Treatment Plant.	Rose Haven/ Holland Point	August 15, 1996	N/A
UA-89085-0	Agreement with Piney Orchard Development for the design and construction of a private treatment facility and reserved allocations.	Piney Orchard	October. 3, 1988	N/A

Number	Agreements	Sewer Service Area	Effective Date	Expiration Date
N/A	Agreement with Two Rivers Development Company, LLC; Koch-Two Rivers, Inc.; Two Rivers Investors, LLC; and Piney Orchard Utility Company, LLC to settle its arrearages by effectuating the transfer of 500,000 GPD of equivalent nutrient load capacity from the Piney Orchard Treatment Plant to Anne Arundel County	Piney Orchard	August 19, 2010	N/A
N/A	Agreement to allow private water and sewer facilities for Reedbird Townhouses until County service becomes available.	Patuxent	May 26, 1976	N/A
N/A	Agreement with Annapolis City to set forth obligations with regard to the operation and joint use of the Annapolis WRF. This supersedes prior agreements.	Annapolis	July 1, 2012	June 30, 2022
N/A	Memo of Understanding between Anne Arundel County and the City for the reciprocal use of Sewer Collection systems.	City of Annapolis	October 15, 2010	N/A
N/A	Effluent Supply Agreement between Anne Arundel County and Constellation Power Source Generation Inc.	Cox Creek	February 7, 2008	N/A
N/A	Developers Rights and Responsibilities Agreement which provides for the County to build certain water and wastewater Infrastructure and the developer to build certain infrastructure within time limits within the Odenton Town Center.	Patuxent	October 3, 2010	N/A
RW-3531- 12-001	Construction and Right-of Way Permit from the National Park Service for Anne Arundel County to allow a water main and a sewer main and related appurtenances to be built and maintained under the Baltimore-Washington Parkway at Maryland Route 198.	Maryland City	September 19, 2012	September 19, 2022
N/A	Odenton Town Center Sanitary Subdistrict Legislation was passed (Bill 71-10) that established the Odenton Town Center Sanitary Subdistrict. Newly connecting development after October 3, 2010, except for projects allocated prior to that date, and existing connected properties that expand or change their use and will generate additional wastewater flow, are subject to a sewer service surcharge that will reimburse the County for building the sewer infrastructure necessary to provide adequate service for the Town Center.	Patuxent	October 3, 2010	N/A

4.5 NPDES Limitations

The Federal Clean Water Act (CWA) and National Pollutant Discharge Elimination System (NPDES) regulations require that no point source, municipal or industrial, may discharge pollutants to Waters of the United States without a NPDES permit. Municipal dischargers, also referred to as "Publicly Owned Treatment Works" (POTWs) are required through their NPDES permits to meet at a minimum the secondary

treatment standards in accordance with the Secondary Treatment Regulations at 40 CFR Part 133. These limits typically include limits for BOD, TSS, pH, dissolved oxygen, and disinfection requirements. The regulations also require permitted facilities to monitor the quality of their discharge and report data to the permitting authority.

In addition, the CWA requires every State to develop water quality standards to protect receiving waters which include designated uses, water quality criteria, and an antidegradation policy. In addition to the secondary treatment standards, NPDES regulations require permit limits to be issued for any pollutant that may cause or contribute to exceeding the State's Water Quality Standards (WQS) requirements.

4.5.1 Total Maximum Daily Loads

Section 303(d) of the CWA requires states to identify and prioritize receiving waters for which effluent limits are not stringent enough to meet the State's Water Quality Standards (WQS). When a receiving water body is listed, the pollutant and the priority of the impairment are identified and placed on the State's "303(d) list."

For each of these water quality-limited segments, the State must determine the maximum level of any impairing pollutant that can be assimilated in the receiving water without causing violations of established water quality standards. This upper limit of pollutant assimilation is called the Total Maximum Daily Load (TMDL). The TMDL establishes and determines the effects of point and non-point sources on receiving water/stream quality.

The Environmental Protection Agency (EPA) and the Maryland Department of Environment (MDE) regulatory agencies have established a process for developing TMDL's in listed waterways. Once the waters to be included on the list have been identified, priority categories (High, Medium and Low) are assigned to each water quality limited segment. These priority rankings, which take into account the severity of the pollution and the uses to be made of the waters, are used for purposes of resource allocation and scheduling of identified improvements. Presently the TMDL process includes biennial reporting of the Section 303(d)-listed waterways and identification of waters scheduled for TMDL development in Maryland's Integrated Report of Surface Water Quality (303(d) list and 305(b) Report).

Maryland's current Integrated Report (IR) describes six different categories; Categories 2, 3, 4a, 4b, 4c, and 5 of water quality:

- a) Category 2 –waters meeting the standards for which they have been assessed.
- b) Category 3 – waters that have insufficient data or information to determine whether any water quality standard is being attained
- c) Category 4a – waters that are still impaired but have a TMDL developed that establishes pollutant loading limits designed to bring the water body back into compliance
- d) Category 4b – waters that are impaired but for which a technological remedy should correct the impairment.
- e) Category 4c – waters that are impaired but not for a conventional pollutant
- f) Category 5 – waters that may require a TMDL

Once the TMDL process is completed for an impaired waterway, future NPDES permits must incorporate the waste load allocations from the approved TMDL by establishing new limits consistent with the approved TMDL.

All of the County's 12 watersheds are listed for at least four water quality impairments in Category 5 of the 303(d) list. Water bodies in Category 5 of the 303(d) list are under evaluation by the State for a TMDL. Impairing substances include nutrients, metals, toxics, bacteria, sediment, and biological.

The status of all promulgated, draft and potential TMDLs for Anne Arundel County's impaired waterbodies can be found on the Maryland Department of the Environment's web page <https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/index.aspx>.

4.5.2 Enhanced Nutrient Removal (ENR)

Starting in 2006 with the signing of a Memorandum of Understanding between Anne Arundel County (County) and the Maryland Department of the Environment (MDE), the County initiated a series of procurements to provide design services for the upgrade of each of its wastewater facilities to achieve Enhanced Nutrient Removal (ENR). As defined by the State, ENR is technology capable of achieving 4 mg/L total nitrogen (TN) and 0.3 mg/L total phosphorus (TP) on an annual average basis.

The County owns and operates seven (7) major water reclamation facilities (WRFs). The existing facilities were upgraded in the 1990s to primarily achieve the seasonal Biological Nutrient Removal (BNR) limits of 8.0 mg/L TN and 2.0 mg/L TP. However, recently issued NPDES permits for the facilities will have required ENR treatment levels to be achieved. These new NPDES permits have two types of limits.

- a) The first is a concentration-based cap of 4 mg/L TN and 0.3 mg/L TP on an annual average basis. The concentration-based cap is based on the actual flow received at the facility and therefore could apply to flow less than the design flow, i.e., WRF's not at hydraulic capacity.
- b) The second type is a mass loading cap. Generally, the mass loading cap is equal to the design flow of the facility multiplied by a concentration based cap.

Under the ENR Upgrade program, each of the facilities was being designed to meet an annual average of 3.0 mg/L TN and 0.3 mg/L TP at the design flow for the facility.

The total maximum pound loadings are calculated based on 4.0 mg/l TN and 0.3 mg/l TP at the design rated capacity as recognized in the 2003 Water and Sewer Master Plan. By reducing the TN and TP discharges below the concentration limits, the facilities will have the capacity to expand by as much as 33% as noted in Table 4-6, while maintaining nutrient loads constant. Once upgraded, the County shall operate each of the ENR facilities in a manner that optimizes the nutrient removal capability of each facility, which may achieve better performance than the loading and concentration limits.

Table 4-6 shows the current design capacity, load cap, and estimated maximum capacity assuming an effluent concentration of 3.0 mg/L TN and 0.23mg/L TP. Under applicable federal and state law, the County may expand the capacity of the WRF's in the future as long as the expanded capacities are in accordance with the County's most recent Water and Sewer Master Plan and the watershed-based nutrient discharge limits, or any more stringent local water quality based limitations are not exceeded by the expansion.

Table 4-6 Current and Future Operational Characteristics

Facility	Current Recognized Design Capacity (MGD)	TN Load (lbs/Year)	TP Load (lbs/Year)	Maximum Capacity (MGD) Based on 3 mg/L Nutrient Cap
Cox Creek	15	182,646	13,705	20
Annapolis	13	158,835	11,956	17.33
Broadneck	8	73,093	5,482	8
Broadwater	2	24,363	1,827	2.67
Patuxent	10.5	91,323	6,849	10.5
Maryland City	3.33	30,441	2,283	3.33
Piney Orchard	1.2	8,527	639	0.93
Totals	52.03	569,229	42,741	62.82

Note: Additional TN and TP loads associated with the transfer of 0.5 MGD of flow from the Piney Orchard WWTP to the Patuxent WRF will be added to the Patuxent loads in the future.

One watershed permit was also established, one for Patuxent/Maryland City. This watershed permit contains an annual pollutant loading of TN and TP (in lbs/yr) permitted to be discharged in accordance with the previously described computation. Prior to the takeover of the Piney Orchard facility, the County acquired wastewater load allocations equivalent to 0.475 MGD through a load transfer. The additional nitrogen and phosphorus load transferred from the Piney Orchard facility is reflected in the watershed permit.

Since July 1, 2019, Piney Orchard facility has been owned and operated by the Anne Arundel County Department of Public Works. This permit will be revised to incorporate the additional nutrient load allocation for the new County-owned facility.

Nutrient load for each watershed can be increased through trading consistent with a statewide policy under development by MDE. The concept of nutrient trading allows a discharger of nutrients, faced with expensive nutrient reductions to meet water quality standards, to purchase "credits" (e.g., pounds of nitrogen) from a second nutrient discharger that has reduced its discharge below its legal requirement.

This process allows dischargers with higher nutrient reduction costs to pay another discharger for equivalent reductions. Trading also enables entities with low clean-up costs to reduce discharges below legal requirements and generate revenue.

With the completion of all ENR projects, the County is in conformance with the Municipal Wastewater segment of its Phase II Watershed Implementation Plan and the County's wastewater treatment facilities will meet the assigned TMDL loads.

4.5.3 On-Site Disposal Systems (OSDS)

Based on the most recent data from the County's Health Department, there are 41,498 septic systems distributed across the County's sewer service areas that serve residential and non-residential properties. Tables 4-7 and 4-8 below show the current numbers of septic systems in Anne Arundel County by sewer service area and by service category respectively.

Table 4-7 Inventory of OSDS by Sewer Service Area

Sewer Service Area	Number Of Septic Systems	Percent
Annapolis	3,422	8.20%
Baltimore City	1,431	3.50%
Bodkin Pt-Pinehurst	142	0.30%
Broadneck	10,160	24.50%
Broadwater	301	0.70%
Cox Creek	3,559	8.60%
Ft. George Meade	0	0.00%
Maryland City	147	0.40%
Mayo-Glebe Heights	132	0.30%
Patuxent	874	2.10%
Piney Orchard	18	0.00%
Rose Haven	5	0.00%
Rural	21,307	51.30%
Grand Total	41,498	100.00%

Table 4-8 Inventory of OSDS by Planned Sewer Service Type

Sewer Service Category	Number Of Septic Systems	Percent
Existing Service	1,839	4.40%
Future Service	10,900	26.30%
No Public Service	21,945	52.90%
Other	8	0.02%
Planned Service	6,806	16.40%
Grand Total	41,498	100.00%

In March 2008, the County completed the On-Site Disposal System Evaluation Study and Strategic Plan. This was an initial effort to map and categorize approximately 41,000 septic systems distributed across the County's sewer service areas. The study found that given the high number of septic systems coupled with their proximity to tidal waters and the sandy soils present along the waterways, the resulting nutrient load is significant. The study also looked at how to most cost effectively reduce the nutrient load whether through connection to public sewer, cluster treatment systems, or individual denitrifying systems. In analyzing these different treatment methods, it was recognized that OSDS equipped with denitrifying systems can reduce the nitrogen load from 40 mg/l to 20 mg/l, while connection to ENR upgraded WRF's reduces the nitrogen load down to at least 4 mg/l.

In July 2012, Anne Arundel County submitted the Phase II Watershed Implementation Plan to the Maryland Department of the Environment (MDE). This was a sector based approach, focusing on approximately 20,000 septic systems. Anne Arundel County's Phase II Watershed Implementation Plan (WIP) identified programs, policies and practices and established a commitment to implementation that ensures achievement of the nitrogen, phosphorus, and sediment load reductions assigned to the County by the Maryland Department of the Environment (MDE) in compliance with the Chesapeake Bay TMDL.

As part of the Phase II Watershed Implementation Plan, the County was tasked to reduce the load from OSDS. DPW originally developed a strategy to connect approximately 20,000 of these septic systems to public sewer or cluster treatment systems. This strategy was based on the findings of the OSDS Evaluation Study and augmented with information from the Health Department regarding septic problem areas to provide the County a prioritized approach to solve public and environmental health concerns related to OSDS.

Another aspect of the County's strategy would include increased pollutant load caps at the WRF's. For instance, Table 4-9 shows maximum hydraulic capacity as limited by the respective nitrogen load caps for each of the WRF's equipped with ENR; however, should existing septic loads be reduced significantly, a correspondingly significant increase in pollutant load cap, and hence hydraulic capacity, should be recognized in the WRF discharge permit limits. This would be in effect considered a nutrient trade between non-point source (septic) and point source (WRF). While any TMDL implementation plan should demonstrate a net decrease in total pollutant, it should be expected that the trade-off exceeds a 1:1 ratio. For further information on the trading aspects of OSDS connections to public sewer see MDE's Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed Policy.

Table 4-9 Nutrient Based WRF Capacity Limits

Water Reclamation Facility	Current Design Capacity (MGD)	Maximum Capacity Based on Nutrient Cap (MGD)	Projected 2050 Flow (MGD)	Build Out Flow (MGD)
Annapolis	13.00	17.39	10.16	15.01
Broadneck	8.00	8.00	6.11	10.69
Broadwater	2.00	2.67	1.35	2.58
Cox Creek	15.00	20.00	14.00	22.57
Total by Watershed	38.00	48.06	31.62	50.85
Maryland City	3.33	3.33	2.34	3.70
Patuxent	10.50	10.50	6.94	13.81
Piney Orchard	1.2	0.93	0.66	0.75
Total by Watershed	15.03	14.76	9.94	18.26

To assist in the development and implementation of an OSDS conversion program, the County initiated a Septic Task Force 2017. The Septic Task Force had four overall goals:

- Develop a suite of recommendations that will inform decision making
- Identify near-term strategies to support effort
- Identify long-term strategies and approaches
- Identify areas requiring additional investigation for County Staff

The Septic Task Force completed its work in 2018 with a summary of recommendations for the development of a septic connection program and for changes to the County's petition process. The petition process is the process used by residents to request the extension of public sewer.

The Septic Task Force was reconvened in 2019 and 2020 to provide input on changes to the petition process, which were enacted by the County Council. In 2019 and 2020 the County Council made several changes to the County Code for the petition projects:

- a) Changing the basis of the assessments to be based on the individual number of properties instead of the previous front foot assessment approach
- b) Creating the ability for homeowners in certain eligible areas to have a partial deferment of the assessment
- c) Creating the ability for DPW to offer a subsidy to a project in an eligible area

The changes were intended to improve the process and make projects more affordable in high impact areas. DPW has developed a new septic connection program and began outreach efforts to communities in 2021 to inform the public about the new program changes.

The OSDS strategic planning team is a multi-disciplinary team that assists Anne Arundel County in the development, implementation and execution of the septic-to-sewer OSDS Conversion Program and other initiatives related to nutrient management. Such services include, but may not be limited to, planning, budgeting, public outreach, program monitoring, and public policy analysis related to the needs of the program.

Phase III Watershed Implementation Plan

In August 2019 MDE issued the Phase III Watershed Implement Plan (WIP) for the State of Maryland. According to MDE, the Phase III WIP is designed to be locally-driven, achievable, and balanced. The Phase III WIP is more focused on nitrogen because EPA's modeling results indicated that the State is on track to meet its phosphorus and sediment goals for 2025, but there was still a gap in meeting the nitrogen goal.

MDE's intent in the Phase III WIP is to use enhanced capacity from wastewater treatment plants and additional agricultural implementation for meeting 2025 goals so that the more challenging restoration in stormwater and septic sectors can be done beyond 2025.

The Phase III WIP therefore provides more flexibility to develop longer-term management strategies. Working with the OSDS strategic planning team, a long-term strategy is being developed to maintain nitrogen reductions into the future while accommodating planned anticipated growth within the sewer service areas.

This integrated management plan, expected to be completed in 2022, aims to use a combination of approaches to maintain long-term compliance. These strategies include a septic to sewer connection program (Policy NE4.3: Reduce total nutrient loads from onsite septic systems: Goal of connecting 6,000 units over 30 years), upgrades to existing minor treatment facilities, evaluate the County taking responsibility for the ownership and operation of one or more private minor wastewater treatment plants (each with capacity less than 0.5 MGD), improving plant performance to the level of enhanced nutrient removal, and an indirect potable water reuse program. The integrated plan will be introduced in 2022 for review and comment by MDE. DPW expects to continue to refine and develop these strategies in the future.

4.5.4 Water Reuse

Per the Wolman report¹, "The State should encourage the use of water conservation and water reuse technologies, while ensuring the protection of public health." Anne Arundel County plans to pursue

¹ Wolman, M. Gordon (2008). *Water for Maryland's Future: What We Must Do Today, Final Report of the Advisory Committee on the Management and Protection of the State's Water Resources*, Vol. 1, p. 25.

alternative wastewater strategies that are responsive to the needs of its citizens and the environment. Currently, Anne Arundel County sends treated effluent to Talen Energy from the County's Cox Creek WRF. Other water reuse initiatives may prove to be feasible and desirable. Advanced wastewater treatment and/or reuse facilities may support water conservation, provide groundwater replenishment, and maintain long term nutrient load allocations. In addition, reuse applications would reduce the discharge of nutrients such as nitrogen and phosphorus to the Chesapeake Bay and its tributaries.

DPW is currently evaluating Managed Aquifer Recharge (MAR), which would replenish the groundwater with effluent from an advanced treatment facility. Investigations to support this program will proceed in three phases: a pilot testing phase, a demonstration phase, and a full scale implementation phase. DPW expects to initiate the pilot phase beginning in 2022, with the installation of an advanced water treatment pilot system to perform treatment optimization studies and technology evaluations that will support the development of a water reuse program. Concurrent with this, test wells will be constructed to allow reinjection of conditioned drinking water into the aquifers to observe hydrogeological effects.

4.5.5 County Pretreatment Program

The Pretreatment Program is an EPA approved program designed to establish guidelines and limit pollutants discharged to the County sewer system at the source. The program has established its guidelines through industrial and commercial permitting and enforcement.

The pretreatment program is a self-funded program that currently has three major areas of concern: industrial discharges; commercial food handling services and marina pump outs. The industrial permitting program is designed to limit the amount and strength of various chemicals and pollutants from entering the County's sewer system. Through the industrial program the County has been able to enhance the employee's health and safety and help keep the environment clean. This is done through on-site inspections and wastewater sampling and monitoring. The commercial food handling services portion is also a permit oriented program limiting the businesses to the amount of solids being discharged to the collection system by requiring grease traps to be installed and maintained in the line of the kitchen wastewater discharge. This is primarily handled through grease trap inspections. The marina pump out is a permit and inspections program designed to educate boaters and marina owners and to limit the types of pollutants being discharged to the County system. This allows boaters a place to discharge on board wastes instead of discharging wastes overboard to the open waters of the Chesapeake Bay. Currently the pretreatment program maintains approximately 1,500 permits.

The State's planned Tributary Strategy currently under development, and possible maximum daily load (TMDL) based limits could significantly impact treatment costs. If required, the County will consider requiring additional pre-treatment or potentially apply additional surcharges in order to collect the actual cost of treatment of excessive strength waste.

4.6 Optimization of Facilities and Reduction of O&M Costs

The Department of Public Works is actively engaged in investigating the existing sewerage service areas and sub-drainage basins to ensure the expansion of infrastructure will efficiently service future planned development. The investigation is focused on ways to optimize operation and maintenance (O&M), reduce cost and consolidate facilities. Every effort will be made to ensure proposed infrastructure will service both existing and future needs. Component standardization, phasing of infrastructure and optimizing site location are key factors towards reduction of future O&M costs. Collection system piping and pump station facilities financed by the development community or the County's Utility Enterprise Fund will continue to be reviewed with optimization and reduction of O&M costs in mind. Facilities will be planned with the

potential future service area taken into consideration as well as implementation of project phasing to service the existing, interim and future conditions.

4.6.1 Sewer Strategic Planning – Countywide Focus

The County operates and maintains a sewer computer model that is part of the Sewer and Water Allocation, Management and Planning System (SWAMP) and is further described in Appendix B. Flow data from the County's metering program is utilized to calibrate the model. The computer model is utilized to check capacity availability for proposed development while considering existing, allocated and estimated flows from development under the Office of Planning and Zoning subdivision review process within each service area.

The Department of Public Works completed a Comprehensive Sewer Strategic Plan (CSSP) for the entire County in 2007. The CSSP consisted of a two-phase approach for planning future modifications and expansion of the County's existing wastewater collection and treatment system.

In the first phase of the program, the County's wastewater treatment plants were evaluated on a number of criteria including the State's effluent total nitrogen discharge goals and other future discharge permit requirements, capacity of the receiving water body, constraints imposed by the location of each facility, and re-use options. Based on this information the maximum possible expansion of the treatment plants was determined.

The second phase of the program evaluated ways to expand or modify the existing wastewater conveyance system to route flow toward treatment plants with the most available capacity to accommodate future growth in a cost effective manner. The Strategic Plan provided a strategy for optimizing existing facilities, designating approximate location and size of future pump stations & force mains, and included recommendations for existing infrastructure upgrades required to meet future service area needs. It also provided the basis for the Capital Improvement Program (CIP) and direction to the development community regarding infrastructure expansion and sizing.

The recently completed North County Sewer Strategic Plan Project further evaluated alternatives and provided recommendations relative to four of the County's ten sewer service areas (SSAs); specifically, Cox Creek, Baltimore City, Patuxent and Broadneck. The County is projecting a shortfall in available sewer capacity in both the Cox Creek and Baltimore SSAs; hence, a primary purpose of the project was to identify the capacity shortfalls and evaluate necessary projected upgrades for a period of approximately 20 years (year 2040).

Two viable diversions were identified and analyzed to divert flow from the Cox Creek SSA to the Broadneck SSA – Diversion A and Diversion B. Diversion A diverts flow from the Cox Creek SSA to the Broadneck SSA. Diversion B also diverts flow from the Cox Creek SSA to the Broadneck SSA. Diversions A and B will impact Cayuga Farms SPS and portions of its force main. Diversions A and B equate to a total diverted flow of 1.14 MGD which is adequate to alleviate the projected capacity shortfall in the Cox Creek SSA. They would require a 1.8 MGD upgrade to the Cayuga Farms SPS. The total Cayuga Farms SPS capacity would then be 4.7 MGD. Diversions C and D were analyzed to divert flow from the Baltimore City SSA to the Patuxent SSA, however, they deemed to not be viable due to their projected cost and other strategic planning concerns.

Conclusions from the North County Sewer Strategic Plan Project were to pursue Diversions A and B to address the Cox Creek SSA capacity shortfall. The County will likely need to approach Baltimore City and Baltimore County in the near future regarding the purchase of additional capacity to address the projected capacity shortfall in the Baltimore City SSA.

Major recommendations and findings from these strategic planning projects have been incorporated into the appropriate sections of this document. Potential infrastructure upgrade projects and future sewer extensions have been reflected on the appropriate Service Area Maps (S-1 through S-12).

4.6.2 Capacity, Management, Operation, Maintenance (CMOM)

Under the provisions of the Clean Water Act, the Environmental Protection Agency has been given oversight of Capacity, Management, Operation, and Maintenance (CMOM) programs that are intended to lower the risks to public health or the environment by improving the performance of sewer collection systems and the response to sanitary sewer overflows (SSOs) when they occur.

Anne Arundel County has adopted a CMOM program to document the actions being undertaken to properly manage, operate, and maintain all parts of the sewer collection system at all times. The CMOM program was ultimately approved by MDE in 2005 and has been utilized ever since.

The short-term goals are to focus on utilizing asset management tools (such as geographic information systems, computer information and management system, and hydraulic modeling) that the County already has in place to improve the operation and maintenance of the collection system. Long-term goals will focus on continuing to reduce SSOs resulting from such things as mechanical problems at pumping stations, blockages, power failures, and lack of hydraulic capacity.

The County maintains an Allocation System for water and wastewater capacity. This system is used to monitor subdivision activity versus available capacity. It provides a "near-term" perspective on project activity, planned growth, and sewer flows as opposed to the "long-term" projections presented in Table 4-2. Sewer Allocation Reports for each SSA are presented in Section 4.7 Sewer Service Area Descriptions. Further information on the County's Allocation System can be found in Appendix B.

4.6.3 Excellence in Cost Effective Leadership (EXCEL) Program

In 1997, the Anne Arundel County Department of Public Works Bureau of Utility Operations created a joint labor and management program to help the agency become more efficient and cost effective by reorganizing and changing work practices. The program, Excellence in Cost Effective Leadership (EXCEL), has helped the Bureau reduce costs while maintaining environmentally sound water and wastewater services.

The Steering Team, a joint labor and management team, was created to provide leadership and empowerment to employees so the Bureau could become more competitive while increasing the cost-effectiveness of its operations without resorting to layoffs or a reduction in the quality of service.

Through the EXCEL Program employee work teams were created to develop strategies for improvement that could be implemented by the Bureau. Key strategies for increasing effectiveness, productivity and participation of all employees have included implementing a flexible, multi-skilled workforce, providing intensive training to increase the skill level of employees, and moving to a team-based organizational structure while decreasing layers of management. Work teams are focused on re-engineering the way they perform tasks, improving maintenance programs to maximize the life cycle of the Bureau's equipment, and using new technology to improve performance and efficiency while reducing the need for manpower.

The results of the EXCEL Program have been tremendous for the Department of Public Works. By moving to a team-based organizational structure, the supervisory ratio went from 1 supervisor for 9 employees to 1 supervisor for 14 employees without resorting to layoffs or a reduction in the quality of service.

Employees are undergoing extensive training to develop multiple skills in the fields of mechanical, electrical, instrumentation, safety, laboratory and operations as part of a program that increases efficiency and productivity by creating a more flexible workforce in operations and maintenance.

4.7 Sewer Service Area Descriptions

4.7.1 Baltimore City Sewer Service Area No. 1

4.7.1.1 *General Description*

The drainage area of the Patapsco River generally establishes the limits of the Baltimore City Sewer Service Area. The County line is the western and northern boundary. The eastern and southern limits generally follow the watershed boundary of Deep Run and the Patapsco River west of Wagner's Point, including Jessup north of MD Route 175 and the area north of the Baltimore Beltway (Route 695) near Cabin Branch Creek. The boundaries are shown on the adopted Master Plan Maps S-1 and S-2.

The sewer service area encompasses approximately 18,739 acres and includes the communities of Brooklyn Park, Linthicum, Hanover, Jessup, and the BWI Airport. According to the County's current Land Use Plan, the service area north of MD 100 is primarily designated for medium density residential and industrial park land uses. It also includes the Buckingham Mixed-Use Transit site. South of MD 100, the service area is primarily designated for lower density residential uses, with the exception of the Arundel Preserve Mixed-use Employment site and the Arundel Mills Mall. There are roughly 2,315 acres of vacant land within the service area that could be served by public sewer in the future.

There are two non-County systems located within the Baltimore City Sewer Service Area. They are described in Section 4.3.1, listed in Table 4-4 and depicted on the adopted Master Plan Maps S-1 and S-2.

4.7.1.2 *Projected Population Growth and Flows*

Population forecasts in the Baltimore City SSA indicate an increase to 65,538 by 2050. Much of the growth in this area will occur along the BW Parkway corridor and near the BWI Airport. Office park development continues in the area west of the airport and along West Nursery Road to the north.

Several residential Planned Unit Developments are under construction or complete near the Arundel Mills Mall and in the Jessup community. Another Planned Unit Development is being planned in Brooklyn Park. Redevelopment along some of the older commercial highway corridors in the service area is also being promoted. The Arundel Preserve mixed use development in Hanover will include a mix of office, retail and multifamily uses.

As shown in Table 4-2, the average daily sewer flows in the service area are projected to increase to 6.58 MGD by 2050. The allowable and unused capacity for the Baltimore City Service Area is listed in Table 4-10.

Table 4-10 Sewer Allocation Report for Baltimore City SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		6,390,000	6,390,000	6,390,000	6,390,000			
Flow		4,750,000	4,690,000	5,530,000	5,990,000			
Capacity Available For Allotment		1,640,000	1,700,000	860,000	400,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	10,000	10,000	0	10,000	0	10,000	10,000	0
2) Public Service	25,000	25,000	0	25,000	0	25,000	25,000	0
3) Assisted Housing	15,000	15,000	0	15,000	0	15,000	15,000	0
4) Buildable Lots	20,000	20,000	0	20,000	0	20,000	20,000	0
5) Community Development	75,000	75,000	0	75,000	0	75,000	75,000	0
6) Minor Subdivision	13,500	13,500	750	12,750	0	12,750	13,500	0
7) Major Subdivision	662,200	662,200	310,600	351,600	240,000	111,600	662,200	184,750
8) Commercial Complex	430,000	430,000	208,250	221,750	154,000	67,750	430,000	218,500
9) Industrial Subdivision	310,000	310,000	105,250	204,750	20,000	184,750	310,000	10,750
10) Reserved Capacity	79,300	139,300	0	139,300	0	139,300	139,300	0
Totals (GPD)	1,640,000	1,700,000	624,850	1,075,150	414,000	661,150	1,700,000	414,000

No recommended allotment changes

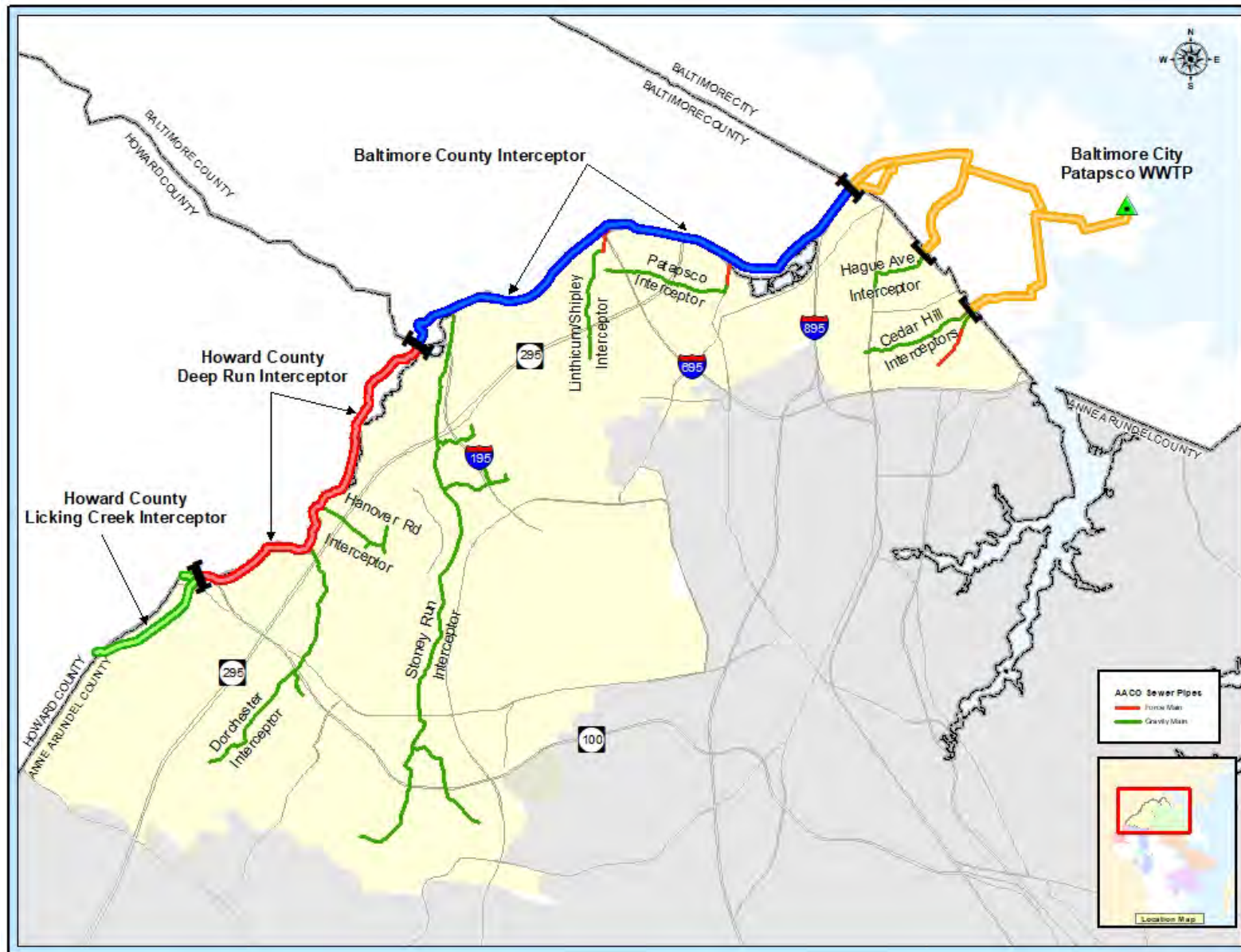
4.7.1.3 Water Reclamation Facility

The Patapsco Wastewater Treatment Plant, located on Wagner's Point in Baltimore City, provides treatment for the majority of sewage in the service area. The plant, owned and operated by Baltimore City, has an allowable operating capacity of 81.0 MGD (from 73.0 MGD before the ENR upgrades). Anne Arundel County's existing flows are approximately 4.69 MGD out of a purchased capacity of 6.39 MGD based on the existing allowable operating capacity of the plant.

Anne Arundel County has entered into several agreements with both Howard and Baltimore Counties and Baltimore City regarding jointly utilizing sewerage facilities. These agreements stipulate capacity allocations to Anne Arundel County as well as capital and operating cost allocations. Anne Arundel County's allotted capacity within the conveyance system that is owned and operated by other jurisdictions, as specified in the aforementioned agreements, is schematically summarized in Figure 4-2.

ENR upgrades at the Patapsco WWTP were completed in 2020. Major projects at the facility included Biological Aerated Filters (SC-845), Denitrification Filters (SC-852), and ENR Enhancements to Existing Facilities (SC-855). Based on the results of the AACO Wastewater Flow Projection Tool, 2045 average daily flows will be approximately 6.44 MGD. The County currently has an allotment of 6.39 MGD at the Patapsco WWTP.

Figure 4-2 Baltimore City SSA Sewer Connection Points



4.7.1.4 Pumping Station, Collection and Conveyance Systems

A list of pump stations is provided in Table 4-11 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-3. The inventory of this infrastructure within the SSA includes the following:

- a) 9 County-owned sewer pump stations
- b) 151.7 miles of gravity mains ranging from 6 to 42 inches in diameter
- c) 1.2 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 4 inches in diameter
- d) 1.7 miles of force mains ranging in size from 2 to 18 inches in diameter
- e) Approximately 12,400 connections

The integral backbone of the County's portion of the Baltimore City SSA consists of seven major gravity interceptors: Licking Creek, Stoney Run, Callaway Branch, Riverside, Cedar Hill (2), and Piney Run interceptor. The Licking Creek and Piney Run interceptors discharge into Howard County's Deep Run interceptor. The Deep Run, Stoney Run, and Callaway Branch interceptors discharge into the Patapsco interceptor, which is owned and operated by Baltimore County. All wastewater flow that goes to Howard County and Baltimore County must be pumped through Baltimore County's Patapsco Pumping Station. This Baltimore County pumping station (located adjacent to Anne Arundel County's Patapsco Pumping Station) has a peak capacity of 80.0 MGD. Flow from the Brooklyn Sub-Service Area is conveyed directly to Baltimore City. Approximately half the flow goes through Baltimore City's Brooklyn Park Pump Station and the remaining flow goes directly into Baltimore City's gravity system.

Table 4-11 Baltimore City Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Cedar Hill	County	Cedar Hill Blvd	S-1	N3B4	700336	1.492
Church Circle	County	311 Church Circle	S-1	K04A1	700034	0.216
Harbor Valley Estates	County	5662 Harbor Valley Rd	S-1	M02C1	700234	0.252
Linthicum/Shipleigh	County	834 Hammonds Ferry Rd N	S-1	J02A2	700245	1.9728
Magnolia Creek	County	Old Jessup Rd	S-2	D8A1	700335	0.6192
Patapsco	County	6816 Baltimore Annapolis Blvd	S-1	L02C1	700035	3.024
Patapsco Park	County	200 Shenandoah Ave	S-1	L02C2	700036	0.72
Ridgeway Manor	County	25F Terrace Rd	S-1	K02B1	700270	0.023
State Highway	County	7530 Old Telegraph Rd	S-2	I07A2	700313	0.223
Furnace Avenue BWI	Private	Furnace Ave	S-1	I03C4	700322	
Ridge Road Hotels	Private	Ridge Rd	S-2	H07D3	700320	
Stoney Run BWI	Private	Stoney Run ROW	S-1	I04D4	700321	

4.7.1.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

These pump stations are being upgraded by either development projects, through the County's CIP, or they have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

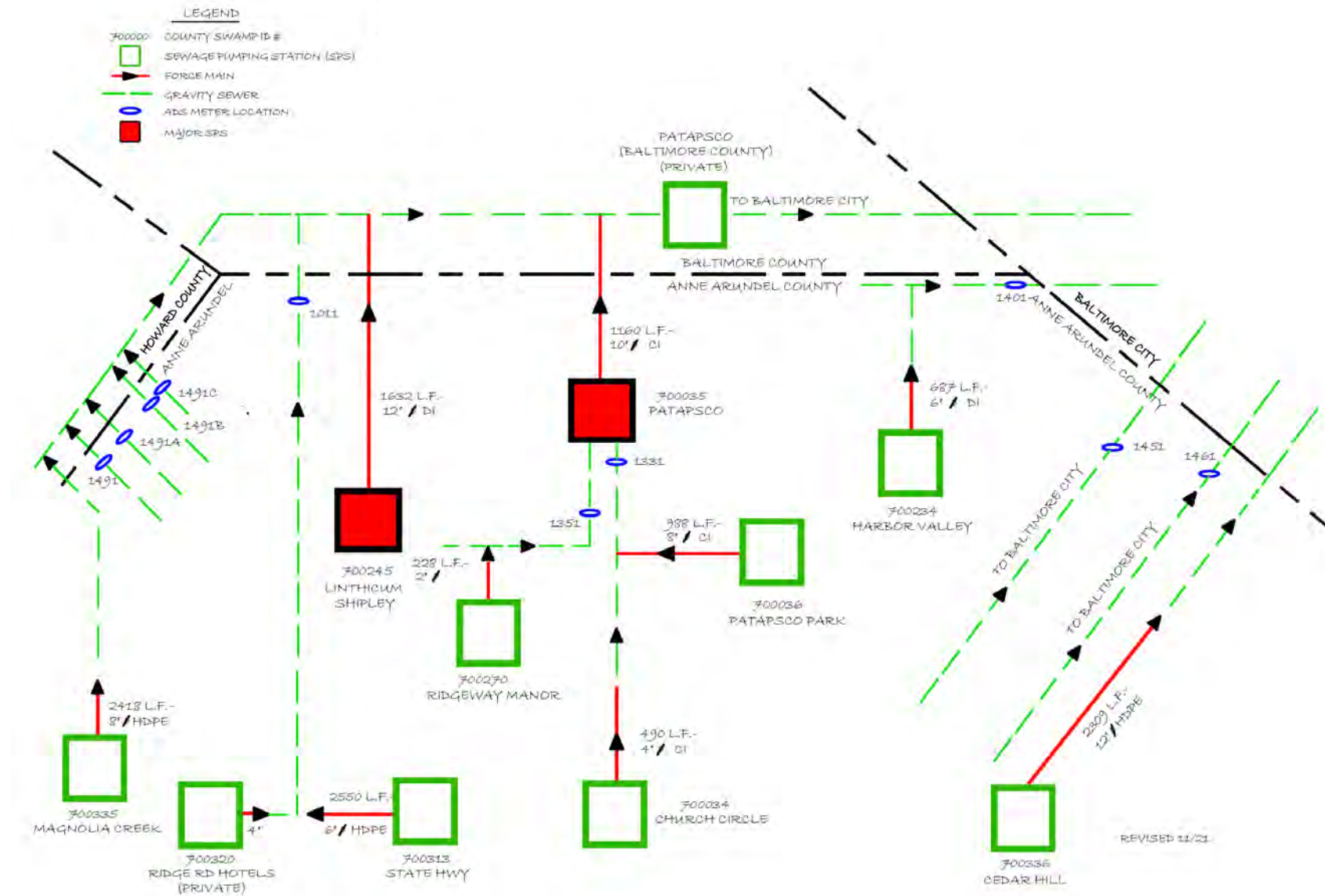
- a) Linthicum/Shipleigh (CSP, CIP S7918180, X764263S7918161)
- b) Patapsco (CSP, CIP S7918170, S7918162)
- c) Patapsco Park (CSP, S7918170)
- d) State Highway (CSP, Development Project)

New pump station (SPS) facilities designed and constructed as either development projects or through the County's CIP are anticipated in the following locations:

- a) Ridge Road Merritt SPS (Development Project)

A number of the capacity deficient gravity mains and force mains were also identified through the CSP. Ongoing investigations will determine specific capacity for infrastructure upgrades (pump stations / piping) and timing of these improvements.

Figure 4-3 Baltimore City SSA



4.7.2 Cox Creek Sewer Service Area No. 2

4.7.2.1 *General Description*

The Cox Creek service area is located in the northern portion of the County. It is generally bounded by Baltimore City to the North, Rock Creek to the East, Elvaton Road and the Magothy River to the South, and Baltimore-Washington International Airport to the West. The boundaries are shown on the Master Plan Maps S-1 thru S-5.

The Cox Creek sewer service area encompasses approximately 29,222 acres. The service area covers the communities of Ferndale, Glen Burnie, Harundale and Pasadena. The current Land Use Plan designates the majority of Glen Burnie, Ferndale and Harundale for medium density residential land uses, with commercial uses concentrated along the Ritchie Highway and Crain Highway corridors. The Glen Burnie Town Center is developed and planned as a mixed-use activity hub. Much of the Pasadena area is planned for low-medium density residential uses, with commercial uses along Mountain Road. Existing and planned industrial uses are located on the east side of BWI Airport and on Marley Neck. There are 2,745 acres of vacant land within the service area that could be served by public sewer in the future.

There are no non-County owned and / or operated systems located within the Cox Creek Sewer Service Area.

4.7.2.2 *Projected Population Growth and Flows*

Population in the Cox Creek service area is projected to increase to 178,157 residents by 2050. Much of the future growth in the service area will occur on the Marley Neck where several large residential developments are underway including Tanyard Springs, Tanyard Cove, Symphony Village at Tanyard Cove, and Osprey Landing. Over 3,200 residential units are planned within these four development projects combined. Additional residential development will likely continue along Solley Road. Commercial redevelopment will be promoted in revitalization districts along Ritchie Highway and Mountain Road, and the area near the Cromwell Light Rail Station is planned for longer-term redevelopment as a mixed-use transit hub.

The average daily sewage flow for Cox Creek WRF is projected to increase to 14.0 MGD by 2050. Table 4-12 presents the allowable and unused capacity in the Cox Creek service area.

Table 4-12 Sewer Allocation Report for Cox Creek SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		15,000,000	15,000,000	15,000,000	15,000,000			
Flow		11,970,000	11,341,000	13,400,000	14,460,000			
Capacity Available For Allotment		3,030,000	3,659,000	1,600,000	540,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	194,500	194,500	0	194,500	0	194,500	194,500	0
2) Public Service	259,750	259,750	0	259,750	0	259,750	259,750	500
3) Assisted Housing	15,000	15,000	0	15,000	0	15,000	15,000	0
4) Buildable Lots	86,750	86,750	2,000	84,750	0	84,750	86,750	0
5) Community Development	112,000	112,000	0	112,000	0	112,000	112,000	0
6) Minor Subdivision	44,500	44,500	3,000	41,500	0	41,250	44,500	0
7) Major Subdivision	850,000	702,750	422,750	280,000	240,750	39,250	702,750	18,000
8) Commercial Complex	190,250	190,250	146,600	43,650	68,750	(25,100)a	323,100	108,550
9) Industrial Subdivision	616,750	616,750	29,000	587,750	1,250	586,500	616,750	0
10) Reserved Capacity	660,500	1,436,750	0	1,436,750	0	1,436,750	1,303,900	0
Totals (GPD)	3,030,000	3,659,000	603,350	3,055,650	310,750	2,744,900	3,659,000	127,050

Recommended allotment changes:

a. Transfer 103,100 GPD from Reserved Capacity to the Commercial Complex category to cover Active Projects.

4.7.2.3 Water Reclamation Facility

The Cox Creek Water Reclamation Facility is located off Wagner Road. The 15.0 MGD rated facility provides activated sludge secondary treatment and phosphorus reduction facilities with an annual average daily flow of approximately 11.34 MGD. The treated effluent is discharged to the Patapsco River.

In order to meet the Bay Restoration Program pollutant limits, the Cox Creek WRF required major ENR upgrades. Conventional means for ENR upgrades requiring significant expansion of the secondary clarifiers and corresponding encroachment into critical areas and wetlands, were not practicable due to the site (acreage) housing the Cox Creek WRF being fully used. Therefore an innovative design approach that provides ENR level treatment on a smaller footprint was selected.

The selected design approach for the Cox Creek ENR was a state-of-the-art membrane filtration system, the first of its size in the state of Maryland and it was completed in 2017 (CIP S802200). This ENR facility fully retrofits the process with a membrane bioreactor (MBR). The project included phased demolition of existing facilities and construction of a new membrane filtration facility, influent flow meter, two rectangular primary clarifiers, fine screen facility, ENR reactors, four-stage Bardenpho bio-reactors, chemical feed systems, membrane, gravity thickener, odor control system, upgraded power distribution system, equalization basins and a high rate clarification. These upgrades led to significant improvements to

the area's local waters by reducing nitrogen discharged from the facility into the Chesapeake Bay by 50% as well as reducing phosphorus discharge by 80%. Additionally, the MBR facility will accommodate future expansion to provide for the planned growth and development in the SSA. Currently there are some non ENR related projects (S806100, S806101, S806102) at the Cox Creek WRF that are essential to assuring continuous and reliable plant operations within stringent environmental permit limits.

With the completion of CIP Project S792905 - Cayuga Farms Interceptor Ph 2 in 2017, an additional 0.089 MGD average daily flow (ultimate flows of approximately 0.118 MGD) was diverted from the Cox Creek SSA to the Broadneck SSA.

The recently completed North County Sewer Strategic Plan Project further evaluated alternatives and provided recommendations to address the future capacity shortfalls at the Cox Creek WRF. Two viable diversions were identified and analyzed to divert flow from the Cox Creek SSA to the Broadneck SSA – Diversion A and Diversion B. Both proposed diversions would divert flow from the Cox Creek SSA to the Broadneck SSA. Diversions A and B will impact Cayuga Farms SPS and portions of its force main. Diversions A and B equate to a total diverted flow of 1.14 MGD which is adequate to alleviate the projected over-capacity issues in the Cox Creek SSA. They would require a 1.8 MGD upgrade to the Cayuga Farms SPS. The total Cayuga Farms SPS capacity would then be 4.7 MGD.

The above alternatives have been reflected on the appropriate Service Area Maps (S-1 through S-12) to recognize planned or potential changes to the Sewer Service Areas impacted if any one or all of the alternatives are implemented.

4.7.2.4 Pumping Station, Collection and Conveyance Systems

A list of pump stations is provided in Table 4-13 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-4. The inventory of this infrastructure within the SSA includes the following:

- a) 55 County-owned sewer pump stations
- b) 393.4 miles of gravity mains ranging from 6 to 60 inches in diameter
- c) 8.29 miles of pressure collectors (grinder pump systems) ranging from 1.25 to 8 inches in diameter
- d) 41.23 miles of force mains ranging in size from 1.5 to 54 inches in diameter
- e) Approximately 40,000 connections

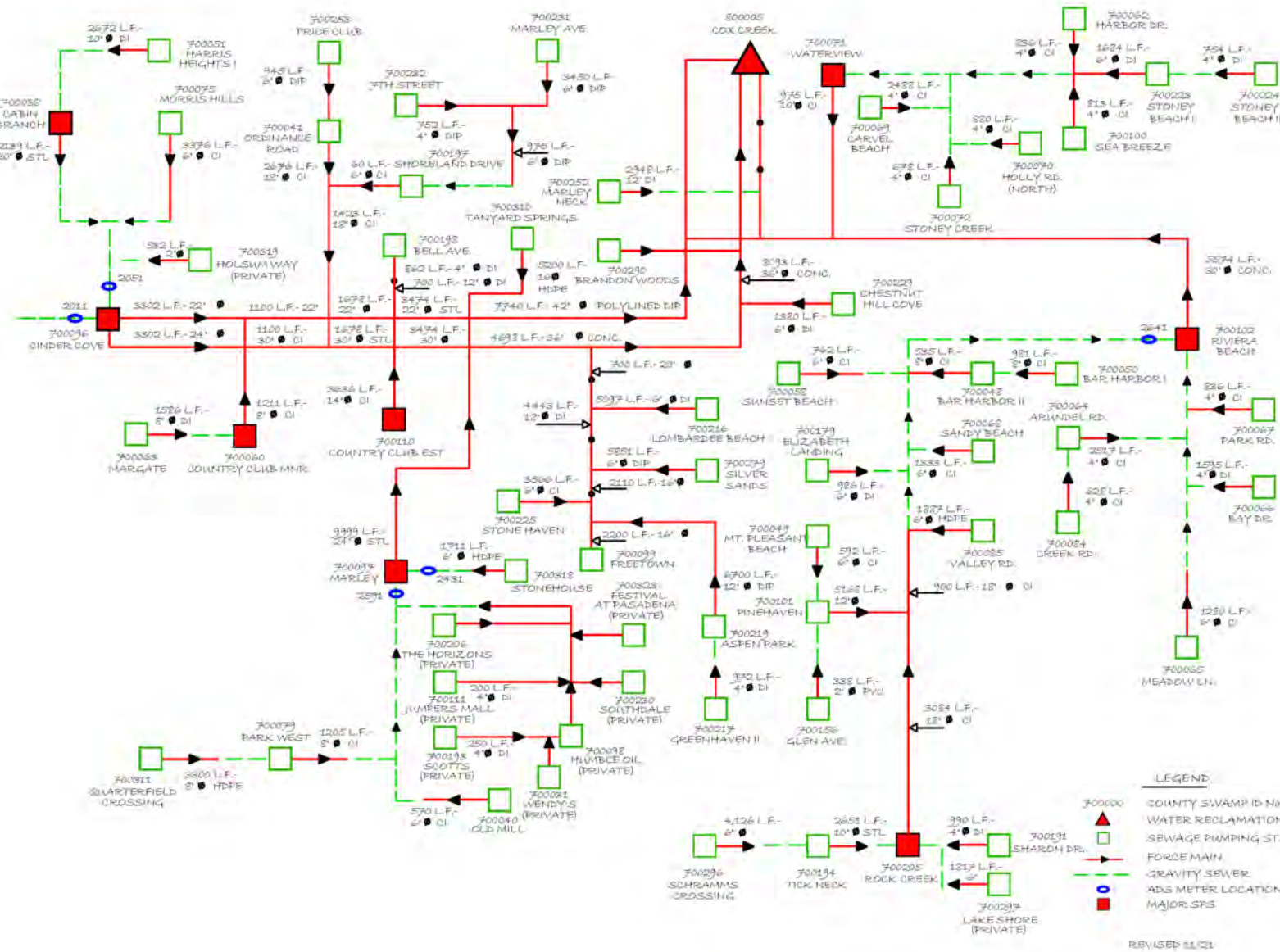
The integral backbone of the Cox Creek conveyance system is the Cross County Force Main (CCFM) that conveys wastewater from 19 pump stations to the treatment facility. This common force main is made up of two parallel lines: a predominately 42-inch diameter North CCFM and a 36-inch diameter South CCFM. Manifold force mains such as this add complexity to the system as head conditions are affected by the discharge rates of the various connected pump stations.

Table 4-13 Cox Creek Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
7th Street	County	995 7th St	S-3	O05C3	700232	0.1152
Arundel Road	County	232 Arundel Rd	S-3	S07A1	700064	0.5688
Aspen Park	County	7601 Appalachian Dr	S-3	Q08C3	700219	1.6416
Bar Harbor I	County	119F Bar Harbor Rd	S-3	S07B1	700050	0.85824
Bar Harbor II	County	16 Johnson Rd	S-3	S07C1	700048	0.9792
Bay Drive	County	206F Harlem Rd	S-3	S06C2	700066	0.1152
Bell Avenue	County	1069 Bell Ave	S-3	O06D1	700198	0.288
Brandon Woods Business Park	County	7635 Gambrills Cove Rd	S-3	Q06A2	700290	0.432
Cabin Branch	County	1071 Cedar Ave	S-1	L04B1	700038	2.88
Carvel Beach	County	424 Carvel Beach Rd	S-3	R07D1	700069	0.23184
Chestnut Hill Cove	County	1298 Hollow Glen Ct	S-3	Q06B2	700229	0.48096
Cinder Cove	County	90 Hammerlee Rd	S-2	N05C2	700096	14
Country Club Estates	County	7829 Leymar Rd	S-2	O06C3	700110	1.152
Country Club Manor	County	1038 Dumbarton Rd	S-2	N06A2	700060	0.8064
Creek Rd	County	8596 Creek Rd	S-3	T07D3	700084	0.16416
Elizabeth Landing	County	1021 Elizabeths Landing Way	S-3	R07B2	700179	0.576
Freetown	County	8068 Solley Rd	S-3	P08C1	700099	1.728
Glen Avenue	County	7749 Glen Ave	S-3	Q08A2	700156	0.0216
Green Haven II	County	835 205th St	S-3	Q08B1	700217	0.2664
Harbor Drive	County	7797 Harbor Dr	S-3	R06A2	700062	0.072
Harris Heights	County	681 Cedar Ave	S-1	M04D1	700051	1.0094
Holly Rd North	County	8205 Holly Rd	S-3	R06B2	700070	0.144
Lombardee Beach	County	7597 Beaver Rd	S-3	R07D2	700216	0.3168
Margate	County	917 Sunnybrook Dr	S-2	N06A3	700063	0.6768
Marley	County	521 Norman Ave	S-2	N07B3	700097	14.76
Marley Avenue	County	1722 Marley Ave	S-1	O05B4	700231	0.2592
Marley Neck	County	730 Pittman Rd	S-1	Q04C3	700252	1.8
Meadow Lane	County	8468 Meadow Ln	S-3	S06B1	700065	0.468
Morris Hills	County	205 Arundel Corporation Rd	S-1	N04D1	700075	0.6192
Mount Pleasant Beach	County	1073 Locust Dr	S-3	R08D1	700049	0.4176
Old Mill Road	County	290 Chalet Dr	S-2	N10D4	700040	0.4032
Ordinance Road	County	6769 Waterview Ct	S-1	N05B1	700041	1.44
Park Road	County	127 Park Rd	S-3	S07D4	700067	0.16272

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Parke West	County	7845R Parke West Dr	S-2	L08C3	700079	1.03968
Pine Haven	County	7680 Briar Ln	S-3	R08D4	700101	1.204
Price Club	County	600R E Ordnance Rd	S-1	O04C4	700253	0.46656
Quarterfield Crossing	County	577 Jones Rd	S-2	K07B3	700311	0.481
Riviera Beach	County	107 Carroll Rd	S-3	S07D2	700102	10.944
Rock Creek	County	1263 Pekin Rd	S-3	R08B2	700205	3.842
Sandy Beach	County	136R Sandy Beach Dr	S-3	S07C2	700068	0.4608
Schramms Crossing	County	8110 Bell Tower Crossing	S-3	Q09C3	700296	0.67536
Sea Breeze	County	8005 Shore Rd	S-3	R06B1	700100	0.24192
Sharon Drive	County	4400 Sharon Dr	S-3	S09B2	700191	0.144
Shoreland Drive	County	968 Shoreland Dr	S-2	N06A1	700197	0.684
Silver Sands	County	869 North Shore Rd	S-3	Q08D1	700279	0.3744
Stone Haven	County	8109 Stone Haven Dr	S-3	Q08D3	700225	0.396
Stonehouse Run	County	7622 Holly Ridge Dr	S-3	O07A2	700318	0.504
Stoney Beach I	County	1931 Hilltop Rd	S-3	S06D3	700223	0.4824
Stoney Beach II	County	1351 Triwater Ct	S-3	S06D3	700224	0.12528
Stoney Creek	County	8250 Fort Smallwood Rd	S-3	R07A1	700072	0.15696
Sunset Beach	County	8450 Byrd Rd	S-3	R07B1	700058	0.52416
Tanyard Springs	County	7460 Marley Neck Blvd	S-3	P05B3	700310	2.988
Tick Neck Road	County	8030 Mayfield Rd	S-3	R09C4	700194	2.0088
Valley Road	County	1240 Rock Hill Rd	S-3	S08C4	700085	0.64368
Waterview	County	700 Waterview Dr	S-3	R06B4	700071	2.016
Festival at Pasadena	Private	8139 Ritchie Hwy	S-3	O9B3	700323	
Holsum Way	Private	Holsum Way	S-1	N05D4	700319	
Humble Oil	Private	8101R Ritchie Hwy	S-3	O09C2	700098	0.338
Jumpers Mall	Private	8064 Ritchie Hwy	S-3	O09C4	700111	0.163
Lake Shore	Private	31R Magothy Beach Rd	S-3	S10D1	700297	
Scotts	Private	8120F Ritchie Hwy	S-3	O09C1	700193	0.035
Southdale	Private	8049F Jumpers Hole Rd	S-3	O09C4	700230	0.049
The Horizons	Private	8030R Ritchie Hwy	S-2	O09C4	700206	0.288
Wendys	Private	8142 Ritchie Hwy	S-3	O09C2	700031	0.4

Figure 4-4 Cox Creek SSA



4.7.2.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

Infrastructure CIP projects in the Cox Creek SSA include:

- a) Silver Sands Force Main Repair (CIP X7388219)
- b) Stone Haven FM Replacement (CIP X7388280)
- c) Ft. Smallwood Gravity Sewer Replacement (CIP X7388269)
- d) Homer Ave - Oakleigh Ave Sewer Replacement (CIP X7388278)
- e) Glen Burnie Sanitary Sewer Upsizing (CIP X738800)

These pump stations are being upgraded by either development projects, through the County's CIP, or they have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Arundel Road (CIP S7918162)
- b) Aspen Park (CSP)
- c) Bay Drive (CIP S7918162)
- d) Bar Harbor I & II (CIP S7918160)
- e) Bell Avenue (CIP S7918162)
- f) Cabin Branch (CSP)
- g) Chestnut Hill Cove (CSP)
- h) Country Club Estates (CIP S7918163)
- i) Creek Road (CIP S806216)
- j) Glen Avenue (CSP)
- k) Harbor Dr (CIP S806216)
- l) Harris Heights (CSP)
- m) Marley Avenue (CIP S7918166)
- n) Marley Neck (CIP S806214)
- o) Meadow Lane (CIP S806216)
- p) Mt. Pleasant Beach (CIP S7918162)
- q) Ordnance Road (CSP)
- r) Park Road (CIP S806216)
- s) Park West (CIP S7918133)
- t) Pine Haven (CSP, CIP S7918162)
- u) Price Club (CSP)
- v) Sandy Beach (CIP S806216)
- w) Sea Breeze (CIP S806216)
- x) Shoreland Drive (CIP S7918174)
- y) Schramms Crossing (CSP)
- z) Sunset Beach (CIP S806216)
- aa) Stone Haven (CIP S7918165)
- bb) Valley Rd (CIP S806214)
- cc) Waterview (CIP S7918132)
- dd) 7th Avenue (CIP S806216)

New pump station facilities designed and constructed as either development projects or through the County's CIP are anticipated at Tanyard Shores and Brewers Island (Development Projects).

A number of the capacity deficient gravity mains and force mains were also identified through the CSP. On-going investigations will determine specific capacity for infrastructure upgrades (pump stations / piping) and timing of these improvements.

4.7.3 Maryland City Sewer Service Area No. 3

4.7.3.1 General Description

The Maryland City sewer service area encompasses approximately 7,184 acres and includes the portion of the Patuxent River drainage basin west of Fort Meade. It covers the area south of MD 175 and extends from the western boundary of the County eastward and southward to the limits of Fort Meade. The service area includes the community of Maryland City, the Russett PUD, and portions of Jessup and extends east of the Baltimore Washington Parkway to include a large tract of federally owned property leased by the District of Columbia. The boundaries are shown on the Master Plan Maps S-2 and S-4.

According to the County's current Land Use Plan, the service area is planned primarily for medium and high-density residential uses in Maryland City and office park uses in Jessup, Annapolis Junction, and along MD 198. In addition, the service area includes the National Business Park and Shannon's Glen Mixed-Use Employment Area, just south of MD 175, some of which is completed or under construction; and the Arundel Gateway Mixed-Use Commercial site, south of MD 198. There is a considerable amount of open space in the service area including the Little Patuxent River floodplains and the Oxbow Natural Area. There are roughly 1,029 acres of vacant land within the service area that could be served by public sewer in the future.

There are three non-County owned and / or operated treatment facilities located within the Maryland City SSA. These are described in Section 4.3.1, listed in Table 4-4 and shown on Master Plan Maps S-2 and S-4.

4.7.3.2 Projected Population Growth and Flows

Population within the Maryland City sewer service area is projected to increase to approximately 32,212 residents by the year 2050. Anticipated development over the planning horizon includes the continued build out of the National Business Park, Arundel Gateway, continued development on the Konterra property in Annapolis Junction, redevelopment on the Laurel Race Track site, and some commercial revitalization along MD 198.

As shown in Table 4-2, the average daily sewer flows in the service area are projected to increase to 2.34 MGD in 2050. The allowable and unused capacity for the Maryland City Service Area is listed in Table 4-14.

Table 4-14 Sewer Allocation Report for Maryland City SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		3,300,000	3,330,000	3,330,000	3,330,000			
Flow		1,359,000	1,393,000	1,970,000	2,290,000			
Capacity Available For Allotment		1,941,000	1,937,000	1,363,000	1,040,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	2,500	2,500	0	2,500	0	2,500	2,500	0
2) Public Service	1,250	1,250	0	1,250	0	1,250	1,250	0
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	4,750	4,750	0	4,750	0	4,750	4,750	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	0	0	0	0	0	0	0	0
7) Major Subdivision	415,850	415,850	368,600	47,250	17,250	30,000	415,850	250,000
8) Commercial Complex	176,250	176,250	271,500	(95,250)	6,500	(101,750) ^a	388,250	75,750
9) Industrial Subdivision	619,550	619,550	223,250	396,300	0	396,300	619,550	0
10) Reserved Capacity	750,850	716,850	0	716,850	0	716,850	504,850	0
Totals (GPD)	1,971,000	1,937,000	863,350	1,073,650	23,750	1,049,900	1,937,000	325,750

Recommended allotment changes:

a. Transfer 108,250 GPD from Reserved Capacity to Commercial Complex Category to cover active projects.

Notes: Laurel Race Track's highest recorded daily flow was 1,560 EDUs in December 2017. This flow exceeds the credit of 1,162 EDUs previously offered

4.7.3.3 Water Reclamation Facility

The Maryland City Water Reclamation Facility is located adjacent to and west of Maryland City and discharges to the Patuxent River. This WRF was constructed in 1990 by the Russett Developer and was designed to serve the capacity requirements of the Russett Development as well as estimated flows for the existing and planned service categories within the service area. The plant had a capacity of 2.50 MGD. In order to meet the wastewater service requirements of existing and new utility customers in the service area, the County expanded the capacity of the Maryland City WRF from 2.50 MGD to 3.33 MGD, and upgraded the treatment process to achieve a level of treatment that allows the facility to meet current wasteload limitations. The expansion of the Maryland City WRF (CIP S806601) and ENR upgrade (CIP S803000) were completed in 2017. An existing average daily flow of 1.39 MGD is received at the plant.

4.7.3.4 Pumping Station, Collection and Conveyance Systems

A list of pump stations is provided in Table 4-15 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-5.

The inventory of this infrastructure within the SSA includes the following:

- a) 8 County-owned sewer pump stations
- b) 43.5 miles of gravity mains ranging from 4 to 24 inches in diameter
- c) 0.05 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 3 inches in diameter
- d) 14.9 miles of force mains ranging in size from 6 to 20 inches in diameter
- e) Approximately 4,450 connections

There are large developable tracts of land within the planned service category in this sewer service area. Development of these areas will require extensive comprehensive planning of conveyance and pumping infrastructure due to the impact on infrastructure within the service area.

Table 4-15 Maryland City Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Annapolis Junction	County	8207 Dorsey Run Rd	S-2	D10C4	700306	2.16
Arundel Gateway	County	3255 Laurel Ft Meade Rd	S-4	D12A3	700328	2.981
Barbers Trailer Park	County	413 Kokomo Ct	S-4	A12B3	700073	0.356
Little Patuxent	County	2401 Russett Green W	S-4	C11D1	700271	3.74
Maryland City	County	3533 Tejon Rd	S-4	A12A1	700273	4.205
National Business Park	County	116 National Business Pkwy	S-2	D10A4	700289	1.1952
Russett Phase II	County	3000 Lost Creek Blvd	S-2	C10C4	700293	0.576
Russett Phase III	County	8061 Pennington Dr	S-2	C10B2	700295	0.9

4.7.3.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

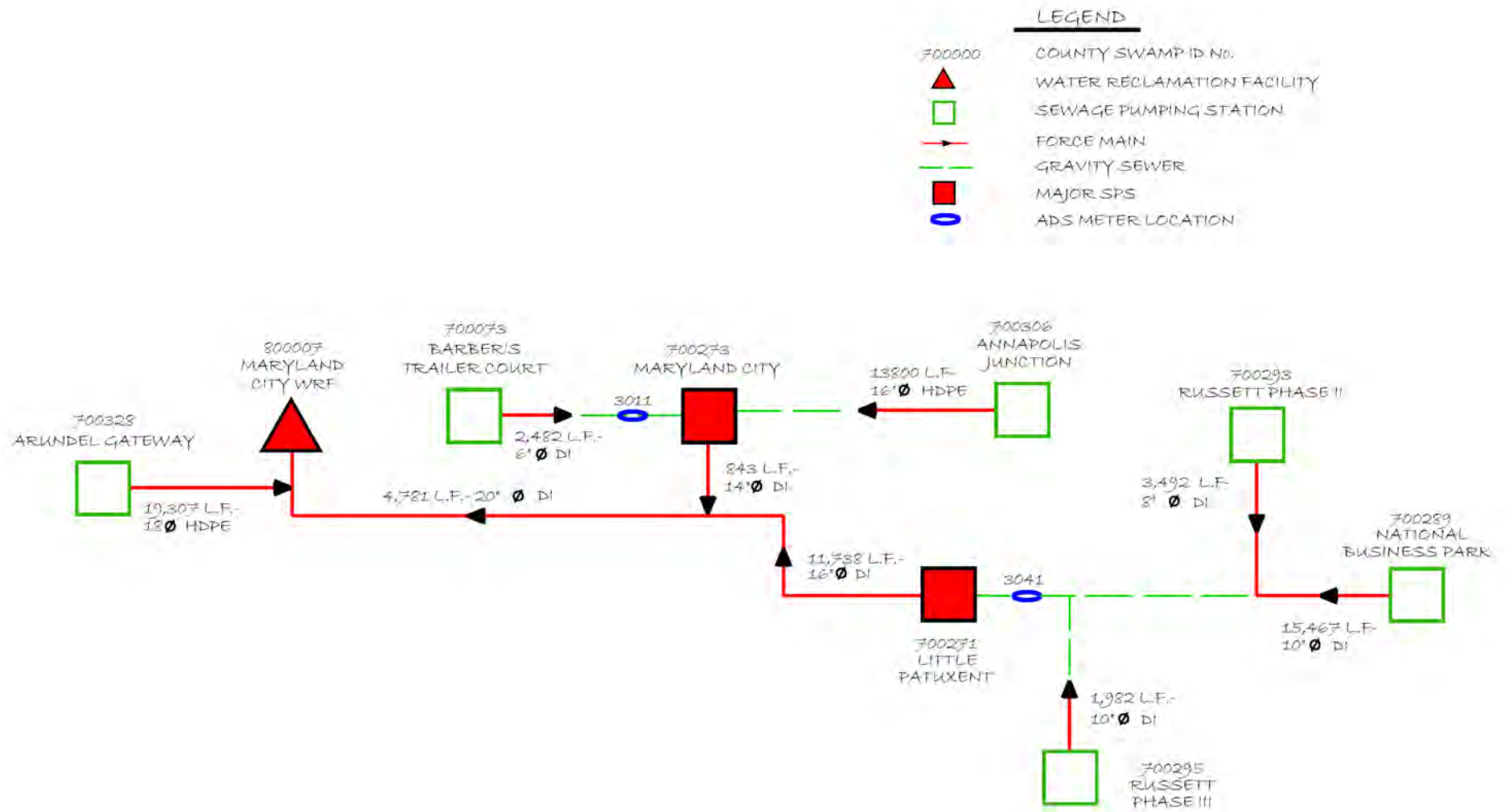
These pump stations are being upgraded by either development projects or through the County's CIP, or have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Maryland City SPS (CIP S808401)
- b) Little Patuxent (CIP S806214)
- c) Russett II (CSP)

New pump station facilities designed and constructed as development projects are anticipated at Brock Bridge Landing and Chestnut Avenue Property. The Brock Bridge Landing subdivision plans to construct a sewer pumping station and force main that will convey sewer flows from their site and other properties in the vicinity to MH 37879 on Brock Bridge Road. The Chestnut Avenue Property plans to construct a new sewer pumping station and force main that will convey sewer flow from their site and other properties in the vicinity of MH 40580 at the intersection of MD Route 175 and Shannon's Glen Drive.

A number of capacity-deficient gravity mains and force mains were also identified through the CSP. On-going investigations will determine specific capacity for infrastructure upgrades (pump stations / piping) and timing of these improvements.

Figure 4-5 Maryland City SSA



4.7.4 Patuxent Sewer Service Area No. 4

4.7.4.1 General Description

The Patuxent sewer service area includes the portion of the Patuxent River drainage basin east of Fort Meade. It covers portions of Severn, Jessup, Odenton and Crofton and includes the communities of The Provinces, Seven Oaks, and the Odenton Town Center. The service area encompasses approximately 14,879 acres. According to the current Land Use Plan, this service area is designated predominantly for a mix of low and medium-density residential use, with smaller pockets of high-density residential uses. The Odenton Town Center is planned as a transit-oriented mixed-use development; and the Parkside development located at MD 175 and the BW Parkway is under construction as a residential mixed-use site. Commercial land uses are concentrated primarily along MD 3 in Crofton and Gambrills. In addition, the Waugh Chapel Towne Centre and the Villages at Waugh Chapel Mixed-Use Commercial developments are located at the southwest intersection of MD 3 South and Waugh Chapel Road.

The Two Rivers Planned Unit Development which contains over 2000 single-family dwellings and townhouses located at the south end of the service area is under construction. There are approximately 1,098 acres of vacant land within the service area that could be served by public sewer in the future.

There are two non-County owned and / or operated treatment facilities located within the Patuxent SSA. These systems are listed in Table 4-4 and shown on Master Plan Maps S-4 and S-6.

4.7.4.2 Projected Population Growth and Flows

Population within the Patuxent sewer service area is forecasted to reach 109,011 by 2050. Future growth in the area will include a mix of residential, office and retail development in the Odenton Town Center. Major projects being planned in the Odenton Town Center include the Village at Odenton Station and Town Center Commons. Future growth in the service area will also include a planned Mixed-Use Residential site located in the Waugh Chapel Village area.

Table 4-2 indicates that average daily sewage flows are projected to increase to 6.94 MGD by 2050. Table 4-16 presents the allowable and unused capacity in the Patuxent service area.

Table 4-16 Sewer Allocation Report for Patuxent SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		10,500,000	10,500,000	10,500,000	10,500,000			
Flow		5,706,000	5,772,000	7,040,000	7,630,000			
Capacity Available For Allotment		4,794,000	4,728,000	3,460,000	2,870,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	5,500	5,500	0	5,500	0	5,500	5,500	0
2) Public Service	10,000	0	0	0	1,750	(-1,750) ^a	12,000	0
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	3,250	3,250	0	3,250	0	3,250	3,250	0
5) Community Development	10,000	10,000	0	10,000	0	10,000	10,000	0
6) Minor Subdivision	5,750	5,750	750	5,000	0	5,000	5,750	0
7) Major Subdivision	1,161,750	1,161,750	833,700	328,050	49,000	279,050	1,161,750	310,750
8) Commercial Complex	283,250	283,250	247,250	36,000	29,500	6,500	283,250	482,000
9) Industrial Subdivision	65,100	65,100	9,500	55,600	0	55,600	65,100	0
10) Reserved Capacity	3,249,400	3,193,400	0	3,193,400	0	3,193,400	3,181,400	0
Totals (GPD)	4,794,000	4,728,000	1,091,200	3,636,800	80,250	3,556,550	4,728,000	792,750

Notes:

The unallocated portion of the Halle Property is not included in Active Projects because it cannot be allocated until the plant is expanded. It is included in Potential Projects at this time, 252,750 GPD (1,011 EDUs). Per the DRRA, allocation occurs upon the date of the approval of the Site Development Plan for each phase.

Recommended allotment changes:

a. Transfer 2,000 GPD from Reserved Capacity to Public Service Category to cover active projects.

4.7.4.3 *Water Reclamation Facility*

Sewage from the service area is collected and conveyed to the Patuxent Water Reclamation Facility (WRF) located west of Maryland Route 3 just north of Crofton. The plant has a rated capacity of 10.5 MGD and discharges to the Little Patuxent River. The existing average daily flow at the plant was 5.77 MGD. The facility utilizes an oxidation ditch activated sludge process designed for nitrification/ denitrification and phosphorus removal. Under Capital Project S804100 (Patuxent WRF ENR) improvements were completed ensuring that the facility is capable of achieving an annual average effluent TN concentration of 3.0 mg/l or less under all design conditions. These improvements included supplemental carbon storage, a feed system, and new denitrifying filters.

An expansion of the capacity at the Patuxent WRF was completed in 2017, under Capital Project S806501 from 7.5 MGD to 10.5 MGD. With the completion of the expansion and ENR upgrades at the plant, a new set of effluent limits based on the average daily flow rate of 10.5 MGD was activated. These limits were based on achievement of annual average effluent TN concentration of 3.0mg/L from the facility.

4.7.4.4 *Pumping Station Collection, and Conveyance Systems*

A list of pump stations is provided in Table 4-17 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-6. The inventory of this infrastructure within the SSA includes the following:

- a) 10 County-owned sewer pump stations
- b) 226.3 miles of gravity mains ranging from 6 to 36 inches in diameter
- c) 3.1 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 3 inches in diameter
- d) 7.5 miles of force mains ranging in size from 1.5 to 24 inches in diameter
- e) Approximately 23,900 connections

The integral backbone of the Patuxent conveyance system consists of three major gravity interceptors: Severn Run Interceptor, Patuxent Interceptor, and the Odenton Interceptor. The Odenton Interceptor was upgraded under CIP Project 805900. In response, the County established a Sanitary District that incorporates the Odenton Town Center. The District provides for assessment of sewer surcharges to new development to allow for recovery of costs incurred by the County towards the cost of the Odenton interceptor expansion. This project included right of way acquisition and the design and construction of sanitary sewer collectors and interceptor upgrades to serve the proposed Odenton Town Center.

There are large developable tracts of land within the planned service category. Development of these areas will require extensive comprehensive planning of conveyance and pumping infrastructure due to the potential impact on infrastructure within the service area.

Table 4-17 Patuxent Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Parkside	County	8006 Parkside Blvd	S-2	E9A3	700330	0.8136
Clark Heights	County	8326F Dubbs Rd	S-2	J10C2	700005	0.2016
Crofton Walk-in	County	1451 Crain Hwy N	S-6	I18C3	700004	5.76
Pigeon House	County	1651F Crain Hwy N	S-6	H19B1	700001	0.144
Regency at Two Rivers	County	Catbriar Way	S-6	G17D4	700334	0.216
Ridgeview Plaza	County	2661 Annapolis Rd	S-2	F09D2	700314	1.309
Ridgeway	County	21 Burns Crossing Rd	S-2	J10C3	700002	3.456
Riverwalk at Crofton	County	1304 Foggy Turn	S-6	I18C4	700333	0.22752
Severn Run	County	1501 Old Mill Rd	S-4	I11B1	700003	10.8
Storch Property	County	1035 Crain Hwy N	S-6	I16B2	700107	2.16
Two Rivers II	County	2785 Conway Rd	S-6	G17A4	700327	1.958
Walden	County	1500 Underwood Rd	S-6	K17C1	700291	0.4032
Wilsons Grove	County	2110 Johns Hopkins Rd	S-6	K17D2	700326	0.281

4.7.4.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

Infrastructure CIP projects in the Patuxent SSA include:

- a) Pigeon House FM Replacement (CIP X7388279)

These pump stations are being upgraded by either development projects or through the County's CIP, or have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Pigeon House (CSP, CIP S7918153)
- b) Severn Run (CSP, CIP S7918179)
- c) Storch Property (CSP, CIP S7918155)
- d) Clark Heights (CIP S7918155)
- e) Ridgeway (CIP S7918178)

New pump station facilities designed and constructed as either development projects or through the County's CIP are anticipated at Two Rivers I & III (Development Project).

A number of the capacity deficient gravity mains and force mains were also identified through the CSP. Further defined infrastructure planning is also underway to facilitate the full development of the Odenton Town Center. On-going investigations will determine specific capacity for infrastructure upgrades (pump stations / piping) and timing of these improvements.

4.7.5 Broadneck Sewer Service Area No. 5

4.7.5.1 *General Description*

The Broadneck service area is located in the east-central portion of the County. The Magothy and Severn Rivers, including a portion of the headwater of the Severn River along Benfield Road and MD Route 3, generally bound it.

The sewer service area encompasses approximately 28,331 acres. The major land uses in the service area are low and low-medium residential and rural/agricultural, with localized areas of commercial development. The most densely populated areas include Severna Park, Pasadena and Cape St. Claire. This area also includes the U.S. Naval Station Reservation which will remain served by the existing private WRF within the Reservation.

There are about 1,507 acres of vacant land within the service area that could be served by public sewer in the future.

There are eight non-County owned and / or operated treatment facilities located within the Broadneck SSA. These systems are listed in Table 4-4 and depicted on the adopted Master Plan Maps S-4, S-5 and S-7.

4.7.5.2 *Projected Population Growth and Flows*

Population within the Broadneck sewer service area is projected to increase to 95,930 by the year 2050. Future growth within the service area will be primarily new residential development or infill. Commercial development or redevelopment will occur at hubs along Ritchie Highway and along Veterans Highway in Severna Park. The Severna Park Mall and surrounding area is targeted for redevelopment as a village center with a mix of uses.

Table 4-2 indicates that average daily sewage flows are projected to increase to 6.11 MGD by 2050. Table 4-18 presents the allowable and unused capacity in the Broadneck service area.

4.7.5.3 *Water Reclamation Facility*

The Broadneck Water Reclamation Facility is located off Log Inn Road. The facility is rated at 8.0 MGD with the annual average daily flow of 4.66 MGD. The treated effluent from the plant discharges through an outfall to the Chesapeake Bay, approximately 4,000 feet from the shoreline.

The WRF was expanded from 6.0 MGD to 8.0 MGD under Capital Project S803100. The facility required significant capital improvements to meet the "limit of technology" level of 3.0 mg/L TN at the proposed re-rated plant capacity of 8.0 MGD. Sufficient space is available on the existing site for the facility to be increased to 12.0 MGD if necessary, however the nutrient cap limits hydraulic capacity to 8.0 MGD at ENR treatment levels.

Table 4-18 Sewer Allocation Report for Broadneck SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		8,000,000	8,000,000	8,000,000	8,000,000			
Flow		5,308,000	4,660,000	6,010,000	6,190,000			
Capacity Available For Allotment		2,692,000	3,340,000	1,990,000	1,810,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	46,750	46,750	0	46,750	0	46,750	46,750	0
2) Public Service	48,250	48,250	0	48,250	2,250	46,000	48,250	500
3) Assisted Housing	15,000	15,000	0	15,000	0	15,000	15,000	0
4) Buildable Lots	78,500	78,500	1,000	77,500	0	77,500	78,500	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	16,250	16,250	4,000	12,250	0	12,250	16,250	0
7) Major Subdivision	160,000	128,750	111,100	17,650	18,500	(850)a	149,350	122,250
8) Commercial Complex	459,250	459,250	50,500	408,750	2,000	406,750	459,250	500
9) Industrial Subdivision	15,500	15,500	11,000	4,500	0	4,500	15,500	14,500
10) Reserved Capacity	1,852,500	2,531,750	0	2,531,750	0	2,531,750	2,511,150	0
Totals (GPD)	2,692,000	3,340,000	177,600	3,162,400	22,750	3,139,650	3,340,000	137,750

Recommended allotment changes:

a. Transfer 19,350 GPD from Reserved Capacity to Major Subdivision Category to cover active projects.

4.7.5.4 Pumping Station, Collection and Conveyance Systems

A list of pump stations is provided in Table 4-19 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-7. The inventory of this infrastructure within the SSA includes the following:

- 60 County-owned sewer pump stations
- 233.65 miles of gravity mains ranging from 6 to 60 inches in diameter
- 14.1 miles of pressure collectors (grinder pump systems) ranging from 1.25 to 4 inches in diameter
- 39.6 miles of force mains ranging in size from 1.5 to 36 inches in diameter
- Approximately 21,400 connections

Table 4-19 Broadneck Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Arnold WTP	County	1336 Jones Station Rd	S-7	T16A2	700299	0.288
Ashberry Court	County	507F Ashberry Ln	S-5	P13B2	700006	0.42912
Atlantis	County	919 Barracuda Cove Ct	S-5	V15A2	700162	0.44784
Bay Hills	County	571 Bay Green Dr	S-5	V15C3	700026	1.728
Belvedere Yacht Club	County	415 Alameda Pkwy	S-5	T14B1	700023	0.3744
Ben Oaks	County	461 Severnside Dr	S-4	M12B2	700192	2.232
Berrywood	County	205R Berrywood Dr	S-5	R12C4	700149	0.20592
Big Cypress Creek	County	3 McKinsey Rd	S-5	Q13B1	700010	11.4
Boone Trail	County	25 Evergreen Trl	S-5	P14A1	700007	0.46368
Brittingham	County	261 Finnegan Dr	S-5	P11C1	700259	0.42624
Buschs	County	341 Buschs Frontage Rd	S-7	W16C3	700028	0.5184
Cape Arthur II	County	4F Giddings Rd	S-5	S13D3	700057	0.42912
Cape Arthur III	County	208F McKinsey Rd	S-5	R13A3	700014	0.75888
Cape Arthur V	County	133 McKinsey Rd	S-5	R13D2	700016	1.98
Cape St. Claire I	County	964 Woodland Cir	S-7	W16B1	700143	3.11
Cape St. Claire II	County	1084 Little Magothy View	S-5	X15C4	700145	0.7488
Cape St. Claire III	County	1260 Swan Dr	S-7	X16D4	700144	0.51552
Cape St. Claire IV	County	1133 River Bay Rd	S-5	W15A1	700185	0.37152
Cape St. Claire V	County	1379R Greenway Dr	S-5	V15B3	700199	0.432
Cape St. Claire VIII	County	1007 Lakeview Ln	S-5	W15D2	700236	0.19008
Cape St. Claire X	County	1008F Lake Claire Dr	S-5	W15D3	700237	0.02304
Carrollton Manor I	County	638 Jumpers Hole Rd	S-5	O13C1	700187	0.18432
Carrollton Manor II	County	658 Shore Rd	S-5	O13C1	700188	0.20304
Carrollton Manor III	County	726 Shore Rd	S-5	O13B4	700189	0.17568
Carrollton Manor IV	County	581 Park Rd	S-5	O13A3	700190	0.92736
Cattail Creek	County	91 Robinson Landing Rd	S-5	Q12B2	700009	10.138
Cayuga Farms	County	428 University Dr	S-2	L10C4	700304	2.7446
Cedar Point Road	County	9F Cedar Point Rd	S-5	P14A3	700008	0.1152
Cedar Road	County	4 Dogwood Rd	S-5	Q13C4	700011	0.11808
Colchester I	County	506 Lymington Rd	S-5	P13C3	700150	0.34704
Dill Road	County	683 Dill Rd	S-5	R13C2	700167	0.2088
Divinity Cove	County	210 Mill Church Rd	S-5	S14A3	700183	0.17712
Doris Drive	County	857 Doris Dr	S-5	T14A3	700022	0.55008
East-West Boulevard	County	8373 Veterans Hwy	S-4	M11D3	700292	0.42768

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Evergreen Commons	County	800 Janet Dale Ln	S-2	K09D3	700316	0.21
Fair Oaks	County	303 Fairtree Dr	S-5	R12C1	700125	0.22752
Forked Creek	County	1160 Greenhill Rd	S-5	T15A1	700163	2.76048
Haskell Drive	County	423 Haskell Dr	S-5	S14B1	700018	1.08
Lakeland	County	531 Lakeland Rd S	S-4	O13D4	700166	0.56448
Lakeview	County	775 N Lakeview Dr	S-5	T14D1	700021	1.008
Little Cypress Creek	County	271 Cypress Creek Rd	S-5	R13B1	700015	0.2088
Long Meadow	County	613 Cypress Rd	S-5	R13B4	700171	0.15696
Manhattan Beach I	County	755R Dividing Creek Rd	S-5	S14D3	700122	1.08
Manhattan Beach II	County	351 Magothy Rd	S-5	S13C2	700123	0.72
Manhattan Beach III	County	807 Natures Run	S-5	R14A1	700124	0.2592
Mill Creek	County	199 Campus Green Dr	S-5	S15A1	700020	10.8
Old Jones Station	County	55 Jones Station Rd	S-5	S14C3	700181	0.7488
Park Retreat	County	8290 Railroad Avenue	S-3	O10B2	700325	0.210
Pasadena Elementary School	County	509 Pasadena Rd	S-5	P10B3	700317	0.173
Round Bay I	County	6F Ridout Rd	S-5	Q14A2	700012	0.2304
Round Bay II	County	106 Severn River Rd	S-5	Q14B1	700013	0.12096
Round Bay III	County	821 Ritchie Hwy	S-5	R14D1	700017	1.3176
Shipleys Choice	County	316R Sourwood Ct	S-4	N11C1	700207	0.4248
Solomons Choice	County	8386 Woodland Rd	S-4	N10B3	700329	0.144
Twin Harbors I	County	181 Baybourne Dr	S-5	S14A4	700146	0.1728
Twin Harbors II	County	124F Shore Rd	S-5	S14C1	700147	0.144
Twin Harbors IV	County	226 Peninsula Farm Rd	S-5	S14C1	700019	0.648
Twin Harbors V	County	241R Peninsula Farm Rd	S-5	S14B4	700148	0.1728
Ulmstead Estates	County	725 White Swann Dr	S-5	U14D1	700024	0.3528
Whispering Woods I	County	401 Blossom Tree Dr	S-7	V16C3	700027	0.216
Whispering Woods II	County	1435 Shot Town Rd	S-7	U17D1	700025	0.8352
Whitehurst	County	480 White Cedar Ln	S-5	R12B2	700126	0.32832
I-97 Business Park	Private	231R Najoles Rd	S-4	M12D4	700332	
Westinghouse	Private	896 Oceanic Dr	S-7	Y18A3	700029	0.396

4.7.5.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

The integral backbone of the County's conveyance system is a series of pumping facilities that convey wastewater south along Ritchie Highway by the Big Cypress Creek pumping station to the Mill Creek pump station near Anne Arundel Community College. Wastewater from the Mill Creek facility is pumped along College Parkway to where it flows by gravity to MD Route 50 and ultimately to the Broadneck WRF. These major components were re-evaluated as a part of the strategic planning effort, regarding their ability to convey the future flow requirements of the service area as well as the potential future flows from the Broadneck SSA.

Infrastructure CIP projects in the Broadneck SSA include:

The Cayuga Farms Interceptor Phase II (CIP S792905) was completed in 2017 and an additional 0.089 MG average daily flow (ultimate flows of approximately 0.118 MGD) was diverted from the Cox Creek SSA to the Broadneck SSA. The Quarterfield School SPS (Public) has been abandoned and the sewer flow from the area has been re-routed from the Cox Creek SSA to the Broadneck SSA.

Force Main Replacements are planned for at the following pumping stations:

- a) Cattail Creek Rt 2 (CIP S808101)
- b) Cedar Rd (CIP X7388283)
- c) Route 50 (CIP X7388135)

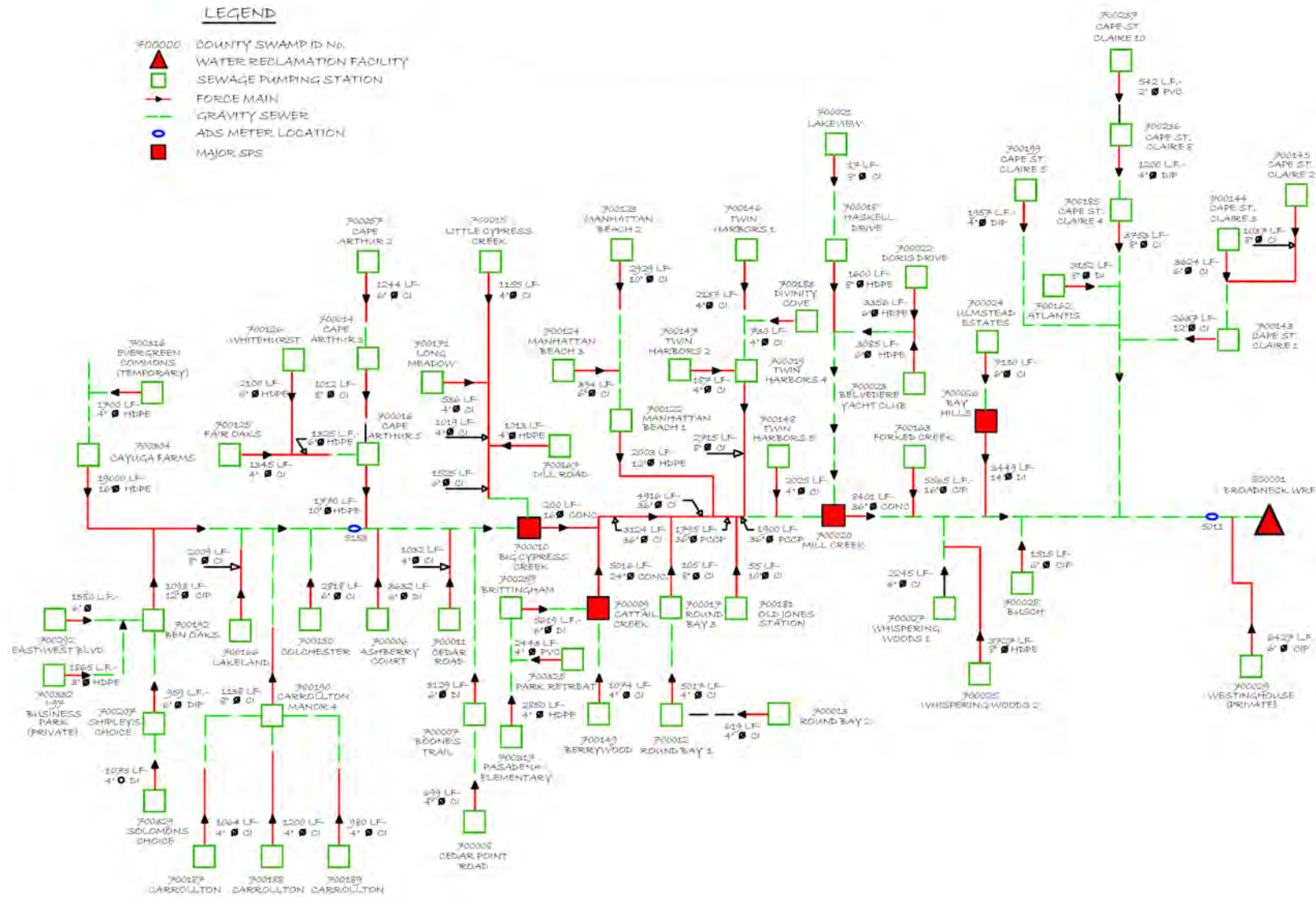
These pump stations are being upgraded by either development projects or through the County's CIP, or have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Brittingham (CSP, Development Project)
- b) Cape St. Claire II (CSP)
- c) Cape St. Claire III (CSP)
- d) Cape St. Claire IV (CSP)
- e) Cape St. Claire V (CSP)
- f) Cape St. Claire VIII (CSP)
- g) Cape St. Claire X (CIP S806216)
- h) Evergreen Commons (To be Abandoned)
- i) Fair Oaks (CSP)
- j) Mill Creek (CIP S7918181)
- k) Round Bay I, II, III (CSP)
- l) Shipley's Choice (CSP)
- m) Ulmstead Estates (CSP)
- n) Whispering Woods I, II (CSP)
- o) Whitehurst (CSP)

New pump station facilities designed and constructed as either development projects or through the County's CIP are anticipated at the Route 50 Crossing SPS (CIP X7388135).

A number of the capacity deficient gravity mains and force mains were also identified through the CSP. On-going investigations will determine specific capacity for infrastructure upgrades (pump stations\ piping) and timing of these improvements.

Figure 4-7 Broadneck SSA



4.7.6 Annapolis Sewer Service Area No. 6

4.7.6.1 *General Description*

The Annapolis sewer service area includes the City of Annapolis and the surrounding area. It is generally bounded by the Severn River, the Chesapeake Bay, South River and MD 50. The southern boundary extends beyond the South River to include the Woodland Beach, South River Colony, and Sylvan Shores drainage areas. The northwestern boundary extends north of Route 50 to include the Bacon Ridge Branch Watershed. The boundaries are shown on Master Plan Maps S-6 through S-9.

The service area encompasses 19,619 acres, of which 4,892 acres fall within the City of Annapolis. The Annapolis area is heavily oriented to water-related recreation and commercial ventures. Other than the City itself, other urbanized areas include the Parole Growth Management Area and the MD Route 2 corridor in Edgewater. There are approximately 617 acres of vacant land within the service area that could be served by public sewer in the future.

According to the County's current Land Use Plan, the majority of land in the County portion of the service area (excluding the City of Annapolis) is planned for low-density residential use. Densities are higher in the Heritage Harbor and Riva Trace communities and in the Woodland Beach community in Edgewater. Commercial and office uses are planned primarily in the Parole Town Center and along MD 2 in Edgewater. The Parole Town Center is an existing mixed-use activity center that includes retail and office uses, regional commercial services and a variety of types of residential uses.

The City of Annapolis is primarily developed. However, redevelopment of property and several annexations from the County have occurred in recent years. Future development will be primarily from infill of single-family homes and redevelopment of commercial properties. West Street (MD 450) has been targeted as a revitalization corridor.

There are five privately or independently owned and / or operated systems located within the Annapolis SSA. These systems are described in Section 4.3.1, listed in Table 4- 4 and depicted on Master Plan Maps S-7 and S-9.

4.7.6.2 *Projected Population Growth and Flows*

Population within the Annapolis sewer service area is projected to increase to 97,878 by the year 2050. The County portion of the population increase is 50,032 and the City portion is 47,846. Future County residential growth will primarily be concentrated in the Parole Town Center with lower density infill development occurring in other areas on the Annapolis Neck. County commercial and office uses will continue to be concentrated in the Parole Town Center and along MD 2 and Mayo Road in Edgewater. The Annapolis Town Center at Parole mixed use development is near completion and includes a hotel, multifamily condominium units, townhouses, retail and office uses.

For the City, the growth potential will be focused primarily on the redevelopment of various properties currently zoned for commercial use that will be targeted for mixed-use development in the future. With few exceptions, these properties are previously developed sites that could accommodate additional uses and density, and in so doing provide greater value to the City. The Future Land Use Map included in the City's Annapolis Ahead 2040 Comprehensive Plan, which is currently in draft form, identifies these properties as "Mixed-Use". The adopted forecast of new household growth for the City would result in adding roughly 1,500 households through 2045. This growth will generally be allocated to three groups:

- About 37 percent to completing the remaining development pipeline;
- About 19 percent to building out the remaining zoned capacity (e.g. vacant lots); and

- About 44 percent to mixed-use infill and redevelopment with a priority focus on delivering new affordable housing units.

In addition to this anticipated growth within the City's current land area, the City must also plan for redevelopment within a modest planned growth area beyond the City's current municipal boundary. This land-use based projection assumes a maximum build-out scenario and expansion of the City boundary by approximately 100 acres and, if annexed into the City, would likely include both residential and commercial uses.

Table 4-2 indicates that average daily sewage flows are projected to increase to 10.16 MGD by 2050. Table 4-20 presents the allowable and unused capacity in the Annapolis service area and Table 4-21 shows the City of Annapolis Flow Projections.

4.7.6.3 Water Reclamation Facility

Sewage from the service area is collected and conveyed to the Annapolis Water Reclamation Facility (WRF) located off Edgewood Road in the City of Annapolis. This facility utilizes an activated sludge process providing nitrification/denitrification. The WRF was expanded to 13.0 MGD (under Capital Project S792400). To meet the effluent TN "limit of technology" goal of 3.0 mg/L at the expanded capacity of 13.0 MGD, significant capital improvements were required. The Annapolis WRF ENR (Capital Project S802900) was recently completed in 2017.

The Wastewater Flow Projection Tool indicated that the 2050 average daily flow would be approximately 10.16 MGD. At the current rated capacity there is no immediate concern regarding additional capacity requirements in this SSA.

There is sufficient space on site to increase the total capacity of the facility to as much as 17.5 MGD if necessary in the future. By Agreement, the treatment facility is jointly owned by the City of Annapolis and Anne Arundel County. However, Anne Arundel County is responsible for operation and maintenance of the plant. An average daily flow of 8.72 MGD was recorded in the November 2021 Allocation Report. Of that, approximately 4.58 MGD was received from the City of Annapolis and 4.14 MGD from the County. Both jurisdictions have their own collections systems and incoming connections to the facility, which are metered. The effluent from the facility is discharged to the Severn River. The plant contains a 13 million gallon emergency storage basin on-site. An agreement has been executed to address capacity requirements for each jurisdiction. Under this agreement, the flow split at the Annapolis WRF is 6.3 MGD for Anne Arundel County and 6.7 MGD for the City of Annapolis at the 13.0 MGD total rated capacity.

Table 4-20 Sewer Allocation Report for Annapolis SSA, November 2021

				Current		Master Plan		
		Prior Period	Total	City of Annapolis	County	2020	2025	
Safe Capacity		13,000,000	13,000,000	6,700,000	6,300,000	13,000,000	13,000,000	
Flow		8,724,000	8,724,000	4,584,462	4,139,538	9,650,000	9,920,000	
Capacity Available For Allotment		4,276,000	4,276,000	2,115,538	2,160,462	3,350,000	3,080,000	
Allotment Category	Previous Allotment	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	32,500	32,500	0	32,500	0	32,500	32,500	0
2) Public Service	191,500	191,500	0	191,500	0	191,500	191,500	43,250
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	1,500	0	250	(250)	0	(250)a	10,250	0
5) Community Development	285,000	285,000	0	285,000	0	285,000	285,000	0
6) Minor Subdivision	21,500	21,500	4,750	16,750	0	16,750	21,500	0
7) Major Subdivision	397,750	397,750	75,250	322,500	30,250	292,250	397,750	6,500
8) Commercial Complex	232,200	232,200	91,200	141,000	19,500	121,500	232,200	351,250
9) Industrial Subdivision	56,500	56,500	0	56,500	0	56,500	56,500	0
10) Reserved Capacity	657,502	446,512	0	446,512	0	446,512	436,262	0
Mayo & Glebe Heights	288,000	497,000	11,275	485,725	6,525	479,200	497,000	13,050
Reserved Capacity, City	2,112,048	2,115,538	0	2,115,288	0	2,115,288	2,115,538	0
Totals (GPD)	4,276,000	4,276,000	182,725	4,093,025	56,275	4,036,750	4,276,000	414,050

Notes:

Mayo and Glebe Heights' flow and activity is reflected in the above totals.

Recommended allotment changes:

a. Transfer 250 GPD from Reserve Capacity to Buildable Lots Category to cover active projects.

Table 4-21 City of Annapolis Sewer Flow Projections

Year	Average Daily Flow (MGD)
2020	3.93
2025	4.15
2030	4.27
2035	4.40
2040	4.52
2045	4.64
2050	4.78

4.7.6.4 Pumping Station, Collection, and Conveyance System

The inventory of the City of Annapolis owned and operated pump stations is included in Table 4-22 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-8. The City owned and operated collection system within the SSA consists of a network of gravity collectors and force mains and includes 26 sewer pumping stations. The system serves approximately 98% of the City. Flows from the Naval Academy pass through the City collection system before reaching the Annapolis WRF.

A list of County pump stations is also included in Table 4-22 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-9. The inventory of this infrastructure within the SSA includes the following:

- a) 61 County-owned sewer pump stations
- b) 138.7 miles of gravity mains ranging from 4 to 96 inches in diameter
- c) 9.26 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 6 inches in diameter
- d) 40.91 miles of force mains ranging in size from 1.5 to 30 inches in diameter
- e) Approximately 13,700 connections

The integral backbone of the County's portion of the Annapolis service area conveyance system is a 30-inch diameter manifold force main that conveys sewage from the Parole sewer pump station to the Annapolis WRF. Manifold force mains add complexity to the system as head conditions are affected by the discharge rates of the other connected pump stations.

A large area designated as planned service lies along Forest Drive south of Bywater Road. Development in this area would require comprehensive planning to designate drainage areas that could be served by pump stations designed and constructed to discharge against the head conditions of Parole and Hunt Meadows pump stations.

Table 4-22 Annapolis Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Admiral Drive	City of Annapolis	Admiral Drive	S-7	N/A	N/A	0.500
Annapolis Roads Apts.	City of Annapolis	1111 Lake Heron Drive	S-7	N/A	N/A	0.040
Awald Road	City of Annapolis	986 Awald Road	S-9	N/A	N/A	0.090
Bay Front Drive	City of Annapolis	7025 Bay Front Drive	S-9	N/A	N/A	0.060
Baywoods	City of Annapolis	Private	S-9	N/A	N/A	0.050
Belmont	City of Annapolis	927 King James Landing Road	S-9	N/A	N/A	2.200
Boucher Avenue	City of Annapolis	1225 Boucher Avenue	S-9	N/A	N/A	0.100
Bristol Drive	City of Annapolis	31 Bristol Drive	S-7	N/A	N/A	0.140
Bywater Estates	City of Annapolis	701 Bywater Road	S-9	N/A	N/A	0.150
Fairfax Road (Parole)	City of Annapolis	2035 Forest Drive	S-7	N/A	N/A	0.150
Hanover Street	City of Annapolis	270 Hanover Street	S-7	N/A	N/A	0.040
Harness Creek	City of Annapolis	49 Harness Creek View Court	S-9	N/A	N/A	0.050
Hunt Meadows	City of Annapolis	3061 Harness Creek Road	S-9	S22A3	800020	0.220
Kingsport	City of Annapolis	700 Greenbriar Lane	S-9	N/A	N/A	0.075
Monterey (W. Annap.)	City of Annapolis	307 Monterey Avenue	S-7	N/A	N/A	0.050
Newtowne	City of Annapolis	Newtowne Drive	S-9	N/A	N/A	0.160
Porter Road	City of Annapolis	160 Porter Road	S-7	N/A	N/A	0.050
President Point #1	City of Annapolis	4 President Point Drive	S-7	N/A	N/A	0.040
President Point #2	City of Annapolis	11 President Point Drive	S-7	N/A	N/A	0.040
Second Street	City of Annapolis	713 Second Street	S-7	N/A	N/A	5.000
Shearwater Drive	City of Annapolis	5 Spa Creek Landing Road	S-7	N/A	N/A	0.010
Smith Avenue	City of Annapolis	300 Smith Avenue	S-7	N/A	N/A	0.600
Sumner Road	City of Annapolis	413 Schley Road	S-7	N/A	N/A	0.110
Truxtun Park	City of Annapolis	275 Pump House Road	S-9	N/A	N/A	0.250
Wardour	City of Annapolis	1 Alden Lane	S-7	N/A	N/A	0.040
Whiton Court	City of Annapolis	1808 Whiton Court	S-9	N/A	N/A	0.080
Anchorage I	County	22 Dale Dr	S-9	U23A2	700120	0.432
Anchorage II	County	1152 Mainsail Dr	S-9	U22B2	700121	0.1152
Annapolis Landing	County	3124 Stonehenge	S-9	O23A4	700176	0.5616
Annapolis Roads	County	1050 Old Bay Ridge Rd	S-9	U22B3	700215	0.31968
Arundel on the Bay I	County	1337 Magnolia Ave	S-9	V25A4	700132	0.756
Arundel on the Bay II	County	3500R Rockway Ave	S-9	V24C2	700131	0.1584
Arundel on the Bay III	County	3313 Shore Dr	S-9	V24D2	700130	0.2304
Arundel on the Bay IV	County	1319 Fishing Creek Rd	S-9	V24C4	700129	0.252

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Arundel on the Bay V	County	1260F Washington Dr	S-9	V24D3&4	700128	1.3536
Arundel on the Bay VI	County	3331 Thomas Point Rd	S-9	U24A1	700127	1.872
Bay Ridge I	County	36 Bay Dr	S-9	V23B1	700055	1.224
Bay Ridge II	County	226 W Lake Dr	S-9	V22C2	700053	0.1152
Bay Ridge IX	County	17 River Dr	S-9	W23D4	700165	0.22032
Bay Ridge V	County	69 Bay Dr	S-9	V23A2	700052	0.8352
Bay Ridge VI	County	2 Bay Dr	S-9	V23B3	700056	0.98208
Bay Ridge VII	County	148 E Lake Dr	S-9	V23A3	700054	0.18288
Bay Ridge VIII	County	42R E Lake Dr	S-9	V22B2	700164	0.527
Bay View	County	1850 Shore Dr	S-9	Q24A4	700092	1.656
Bentley Road	County	1018 Shore Dr	S-9	Q23B2	700046	0.2592
Berkshire	County	3095 Newington Dr	S-9	O22B2	700151	0.12096
Broad Creek	County	1F Harry S Truman Pkwy	S-7	P20A3	700226	0.144
Broad Reach	County	434 Lightship Landing Way	S-7	Q21A2	700331	0.1368
Cape St. John I	County	298 Cape St John Rd	S-9	P21B3	700136	1.0267
Cape St. John II	County	3001 Friends Rd	S-9	P22A4	700137	0.144
Cape St. John III	County	3033 Friends Rd	S-9	P22A3	700138	0.144
Cape St. John IV	County	2989F Poplar Trl	S-9	P22A4	700139	0.2304
Cape St. John V	County	2998A Dogwood Trl	S-9	P22A1	700140	0.144
Cape St. John VI	County	210 Cape Saint John Rd	S-9	Q22D4	700141	0.144
Cape St. John VII	County	123F Island View Rd	S-9	Q22D4	700142	0.144
Chesapeake Harbour I	County	2111 Chesapeake Harbour Dr E	S-9	U22A1	700200	0.34704
Chesapeake Harbour II	County	7008R Channel Village Ct	S-9	U21B2	700222	0.3744
Dreams Landing	County	550 Dreams Landing Way	S-7	S18B4	700312	0.1296
Edgewater Village	County	50 Central Ave W	S-9	P24D2	700308	0.2232
Generals Highway	County	2110F Generals Hwy	S-7	Q19B2	700086	1.8
Ginger Park	County	149 Bausum Rd	S-7	Q20C3	700305	0.06192
Heritage Harbor I	County	998 Mastline Dr	S-6	O20C4	700081	1.2744
Heritage Harbor II	County	516 Coover Rd	S-7	O20B1	700080	1.6128
Highland Beach I	County	3273 Washington Ave	S-9	V23D3	700209	0.2448
Highland Beach II	County	1455 Chesapeake Ave	S-9	V24D1	700210	0.203
Hillsmere I	County	509 Beach Dr	S-9	U23C4	700045	1.296
Hillsmere II	County	107 Green Spring Dr	S-9	T24A4	700157	0.144
Hillsmere III	County	133F East Bay View Dr	S-9	U24D4	700158	0.19152

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Hillsmere IV	County	126 Bay View Dr W	S-9	T24D2	700159	0.144
Hillsmere V	County	623F Demyan Dr	S-9	T24D1	700160	0.2304
Hillsmere VI	County	616 Harbor Dr	S-9	T24A4	700161	1.0152
Hillsmere VII	County	129 Kuethe Dr	S-9	U23C3	700083	0.2232
Holley Rd South	County	257 Riverside Rd	S-9	Q23D1	700091	0.08928
Hoot Owl	County	513 Hoot Owl Rd	S-9	O22B1	700082	0.6912
Jennifer Road	County	110 Jennifer Rd	S-7	R19B1	700258	4.032
Krapish	County	3030F Old Riva Rd	S-9	P22D3	700076	0.2736
Loretta Heights	County	36 Defense St	S-7	R20D4	700093	0.36
Monticello	County	1930 Lizzio Ln	S-7	R19D4	700309	0.144
Parole	County	2446 Solomons Island Rd	S-7	R20C4	700212	10.1
Riva II	County	171 Harry S Truman Pkwy	S-7	Q20D3	700089	1.296
Riva Woods	County	2741 Lury Ln	S-9	P21A2	700172	0.576
Riverview	County	3085R Riverview Rd	S-9	P22C4	700078	0.1008
South River Colony	County	3440 Monarch Dr	S-9	Q25D4	700294	0.12816
Sylvan Shores	County	201 Poplar Rd	S-9	O22A3	700233	1.584
Thomas Point I	County	1536 Gordon Cove Dr	S-9	U25A1	700133	0.396
Webster Place	County	532 Shore Dr	S-9	Q23B1	700077	1.3824
Woodland Beach	County	34 Mayo Rd	S-9	P23A2	700235	5.148
London Town Publik House	Private	837R Londontown Rd	S-9	R23D4	700272	Private
Rolling Knolls ES	Private	1985 Valley Rd	S-7	Q19B2	700338	Private

4.7.6.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

One Force Main Replacement is planned at the following pumping station:

- a) Arundel on the Bay III (CIP X7388289)

These pump stations are being upgraded by either development projects, through the County's CIP, or they have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future.

- a) Anchorage I (CIP S7918159)
- b) Annapolis Roads (CSP)
- c) Arundel on the Bay I, V (CIP S7918147)
- d) Bay Ridge I, II, V, VI, VII, VIII, IX (CIP S806208, S7918134)
- e) Berkshire (CIP S7918159)

- f) General's Highway (Sam's Club) (CSP)
- g) Heritage Harbor II (CSP, CIP S7918157)
- h) Parole (CIP S7918177)
- i) Hillsmere I (CIP S7918172)
- j) Riva II (CIP S7918159)
- k) Southdown Shores (CSP)

New pump station facilities designed and constructed as either development projects or through the County's CIP are anticipated in the following location:

- a) Edgewater Beach Sewer Extension (Potential Petition Project) (CIP S808501 S8056-01)

Work on this potential petition project includes the design, right of way acquisition and construction of a sanitary sewer collection system (pumping station, force main , gravity mains) serving the Edgewater Beach Community. This community has been identified as an On-site Wastewater Management Problem Area for a number of years. It consists of relatively small lots developed with single family homes served by private wells and septic systems, the majority of which are located in the Chesapeake Bay Critical Area. The density of individual septic systems is contributing to the degradation of local groundwater, and some private wells in the community have been found to have elevated nitrate levels.

The County has applied for Bay Restoration Grant and MDE low interest loans in 2020 to help finance the sewer extension.

A number of the capacity deficient gravity mains and force mains were also identified through the CSP. On-going investigations will determine specific capacity for infrastructure upgrades (pump stations\ piping) and timing of these improvements.

Figure 4-8 City of Annapolis SSA

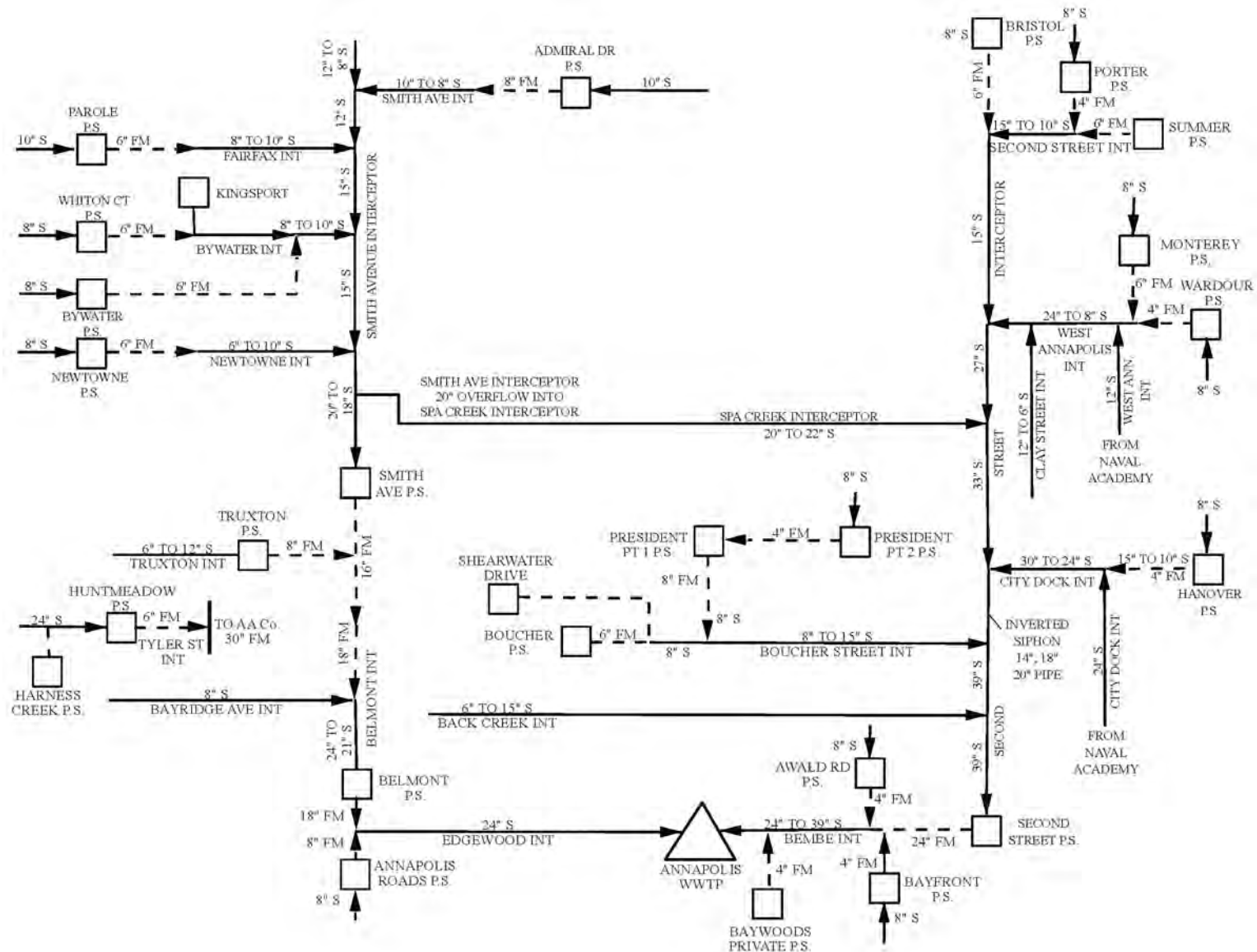
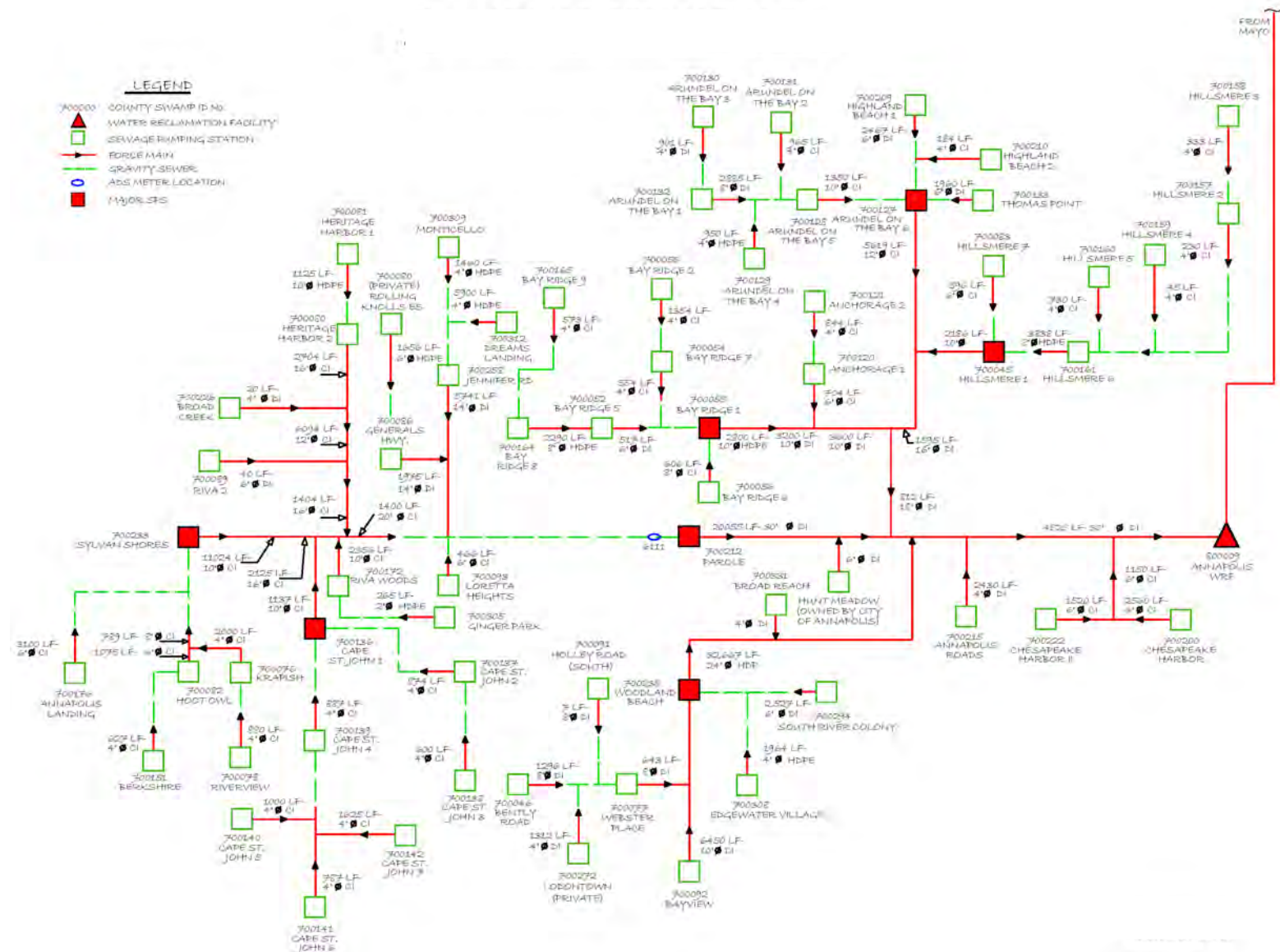


Figure 4-9 Annapolis SSA



4.7.7 Mayo Sewer Service Area No. 7

4.7.7.1 *General Description*

The Mayo sewer service area is located on the Mayo peninsula east of Glebe Bay and is bordered by the South and Rhode Rivers. The area encompasses approximately 3,847 acres of land and includes the Glebe Heights sub-service area. The boundaries are shown on Master Plan Maps S-9 and S-10.

The majority of this service area is low-density residential with a few small community commercial centers. There are also a number of marinas and marine-related activities as well. This SSA also contains one of the County's largest parks, the Beverly-Triton Beach Park. There are approximately 278 acres of vacant land within the service area that could be served by public sewer in the future.

There are no independently operated treatment facilities located within the Mayo SSA.

4.7.7.2 *Projected Population Growth and Flows*

Population in the sewer service area is projected to increase to approximately 9,986 by the year 2050. Future development in the Mayo service area will be on a few vacant residential sites planned for single-family homes, infill residential development within existing neighborhoods and redevelopment of commercial and marina properties.

The allowable and unused capacity for the Mayo Service Area is listed in Tables 4-23 and 4-24.

Table 4-23 Sewer Allocation Report for Mayo & Glebe Heights, November 2021

		Prior Period	Current					
Safe Capacity		1,140,000	1,140,000					
Flow		556,000	643,000					
Capacity Available For Allotment		584,000	497,000					
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	0	0	0	0	0	0	0	0
2) Public Service	0	0	0	0	0	0	0	0
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	10,000	10,000	900	9,100	0	9,100	10,000	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	675	675	675	0	0	0	675	0
7) Major Subdivision	32,350	32,350	9,250	23,100	3,150	19,950	32,350	13,050
8) Commercial Complex	10,000	10,000	1,350	8,650	3,375	5,275a	10,000	0
9) Industrial Subdivision	0	0	0	0	0	0	0	0
10) Reserved Capacity	530,975	443,975	0	443,975	0	443,975	443,975	0
Totals (GPD)	584,000	497,000	12,175	484,825	6,525	478,300	497,000	13,050

Notes:

a. This information is for monitoring Mayo activity only. This information is included in the Annapolis SSA report as well. No allotment changes recommended.

4.7.7.3 Water Reclamation Facilities

With the completion of multiple CIP Projects under S769700 (Mayo WRF Expansion), the building moratorium imposed in the Mayo sewer service area in August 2008 was lifted in November 2017. Septic tank effluent from the Mayo service area is now pumped to the Annapolis WRF for treatment and disposal at the existing Annapolis WRF outfall.

Wastewater treatment at the existing Mayo WRF has been discontinued and the Mayo WRF pumping station was converted into a regional pumping station capable of pumping the ultimate design peak flow of 3.58 MGD from the Mayo peninsula to the Annapolis WRF. A new force main was constructed under the South River to convey the septic tank effluent to the Annapolis WRF.

Much of the existing Mayo WRF, as well as the existing effluent force main and outfall to the Rhode River is being abandoned under CIP Project S769722. No changes to the step collection system are anticipated as a result of this upgrade.

Flow from the Glebe Heights Communal System (GHCS) is now conveyed to the Mayo Regional Pumping Station (and ultimately to the Annapolis WRF) through a new force main completed under CIP project

S769706 (Mayo Glebe Heights SPS and FM). The GHCS is also now in the process of being decommissioned under CIP Project S769722.

Although technically now part of the Annapolis sewer service area, the Mayo sewer service area will continue to be tracked separately in this document as required by MDE.

4.7.7.4 Pumping Station, Collection, and Conveyance Systems

Each property within the sub-drainage areas served by the Mayo Regional SPS has a septic tank. The effluent from these septic tanks is conveyed away from the individual properties through either a small diameter gravity sewer pipe or pumped from the property using a fractional horsepower effluent pump. The effluent is then collected in local community pump stations and pumped to the Mayo Regional SPS through a manifold force main.

A list of pump stations is provided in Table 4-24 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-10.

Table 4-24 Mayo Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Beverly Beach I	County	510 Cedar Ave	S-10	T27C4	700284	0.6624
Beverly Beach II	County	115 Grande View Ave	S-10	T27C30	700285	0.288
Beverly Beach III	County	1693 Cliff Dr	S-10	S27B2	700286	0.0835
Beverly Beach IV	County	326 Linden Ave	S-10	S27B1	700287	0.0792
Camp Letts	County	3800 Camp Letts Rd	S-9	R26D2	700315	0.0864
Carrs Ridge I	County	1168 Carrs Wharf Rd	S-10	S26B4	700274	0.2448
Carrs Ridge II	County	3901R Rhode Harbor Rd	S-10	S26C1	700275	0.05184
Carrs Ridge III	County	4189 Carrs Ridge Rd	S-10	S27A4	700277	0.0432
Carrs Ridge IV	County	3968 Germantown Rd	S-10	S26C3	700276	0.05184
Carrs Ridge V	County	4045 Cadle Creek Rd	S-10	S27D1	700278	0.05184
Glebe Heights I	County	3429 Glebe Dr	S-9	R24C1	700247	0.1584
Glebe Heights II	County	402 Beach Dr	S-9	R24D3	700248	0.047088
Glebe Heights III	County	418 Beach Dr	S-9	R24D3	700249	0.045648
Glebe Heights IV	County	3306 Leritz Ln	S-9	R24D4	700250	0.039168
Glebe Heights V	County	3306F Kenney Ct	S-9	R24D2	700251	0.0288
Holly Hill I	County	3824 Twin Oak Dr	S-9	S26D1	700257	0.2304
Holly Hill II	County	216 Holly Rd	S-9	R26A1	700256	0.036
Loch Haven I	County	3451 Shady Dr	S-9	S24C2	700280	0.288
Loch Haven II	County	3495 Cedar Dr	S-9	S24D2	700281	0.072
Mayo Regional	County	551 Pure Water Way	S-9	R25B1	700288	3.6
River Club Estates	County	3940 W Shore Dr	S-9	R26A1	700246	0.0288
Selby On The Bay I	County	3696 7th Ave	S-9	S25C2	700266	0.56736
Selby On The Bay II	County	865 Holly Ave	S-9	S25C1	700267	0.06624
Selby On The Bay III	County	3672 8th Ave	S-9	S25C4	700268	0.11232
Selby On The Bay IV	County	924 Holly Ave	S-9	S25B4	700269	0.1944
Shoreham Beach I	County	3906 Dogwood Trl	S-9	T26A3	700282	0.17136
Shoreham Beach II	County	4262 Carvel Ln	S-10	T27A1	700283	0.13392
Triton Beach	County	4221 Shoreham Beach Rd	S-10	S26B2	700260	0.396
Turkey Point I	County	900 Old Turkey Point Rd	S-9	S26A3	700263	0.1656
Turkey Point II	County	1147 Turkey Point Rd	S-9	T26D4	700264	0.1152
Turkey Point III	County	1267 Turkey Point Rd	S-9	T25B4	700265	0.04032
West Shore I	County	4101 Waterview Dr	S-10	T26C4	700261	0.06048
West Shore II	County	1281 Mayo Ridge Rd	S-10	S26B1	700262	0.05472

The inventory of this infrastructure within the SSA includes the following:

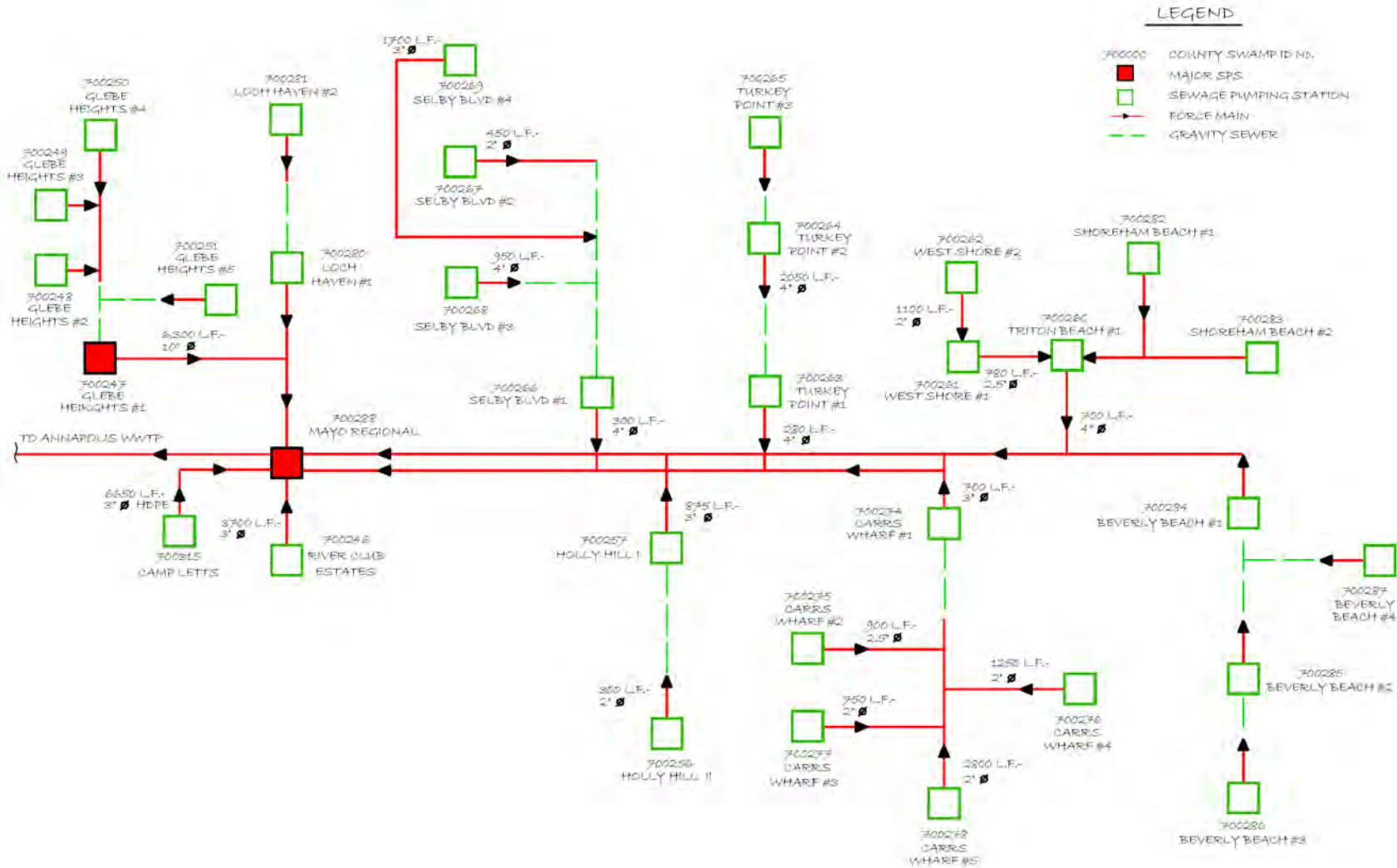
- a) 33 sewer pump stations
- b) 16.5 miles of gravity mains ranging from 4 to 10 inches in diameter
- c) 29.4 miles of pressure collectors (step pump systems) ranging from 1.5 to 6 inches in diameter
- d) 16.58 miles of force mains ranging in size from 2 to 16 inches in diameter
- e) Approximately 3,400 connections

4.7.7.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

These pump stations are being upgraded through the County's CIP, or have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Triton Beach Upgrade (CIP S799204)
- b) West Shore I and II (CIP S799205)
- c) Shoreham Beach SPS I & II (CIP S799209)
- d) Loch Haven I, II SPS Upgrades (CIP S7992-11)
- e) Carrs Ridge 1 SPS & FM (CIP S7992-12)
- f) Selby Service Area Piping (CIP S799211)
- g) Shoreham Beach I SPS & FM (CIP S799213)
- h) River Club Estates (CSP)

Figure 4-10 Mayo SSA



4.7.8 Broadwater Sewer Service Area No. 8

4.7.8.1 General Description

The Broadwater sewer service area lies on the Broadwater peninsula in the southeastern portion of the County and is generally bounded by the West River to the north and the Chesapeake Bay to the east. It includes the developed areas of Shady Side, Deale, and Churchton. The boundaries are shown on Master Plan Maps S-10 and S-11.

The Broadwater sewer service area covers approximately 6,476 acres. The County's Land Use Plan designates the majority of the land area for low and low-medium density residential use with small commercial hubs in Shady Side, Churchton, and Deale. The area also includes several marina uses and related commercial development along Rockhold and Tracy's Creeks. There are approximately 1,229 acres of vacant land in the service area that could be served by public sewer in the future.

There are no independently operated treatment facilities located within the Broadwater SSA.

4.7.8.2 Projected Population Growth and Flows

Population in the Broadwater area is projected to increase to approximately 12,818 residents by the year 2050. Future development will primarily be from building single-family homes on existing vacant residential lots and redevelopment of commercial and marina properties. The allowable and unused capacity for the Broadwater Service Area is listed in Table 4-25.

Table 4-25 Sewer Allocation Report for Broadwater SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		2,000,000	2,000,000	2,000,000	2,000,000			
Flow		1,243,000	1,243,000	1,470,000	1,500,000			
Capacity Available For Allotment		757,000	757,000	530,000	500,000			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	70,000	70,000	0	70,000	0	70,000	70,000	0
2) Public Service	100,000	100,000	0	100,000	0	100,000	100,000	0
3) Assisted Housing	15,000	15,000	0	15,000	0	15,000	15,000	0
4) Buildable Lots	421,000	421,000	750	420,250	0	420,250	421,000	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	18,000	18,000	6,000	12,000	0	12,000	18,000	0
7) Major Subdivision	75,500	75,500	7,000	68,500	2,500	66,000	75,500	250
8) Commercial Complex	27,000	27,000	4,750	22,250	0	22,250	27,000	0
9) Industrial Subdivision	2,250	2,250	1,750	500	0	500	2,250	0
10) Reserved Capacity	28,250	28,250	0	28,250	0	28,250	28,250	0
Totals (GPD)	757,000	757,000	20,250	736,750	2,500	734,250	757,000	250

4.7.8.3 Water Reclamation Facility

The Broadwater Water Reclamation Facility is located off Deep Cove Road and serves the Broadwater peninsula communities. It has a capacity of 2.0 MGD and serves households in Deale, Franklin Manor, Cape Anne, Avalon Shores, Idlewilde-Snug Harbor, Galesville and Chalk Point. The Broadwater facility is an activated sludge BNR secondary treatment plant with an average daily flow of 1.24 MGD. The Broadwater WRF ENR upgrade was completed in 2016 under Capital Project S803700.

Based on the results of the AACO Wastewater Flow Project Tool, 2050 average daily flows will be approximately 1.35 MGD. At the current rated capacity there is no immediate concern regarding additional capacity requirements in this SSA. The Broadwater facility is considered to be adequately sized to service development within the existing and planned service categories with the current land use and zoning.

4.7.8.4 Pumping Station, Collection and Conveyance Systems

A list of pump stations is provided in Table 4-26 and a schematic of the relationship between pump stations and the connecting infrastructure (pressure and gravity) is provided in Figure 4-11. The inventory of this infrastructure within the SSA includes the following:

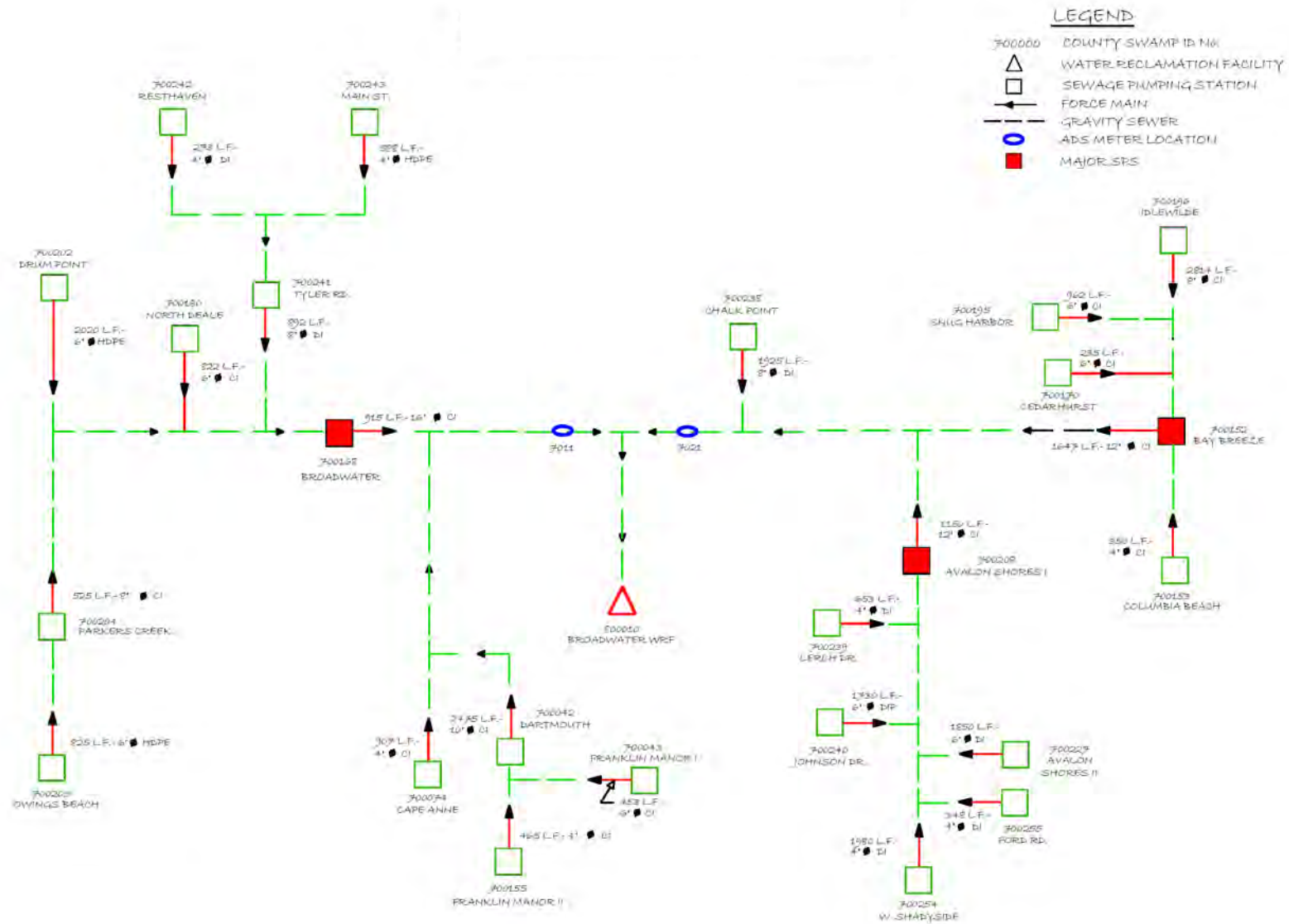
- a) 24 sewer pump stations
- b) 57.7 miles of gravity mains ranging from 8 to 48 inches in diameter
- c) 12.1 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 8 inches in diameter
- d) 5.2 miles of force mains ranging in size from 4 to 16 inches in diameter
- e) Approximately 4,700 connections

The major infrastructure components of the Broadwater collection and conveyance system are currently sized to handle the anticipated flows within the current planning period.

Table 4-26 Broadwater Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Avalon Shores I	County	6202 Shady Side Rd	S-10	S31A4	700208	2.16
Avalon Shores II	County	1517 Snug Harbor Rd	S-10	T30C4	700227	0.396
Bay Breeze	County	1575 Columbia Beach Rd	S-11	T31C2	700152	2.88
Broadwater	County	830 Broadwater Rd	S-11	R33C3	700168	6.48
Cape Anne	County	5636 Battee Dr	S-11	R33B1	700074	0.216
Cedarhurst	County	1187F Holly Ave	S-10	T31D1	700170	0.36
Chalk Point	County	5118 Chalk Point Rd	S-10	R31C4	700238	1.0296
Columbia Beach	County	1680 Columbia Beach Rd	S-11	T32D1	700153	0.288
Dartmouth	County	5614 Dartmouth St	S-11	S33D2	700042	1.152
Drum Point	County	6087 Drum Point Rd	S-11	Q35D3	700202	0.432
Ford Rd	County	1409 Ford Rd	S-10	S30A4	700255	0.17712
Franklin Manor I	County	1280 Ellicott Ave	S-11	S33A3	700043	0.648
Franklin Manor II	County	5626 Carvel St	S-11	S33C1	700155	0.0216
Idlewilde	County	4739 Idlewilde Rd	S-10	T29B3	700196	0.54
Johnson Drive	County	1223 Johnson Dr	S-10	S30C4	700240	0.3312
Lerch Drive	County	5100 Lerch Dr	S-10	S30C2	700239	0.1872
Main Street	County	936 Main St	S-11	R34C1	700243	0.1584
North Deale	County	5920 Deale Churchton Rd	S-11	Q34C1	700180	0.432
Owings Beach	County	6042 Melbourne Ave	S-11	Q35B4	700203	0.432
Parkers Creek	County	759 Mason Beach Rd	S-11	Q35A4	700204	0.936
Rest Haven	County	858 Cedar Dr	S-11	R34C2	700242	0.13104
Snug Harbor	County	1703 Cedar Ave	S-10	T30B3	700195	0.432
Tyler Rd	County	5929 Tyler Rd	S-11	Q34B4	700241	0.5616
West Shady Side	County	6530 W Shady Side Rd	S-10	S30D4	700254	0.1584

Figure 4-11 Broadwater Service Area



4.7.8.5 Required Infrastructure Improvements (also see Table 4-37 in Section 4.10)

Infrastructure CIP projects in the Broadwater SSA include two pump station upgrades. These pump stations are being upgraded through the County's CIP, or have been identified through the CSP as potentially requiring upgrades to meet sub-drainage flow requirements in the future:

- a) Lerch Drive (CSP)
- b) West Shady Side (CIP S806214)

Force Main Replacements are planned for at the following pumping stations:

- a) Bay Breeze SPS FM Replacement (CIP X7388296)
- b) Chalk Pt FM Replacement (CIP X7388282)

4.7.9 Piney Orchard Sewer Service Area No. 9**4.7.9.1 General Description**

The Piney Orchard sewer service area is located in the mid-western portion of the County and encompasses approximately 1,271 acres of land. It is bordered by the Patuxent Research Refuge to the west and the Odenton Town Center to the north. The service area consists of an approved Planned Unit Development (PUD) known as Piney Orchard. Construction of the development began in 1987, and consists of approximately 4,100 dwelling units. The land uses include medium density residential and mixed commercial uses. Approximately five acres of the service area are undeveloped. The remainder of the service area is primarily open space.

The wastewater collection system is owned, operated and maintained by the County Department of Public Works. The sewer collection system in the service area contains primarily gravity sewer mains. The area is depicted on the adopted Master Plan maps S-4 and S-6.

4.7.9.2 Projected Population and Growth Flows

Population within the service area is projected to increase to approximately 15,180 residents by the year 2050. Development will occur primarily in the Piney Orchard PUD, where planned housing and commercial uses will be built.

Table 4-27 Sewer Allocation Report for Piney Orchard SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		1,200,000	1,200,000	1,200,000	1,200,000			
Flow		674,000	572,000	674,000	674,000			
Capacity Available For Allotment		26,000	128,000	26,000	26,000			
Allotment Category	Allotment 6/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	0	0	0	0	0	0	0	0
2) Public Service	0	0	0	0	0	0	0	0
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	10,000	0	0	0	0	0	0	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	0	0	0	0	0	0	0	0
7) Major Subdivision	0	0	3,000	(3,000)	9,500	(12,500) ^a	32,500	250
8) Commercial Complex	2,250	2,250	2,250	0	0	0	2,250	0
9) Industrial Subdivision	0	0	0	0	0	0	0	0
10) Reserved Capacity	13,750	23,750	0	11,250	0	11,250	93,250	0
Totals (GPD)	26,000	26,000	5,250	8,250	9,500	(1,250)	128,000	250

Notes

Anne Arundel County purchased the Piney Orchard WRF in July of 2019, and it is now operating as a separate sewer district.

Recommended allotment changes:

a. Transfer 12,500 GPD from Reserved Capacity to Major Subdivision Category to cover active projects.

4.7.9.3 *Water Reclamation Facility*

Prior to July 1, 2019, the wastewater treatment facility was owned by the Piney Orchard Utility Company, LLC and operated by the Maryland Environmental Service (MES). Since July 1, 2019, the facility has been owned and operated by the Anne Arundel County Department of Public Works. The Piney Orchard WRF was built in 1989 with an original design capacity of 1.2 million gallons per day (MGD). The facility includes preliminary treatment, Carrousel reactors configured as a 5-stage Bardenpho process, secondary clarifiers, denitrification filters, and UV effluent disinfection.

The facility is currently permitted at a hydraulic design flow of 1.2 MGD, however, permit loading rate parameters are based on a 0.7 MGD plant rated operational flow. This is the result of a 2013 agreement between the Two Rivers Development Company and partners, the Piney Orchard Utility Company, and the County that traded 500,000 GPD of equivalent nutrient load capacity, minus a 5% nutrient load retirement, from the Piney Orchard Treatment Plant to Anne Arundel County. The existing average daily flow at the facility is approximately 0.57 MGD. The Piney Orchard WRF effluent is discharged into the Little Patuxent River.

4.7.9.3.1 *Strategic Plan for Infrastructure Expansion*

The Piney Orchard WRF is currently sized to service the existing and planned service categories of the service area with the current land use and zoning.

4.7.9.4 *Pumping Station Collection and Conveyance Systems*

The inventory of this infrastructure within the SSA includes the following:

- a) 29.9 miles of gravity mains ranging from 8 to 20 inches in diameter
- b) 0.25 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 2.5 inches in diameter
- c) Approximately 4,200 connections

The major infrastructure components are currently sized to handle the anticipated flows within the current planning period.

4.7.9.5 *Required Infrastructure Improvements*

The County is in the process of upgrading the Piney Orchard facility with several projects under CIP S807600. The planned upgrades will improve operability and health and safety conditions for personnel, while cost effectively adding infrastructure to sustainably meet secondary treatment levels and reliably and consistently achieve ENR permit limits. The design of the Enhanced Nutrient Removal, Safety and SCADA upgrades at the facility is planned under Project CIP S807601.

Table 4-28 Piney Orchard Sewer Service Area Inventory of Pumping Stations

Station Name	Owner	Address/Location	Master	Operating	A.A. County	Design
Piney Orchard (Rivers Edge)	County	Sandy Walk Way	S-4	G14C1	700324	

4.7.10 Bodkin Peninsula Sewer Service Area No. 10

4.7.10.1 General Service Area Description

The Bodkin Peninsula is located in the northeast section of Anne Arundel County on the peninsula extending northward from Downs Memorial Park between Bodkin Creek and the Chesapeake Bay. The service area is approximately 317 acres. Approximately eight acres are undeveloped. The service area boundary is shown on Map S-3.

There are no independently operated treatment facilities located within the Bodkin Peninsula SSA.

4.7.10.2 Projected Population and Growth Flows

Population within the service area is projected to increase to approximately 314 residents by the year 2050.

4.7.10.3 Wastewater Management System

The existing treatment facility was constructed privately; however, the County assumed responsibility for ownership and maintenance of the system in November 1986. The overall wastewater management system is based on communal on-site septic systems (leach field systems) to serve the Pinehurst Communities, of which there are currently 19 connections. The communal septic system, which serves the area, is divided into three sub-systems with separate disposal fields. The communal septic system was designed to serve only the existing development.

The County initiated CIP S802366 (Bodkin Point System Condition Assess) to evaluate the existing conditions at the three communal systems currently serving 19 homes in the Bodkin Point area. Areas to evaluate will include existing tanks, pumps, controls, and drainfields. Work will also include assessments of the following: (a) requirements to expand the facility handle the additional 8 homes not served along Pinehurst Harbor Way, (b) expansion of the facility to a small cluster system to treat flow from nearby Pinehurst Community.

4.7.11 Rose Haven / Holland Point Sewer Service Area No. 11

4.7.11.1 General Service Area Description

This service area is located in South County on the southeastern tip on the Chesapeake Bay at the Calvert County boundary line. Encompassing approximately 387 acres, Rose Haven and Holland Point were previously within the Rural Service Area. County takeover of the Rose Haven private system and provision of service to Holland Point was requested and approved as a result of petitions by the citizens of the two communities. The service area consists of a total of approximately 400 dwelling units and commercial developments including a marina, commercial strip center, restaurant and motel. Approximately 32 acres are undeveloped. The boundaries are shown on Master Plan Map S-12.

Construction of a capital project commenced in 1998 to construct low-pressure sewers, gravity and pumping facilities to serve both Rose Haven and Holland Point and was completed in 2001. A special \$6 million federal grant from the Environmental Protection Agency as well as local citizens' front foot assessment over the next 30 years provided the funding for the design and construction of the infrastructure. The project's scope included the expansion of the Chesapeake Beach Wastewater Treatment Plant located in Calvert County and the necessary collection and pumping infrastructure to transport the wastewater from the two communities to the Calvert County facility. Through an intra- jurisdictional agreement, executed between Anne Arundel County and the owners of the Chesapeake Beach Wastewater Treatment Plant, permission was obtained for transport and treatment up to 0.1375 MGD at the Calvert County facility.

Anne Arundel County currently has an existing average daily flow of approximately 0.10 MGD to this facility. There are no independently operated treatment facilities located within the Rose Haven SSA.

4.7.11.2 Projected Population and Growth Flows

Population in the sewer service area is projected to increase to approximately 820 people by the year 2050. Future development in the Rose Haven / Holland Point Service Area will be from building single family homes on existing vacant residential lots and redevelopment of commercial and marina properties.

The allowable and unused capacity for the Rose Haven / Holland Point Service Area is listed in Table 4-29.

Table 4-29 Sewer Allocation Report for Rose Haven SSA, November 2021

			Master Plan					
		Prior Period	Current	2020	2025			
Safe Capacity		137,500	137,500	137,500	137,500			
Flow		100,000	100,000	100,000	100,000			
Capacity Available For Allotment		37,500	37,500	37,500	37,500			
Allotment Category	Allotment 06/01/20	Prior Allotment Less Connections	Allocated 9/14/21	Available Capacity	Active Projects Under Review	Resulting Capacity	Recommended Allotment	Potential Projects
1) Public Health	0	0	0	0	0	0	0	0
2) Public Service	0	0	0	0	0	0	0	0
3) Assisted Housing	0	0	0	0	0	0	0	0
4) Buildable Lots	14,750	14,750	14,750	0	0	0	14,750	0
5) Community Development	0	0	0	0	0	0	0	0
6) Minor Subdivision	0	0	0	0	0	0	0	0
7) Major Subdivision	1,000	1,000	750	250	0	250	1,000	0
8) Commercial Complex	3,750	8,750	8,750	0	0	0	3,750	0
9) Industrial Subdivision	0	0	0	0	0	0	0	0
10) Reserved Capacity	18,000	13,000	0	13,000	0	13000a	18,000	0
Totals (GPD)	37,500	37,500	24,250	13,250	0	13,250	37,500	250

	Gallons	EDUs
Total Capacity (550 EDUs * 250 gpd)	137,500	550
Current Flow	100,000	
Connected - Rose Haven Residential		185
Connected - Rose Haven Commercial		25
Connected - Holland Pt. Residential		177
Connected - Holland Pt. Commercial		0
Allocated units for approved project	750	4
Reserved by Agreement-Rose Haven Utilities	8,750	35
Active projects	0	0
Pending permits	0	0
Building Permits Issued but not connected	0	0
Building Permits issued and connected		65
Allocated to remaining buildable lots	14,750	59
Available Capacity	13,250	0

4.7.11.3 Pumping Station Collection and Conveyance Systems

Pumping station information is provided in Table 4-30. The inventory of this infrastructure within the SSA includes the following:

- a) 1 sewer pump station
- b) 2.7 miles of 8 inch diameter gravity mains
- c) 3.8 miles of pressure collectors (grinder pump systems) ranging from 1.5 to 4 inches in diameter
- d) 2.5 miles of 8 inch diameter force main
- e) Approximately 430 connections

The major infrastructure components are currently sized to handle the anticipated flows within the current planning period.

Table 4-30 Rose Haven/Holland Point Sewer Service Area, Inventory of Pump Stations

Station Name	Owner	Address/Location	Master Plan Map	Operating Map 200/40	A.A. County Station ID Number	Design Capacity (MGD)
Rose Haven	County	7034 Sycamore Ave	S-12	R38/C2	700303	0.579

4.7.11.4 Required Infrastructure Improvements

No major projects are planned for this area.

4.7.12 Rural Service Area

The Rural Service Area encompasses nearly 129,503 acres and consists of the remaining County land outside of the aforementioned designated sewer service areas. This includes land west of the Broadwater SSA to the County boundary and south of Crofton to the Calvert County boundary line. In addition, the area north of Annapolis along the southern shore of the Severn River north of Route 50; the area between Gibson Island, Rock Creek, and the Magothy River; and the area south of Fort Meade between the Little Patuxent and Patuxent Rivers are also designated as part of the Rural Service Area. Approximately 11,963 acres of the service area are vacant.

The Rural Service Area lies outside of the County's planned growth areas. Population is projected to increase to approximately 67,101 residents by 2050. Properties in the Rural Area are generally planned for very low-density development and are typically served by individual septic and well systems or private community systems. There are no plans to extend public utilities into the Rural Service Area in the foreseeable future. See Section 4.5.4 for further information regarding onsite disposal systems serving the rural and other SSA's.

There are 26 independently operated wastewater treatment facilities within the Rural Service Area. These systems are described in Section 4.3.1, listed in Table 4-4 and depicted on the adopted Master Plan Maps S-2 thru S-12.

4.7.13 Summary of Sewer Service Areas

Future development potential utilizing public sewer within the sewer service areas is limited by the hydraulic capacity of the water reclamation facilities and regulatory nutrient caps. Based on the results of the AACO Flow Projection Tool (see Table 4-2), the hydraulic capacity of the Baltimore City SSA (determined by agreement with Baltimore City) will be reached or exceeded by 2045. Additionally, all of the service areas except for the Baltimore City SSA, Annapolis SSA and the Broadwater SSA could exceed the established nutrient cap limitations. Table 4-31 shows the design capacity of the treatment plants, projected build-out flows based on current zoning and maximum capacity based on the nutrient caps. Future land use plans should take into consideration these limitations to sewer capacity. The existing public sewer system is sized and was constructed based on current GDP planned land use and zoning. Upgrades to pipes and facilities will be required to accommodate new development that occurs at increased densities in certain areas.

Table 4-31 Future Development Limitations

Sewer Service Area	Current WRF Capacity (MGD)	Build-out Flows (MGD)	Maximum Capacity Based on Nutrient Cap (MGD)
Baltimore City	6.39	10	N/A
Cox Creek	15	22.57	20
Maryland City	3.33	3.70	3.33
Patuxent	10.5	13.81	10.5
Broadneck	8	10.69	8
Annapolis WRF Total	13	15.01	17.33
Broadwater	2	2.58	2.67
Piney Orchard	0.7	0.75	0.93

4.8 Sludge Management

The Department of Public Works, through the Bureau of Utility Operations, is responsible for the treatment of domestic sewage received at its Water Reclamation Facilities. The treatment generates Bio-Solids (sewage sludge), which is further treated and reused by a private contractor as described in Appendix C. The Bureau of Utility Operations is also responsible for the management of the County's Septage Management Program. The program governs the disposal of domestic septage that is discharged into the County's system, by private entities at one of the County's three septage-receiving points (See Appendix E). The County is currently evaluating its Bio-Solids management program in response to recent regulations imposed by the Department of Agriculture regarding Fall/Winter land application.

4.9 On-Site Wastewater Management Problem Areas

The Anne Arundel County Health Department has identified 33 on-site wastewater management areas within Anne Arundel County that show indication of operational problems. These areas have problems such as high water table, small lot size, impermeable soil or excessive slope. The Department of Health will monitor these areas and if petitions are submitted for service within the areas, action will be taken accordingly. Figure 4-12 shows the location of the problem areas in the County. Table 4-32 is a list of wastewater management problem areas.

Figure 4-12 On-Site Waste Management Problem Areas

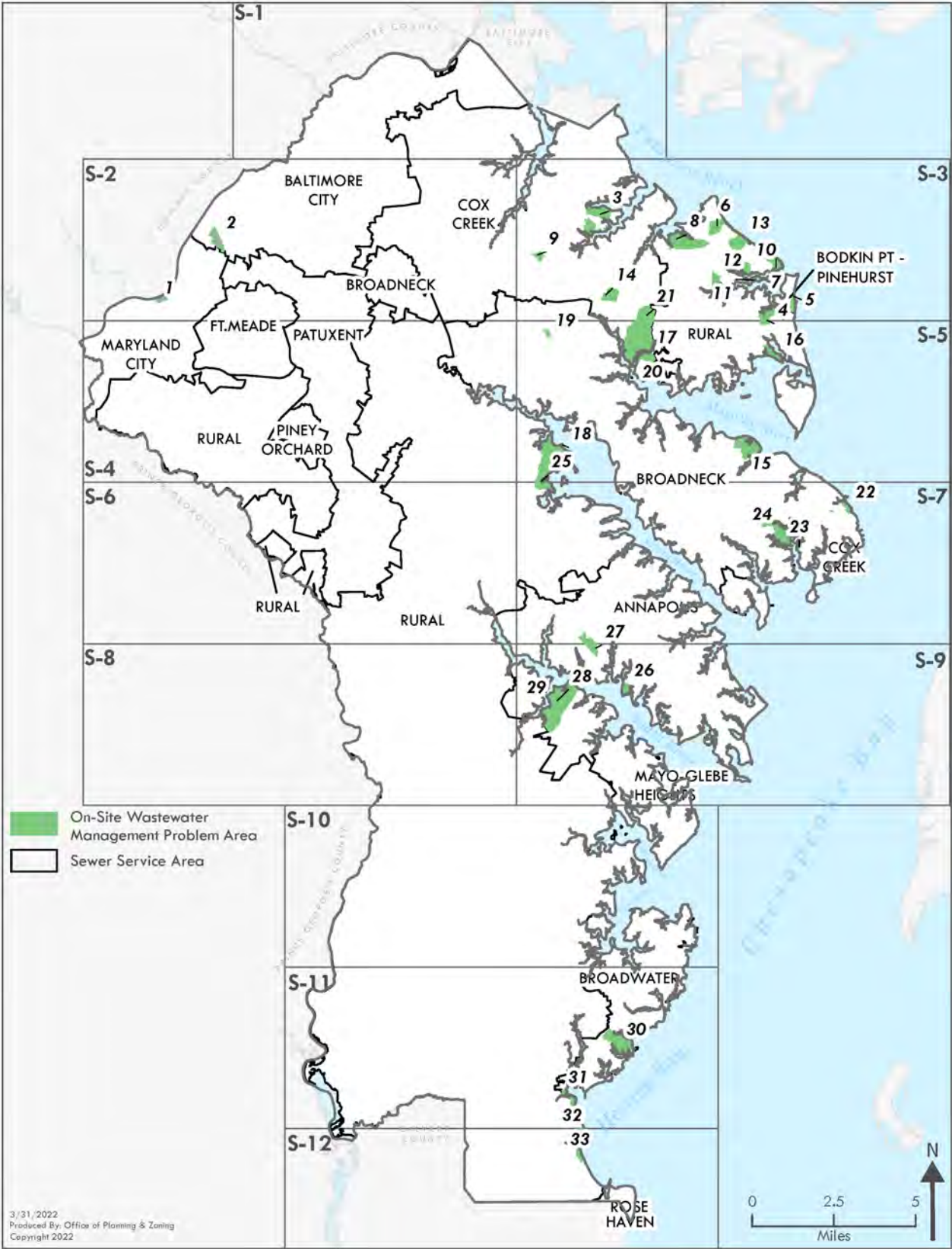


Table 4-32 On-Site Wastewater Management Problem Areas

Location	Master Plan Map / Grid Number	Problem Description				
		High Water Table	Impermeable Soils	Small Lot Size	Steep Slopes	Well Setbacks
1. Brockbridge Road	S-2 / C10	X	X	X		X
2. Champion Forest	S-2 / E8			X	X	
3. Communities off Nabbs Creek Road	S-3 / Q7	X	X	X	X	X
4. Green Gables	S-3 / W10	X		X	X	X
5. Pinehurst	S-3 / W10	X	X	X	X	X
6. Venice on the Bay (Lower End)	S-3 / U7	X	X	X		X
7. Bayside Beach	S-3 / W8	X	X	X	X	X
8. Rock Creek Park	S-3 / T8	X	X	X	X	X
9. Freetown	S-3 / O8	X				
10. Bahama Beach	S-3 / V9	X		X		X
11. Poplar Ridge	S-3 / V9	X		X		X
12. Belhaven Beach	S-3 U9	X		X	X	X
13. Kurtz Beach	S-3 / V8	X		X		X
14. Clearview Village	S-3 / R9	X	X	X		
15. Shore Acres Around Lake Placid	S-5 / V14	X	X			X
16. Long Point on Magothy (Lower End)	S-5 / W11	X		X		X
17. Laurel Acres	S-5 / S12	X	X	X		X
18. Herald Harbor (Lower Area)	S-5 / P15		X	X		
19. Huntshire, Pasadena	S-5 / P11	X		X		
20. Maple Road	S-5 / S12	X				
21. Chelsea Beach	S-3, S-5 / S10, S11	X		X		X
22. Log Inn Estates	S-7 / Y16	X	X			X
23. Whitehall Manor	S-7 / X18	X				
24. Amberly	S-7 / W17	X	X	X		
25. Palisades on Severn	S-5 / P15	X		X	X	X
26. Wild Rose Shores	S-9 / R22		X	X	X	X
27. Gingerville Manor	S-7, S-9 / Q21		X	X		X
28. Edgewater Beach	S-9 / P22	X	X	X	X	X
29. Southdown Shores	S-9 / P23		X	X		X
30. Broadwater Point Road	S-11 / R34	X	X	X		X
31. Highview on the Bay	S-11 / P35		X	X		X
32. Arkhaven	S-11 / P36	X	X	X		X
33. Fairhaven	S-12 / Q37		X	X	X	X

4.10 Financial

4.10.1 General

The Sanitary District of the County encompasses the whole County except for that portion that lies within the corporate limits of the City of Annapolis. The Anne Arundel County Charter assigns the responsibility for the construction and operation of the wastewater facilities in Anne Arundel County to the Department of Public Works. The Charter requires that all wastewater facilities operated by the County be completely self-sustaining. Furthermore, the Anne Arundel County Code, Article 4, Title 10, limits the outstanding debt of the County for water and wastewater facilities to 5.6 percent of the County's assessable basis of real property, 14 percent of the County's assessable basis of personal property and 14 percent of the operating real property described in § 8-109 of the Tax-Property Article of the State Code, computed as of the first day of the then current fiscal year.

4.10.2 Charges and Assessments

In accordance with the requirements set forth in the Charter, Anne Arundel County has established charges and assessments for connections to the system that are used to pay all operating costs and debt service for the sewer utilities. Four principal charges have been established as described below. Table 4-33 lists the rates for the sewer charges.

A. Connection Charges

- i. **Tap Connection Permit Fee** - The Tap Connection Permit allows property owners to hire an Anne Arundel County licensed and bonded utility contractor of their choosing to tap the County's sewer main and install a sewer connection for the property owner.
- ii. **Capital Facility Connection Charge** - This charge recovers the cost of constructing the sewage treatment plants, the pumping stations and the conveyance facilities other than the lateral lines. The charge is collected at the time of building permit or connection permit issuance. New homes must pay in full while existing homes have the option to pay using an installment plan over 30 years, or 40 years if in a Septic to Sewer Conversion Area.
- iii. **Inspection Fee** - These charges cover the cost of inspecting the tap installation and service connection and is paid when the building permit, tap connection permit or connection permit application are submitted to the County.
- iv. **Permit Application Fee** - This charge covers the cost of processing the tap connection permit or connection permit.

B. Utility Assessment

This assessment allows the County to recover costs incurred to construct/extend the sewer mains and is paid annually from the inception of service for a period of 30 years, or 40 years for residential property located in the Septic to Sewer Conversion eligible area. Properties in the eligible area may also defer up to half of the assessment for 40 years or until a deed transfer, whichever occurs first.

C. User Charge

This bimonthly or quarterly charge recovers the cost of operating and maintaining the sewage treatment plants and other major infrastructure.

D. Environmental Fee

This charge covers the cost for upgrading and rehabilitating wastewater capital facilities and is paid quarterly with the user charge.

Table 4-33 Residential Sewer Charges

Type	Fee (Effective July 1, 2021)
Tap Connection Permit Application Fee	\$25.00
Tap Connection Permit Issuance Fee	\$234.00
Capital Facilities Connection Charge	\$ 9,351.00
Connection Permit Application Fee	\$25.00
Connection Permit Inspection Fee	\$30.00
Quarterly Usage Charges (1-01-12) 1-1-21	\$4.97 per 1,000 gallons
Environmental Protection Fee	32.5% of the water and wastewater charge
Sewer Only - based on 14,000 gallons*	\$69.58

*Five-year average for residential water usage that is used as the basis for sewer consumption for sewer only accounts, unless the resident requests to have their well water metered.

Tables 4-34 and 4-35 provide financial management statistics for the Anne Arundel County Sewer System. Table 4-34 furnishes the status of the Debt Service Fund and Table 4-35 provides financial information for the Operating Debt Fund. The City of Annapolis sewer fund fiscal information follows in Table 4-36.

Table 4-34 Debt Service Fund – Sewer

Revenues	Fiscal Year 2019	Fiscal Year 2020
Investments	\$6,114,738	\$4,116,650
Front Foot Assessment fees	\$2,451,686	\$1,904,917
Capital Facility Connection fees (includes Mayo)	\$17,390,267	\$16,765,627
EPF fees	\$11,256,303	\$12,945,851
Miscellaneous	\$2,414,105	\$2,731,396
Total Revenues	\$39,627,099	\$38,464,441
Expenses	Fiscal Year 2019	Fiscal Year 2020
Principal	\$20,737,178	\$22,400,775
Interest	\$18,645,309	\$20,262,216
Pro rata	265,000	265,000
Miscellaneous	\$367,579	\$596,240
Total Expenses	\$40,015,065	\$43,524,231
Revenue over (under) expenses	(\$387,966)	(\$5,059,790)

Table 4-35 Sewer Operating Fund, Financial Management Statistics

	Fiscal Year 2019	Fiscal Year 2020
Sewer Charge Revenue	\$47,937,964	\$51,466,881
Other Revenue – Sewer (See schedule D below)	\$13,999,166	\$11,625,077
Total Revenue	\$61,937,130	\$63,091,958
Sewer Operations & Maintenance Expense	\$70,021,025	\$72,762,400
Fees paid to Other Jurisdictions - Sewer	\$2,976,820	\$3,143,272
Total O&M	\$72,997,845	\$75,905,672
Operating income or (loss)	(-\$11,060,715)	(-\$12,813,714)

Schedule D – Detail of Other Revenue on Table 4-34

Revenue	Fiscal Year 2019	Fiscal Year 2020
Penalty Charges	\$1,840,146	\$1,385,679
Pretreatment	\$263,200	\$266,227
Haulers	\$2,300	\$3,000
Pro rata	\$117,400	\$111,500
Reimbursement for Lake Shore	\$43,317	\$32,757
Reimbursement -Damages	\$0	\$0
Leachate	\$89,446	\$60,841
Developer Services Fees (Inspections)	\$112,000	\$107,839
Reimbursement – City of Annapolis WWTP	\$2,733,339	\$1,997,782
Allocation Usage Charges - Wastewater	\$2,539,804	\$2,273,260
Reimbursement – Capital projects (sewer)	\$2,798,663	\$2,388,524
Miscellaneous Recoveries	\$3,459,551	\$2,997,668
Total	\$13,999,166	\$11,625,077

Table 4-36 City of Annapolis Financial Management Statistics – Sewer

Category	Fiscal Year 2019	Fiscal Year 2020
Sewer Charges	\$7,721,033	\$7,649,590
Capital Facility Charges	\$105,902	\$190,167
Other	\$422,956	\$448,923
TOTAL REVENUE	\$8,249,891	\$8,288,680
Personnel	\$975,888	\$890,161
Operating	\$785,194	\$552,502
AA County Contract	\$3,796,115	\$4,026,385
Debt Service	\$604,167	\$529,628
Depreciation	\$733,281	\$720,195
Administrative/Transfers	\$1,259,608	\$636,808
TOTAL EXPENSES	\$8,154,253	\$7,355,679
TOTAL FLOW-CITY (MG)	1663.9 (50.42%)	1436.80 (50.15%)
TOTAL FLOW-COUNTY (MG)	1635.96 (49.58%)	1428.06 (49.85%)

4.10.3 Capital Improvement Program

Anne Arundel County utilizes a six-year Capital Improvement Program for planning the necessary expansions to the water and wastewater system. All plans for major water and sewer projects financed by Anne Arundel County must be reviewed and approved by the Office of Planning and Zoning, the Planning Advisory Board, the County Council, and finally approved by the County Executive. Table 4-37 lists the current wastewater capital improvement projects within Anne Arundel County. The City of Annapolis also uses a six-year Capital Improvement Program. Table 4-38 lists the current capital wastewater projects within the City of Annapolis.

Table 4-37 Wastewater Capital Improvement Projects, Anne Arundel County

Contract Title	Contract Number	Description
Mayo WRF Expansion	S769702	This contract consists of the design of a force main from the existing Mayo WRF Pump Station to the Annapolis WRF.
Mayo ENR FM - Loch Haven	S769717	This contract is for the design and construction of the Mayo-Annapolis force main along Loch Haven Road from Mayo WRF to the South River.
Glebe Heights WRF ABN	S769722	This contract is for the decommissioning of Glebe Heights WRF.
Mayo ENR FM-Decommissioning	S769722	This contract is for the decommissioning of treatment at the Mayo WRF.
Waterview SPS Retrofit	S7918132	This project upgrades to the pump station including new pumps, a new odor control system and ventilation and safety equipment. Reliability is also being added through the addition of a new stand-by generator, an emergency by-pass vault and comminutor improvements.
Park West SPS Retrofit	S7918133	This project is upgrading the pump station by improving the pump-around system, replacing the sewage pumps, valves, and pump controls. The pump station will also receive new facility lighting, a new water service and an update to the access ladders. Pump Station reliability will be improved by the addition of a backup generator.
Annapolis SSA Check Valve Vaults 1	S7918134	This project is to upgrade the sewer pump stations within the Bay Ridge community. The stations involved include Bay Ridge 2,5,6,7,8 &9.
Arundel on the Bay I Upgrades	S7918147	Upgrade of Arundel on Bay I Sewage Pump Stations to comply with County Standards and NFP 820 Requirements: Upgrades includes: Pump, piping, fitting replacements; ventilation upgrades, electrical and control upgrades, emergency bypass connection addition/modifications; coating of wetwell and station screenings.
Arundel on the Bay V Upgrades	S7918147	Upgrade of Arundel on Bay V Sewage Pump Stations to comply with County Standards and NFP 820 Requirements: Upgrades includes: Pump, piping, fitting replacements; ventilation upgrades, electrical and control upgrades, emergency bypass connection addition/modifications; coating of wetwell and station screenings.
Pigeon House SPS Retrofit	S7918153	Upgrade of Pigeon House Sewage Pump Station to comply with County Standards and NFP 820 Requirements: Upgrades includes: Pump, piping, fitting replacements; ventilation upgrades, electrical and control upgrades, emergency bypass connection addition; coating of wetwell and station screenings.
Clark Heights SPS Retrofit	S7918155	Upgrade of Clark Heights sewage pumping station to meet current control and operational standards. Scope includes control panel modifications, new guiderails, new bypass vault, and replacement of pumps at Clark Heights sewage pumping station.
Storch Property SPS Retrofit	S7918155	Upgrade of Storch Property sewage pumping station to meet current control and operational standards. Scope includes replacement of suction valves, dual bubbler system, grinder installation, and raising the flood protection wall.
Heritage Harbor 2 SPS	S7918157	This project consists of design and construction to replace the dry well, install a grinder sized for the pump station design flow, install a cathodic protection system, upgrade the pump station controls, upgrade the existing valves, and modify the valve vault piping configuration.
Anchorage I	S7918159	This contract is for upgrade of Anchorage 1 sewage pumping stations to meet current control and operational standards.
Berkshire	S7918159	This contract is for upgrade of Berkshire sewage pumping stations to meet current control and operational standards.
Riva II SPS Upgrades	S7918159	This contract is for upgrade of Riva II sewage pumping stations to meet current control and operational standards.

Contract Title	Contract Number	Description
Bar Harbor I & II SPS Upgrades	S7918160	This contract is for upgrades to the Bar Harbor 1 & 2 SPS sites. Upgrades include new valves, fall protection, and control panel modifications.
Cox Creek Control Panel Mods	S7918162	This is a progressive award contract with Control panel modification and upgrade design at 7 SPSs in the Cox Creek SSA.
Country Club Estates	S7918163	This project consists of design and construction of upgrades to the 1.15 MGD Country Club Estates SPS including new comminutor, valves, surge protection, controls, control panel modifications, modifications to bring the station into code compliance, installation of an emergency generator, pump replacement, roof replacement, and station painting.
Stonehaven SPS Upgrades	S7918165	This project is for upgrades to the electrical and control systems to meet current codes and County standards including upgrades to the bypass piping, upsizing of the pumps, and compliance with State requirements for emergency storage.
Marley Avenue SPS Upgrade	S7918166	Upgrade of Marley Ave SPS to include upgrade the two existing submersible pumps, new underground emergency storage tank, new emergency generator, new control panel(s), new wet well and valve vault, supply fans, new chain link slide gate.
Cox Creek Control Panels 1	S7918170	Upgrade of Patapsco and Patapsco Park sewage pumping stations to meet current control and operational standards.
Bay Drive Control Panels	S7918171	Control system upgrades to Bay Drive SPS.
Bell Avenue SPS Control Panels	S7918171	Control system upgrades to Bell Avenue SPS.
Cox Creek Control Panels 2	S7918171	Upgrade of Mt. Pleasant Beach, Arundel Rd. and Bay Dr. sewage pumping stations to meet current control and operational standards.
Hillsmere I SPS Upgrade	S7918172	This project is for the design and construction of upgrades to the Hillsmere 1 Sewage Pump Station to meet current control and operational standards. Specific upgrades include upsize pumps, replace valves, install FM bypass and vault, dual bubbler float control, upgrade controls etc.
Shoreland Drive SPS Structural Evaluation	S7918174	This contract is for Service upgrades to Shoreland Dr SPS (repair masonry cracks and replace the roof).
Marley SPS Grating Improvements	S7918175	This contract is for replacement of upper and lower grating, installation of access hatches and guardrail at the Marley SPS.
Parole SPS Pump Retrieval Mod	S7918177	This contract includes design and construction of modifications to the pump retrieval system at the Parole SPS.
Ridgeway SPS Improvements	S7918178	Upgrade of the Ridgeway sewage pumping station. Scope includes improve safety and accessibility to the equipment access for maintenance activities, alleviate flooding in the valve vaults.
Severn Run SPS Upgrade	S7918179	This project will upgrade the sewer pump station including the replacement of pumps and valves along with upgrade controls including the addition of VFDs and flow meters.
Linthicum/Shipleigh SPS Upgrade 2	S7918180	This contract includes design, construction, and construction management for the upgrade of the Linthicum Shipleigh SPS to a capacity of 3.0 MGD, including new pump, electrical work, and wet well and dry wells compatible with an eventual expansion to 4.9 MGD.
Mill Creek SPS Improvements	S7918181	Upgrade of the Mill Creek sewage pumping station to meet current control and operational standards. Scope includes pumps replacement and associated electrical and mechanical upgrades, valves, grinder, odor control, etc.
Broadneck WRF Digester Demo	S792706	This project is to demolish and remove the existing abandoned digester and associated equipment at the Broadneck WRF.

Contract Title	Contract Number	Description
Quarterfield Elementary SPS Demo	S792707	This contract includes decommissioning and demolition of the abandoned Quarterfield Elementary SPS.
Patuxent Filter Bldg Decommission	S792708	This contract includes the demolition the abandoned filters at Patuxent WRF. Work is being done in conjunction with S802367 (Patuxent WRF Chlorine Room Renov.).
Annapolis WRF Trck Scale Demo	S792709	This contract will include design, construction, and inspection for the removal of the existing truck scale at the Annapolis WRF and related restoration work.
Evergreen Commons SPS	S792710	Work on this contract will include the decommissioning and demolition of the Evergreen Commons SPS.
Furnace Branch Gravity Sewer Replacement	S797801	This contract includes design, construction, and inspection for the replacement of approximately 590 LF of gravity sewer across Furnace Branch Creek along Gov. Ritchie Hwy in Glen Burnie.
Triton Beach SPS Upgrade	S799204	This contract includes design, inspection, and construction of upgrades to the Triton Beach Sewage Pumping Station.
West Shore I & II	S799205	This contract includes study, design and construction of upgrades to West Shore Sewer Pump Stations 1 & 2.
Shoreham Beach I & II	S799209	This contract includes the design, construction and inspection of upgrades at Shoreham Beach II SPS.
Selby Service Area Piping	S799211	This contract includes design, construction & inspection of 4,110 LF of piping upgrades in the Selby Subservice area of the Mayo Service Area.
Shoreham Beach I SPS & FM	S799213	Work on this contract includes an analysis of problems associated with the Shoreham Beach I SPS force main and recommendation for improvements.
Dewatering Facilities - Design	S800601	This contract is for planning & design of dewatering improvements at MD City WRF, Broadneck WRF, Annapolis WRF and Patuxent WRF. Construction under contracts S800603 (Broadneck), S800604 (Annapolis), S800605 (Maryland City) & S800606 (Patuxent).
Broadwater WRF Dewatering	S800603	Construct dewatering facilities at the Broadneck WRF, including a new Dewatering Building with truck loading, a new lime storage silo, and two new 2-meter belt filter presses (BFP). Other improvements include BFP feed / thickened sludge pumping and piping, filtrate pumping, chemical systems, odor control, and gravity thickening drainage improvements.
Annapolis WRF Dewatering	S800604	Construct dewatering facilities at the Annapolis WRF.
Maryland City WRF Dewatering	S800605	Construct dewatering facilities at the Maryland City WRF including new NPW upgrades.
Patuxent WRF Dewatering	S800606	Construction of dewatering facility at Patuxent WRF.
BFP Procurements	S800607	This contract is to procure 8 Belt Filter Presses (BFPs) for Annapolis WRF (3 BFPs), Broadneck WRF (2 BFPs) and Patuxent WRF (3 BFPs).
Broadneck WRF Hydraulic Study	S802352	This project will evaluate the hydraulic restrictions at the Broadneck WRF in order to develop recommended improvements.
Broadwater WRF Blower Bldg Rehab	S802355	This contract will perform a study of alternatives for the rehabilitation and upgrade of the existing blower building. Work will include replacement of ex. MCC, blowers, and primary sludge pumps, as well as NFPA compliance.
Broadwater WRF Wet Well Coating	S802356	This contract includes the design, construction and inspection services for the cleaning and rehabilitation of the Broadwater WRF wet well.
Broadwater WRF PCS Upgrade	S802363	This contract is for upgrade the existing Broadwater WRF process control system (PCS) which is at the end of its useful life.

Contract Title	Contract Number	Description
Broadwater WRF Polymer Repl	S802365	This contract will replace the polymer system and provide programming services to integrate the new system into the operation of the rotary press. Controls should include a "HAND" option of the rotary press controls.
Bodkin Point System Condition Assess	S802366	Work under this contract will include an evaluation of the existing conditions at the three communal systems serving 19 homes in the Bodkin Point area. Areas to evaluate will include existing tanks, pumps, controls, and drain fields. Work will also include assessments of the following: (a) requirements to expand the facility handle the additional 8 homes not served along Pinehurst Harbor Way, (b) expansion of the facility to a small cluster system to treat flow from nearby Pinehurst Community.
Patuxent WRF Chloring Rm Reno	S802367	The scope of this contract includes renovation of the abandoned chlorine room at the Patuxent WRF Filter Building. The room will be renovated to support future uses including the installation of a pilot system for advanced water treatment plant. Modifications are expected to include improved lighting, painting, heating, and support furnishings for laboratory work.
Annapolis HW & Gen Bldg Roof Repl	S802368	This contract includes the removal and replacement of the existing roof at the Annapolis WRF Headworks Building. The building roof area is approximately 7900SF.
Broadwater Maint Bldg Roof Repl	S802369	This project will provide funds for the replacement of the existing roof of the maintenance and lab building at the Broadwater WRF.
Broadneck WRF WAS Pump Rm Ren	S802371	Work on this contract includes the design, construction, and inspection for the replacement of the existing Waste Activated Sludge pumps and related equipment. Work will also include demolition of all unused equipment, repainting, and upgrades for code compliance.
WWSS Camera & Gate Upgrades	S804606	Professional installation services for fiber data lines and network equipment to various wastewater facilities, on site WIFI, VoIP, and CCTV security cameras and associated labor and equipment.
Marley SPS WW Improvements	S805402	This project includes final design services, construction & inspection of improvements to the wet well at the Marley SPS. The improvements should alleviate air binding in pump # 4.
Cox Creek Non-ENR Misc Imprv	S806103	Miscellaneous improvements for Non ENR.
SPS Gen Replace Design 1 & 2	S806205/S806206	This multi-year contract provides funding for design of the replacement and installation of generators at sewage pumping stations throughout Anne Arundel County.
SPS Gen Replace CMI Services	S806207	This contract provides construction management and inspection services for replacement generators and fuel tanks at sewage pumping stations throughout Anne Arundel County.
SPS Fac Gen Replace Phase 8	S806208	This multi-year project provides funding for design and construction of replacement generators and fuel tanks at sewage pumping stations throughout Anne Arundel County.
SPS Fac Gen Replace Phase 14	S806214	This contract is for the evaluation/replacement and installation of generators and fuel tanks at seven (7) sewage pumping stations. This phase includes Valley Road, West Shady Side, Marley Ave., Marley Neck, Little Patuxent, Loch Haven I, Turkey Point I.
Cape St. Claire X	S806216	This contract is for the installation of portable generator connections at Cape St. Claire X SPS.
Carvel Beach	S806216	This contract is for the installation of portable generator connections at Carvel Beach SPS.
Meadow Lane SPS	S806216	This contract is for the installation of portable generator connections at Meadow Lane SPS.

Contract Title	Contract Number	Description
SPS Fac Gen Replace Phase 15	S806216	This contract is for the installation of portable generator connections at fourteen (14) sewage pumping stations - Berkshire, Cape St. Claire 10, Carvel Beach, Creek Road, Glen Ave. Harbor Drive, Meadow Lane, Mount Pleasant Beach, Park Road, Sandy Beach, Sea Breeze, 7th Avenue, Stoney Creek, Sunset Beach, Pigeon House.
SPS Gen Replace Design 3	S806217	This multi-year Task Order contract provides funding for design of the replacement and installation of generators at sewage pumping stations throughout Anne Arundel County.
SPS Fac Gen Replace Phase 16	S806219	This project is for the installation of portable generator connections at the following fifteen (15) sewage pumping stations - Clark Heights, Franklin Manor 2, Carrs Ridge 2, Glebe Heights 2, Glebe Heights 3, Glebe Heights 4, Glebe Heights 5, Holly Hills 2, Loch Haven 2, River Club, Turkey Point 2, Turkey Point 3, West Shores 1, West Shores 2, and Holly Road North.
Pinehaven SPS Fac Gen Repl	S806220	Install new generator and ancillary equipment at Pine Have sewage pumping station.
Park West SPS Fac Gen Install	S806221	This project is upgrading the pump station by improving the pump-around system, replacing the sewage pumps, valves, and pump controls. The pump station will also receive new facility lighting, a new water service and an update to the access ladders. Pump Station reliability will be improved by the addition of a backup generator.
SPS Gen Replace CMI Serv Phase 2	S806222	This is multi-year Task Order contract that provides CM/I services for the replacement of generators and fuel tanks at sewage pumping stations throughout Anne Arundel County.
Maryland City NPW Upgrades	S806602	This contract is or additional upgrades to the NPW and liquid polymer systems of Maryland City.
Tanglewood II Sewer	S807200	This project provides the design, right-of-way acquisition, and construction for sewer improvements to approximately 72 homes. This project is in response to a valid petition.
Annapolis WRF Upgrade	S807301	This project will make improvements to several components at the Annapolis WRF, including replacing bar screens, materials/mechanical improvements to primary and secondary clarifiers, roadway improvements, replacing lower shell fish holding pond liner and electrical manhole rehabilitation.
Annapolis WRF Upgrade Ph 2	S807302	This project will make improvements to several components at the Annapolis WRF, including modifications to existing clarifier launders, construction of a new secondary clarifier, pond upgrades, and road rehabilitation.
Broadneck WRF Clarifier Rehab	S807401	This contract includes the design, construction and inspection of improvements to the existing secondary clarifiers at the Broadneck WRF. Work will also include scum handling and sluice gate replacements.
Heritage Harbor Sewer Takeover	S807501	This contract includes design, right of way acquisition, inspection, and construction for any improvements required prior to the takeover of an existing private sewer system serving approximately 106 homes.
Piney Orchard SPS & FM	S807601	This project is for design of Enhanced Nutrient Removal, Safety and SCADA upgrades at the Piney Orchard WWTP.
Crofton SPS Upgrade	S807901	Construction of a new sewage pumping station to replace the existing Crofton sewage pumping station. The new station will be built adjacent to the existing pumping station.
Cox Creek Grit System Improv	S808001	This project will evaluate, design, and construct facilities to address grit handling during high flow events.

Contract Title	Contract Number	Description
Cattail Creek Rt 2 FM Replacement	S808101	This project consists of replacing 17,000 feet of the 24" and 36" Cattail Creek FM (along Rt. 2 between Severna Park and College Parkway) in place by lining it with HDPE pipe.
Grinder Pump Repl/Upgrd Prgm 1	S808201	This project includes infrastructure investigation, rehabilitation and replacement of grinder pump systems. Studies of low pressure force main networks are also included in this project where required.
Broadwater WRF Ops Bldg Addtn	S808301	Renovate and expand operations building and site at the Broadwater Water Reclamation Facility.
Maryland City SPS Upgrade	S808401	Upgrade of Maryland City sewage pumping station. Scope includes include new electrical room, new valves, by-pass connection and grinder.
Edgewater Beach Sewer Ext	S808501	Work on this project includes the design, right of way acquisition and construction of a sanitary sewer collection system serving the Edgewater Beach Community.
OPS Compl Solar Panels-Sewer	S808601	Work includes the design, construction, and inspection of new photovoltaic panels at the Utility Operations Complex. Work will include solar arrays on existing building roofs, canopies over parking lots, electric vehicle charging stations, and other necessary improvements to support the system.
Point Field Landing WW Gravity Extension	S808701	This project is for the design, right of way acquisition and construction of a public sewer extension to the Point Field Landing community.
Broadwater WRF Grit Sys Repl	S809001	Work includes design, construction, and inspection of new grit removal facilities at the Broadwater WRF to replace the existing aging equipment.
Patuxent WRF Clarifier Rehab	S809501	This project will replace the secondary clarifier equipment that is corroded or obsolete at the Patuxent WRF, including replacement of the sludge withdrawal mechanisms and repairs to existing tanks. The project will also include any needed improvements to the scum handling equipment, and extension of the utility water lines to the clarifiers and oxidation ditches.
Glen Burnie Sanitary Gravity Sewer Upsizing	X738800	This is a multi-year sewer infrastructure investigation, rehabilitation and replacement program to ensure the adequacy of the County's Wastewater Collection System.
ROW Clearing - Deale Area	X7388125	Right-of-Way Clearing in the Deale Area for approximately 10,500 LF along a sewer interceptor in the Critical Area.
Route 50 SPS	X7388135	Service upgrades Route 50 SPS.
Rte 50 Sewer Crossing	X7388135	This contract includes the investigation, design and construction necessary to rehabilitate or replace the Route 50 sewer crossing at MH19247.
Large Diameter Sewer Relining	X7388205	Design and construction of cured in place sewer lining of approximately 1,209 lf of 27" sewer main (MH 2854 to MH 2852), 569 lf of 30" sewer main (MH 30405 to MH 2848), and 2,974 lf of 36" sewer main (MH 2840 to MH 2837 and MH 13237 to MH 2845) in the Patuxent area of Anne Arundel County.
Glen Burnie Sewer Upsizing	X7388240	This project consists of design and construction to upsize a 2300 linear foot section of gravity sewer to provide sufficient capacity.
Stoney Run Gravity Line Mods	X7388242	This contract is to replace a section of the sewer pipe running through Patapsco State Park which will reduce overflows and pipe corrosion.
Sewer Main Task Order Ph 1	X7388243	This project is to select an A/E to perform task order design services for the rehabilitation of sewer mains and appurtenances.
Stoney Run Manhole Armoring	X7388245	Design and construction services for the armoring of two manholes which have become exposed due to bank erosion in Stoney Run.
SMRR - Rock Creek ROW MH	X7388254	This contract reinforces a sewer main located in Rock Creek in Green Haven by MH 16920.

Contract Title	Contract Number	Description
Cox Creek ARV Replacement	X7388256	This contract is a task order contract with Wallace Montgomery to provide Schematic Design Reports for the four remaining Cox Creek Force mains that need the ARVs replaced.
Chesapeake Harbor FM Replace	X7388258	This contract will investigate alternatives and provide recommendations for replacement of approximately 4200 lf of 6" force main in the Chesapeake Harbor area of Annapolis.
Whitehall Rd SPS	X7388259	This project includes redesign of the Rte 50 SPS to eliminate conflict with location in a limited access SHA Right of Way. This SPS will replace the Rte 50 sewer crossing from MH 19247.
Sewer Lateral Repl. Ph 18	X7388265	Replacement of 209 standard sewer lateral house connections. Locations throughout Anne Arundel County.
Resurfacing Adjustments	X7388266	Resurfacing Adjustments FY20-FY25.
Sewer Lateral Repl. Ph 19	X7388268	Replacement of 221 standard sewer lateral house connections. Locations are throughout Anne Arundel County.
Ft. Smallwood Gravity Sewer Replacement	X7388269	This contract will design and construct a replacement for the existing gravity sewer utilizing a FM extension to alleviate ongoing problems between MH 27506 and MH 27501 which include frequent backups and overflows.
Special Lateral Repl Ph 18	X7388270	This contract is for replacement of sewer laterals designated as special due to depth, high groundwater, configuration, utility interference, or any other non-standard condition.
Mini Systems Task Order	X7388271	Rehabilitation of sewer lines throughout the County. Scope includes CCTV, cleaning and root removal in 6" and larger sewerlines, manhole rehabilitation sewer lateral inspection, cleaning, and lining sewer mainline point repairs to reduce the amount of I/I entering the sewer system and to minimize maintenance problems.
MH F&C Replacement Task Order	X7388272	Replacement of approximately 750 new Manhole Frame and Covers with updated frames and cover in the Roadways and Right of Ways in various locations throughout Anne Arundel County.
Freetown ARV Replacement	X7388274	Replacement of existing sewer air release valves along Solley Road.
Pine Haven ARV Replacement	X7388275	Replacement of existing sewer air release valves along Duvall Highway and in the Pine Haven community.
6-12" CIPP Lining - Baltimore	X7388276	This contract is for installation of 6" to 12" diameter cured in place sewer lining in various locations throughout Anne Arundel County.
Broadneck SSA ARV Replacement	X7388277	Replacement of existing sewer air release valves in the Broadneck, Patuxent and Mayo Sewer Service Areas.
Homer Ave - Oakleigh Ave Gravity Sewer Replacement	X7388278	This project is for the design and construction of a replacement manhole for Manhole 6014, and rehabilitation of the influent and effluent sewer lines.
Pigeon House FM Replacement	X7388279	This project is for design and Construct replacement of 2000 ft of 4-inch force main between pump station and Gable Court manhole.
Stone Haven FM Replacement	X7388280	Replacement of the existing 6-inch diameter ductile iron force main with approximately 2,881 LF of 8-inch HDPE DR-11 pipe from the Stone Haven Sewage Pumping Station (SPS) to the existing 16-inch force main bypass connection point between Solley.
Bartell Gravity Line Repair	X7388281	This project is for the design and construction for the repair and replacement of a section of 10 inch gravity sewer pipe near 604 Bartell Ave.
Chalk Pt FM Replacement	X7388282	Design, construction and inspection for the replacement of approximately 1900 feet of 8 inch DIP Force Main from Chalk Point SPS to MH10250.

Contract Title	Contract Number	Description
Cedar Rd FM Replacement	X7388283	This project includes the inspection, design, and construction for the replacement of approximately 1400 feet of 4 inch Force Main from Cedar Road SPS to MH2429.
Riviera Beach 2 ARV	X7388285	Replacement of the sewer air release valves along Fort Smallwood Road at Weldon Road and Smallwood Court.
MH F&C Replacement	X7388286	This contract is for replacement of frames and covers on 384 sewer manholes and replacement of covers only on 948 sewer manholes in Annapolis, Arnold, Churchton, Crofton, Deale, Edgewater, Gambrells, Riva, North Beach, Severn, Shady Side, and West River.
Marley ARV Replacement	X7388287	This contract is for replacement of sewer air release valves along Holloway Road, McGowan Avenue and Marley Neck Road.
Sewer Main CMI Services Ph 4	X7388288	This project is to select an A/E to perform task order construction management services for the rehabilitation of sewer mains and appurtenances.
Arundel on the Bay 3 FM Replacement	X7388289	Replace approximately 985 LF of 4" CIP from Arundel On The Bay III SPS to MH 8374.
Truck House Rd MH & Gravity Sewer Replacement	X7388290	This project will provide the design, construction and inspection for the replacement of manhole 17460 and associated piping in Truck House Road.
Resurfacing Adjustment	X7388291	This contract adjusts the height of sewer structures to match the newly paved roadway.
Fork Creek FM Protection	X7388292	This project is part of the stream protection project to protect the Fork Creek force main. This is for a portion of the work being done under B571104.
Fishing Creek Farms Piping Replacement	X7388293	This contract will provide for the construction and inspection of replacement of the low pressure piping and appurtenances in the Fishing Creek Farms vicinity.
Bay Breeze SPS FM Replacement	X7388296	This project is for the design and replacement of approx. 1,500 feet of 12-inch force main from the Bay Breeze SPS., along Columbia Beach Road.
SM Design Task Order Ph 2	X7388297	This project is to select an A/E to perform task order design services for the rehabilitation of sewer mains and appurtenances.
Wastewater Service Conn. FY21	X741226	This project consists of installing service connections and meters to existing water and sewer mains for which service laterals were not originally constructed as part of the capital budget program.
OSDS Strategic Plan	X764249	This contract will provide professional services related to developing the OSDS conversion program strategic plan. Work will be performed in different task areas.
Millersville Outdoor Storage	X764252	This contract will include design services related to the creation of additional outdoor storage at the Millersville Complex. This area provides support for the Utility Operations Repair Crews.
GW Injection Test Well Program	X764260	This contract includes the siting, design, and construction of test wells to support preliminary investigations into a Managed Aquifer Recharge (MAR) program.
Linthicum/Shipleigh SPS Study	X764263	This project will investigate the required upgrades to the collection system and pumping station to enable expansion of the capacity of the Linthicum/Shipleigh SPS from 2.0 MGD to 3.0 MGD.
Septage & Surcharge Rate Study	X764264	The scope of this contract includes evaluation and quantification of the treatment costs associated with septage received on-site at the Annapolis WRF and the Cox Creek WRF.
MAR TW Surface Facilities	X764266	This project will provide for the construction and inspection of the above ground support equipment for the managed aquifer recharge test wells.

Contract Title	Contract Number	Description
Cox Creek Permeate Piping Retro	X764268	Work on this contract will include design, construction, and inspection of modifications to the existing permeate piping at the Cox Creek WRF.
Patuxent WRF AWT Pilot System	X764270	This project will include design, construction, inspection and operational support of an advanced wastewater treatment (AWT) pilot plant facility at the Patuxent WRF.
Collection Syst Odor Control Eval	X764265	Evaluation of alternative technologies for collection system odor control.
Stoney Run Gravity Sewer Modifications	X7388242	This contract will modify the gravity line near Stoney Run. New pipe and manholes will be installed to reduce hydraulic restrictions.
Heritage Harbor Sewer Takeover	Z533273	Work under this contract involves the inspection and evaluation of improvements to facilitate a takeover of the private sewer collection system at Heritage Harbor. This contract is in response to a valid petition.
Reece Rd Gravity Sewer Extension	Z533276	This contract includes the design of an extension of public sewer to eight properties along Reece Road. This is a petition project.
Maple Rd WW Gravity Extension	Z533277	This contract includes the design of an extension of public sewer to eight (8) properties along Maple Road. This project is in response to a valid petition.
Maple Rd WW Low Pressure Extension	Z533277	This contract includes the design of an extension of public sewer to eight (8) properties along Maple Road. This project is in response to a valid petition.
Hidden Cove Sewer Takeover Study	Z533278	This project will investigate the existing private sewer infrastructure serving 16 homes in the Hidden Cove I & II neighborhood and identify needed improvements before takeover by the County.
Bayberry Dr WW Gravity Extension	Z533279	This contract includes the design of an extension of public sewer to three properties along Bayberry Drive.
Design TO Sewer Petitions Ph 1	Z533280	This project is to select an A/E to perform task order services for the design of extensions of public sewer service for customer petitions.

Table 4-38 Wastewater Capital Improvement Projects, City of Annapolis

Project Title	Project Number	Description
Sewer Rehabilitation & Upgrades	72006	Over half of the City's sewers are greater than 50 years old and require repair. Based on typical useful life, risk analysis and other factors, the required sewer rehabilitation capital needs have been projected to address the sewer infrastructure that has exceeded or will reach the end of their useful life. Most of the pipes needing rehabilitation can be lined using trenchless methods, but others, including pump station assets will need replacement. Work is ongoing to further assess and prioritize sewer infrastructure upgrades and rehabilitation.

Appendix A: Water and Sewerage Systems Design Criteria

1. Water System Design Criteria

A. Water Demand and Peaking Factors by Zoning Classification (Residential Districts)

Zoning	Projected Population per Acre	Projected Dwelling Units per Acre	Projected Avg. Flow per Acre @ 100 gpd	Maximum Day Peaking Factor *	Maximum Day Demand gpd/DU *	Maximum Hr. Peaking Factor *
RA	0.54	0.1	54	2.7	-	3.8
RLD	0.54	0.2	54	2.7	-	3.8
R-1	2.59	1	259	2.7	699	3.8
R-2	4.71	2.5	471	2.7	509	3.8
R-5	8.96	3.5	896	2.4	614	3.5
R-10	18.81	10	1,881	2.4	451	3.5
R-15	25.88	15	2,588	1.9	410	3.3
TC	21.66	12	2,166	1.9	343	3.3
R-22	30.68	22	3,068	1.6	223	3.1

* For reference only. Maximum Day and Hour Peaking Factors differ by water pressure zone.

B. Water Demand and Peaking Factors by Zoning Classification (Non-Residential and Mixed Use Districts)

Zoning	Projected Avg. Flow per Acre	Maximum Day Peaking Factor *	Maximum Day Demand GPD/DU *	Maximum Hour Peaking Factor *
C1	1,300	1.4	1,820	2.0
C2	500	1.3	650	1.6
C3	1,300	1.4	1,820	2.0
C4	1,300	1.4	1,820	2.0
MA1	1,300	1.4	1,820	2.0
MA2	1,300	1.4	1,820	2.0
MA3	1,300	1.4	1,820	2.0
MB	1,300	1.4	1,820	2.0
MC	1,300	1.4	1,820	2.0
MXD-R	3,000	1.4	4,200	2.0
MXD-C	3,000	1.4	4,200	2.0
MXD-E	3,000	1.4	4,200	2.0
MXD-T	3,000	1.4	4,200	2.0
OTC districts	3,000	1.4	4,200	2.0
SB	1,300	1.4	4,200	2.0
W1	500	1.3	650	1.6
W2	500	1.3	650	1.6
W3	1,000	1.1	1,100	1.4

* For reference only. Maximum Day and Hour Peaking Factors differ by water pressure zone.

APPENDIX A. WATER AND SEWERAGE SYSTEMS DESIGN CRITERIA

C. Fire Flows

Use	Fire Flow
Residential¹:	
Single Family ²	1,000 gpm at 20 psi residual
Townhouses (R-5)	1,500 gpm at 20 psi residual
Garden Type Apartments (R-15)	2,000 gpm at 20 psi residual
High-Rise Apartments (R-22)	2,500 gpm at 20 psi residual
Commercial:	
Regional Shopping Centers (C-3)	3,000 gpm at 20 psi residual
Office Buildings	3,000 gpm at 20 psi residual
Institutions:	
Hospitals	2,500 gpm at 20 psi residual
Schools	2,500 gpm at 20 psi residual
Industrial:	3,000 gpm at 20 psi residual

- 1. Above fire flows to be used in the absence of site specific data from fire underwriters or construction plans, which would permit a determination of fire flow requirements using insurance industry standards (Insurance Services Office - ISO). Consideration will be given to reducing the requirement where proposed construction includes sprinkler systems; refer to current ISO recommendations.*
- 2. Consideration will be given to reducing the requirement to 750 gpm where it can be demonstrated the 1,000 gpm is technically unfeasible.*

D. Sizing of Facilities

Facility	Criteria
Wells supplying a single treatment facility	Operating: Must provide maximum daily demand with all wells operating (except standby) for a 24-hour period of operation; or Standby: In addition to the operating wells required above, provide extra well capacity in each well field equal to at least 25% of the required operating capacity (i.e., a minimum of 20% of the total well field capacity) for use as standby. Standby wells shall be at least equal in capacity to the largest operating well in a well field or group of independent wells.
Treatment Plants	Maximum day demand
Pumping Stations discharging into system and Transmission Mains	Maximum day demand
Storage Facilities	Operating or Equalizing Capacity for each pressure zone; 20% of maximum day demand, plus Fire Reserve:(all residential) 1,000 gpm for 2 hours = 12,000 gal., or (residential and commercial) 3,000 gpm for 3 hours = 540,000 gal, plus Emergency Reserve:50% of average day demand
Minimum Tank Size	2,000,000 gal. ¹
Distribution System	Peak hourly demand while maintaining a minimum 30 psi residual pressure at curb Maximum daily demand while maintaining a minimum of 40 psi at the curb

1. General criteria; may be some instances requiring smaller tanks.

2. Sewerage Design Criteria

- A. The annual average daily flows are calculated by summing the domestic contribution and infiltration component, plus the industrial contribution. Flow criteria will be in accordance with approved County's Design Guidance for Wastewater and Waterworks Facilities, Part A, Appendix D. See page A- 4.

Peak Design Flow = Peak Flow + Peak Commercial Flow + Peak Industrial Flow + Infiltration and Inflow Allowance¹

Peak flows are equal to the annual average flow multiplied by the peaking factor obtained from the Maryland Department of Environment empirical curve shown under Anne Arundel County, Department of Public Works, Design Guidance for Wastewater and Waterworks Facilities, Part A, Appendix G, Peak Flow Curve. See page A- 5.

Infiltration flows are considered to be constant flow rates and are not included when determining peak flow rates.

APPENDIX A. WATER AND SEWERAGE SYSTEMS DESIGN CRITERIA

- B. Pumping stations, force mains and interceptors are sized for peak design flows as defined in item A. above.
- C. The nominal capacity (based on the annual average daily flow) of the treatment plant is the rated size. The required sizes of certain treatment units within the plan are determined based on the average daily flow expected to occur during the maximum month, since effluent limitations contained in the NPDES Permit must be satisfied under this condition. The maximum month average daily flow (i.e. plants design flow) will be equal to 120% of the annual average flow. However, hydraulically, the treatment components should be designed for the peak design flows, as defined in item A. above.
- D. The determination of the time schedule for providing additional treatment plant capacity is based on having the expanded facilities operational at the time the projected average daily flow occurring during the maximum month equals the nominal or rated capacity of the existing plant. For purposes of developing cost estimation totals, the projected costs have been tabulated as being funded during the year preceding the date required.
 - 1. *Peak Factors for Commercial and Industrial Flows are determined on a case by case basis.*

APPENDIX A. WATER AND SEWERAGE SYSTEMS DESIGN CRITERIA

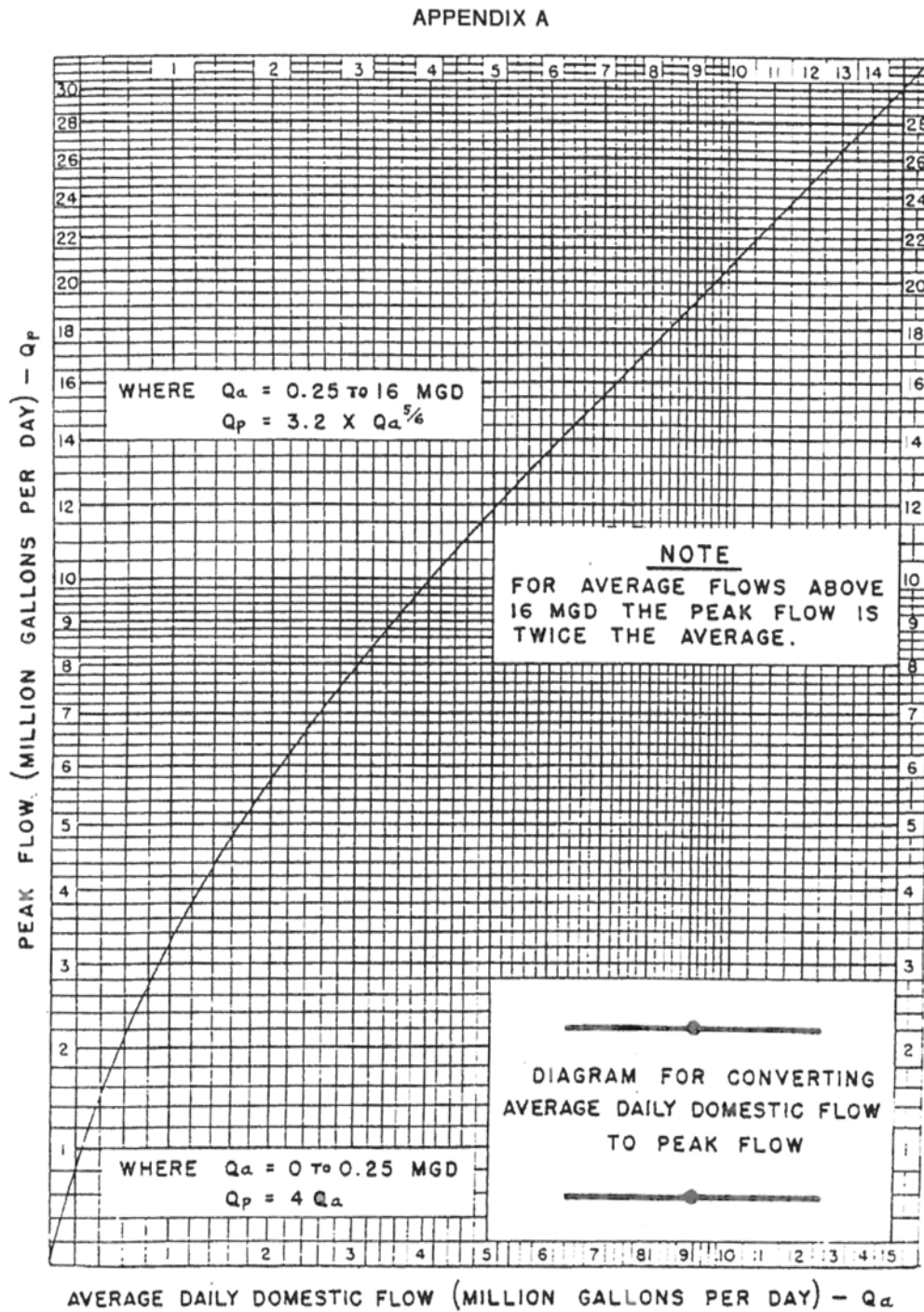
Basis For Wastewater Flow Projections By Zoning For Undeveloped or Partially Developed Areas

Zoning	Projected Population per Acre	Projected Dwelling Units per Acre	Projected Avg. Flow (250 gpd per EDU ^{1,2})	I / I per Acre @100 gpd/acre
RA	0.54	0.1	---	---
RLD	0.54	0.2	---	---
R-1	2.59	1.0	250	100
R-2	4.71	2.5	625	100
R-5	8.96	3.5	875	100
R-10	18.81	10	2,500	100
R-15	25.88	15	3,750	100
TC	21.66	12	3,000	100
R-22	30.68	22	4,400	100

1. EDU = Equivalent Dwelling Unit. This unit could be a townhouse or single-family unit. An apartment unit is estimated at 200 gpd per unit.
2. 250 GPD/EDU has been adopted by the County for wastewater for all service areas. Using 250 GPD/EDU provides much better basis for allocating capacity on a county-wide basis than varying rates from sewer service area to sewer service area and majority of development in the County may be considered to fall in the medium density R5 zoned areas.

Zoning	Average Flow per Acre (gal)	I / I per Acre @ 100 gpd/acre
C1, C3, C4, SB, MA1, MA2, MA3, MB, MC	1,300	100
W1, W2, C2	500	100
W3	1,000	100
MXD-R, MXD-C, MXD-E, MXD-T	3,000	100
OTC districts	3,000	100

APPENDIX A. WATER AND SEWERAGE SYSTEMS DESIGN CRITERIA



Appendix B: Sewer/Water Allocation Management System

The Sewer/Water Allocation, Management and Planning System (SWAMP) is a computerized system providing the County with rapid and accurate means of tracking water and sewer system capacity. Its purpose is to assess current development plans, to ensure water and sewer capacity is available for the development, and to provide an engineering planning tool useful in conducting strategic planning, recommending capital improvements, and preparing updates to the Master Plan for Water Supply and Sewerage Systems.

Operation and maintenance of the SWAMP system involves input from the Departments of Public Works, Inspections and Permits and the Office of Planning and Zoning. Data input requirements from the three County departments include: engineering data on each new segment of the water and sewer systems, water consumption, the status of properties including location, utility service, land use, acreage, and priority level for service. The input is inventoried and cross-referenced to operating maps on file at the Department of Public Works so that any portion of the system can be identified and analyzed.

The SWAMP system has the capabilities to:

- A. Determine the annual average water consumption for each serviced property.
- B. Determine the total daily water consumption by water and sewer system segments.
- C. Determine the adequacy of the hydraulic capacity for any gravity sewer segment under existing flows or simulated future flows and report any inadequate segment(s) and the magnitude of the inadequacy.
- D. Perform hydraulic calculations for the water distribution system to determine residual pressure and flow conditions at all points in the system under any simulated condition.
- E. Perform hydraulic calculations for sewer pump station/force main systems to determine operational parameters under simulated conditions.

The County's hydraulic models have the ability to perform gravity and pressure analyses as well as extended period simulations. The results can be displayed in either graphical or tabular formats. This has greatly increased the County's ability to analyze the systems and conduct strategic planning.

Allocation of Wastewater and Water Capacity

In order to comply with Title 9, Subtitle 5, County Water and Sewerage Plans, of the Environment Article of the State Code, the County Council enacted Bill 72-88. This allows an Allotment Committee, comprised of the Planning and Zoning Officer, Director of Public Works, and the Director of Inspections and Permits and/or their designees, to allocate public water or wastewater service for a subdivision plan or for a site development plan, if adequate capacity exists.

Allotment of Capacity

The Allotment Committee may establish allotments on a service area basis as set forth in the most current version of the Anne Arundel County Master Plan for Water Supply and Sewerage for the following uses:

- A. Public health needs
- B. Public service needs, including County Capital Projects
- C. Assisted housing
- D. Buildable approved lots
- E. County-assisted economic and community development projects
- F. Minor subdivisions, family conveyance subdivisions, and administrative plats
- G. Major subdivisions and planned unit developments

APPENDIX B. SEWER/WATER ALLOCATION MANAGEMENT SYSTEM

- H. Planned commercial complexes
- I. Industrial subdivisions
- J. Reserve capacity

The Allotment Committee may at any time redistribute allotments in order to reflect changes in market demands, development inactivity, or needs of the community and County; and establish sub-uses to the uses listed.

Uncommitted water and wastewater capacity is determined on a regular basis. The Allotment Committee regularly issues a public report of changes in the proportion of capacity available to uses and the availability of unallocated capacity. A copy of the latest report is available by request from the Department of Public Works.

Water and wastewater capacity is contingent on the availability of Federal, State, or County funds to finance water and wastewater Capital Projects. The County is not responsible for providing water or wastewater service and is not liable for monetary damage for the failure to provide service if the County is unable to acquire rights-of-way necessary for the construction of water or wastewater Capital Projects. The County is not responsible for any Federal or State action, including operational moratoria, that temporarily suspends, delays, or otherwise affects an allocation, or if a contractor defaults on a County water or wastewater project in the service area in which an allocation has been made, or any other contingency that affects the timing or ability to connect that is beyond the control of the County.

Private Financing for Additional Capacity

If a developer agrees to provide or finance, at no cost to the County, the cost of all or part of the construction of or addition to a Capital Facility that the County will not immediately provide, the County may allocate water or wastewater capacity for the developer's project in an amount up to the capacity provided or financed by the developer.

Effect of Zoning Action

The grant of a reclassification, special exception, or other zoning action does not entitle any person to an allocation of water or wastewater capacity for that property.

Appendix C: Biosolids (Sludge) Management

In this section, the current biosolids (sludge) handling and utilization/disposal practices are discussed. This includes sludge management activities, sludge production rates and methods of utilization/ disposal.

1. Background

There are seven operating wastewater treatment plants owned and operated by Anne Arundel County and one groundwater facility. These plants range in capacity from 0.7 MGD to 15.0 MGD at the largest water reclamation facility. All plants are similar in that they provide secondary treatment with activated sludge processes. The seven wastewater plants have been or are in the process of being modified to accomplish Enhanced Nutrient Removal (ENR) with various types of activated sludge processes. The groundwater facility was designed to remove solids and accommodate a flow of 0.446 MGD.

In April 1984, Anne Arundel County entered into an agreement with Wheelabrator Water Technologies, Inc. (WWT, Inc.), Bio Gro Division, to manage the processing and utilization/disposal of all generated wastewater biosolids. The contract included the installation and operation of on-site dewatering and biosolids stabilization facilities. The County has closely monitored the contract and is satisfied that the contractor has insured its integrity. The land application contract was re-bid in July 2005, 2015 and again in 2018 and was awarded to Synagro Technologies Inc., who purchased WWT, Inc., Bio Gro Division. The current contract is still with Synagro and is in effect until December 31, 2028.

2. Current Situation

Synagro Technologies Inc. is currently contracted to provide the following services at the Annapolis, Broadneck, Broadwater, Cox Creek, Maryland City, and Patuxent Water Reclamation Facilities:

- A. Receiving, dewatering and lime stabilizing processed biosolids.
- B. Removal and disposal of biosolids through land application at permitted sites within the state of Maryland.
- C. Providing off-site storage for biosolids when land application is restricted due to atmospheric conditions.
- D. Ensuring that their operation:
 - i. Allows biosolids to be removed in a timely manner so as not to interfere with the operation and process of the supported facility that may create a condition that would cause deterioration of plant effluent and increased operating costs caused by the accumulation of excessive biosolids by-products.
 - ii. Does not create any condition that would cause objectionable odors to be emitted from the supported facility.
 - iii. Has a contingency that would prevent the storage of biosolids in excess of its permitted storage capacity.
 - iv. Maintains sufficient permitted land application acreage that would provide for the disposal of one year's biosolids production.

APPENDIX C. BIOSOLIDS (SLUDGE) MANAGEMENT

Table C-1 summarizes the type of biosolids handling systems currently in use at the County's treatment plants, biosolid generations, and process data for the County facilities

Table C-1 Biosolids Management Matrix

WRF	2018 Biosolids Generated		2019 Biosolids Generated		2020 Biosolids Generated	
	DRY TONS	WET TONS	DRY TONS	WET TONS	DRY TONS	WET TONS
Annapolis	4,946	18,997	4404	16,223.70	3,983.95	144,457.54
Broadneck	1,953	11,197	1859	9,404.26	1,919.20	9,473.59
Broadwater	462.55	1,415	439.93	1,448.74	548.84	1,762.26
Cox Creek	89	383	6756.62	26,585.90	7,077.54	29,657.00
Maryland City	827.7	3,122	882.35	3,347.17	953.59	3,714.55
Patuxent	2,188	11,839	2848.66	13,067.45	3,251.63	14,576.25
Mayo	-	-	-	-	-	-
Piney Orchard	N/A		133	754.2	177.25	743.49
TOTAL	10,467	46,953	17,203	70,115	17,735	73,641

3. Sludge Stabilization

At six of the County-owned treatment plants - Annapolis, Broadneck, Broadwater, Cox Creek, Maryland City, and Patuxent - stabilization is accomplished by the addition of lime in sufficient quantity to raise the pH to 12 or higher. The high pH creates an environment that is not conducive to the survival of pathogenic organisms. Consequently, the biosolids should not putrefy, create odors, or pose a health hazard.

The Mayo facility is a land treatment facility and minimal biosolids are generated. However, some generated liquid waste is transported to a County-owned WRF where the material is disposed of through their de-watering system.

4. Dewatering

At the present time, dewatering is accomplished with belt filter presses at all facilities.

5. Utilization/Disposal

The primary method of biosolids disposal in the County is through land application. This has been, and continues to be, performed on both agricultural and marginal sites. (Note: by State of Maryland definition, "marginal" sites are those that exhibit poor quality of topsoils resulting from surface mining or grading. Such sites are typically permitted at biosolids utilization/disposal rates higher than agronomic applications to replenish nutrients and organic matter to the soils).

6. Site Permitting Program

Under present State regulations, an operating permit must be obtained from Maryland Department of the Environment (MDE) to transport and dispose of biosolids. The County's land application site permitting program is presently administered, operated and managed by WWT, Inc., Bio Gro Division.

7. Future Situation

As part of the current sludge handling contract, Synagro upgraded dewatering equipment at one of the Water Reclamation Facilities (WRFs). A capital project is currently underway to upgrade dewatering equipment at the four other WRFs. The upgrades will provide redundancy, increase reliability, improve efficiency, and optimize the biosolids handling operations. In addition, Anne Arundel County is undergoing a Regional Biosolids Facility Study that will examine biosolids sustainability and evaluate alternatives for recycling biosolids in future operations.

The Maryland Department of Agriculture (MDA) regulations limit fall application of nutrients and prohibits winter land application. As a result, upcoming capital projects could include developing storage facilities and strategies, as well as developing pilot projects with public and/or private entities.

Appendix D: Groundwater Protection Plan

The Groundwater Protection Plan documents and summarizes County Department of Health policies and programs regarding on-site sewage disposal systems (septic systems) and the protection of groundwater where public sewer is not available.

1. On-site Sewage Disposal Systems

It is County policy to permit on-site sewage disposal systems for new construction only where an unsaturated soil treatment zone of four feet or greater can be maintained. Sand mound systems may be utilized to obtain a treatment zone as required by COMAR 26.04.02.

Variances may be granted by the Department of Health for building additions and repairs based on the requirements outlined in the Groundwater Protection Plan. The size and design of an on-site sewage disposal system may be reduced, but must meet the minimum requirements of COMAR 26.04.02.05 (Conventional Systems) or 26.04.02.06 (Non-Conventional Systems)

Measures to protect existing water supplies and groundwater include installing water-tight septic and pump tanks, increasing horizontal and/or vertical separations between on-site sewage disposal systems and existing water supply wells, and replacing existing water supply wells with new confined wells.

Special conditions may be added to well construction permits for the protection of groundwater.

2. Repair of Failing On-site Sewage Disposal Systems

- A. Repairs or replacements of existing failed on-site sewage disposal systems shall maintain a four foot treatment zone of unsaturated soil whenever available.
- B. When a failed on-site sewage disposal system cannot be repaired to meet the conventional system design requirements of the Anne Arundel County Private Sewage Disposal Code, a waiver to the County Code may be granted to meet the Conventional requirements of COMAR 26.04.02.05. If the minimum requirements of COMAR 26.04.02.05 cannot be met, a non-conventional system design will be considered based on COMAR 26.04.02.06. Selection of a non-conventional system design will give first consideration to maximizing the soil treatment zone to the ground water but may include any or all of the following options.
 - i. Installation of a system with less than the minimum design size or horizontal setbacks as required by State regulation due to insufficient area with proper separation from water supply wells, property lines, streams, steep slopes, buildings, etc. Such variances will only be allowed if the public health can be protected and is not considered at risk by the proposed septic system design. Water conserving plumbing fixtures will be recommended.
 - ii. Installation of Best Available Technology (BAT) or other Advanced Pretreatment Technology allowed by COMAR 26.04.02.07 will be required to improve effluent quality prior to discharge to an on-site sewage disposal system where a treatment zone of less than four feet is utilized.
- C. When a repair to a failing on-site sewage disposal system cannot be achieved utilizing any of the above options, a holding tank will be recommended.

3. On-site Sewage Disposal Systems Serving Existing Residential Structures for Which Building Additions are Proposed

The Code of Maryland Regulations 26.04.02.03F states that the County may not issue a building permit to alter any residence served by an on-site sewage disposal system until the Approving Authority (Department of Health) has certified the existing on-site sewage disposal system as capable of handling the existing sewage flows and any reasonable foreseeable increase in sewage flows. The Anne Arundel County Department of Health must evaluate the existing on-site sewage disposal system and replacement area to ensure the building alteration does not adversely affect the existing on-site sewage disposal system, future replacement areas or required setbacks to existing water supply wells. The Department of Health may grant approval of building permits when the following conditions are met:

- A. If a review of records indicates that the existing sewage disposal system and proposed building addition meet all current State and County requirements, including a four foot unsaturated soil treatment zone and sufficient system replacement areas, building permit approval may be granted.
- B. If records of the existing sewage disposal system are insufficient, the existing system is evaluated on site. Percolation tests, auger borings, and partial excavation of the existing sewage disposal system may be performed. If the evaluation indicates that the sewage disposal system and proposed building addition meet all current State and County requirements, including a four foot unsaturated soil treatment zone and sufficient system replacement areas, building permit approval may be granted.
- C. If records and/or on-site data indicate that the existing sewage disposal system has insufficient capacity or will not provide adequate treatment for the proposed construction, building permit approval may be issued if the necessary modifications are made to the sewage disposal system to meet all current State and County requirements, including a four foot unsaturated soil treatment zone and sufficient system replacement areas.
- D. If records and/or on-site data indicate that the existing sewage disposal system has insufficient capacity or will not provide adequate treatment for the proposed construction and the site is not suitable for the installation of a system that meets current State and County requirements or there is insufficient area for the required number of replacement systems, building permit approval for a limited home addition may be granted if the existing disposal system is improved to handle the existing sewage flows with the installation of BAT or other Advanced Pretreatment Technology allowed by COMAR 26.04.02.07 and a design which maximizes soil treatment and protection of groundwater. The maximum extent of improvements with a Limited Home Addition is described below.

Limited Home Additions are allowed only when all of the following conditions are met:

- i. The property is not suitable for a conventional design based on County code. This includes properties with insufficient area for the required replacement systems.
- ii. The existing house has a bathroom and an on-site sewage disposal system that is functioning hydraulically or has a repairable failure that meets the non-conventional requirements of COMAR 26.04.02.06.
- iii. The existing house is physically occupied and has not been abandoned within seven (7) years prior to the date of application.
- iv. The proposed building addition does not increase the finished square footage of the house by more than 50 percent or 1000 square feet, whichever is less, or a new house is sized within the square footage criteria.
- v. The building addition or alteration does not increase the number of bedrooms.

APPENDIX D. GROUNDWATER PROTECTION PLAN

- vi. Construction drawings with floor plans show the existing structure and proposed building meet the finished square footage and bedroom limitations and the house footprint does not adversely impact the on-site sewage disposal system, designated future replacement areas, or required setbacks to water supply wells.
- vii. The on-site sewage disposal system will utilize an unsaturated soil treatment zone with a minimum of 4' separation to ground water in preference to a saturated soil treatment zone. A non-conventional design may be used for properties that are unable to meet the conventional requirements of COMAR 26.04.02.
- viii. The septic system upgrade must be installed before the building permit is issued except where a new occupancy permit is required as part of the building permit process. Exceptions may be considered if a sufficient hardship is demonstrated and 125 percent of the construction cost of the sewage disposal system upgrade is placed in an escrow account with the Department of Health.

Appendix E: Septage Management Plan

1. References

- A. COMAR 26.04.02 "Sewage Disposal and Certain Water Systems for Homes, and Other Establishments in the Counties of Maryland Where a Public Sewage System is Not Available."
- B. COMAR 26.04.06 "Sewage Sludge Management."

2. General

This Septage Management Plan details how Anne Arundel County is in compliance with the aforementioned regulations.

3. Septage Quantity Forecast

- A. A 2008 study conducted by the County's Health Department determined that there were approximately 41,000 septic systems in the County. The County's Water and Sewerage Master Plan reports there will always be "No Public Service Areas." This will require homes built in those areas to utilize septic systems.
- B. Each household with a properly functioning septic system generates approximately 250 gallons of septage annually. Using this factor, annual generation of septage in the County is estimated at 10.2 million gallons.
- C. Through normal usage, a properly functioning septic system requires maintenance (solids removal) every 3 to 5 years. If the septic system is failing or used as a holding tank, more frequent removal of septage is necessary, substantially increasing the total volume of septage generated in the County that must be removed. (See par. 4(c)(4)).
- D. Septic haulers reported transporting Anne Arundel County produced septage to other jurisdictions for disposal since 2006. The continuation of this practice and the amount cannot be assured. Political concerns, environmental regulations and public perception may change or influence this practice, requiring the County to provide the necessary facilities to accommodate the added volumes.

4. Responsibilities

This plan is administered jointly by three agencies of Anne Arundel County: the Department of Health, the Department of Inspections and Permits, and the Department of Public Works, Bureau of Utility Operation.

- A. The Department of Health:
 - i. Inspects vehicles used to pump and transport sewage within Anne Arundel County and ensures compliance with federal, state and local regulations.
 - ii. Inspects grease interceptors of commercial facilities (restaurants, hotel kitchens, bars, factory cafeterias or restaurants, clubs or other establishments engaged in the preparation of food) that discharge to a septic system and ensures the interceptor is operated and maintained in accordance with the Anne Arundel County Plumbing Code. (Grease generated by the aforementioned cannot be allowed to enter the County's wastewater treatment system, for its slug loading will have a deleterious impact on the system's biological process, making the resulting sludge unfit for agricultural application). The requirement for conducting this inspection is found in COMAR 10.15.03.
 - iii. Inspects septic systems of applicants seeking a reduced disposal rate under the Department of Public Works Holding Tank Program. The Health Department determines whether the system qualifies as a Holding Tank under COMAR 26.04.02.02K, or whether a repair to the septic system can be made.

APPENDIX E. SEPTAGE MANAGEMENT PLAN

- iv. Reviews requests from marinas to discharge marine-generated septage into the County's wastewater system (coordinated by DPW).
- B. The Department of Inspections and Permits issues licenses to septic haulers to operate within Anne Arundel County, in accordance with the Anne Arundel County Code and other existing regulatory parameters.
- C. The Department of Public Works, Bureau of Utility Operations:
 - i. Issues Hauled Waste Discharge Permits to properly licensed and inspected liquid waste haulers desiring to discharge into the County system.
 - ii. Accepts septage at the County's two septage receiving points (SRP) during normal business hours:
 - a) Annapolis WRF, 7228 Edgewood Road, Annapolis, MD,
 - b) Cox Creek WRF 8833 Wagner Station Road, Curtis Bay, MD
 - iii. Manages the County's Marine Sanitation Pumpout Systems program by reviewing requests from those marinas located within the County that are installing pumpout systems in accordance with Maryland State regulations, and who require permission to discharge the generated wastewater into the County's wastewater system either through a direct connection into the sewer pipes, or by having a septic hauler transport same to a septage receiving station. Requests are routed through a committee chaired by DPW and composed of representatives from the Department of Health, and Inspections and Permits. Comments from the reviewers are compiled and sent to the applicant for action. Once all parameters are met, DPW issues a Special Agreement. The Special Agreement is forwarded to the Maryland Department of the Environment, the Department of Natural Resources, and the septic hauler (if applicable). DPW monitors the discharge through periodic inspection of the facility.
 - iv. Manages the County's Holding Tank program that offers a reduced septage disposal rate to those qualifying for same. The DPW sells and issues holding tank tickets to customers based on Health Department recommendations and their final review.

As of January 10, 2022 there are 240 customers participating in the Holding Tank Program

Type of Waste Received at the two SRP's	FY 21 (in gallons)
Septic Tank Waste	18,797,012
Holding Tank Waste	3,062,575

5. Conclusion

- A. Anne Arundel County is currently in compliance with the disposal parameters of the regulation.
- B. Septage and Holding Tank received are discharged into the two aforementioned facilities headworks for the treatment process with other sewage where it is biologically treated, dewatered and lime-stabilized prior to disposal through the department's biosolids management program.
- C. The aforementioned facilities have the capacity to accept the septage forecasted and generated within Anne Arundel County, excluding that septage which is grease-laden and generated by commercial facilities. NOTE: It is the generator's responsibility for disposing of grease-laden septage through an outlet such as a rendering plant. If subject septage can be pre-treated, disposal at a County facility would be approved.
- D. The County does not accept any septage generated outside of Anne Arundel County.
- E. The County has five additional water reclamation facilities – Broadneck, Broadwater, Maryland City, Mayo and Patuxent – that are not designed to accept septage.

Appendix F: Summary of Text Changes

Appendix F and G are records of those changes and revisions presented as a result of the work performed by the Office of Planning and Zoning, the Department of Public Works, and the Department of Health, as required by the State of Maryland, for the triennial update.

General

All tables and text updates as applicable to existing information and nomenclature.

Chapter 1 – Goals, Policies, and Procedures

- Updated goals, policies, and procedures to incorporate the relevant goals and policies from the Plan2040 General Development Plan
- Updated Growth Tier definitions to account for two new growth tiers (Tier IA and Tier IIA)
- Added Development Policy Areas map

Chapter 2 – Background Information

- Updated information and acreages for land cover, existing land use, planned land use and zoning
- Added information regarding the Development Policy Areas implemented through Plan2040
- Added information on the Region Plan process
- Updated population and housing information
- Revised and updated text on Anne Arundel County Soils
- Revised information on aquifers

Chapter 3 – Water Supply

- Water Pressure Zone (WPZ) text and tables have been revised to reflect current conditions
- Data for non-County facilities, financial statistics and Capital Improvement Program items has been updated
- Data for water demand, population and housing has been updated
- Water quality problem areas have been updated to include an area within the Lower Patapsco aquifer near Fort Meade and an area on the Annapolis / Edgewater peninsula

Chapter 4 – Sewerage Systems

- Sewer Service Areas (SSA) text and tables have been revised to reflect current conditions
- Updated data and projections for waste water demand, population and housing
- Updated information regarding NPDES limitations, TMDLs and Enhanced Nutrient Removal, including future and operational characteristics
- Updated data for non-County facilities, sewer agreements, on-site disposal systems, wastewater management problem areas, financial statistics and Capital Improvement Program items

Appendix G: Water and Sewer Master Plan Map Changes

A. Overall Map Changes

1. All parcels that have been developed or are assessed with the extension of public water or sewer are appropriately updated to reflect Existing Service.
2. Water and Sewer Service category boundaries have been aligned with subdivision or parcel boundaries.
3. Sewer Service Areas and Water Pressure Zones boundaries have been adjusted to match parcel and subdivision boundaries where possible.
4. Water and Sewer Service Category boundaries have been aligned with Sewer Service Areas and Water Pressure Zones boundaries where possible.
5. Water and Sewer Service Category boundaries have been aligned with updated City of Annapolis data to more accurately represent areas that are currently served by the City.

B. Individual Sewer and Water Map Changes

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-1/W-1	1	Removed Possible SSA Boundary Change between Baltimore City SSA and Cox Creek SSA based on the recently completed North County Sewer Strategic Plan Project (Grids K5, L4, L5, M3, M4).	1	Merged the Brooklyn Park South WPZ 350, 532 acres, with the Glen Burnie High 295 WPZ (Grids M2, N2, M3, N3).
S-2/W-2	2	Moved 207 acres within the Cox Creek SSA to the Broadneck SSA to accommodate the Broadneck 113 and 120 Sewer Basins (Grids K8, K9, L9).	2	Moved 29.5 acres previously in Glen Burnie High 295 WPZ to the Airport Square 350 WPZ (Grid I8). This Water Pressure Zone boundary change was made to maximize system efficiency and to provide adequate pressure to the area.
S-2/W-2	-	No Changes	3	Moved 13.5 acres previously in Glen Burnie Low 220 WPZ to the Glen Burnie High 295 WPZ (Grid M6). This Water Pressure Zone Boundary change is to clarify the service coverage.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-2/W-2	3	Changed 4.88 acres from the No Public Sewer Service Category to the Existing Sewer Service Category for Tax Map 22, Block 1, Parcels 28 (Lot 2R), 500 and 498 (8225 Quarterfield Rd, Severn 21144); and moved the area from the Rural SSA to the Patuxent SSA (Grid J10). This change is to correct previous mapping errors and reflect that the area is currently utilizing public sewer utilities. The area is zoned RLD and is located in the General Development Plan's Neighborhood Preservation Development Policy Area	4	Moved 33.3 acres previously in Airport Square 350 WPZ to the Glen Burnie High 295 WPZ (Grids H9, H10, I10). This Water Pressure Zone boundary change was made to maximize system efficiency and to provide adequate pressure to the area.
S-3/W-3	-	No Changes	5	Changed 28.03 acres in the Glen Burnie Low 220 WPZ from the Future Water Service Category to the Existing Water Service Category for Tax Map 16, Block 22, Parcel 886 (Lots 44, 45, 46); and Tax Map 23, Block 4, Parcels 50, 151, 497, 526, 766, 803, and Block 5, Parcel 58 (Grids O10, P10). This change is to correct previous mapping errors and reflect that the area is currently utilizing public water utilities. The area is zoned (C1, C3, R1, R2, and OS) and is located in the General Development Plan's Neighborhood Preservation Development Policy Area.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-3/W-3	-	No Changes	6	Changed 28.03 acres from the No Public Water Service Category to the Existing Water Service Category for Tax Map 17, Block 22, Parcel 395 and Tax Map 24, Block 4, Parcels 34, 38 (Lots 1, and 2), 39 (Lot 1), 42 (Lots A, B and C), 537 and 713; and moved the Rural WPZ boundary to include this area in the Glen Burnie Low 220 WPZ (Grid S10). This change is to correct previous mapping errors and reflect that the area is currently utilizing public water utilities. The area is zoned R1 and is located in the General Development Plan's Neighborhood Preservation Development Policy Area.
S-4/W-4	4	Changed 1.29 acres from the No Public Sewer Service Category to the Existing Sewer Service Category for Tax Map 30, Block 1, Parcel P.43 (1311 Bluegrass Way, Gambrills, 21054); and moved the area from the Rural SSA to the Patuxent SSA (Grid J13). This change is to correct previous mapping errors and reflect that the area is currently utilizing public sewer utilities. This area is zoned R2 and is within the General Development Plan's Neighborhood Preservation Policy Area	7	Moved 33.2 acres previously in the Glen Burnie High 295 WPZ to the Kings Heights/Odenton 330 WPZ (Grids I10, J10, I11, J11). This Water Pressure Zone boundary change was made to maximize system efficiency and to provide adequate pressure to the area.
S-4/W-4	5	Changed 10.81 acres from the Planned Sewer Service Category to the Other Sewer Service Category in the Maryland City SSA, for Tax Map 20, Block 15, Parcel P.96 (3285-3299 Laurel Fort Meade Rd, 20724) (Grid D12). This change is to reflect the current status of this site within the Fort Meade non-County system.	-	No Changes

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-5/W-5	6	Changed 18.97 acres of the Future Sewer Service Category to the Planned Sewer Service Category in the Broadneck SSA for Tax Map 23, Block 18, Parcels P.252 (Lots 2 and 3), P.344, P.819 (Lot 1) (Grids P11, P12, Q11). This change is in accordance with an amendment request that has been recommended for approval. Capacity is currently available and connection to public sewer is feasible.	-	No Changes
S-5/W-5	7	Changed 29.44 acres from the Future Sewer Service Category to the Planned Service Category in the Broadneck SSA for Tax Map 32, Block 22, Parcels 180, 181; Tax Map 39, Block 04, Parcels 56, 57, and 58. This change is in accordance with an amendment request that has been recommended for approval. Capacity is currently available and connection to public sewer is feasible.	-	No Changes
S-6/W-6	8	Changed 5.9 acres from the Planned Sewer Service Category to the No Public Service Category for Tax Map 36, Block 21, Parcel 107 (2751 Conway Rd, Odenton, 21113); and moved the Patuxent SSA boundary to include this area in the Rural SSA (Grids G16, G17). This change is to correct previous mapping errors and reflects the existing conditions of the site which is developed on a septic system, zoned RA and is located in the General Development Plan's Rural and Agricultural Development Policy Area.	8	Moved 12.7 acres previously in the Kings Heights/Odenton 330 WPZ to the Crofton 290 WPZ (Grids J16, I17). These Water Pressure Zone boundary changes were made to reflect the correct zone for the water main alignments, added water mains, and division valve adjustments.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-6/W-6	-	-	9	Changed 7.0 acres from the No Public Sewer Service Category to the Planned Sewer Service Category; and moved the Rural SSA to include this area in the Crofton 290 WPZ for Tax Map 42, Block 11, Parcel 46 (Grids H18, I18). This change is to correct previous mapping errors and reflect that the area is currently utilizing public water utilities.
S-6/W-6	-	No Changes	10	Moved 22.9 acres previously in Broad Creek 210 WPZ to City of Annapolis. This Water Pressure Zone Boundary change is to clarify the service coverage.
S-7/W-7	9	Changed 2.01 acres of the Future Sewer Service Category to the Existing Sewer Service Category within the Annapolis SSA for Tax Map 50, Block 18, Parcel P.47 (Lot 7) (95 Speicher Dr, Annapolis, 21401) (Grids P21, Q21). This change is to correct previous mapping errors and reflect that the area is currently utilizing public sewer utilities. The parcel is zoned R5 and is located in the General Development Plan's Neighborhood Preservation Policy Area.	11	Changed 14.27 acres from the No Public Water Service Category to the Existing Water Service Category in the Broad Creek WPZ and Heritage Harbor Sub-WPZ for Tax Map 44, Block 21, Parcel 99; and Block 22, Parcels 87 (Lot 1), 234 (Lot 2) and 235 (Lot 3) (Grid O19). This change is to correct previous mapping errors and reflect that the area is currently utilizing public water utilities.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map #	Sewer Change #	Sewer Map Changes	Water Change #	Water Map Changes
S-7/W-7	10	Changed 2.72 acres of the Future Sewer Service Category to Existing Service within the Broadneck SSA for Changed 2.72 acres of the Sewer Service Category, Future Service, to Existing Service, within the Broadneck SSA for Tax Map 41, Block 20, Parcel 93 (1036 E College Pkwy, Annapolis 21409) (Grid Y17). This change is to correct previous mapping errors and reflect that the area is currently utilizing public sewer utilities. The site is zoned R1 and is located in the General Development Plan's Peninsula Policy Area.	-	No Changes
S-8/W-8	-	No Changes	-	No Changes
S-9/W-9	-	No Changes	-	No Changes
S-10/W-10	-	No Changes	-	No Changes
S-11/W-11	-	No Changes	-	No Changes
S-12/W-12	11	Changed 0.37 acres of the No Public Sewer Service Category to the Existing Sewer Service Category for Tax Map 82, Block 8, Parcel 8, (Lots 1 and 4) (Grid R38). This change is to correct previous mapping errors and reflect that the area is currently utilizing public sewer utilities. The area is zoned R2 and is in the General Development Plan's Neighborhood Preservation Policy Area.	-	No Changes

C. Sewer Facility and Main Changes

MAP	GRID	Description of Changes
S-1	H4	No change to planned service Ridge Road Merritt SPS.
S-1	H4	No change to planned service FM for Ridge Road Merritt SPS.
S-1	H4, I4	No change to existing gravity sewer mains for Ridge Road 7031.
S-1	I2, I3, J2, K2, L2, M1, M2	No change to Baltimore County Interceptor.
S-1	I3	No change to capital facilities service pipe size upgrade for Stoney Run gravity sewer modifications.
S-1	J2	Added capital facilities upgrade to Linthicum/Shipleigh SPS.
S-1	J2	No change to future service expansion of Linthicum/Shipleigh (Calloway Branch) SPS.
S-1	J3	No change to planned service pipe size upgrade for Element Mixed Use Dev Off Site Sewer.
S-1	J3	No change to planned service pipe size upgrade.
S-1	J3	No change to future service pipe size upgrade per CSSP recommendation.
S-1	J3	Added repair of 10in gravity sewer downstream of MH 7297.
S-1	J3, J4	Added planned gravity service upgrade of existing for Element Mixed Use Dev Off Site Sewer.
S-1	K3	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-1	L2	No change to Patapsco SPS (Baltimore County)
S-1	L2	Changed future service expansion of Patapsco Park SPS to capital facilities upgrade.
S-1	L2	No change to capital facilities service upgrades to Patapsco SPS.
S-1	L2	No change to future service expansion of Patapsco SPS.
S-1	L2	No change to future service expansion of Patapsco Park SPS.
S-1	L2	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-1	L3	No change to future service pipe size upgrade per CSSP recommendation.
S-1	L4	No change to future service expansion of Cabin Branch SPS.
S-1	M1, N1, N2,O2	No change to Baltimore City Interceptor.
S-1	M4	No change to future service expansion of Harris Heights SPS.
S-1	M4	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-1	M5	No change to capital facilities service upgrade of existing gravity sewer for Furnace Branch Sewer Replacement.
S-1	N2	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-1	N3	Changed planned service Cedar Hill SPS to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-1	N3	Added planned service for Cedar Hill.
S-1	N3	Changed from planned service force main to existing for Cedar Hill.
S-1	N3	Changed from planned service gravity to existing for Cedar Hill.
S-1	N5	No change to future service expansion of Ordinance Road SPS.
S-1	O4	No change to future service expansion of Price Club (G.S.A. Depot) SPS.
S-1	O5	No change to capital facilities service expansion of Marley Avenue SPS.
S-1	Q4	Added capital facility upgrades to Marley Neck SPS.
S-1	Q4, R4	No change to future service forcemain to service future SPS per CSSP recommendation.
S-1	R4	No change to future service SPS per CSSP recommendation.
S-1	R5	No change to future service SPS per CSSP recommendation.
S-1, S-2	F5, G5, H3, H4, H5, I3	No change to Deep Run Interceptor.
S-1, S-3	P5, P6	No change to planned service gravity sewer for Tanyard Cove North subdivision.
S-1, S-3	P5, P6, Q5	Added planned service for Tanyard Cove North.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-1, S-3	Q5, R5	No change to future service forcemain to service future SPS per CSSP recommendation.
S-2	B10	No change to future service SPS per CSSP recommendation.
S-2	B10	No change to future service forcemain to service future SPS per CSSP recommendation.
S-2	C10	No change to future service expansion of Russett II SPS.
S-2	C10	Added planned gravity sewer extension for Annapolis Junction Bus Pk.
S-2	D7, D8	Changed from planned service to existing for Magnolia Creek SPS.
S-2	D7, D8, E7, E8	Added planned gravity service for Magnolia Creek
S-2	D9	Added Brock Bridge Landing Planned SPS.
S-2	D9, E9	Added Brock Bridge Landing Planned forcemain.
S-2	E6, F5, F6	No change to Licking Creek Interceptor.
S-2	E8	No change to planned service sewer pump station for Chestnut Avenue subdivision.
S-2	E8	No change to planned service forcemain for planned Chestnut Avenue SPS.
S-2	E8	Changed from planned gravity service to existing for Shannons Glen Off-Site Sewer.
S-2	E8	Added existing service for Shannons Glen Subdivision.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-2	E9	Changed planned service Parkside SPS to existing.
S-2	E9	Added planned gravity service for Parkside.
S-2	E9	Changed from planned service to existing forcemain for Parkside Mixed Use Development.
S-2	E9	Added Brock Bridge Landing Planned Gravity Sewer.
S-2	E9, F9, K9	Added planned service gravity sewer mains for Parkside subdivision.
S-2	F9	Added planned service force main for MD Route 175 RidgeView Plaza to Disney Rd FM
S-2	F9	Changed future service gravity sewer per CSSP recommendation to existing.
S-2	F9	Changed planned service gravity sewer mains for Parkside Community Center Mixed Use Development to existing.
S-2	F9	Changed planned service gravity sewer mains for Parkside Phase 2 Subdivision to existing.
S-2	H10	Added capital project to extend sewer service along Reece Rd.
S-2	H10	Changed planned service gravity sewer for Arundel Forest to existing.
S-2	I7	Changed future service to planned service expansion of State Highways SPS.
S-2	I8	Added planned gravity service upgrade for Sandy Farms.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-2	I9	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-2	I9, I10	No change to future service gravity sewer per CSSP recommendation.
S-2	J10	No change to capital facilities service upgrades to Clark Heights SPS.
S-2	J10	No change to capital facilities service upgrades to Ridgeway SPS.
S-2	K10	Changed planned service Magnolia Creek SPS to existing.
S-2	K7	Changed capital facilities service upgrades to Quarterfield Crossing SPS to existing.
S-2	K7, L7	No change to future service gravity sewer per CSSP recommendation.
S-2	K9	Added capital facility decommissioning of Evergreen Commons SPS.
S-2	K9	No change to planned service abandonment of Quarterfield School SPS.
S-2	K9	No change to future service gravity sewer mains for Cayuga Farms.
S-2	K9	Added planned service gravity sewers for Handschuh-Happel property subdivision.
S-2	K9	No change to planned service gravity sewers for Handschuh-Happel property subdivision.
S-2	K9, L9	Added future gravity service as part of the North County Sewer Strategic Plan.
S-2	L08	No change to capital facilities service upgrades to Park West SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-2	L5	No change to future service pipe size upgrade per CSSP recommendation.
S-2	L5	Added capita facility replacement of MH & adjacent gravity sewer for Homer Ave/Oakleigh Ave.
S-2	L6	No change to future service pipe size upgrade per CSSP recommendation.
S-2	L7	No change to future service pipe size upgrade per CSSP recommendation.
S-2	L9	No change to future service SPS to potentially divert flows from Cox Creek SSA to Broadneck SSA per CSSP recommendation.
S-2	L9	No change to future service pipe size upgrade per CSSP recommendation.
S-2	L9, L10	No change to future service forcemain to service future SPS to divert flows from Cox Creek SSA to Broadneck SSA.
S-2	M5	No change to future service pipe size upgrade per CSSP recommendation.
S-2	M6	No change to future service pipe size upgrade per CSSP recommendation.
S-2	M6	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-2	M7	No change to future service pipe size upgrade per CSSP recommendation.
S-2	M7	Added capital facility gravity sewer upgrade for Glen Burnie Sewer Upsizing.
S-2	M7	Added capital facility gravity sewer upgrade for Glen Burnie Sewer Upsizing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-2	M7	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-2	M9	No change to future service pipe size upgrade per CSSP recommendation.
S-2	N06	Added capital facilities upgrades to Shoreland Dr SPS.
S-2	N5	Changed capital facilities service expansion of Cinder Cove SPS to existing.
S-2	N5	No change to future service pipe size upgrade per CSSP recommendation.
S-2	N6	Changed capital facilities service upgrades to Margate SPS to existing.
S-2	N6	No change to future service pipe size upgrade per CSSP recommendation.
S-2	N8	No change to future service pipe size upgrade per CSSP recommendation.
S-2	N8	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-2	N8, N9	No change to future service pipe size upgrade per CSSP recommendation.
S-2	O5	Added capital facility upgrades to 7th Avenue SPS.
S-2, S-3	N10, O10	No change to future service gravity main.
S-3	O10	No change to future service gravity sewer.
S-3	O6	Changed future service for Runabout Cove to planned service for Brewers Island SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-3	O6	No change to capital facilities service upgrades to Bell Avenue SPS.
S-3	O6	No change to capital facilities service upgrades to Country Club Estates SPS.
S-3	O6	No change to planned service Tanyard Shores SPS.
S-3	O6	Changed future service forcemain to planned service for Brewers Island SPS.
S-3	O6, P6	No change to planned service FM for Tanyard Shores SPS.
S-3	O9	Added planned gravity service for Creekstone Village.
S-3	O9	No change to existing private force main for Festival at Pasadena.
S-3	P10	No change to future service SPS per OSDS Study results.
S-3	P10	No change to future service gravity sewer.
S-3	P5, Q5	No change to planned service gravity sewer mains for Green Ridge Manor subdivision.
S-3	P6, O6	Added planned gravity service for Tanyard Shores.
S-3	P7, Q7	No change to future service forcemain to service future SPS per CSSP recommendation.
S-3	P8, Q8	Added capital facility project for new 6in DIP FM from MH 503117-501821.
S-3	Q08	No change to future service expansion of Aspen Park SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-3	Q10	No change to future service SPS per OSDS Study results.
S-3	Q10, R10	No change to future service forcemain to service future SPS per OSDS Study results.
S-3	Q5	Added capital facility upgrade of Ft. Smallwood Gravity Sewer System.
S-3	Q6	No change to future service expansion of Chestnut Hill Cove SPS.
S-3	Q6, Q7	No change to future service forcemain to service future SPS per CSSP recommendation.
S-3	Q7	No change to future service SPS per CSSP recommendation.
S-3	Q7	No change to future service Locust Grove SPS.
S-3	Q7	No change to future service SPS per CSSP recommendation.
S-3	Q7	No change to future service forcemain to service future Locust Grove SPS.
S-3	Q7	No change to future service forcemain to service future SPS per CSSP recommendation.
S-3	Q8	Changed future service expansion of Glen Avenue SPS to capital facility upgrade.
S-3	Q8	No change to capital facilities expansion of Stonehaven SPS.
S-3	Q8	Changed capital facilities service upgrades to Silver Sands SPS to existing.
S-3	Q8	No change to future service pipe size upgrade per CSSP recommendation.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-3	Q9	No change to future service expansion of Schramms Crossing SPS.
S-3	Q9	Changed capital facilities FM replacement to existing for Schramms Crossing.
S-3	Q9	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-3	R6	Changed Cox Creek WRF (15) to existing.
S-3	R6	Added capital facility project to Cox Creek WRF.
S-3	R6	No change to capital facilities service upgrades to Waterview SPS.
S-3	R6	Added capital facility upgrades to Harbor Dr SPS.
S-3	R6	Added capital facility upgrades to Sea Breeze SPS.
S-3	R7	Added capital facility upgrades to Carvel Beach SPS.
S-3	R7	Added capital facility upgrades to Stoney Creek SPS.
S-3	R7	Added capital facility upgrades to Sunset Beach SPS.
S-3	R7	Changed capital facilities service upgrades to Lombardee Beach SPS to existing.
S-3	R8	No change to capital facilities service upgrades to Pine Haven SPS.
S-3	R8	No change to capital facilities service upgrades to Mount Pleasant Beach SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-3	R8	Changed future service expansion of Pinehaven SPS to existing.
S-3	R9	Changed capital facilities service upgrades to Tick Neck Road SPS to existing.
S-3	R9	No change to future service pipe size upgrade per CSSP recommendation.
S-3	R9	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-3	S6	No change to capital facilities service upgrades to Bay Drive SPS.
S-3	S6	Added capital facility upgrades to Meadow Lane SPS.
S-3	S7	No change to capital facilities service upgrades to Arundel Road SPS.
S-3	S7	No change to capital facilities service upgrades to Bar Harbor I SPS.
S-3	S7	No change to capital facilities service upgrades to Bar Harbor II SPS.
S-3	S7	Added capital facility upgrades to Park Road SPS.
S-3	S7	Added capital facility upgrades to Sandy Beach SPS.
S-3	S-7	Changed capital facilities service upgrades to Riviera Beach SPS to existing.
S-3	S8	Added capital facility upgrades to Valley Rd SPS.
S-3	T7	Added capital facility upgrades to Creek Road.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-3	X9	No change to Bodkin Point WRF (0.007).
S-3	X9	Added capital facilities project to Bodkin Point WRF.
S-3, S-5	P10, P11	No change to future service gravity sewer per OSDS Study results.
S-3, S-5	P10, Q10	No change to future service forcemain to service future SPS per OSDS Study results.
S-3, S-5	Q9, Q10, R9	No change to future service forcemain to service future SPS per OSDS Study results.
S-4	A11	Changed capital facilities to existing for Brock Bridge Rd Sewer Replacement.
S-4	A12	No change to capital facilities service upgrades to Maryland City SPS.
S-4	A13	Changed capital facility capacity expansion to existing & added capital facility Dewatering (S800601).
S-4	C11	Added capital facility upgrades to Little Patuxent SPS.
S-4	C12, D12	Added planned service for Arundel Gateway.
S-4	G14	No change to capital facilities service ENR upgrades to Piney Orchard WRF.
S-4	H11	No change to future service pipe size upgrade per CSSP recommendation.
S-4	H11	No change to planned service gravity sewers for Odenton Town Center at Seven Oaks Subdivision.
S-4	H12	Changed planned service gravity sewer for Jefferson at Odenton Town Center Subdivision to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-4	H12	Changed planned service gravity sewer for Broadstone at Odenton to existing.
S-4	H12	Changed planned service gravity sewer for Odenton Town Center Commons to existing.
S-4	H12, H13	No change to future service forcemain to service future SPS per CSSP recommendation.
S-4	H13	No change to future service SPS per CSSP recommendation.
S-4	I11	No change to capital facilities expansion of Severn Run SPS.
S-4	I11	No change to future service upgrades to Severn Run SPS.
S-4	I13	No change to future service pipe size upgrade per CSSP recommendation.
S-4	I14	No change to future service pipe size upgrade per CSSP recommendation.
S-4	I15	No change to future service pipe size upgrade per CSSP recommendation.
S-4	I15, J15	No change to future service gravity main for future Route 3 SPS and force main.
S-4	K15	No change to future service SPS per CSSP recommendation.
S-4	M11	Added capital facilities upgrades to OPS Bldg.
S-4	M11, M12	Added existing 3" force main for I-97 Business Park Pump Station.
S-4	M12	Changed capital facilities service upgrades to Ben Oaks SPS to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-4	M12	Added planned gravity service for Shipley's Choice Dam Rehab.
S-4	M12	Added capital project extension of gravity sewer service for Point Field Landing WW Extension.
S-4	M12, N12	No change to future service pipe size upgrade per CSSP recommendation.
S-4	N10	No change to planned service forcemain for planned Solomons Choice SPS.
S-4	N10, N11	No change to planned service gravity mains for Solomons Choice subdivision.
S-4	N11	No change to future service expansion of Shipley's Choice SPS.
S-4	N11	No change to future service SPS per OSDS Study results.
S-4	N11	Changed planned service Solomons Choice SPS to existing.
S-4	N11	No change to future service forcemain to service future SPS per OSDS Study results.
S-4	N12	No change to future service SPS per OSDS Study results.
S-4	N12	No change to future service pipe size upgrade per CSSP recommendation.
S-4	N12	No change to future service gravity main per OSDS Study results.
S-4	N12, N13	No change to future service forcemain to service future SPS per CSSP recommendation.
S-4	N12, O12	No change to future service gravity main per OSDS Study results.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-4	N12, O12	No change to future service forcemain to service future SPS per OSDS Study results.
S-4	N13	No change to future service SPS per CSSP recommendation.
S-4, S-6	J15, J16	Added planned gravity service for Waugh Chapel/MD Route 3 N.
S-4, S-6	J15, J16, K15	No change to future service Route 3 forcemain to service future SPS.
S-4, S-5	N12, O12	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	P11	No change to future service expansion of Brittingham SPS.
S-5	P11	Added planned service expansion of Brittingham SPS.
S-5	P12	Added capital facility replacement of manhole & adjacent gravity sewer for Truck House Rd.
S-5	P14	Changed capital facilities service upgrades to Boones Trail SPS to existing.
S-5	Q10, Q11, Q12	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	Q11, R11	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	Q12	No change to future service SPS per OSDS Study results.
S-5	Q12	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	Q13	Added capital facility construction of 4in FM from Cedar Rd SPS to MH 2429.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-5	Q13, R13, R14, R15, S15	Added capital facility upgrade of force main for Cattail Creek Rt 2 FM Replacement.
S-5	Q14	No change to future service expansion of Round Bay I SPS.
S-5	Q14	No change to future service expansion of Round Bay II SPS.
S-5	R10, R11	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	R11	No change to future service SPS per OSDS Study results.
S-5	R12	No change to future service expansion of Fair Oaks SPS.
S-5	R12	No change to future service expansion of Whitehurst SPS.
S-5	R12, S12	Added planned gravity sewer for Maple Rd WW extension.
S-5	R14	No change to future service expansion of Round Bay III SPS.
S-5	R9, S10, S11	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	S11	No change to future service SPS per OSDS Study results.
S-5	S11	No change to future service forcemain to service future SPS per OSDS study results.
S-5	S11	No change to future service gravity main per OSDS Study results.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-5	S12	No change to future service SPS per OSDS Study results.
S-5	S12	No change to future service forcemain to service future SPS per OSDS study results.
S-5	S12, S13	Added planned service LP main for Maple Rd WW extension.
S-5	S14	Changed capital facilities service upgrades to Haskell Road SPS to existing.
S-5	S14	Changed capital facilities service upgrades to Divinity Cove SPS to existing.
S-5	S14	Added existing gravity service for Haskell Road.
S-5	S15	No change to future service SPS per OSDS Study results.
S-5	S15	Added capital facility upgrades to Mill Creek SPS.
S-5	S15	No change to future service upgrades to Mill Creek SPS.
S-5	S15	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	S15	Added future service forcemain to service future SPS per OSDS Study results.
S-5	T12	No change to future service SPS per OSDS Study results.
S-5	T12	No change to future service forcemain to service future SPS per OSDS study results.
S-5	T14	Changed capital facilities service expansion of Doris Drive SPS to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-5	T15, U15	Changed capital facilities service re-alignment of Forked Creek force main to existing.
S-5	U14	No change to future service SPS per OSDS Study results.
S-5	U14	No change to future service expansion of Ulmstead Estates SPS.
S-5	U14, V14	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	U14/U15	Added capital facility extension of gravity sewer along Bayberry Dr.
S-5	U15, V15	No change to future service forcemain to service future SPS per OSDS Study results.
S-5	V14	No change to future service SPS per OSDS Study results.
S-5	V15	No change to future service SPS per OSDS Study results.
S-5	V15	Added future service expansion of Bay Hills SPS.
S-5	V15	No change to future service expansion of Cape St. Claire V SPS.
S-5	V15	Changed capital facilities expansion of Bay Hills SPS to existing.
S-5	W15	No change to future service expansion of Cape St. Claire VIII SPS.
S-5	W15	No change to future service expansion of Cape St. Claire IV SPS.
S-5	W15	Added capital facility upgrade to Cape St. Claire X SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-5	W15	No change to future service expansion of Cape St. Claire X SPS.
S-5	W15	No change to future service forcemain to service future SPS per CSSP recommendation.
S-5	X15	No change to future service Beacon View SPS per OSDS Study results.
S-5, S-7	R15, R16, S15	No change to future service forcemain to service future SPS per OSDS study results.
S-5, S-7	S15, S16	No change to future service gravity main per OSDS Study results.
S-5, S-7	S15, S16, S17	No change to future service forcemain to service future SPS per OSDS study results.
S-5, S-7	X15, X16	No change to future service forcemain to service future SPS per OSDS study results.
S-6	G16	Added planned gravity service for Two Rivers.
S-6	G16, G17	Changed planned service gravity sewer for Two Rivers Subdivision to existing.
S-6	G17	No change to planned service Two Rivers SPS #3.
S-6	G17	No change to planned service forcemain to service planned Two Rivers SPS #3.
S-6	G17, F17	Added existing service forcemain for Two Rivers SPS 700334.
S-6	G17, G18, H17, H18	No change to planned service forcemain to service planned Two Rivers SPS #1.
S-6	G18	No change to planned service Two Rivers SPS #1.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-6	H17	Changed capital facilities service expansion from 3.5MGD to 3MGD, and total plant capacity to 10.5MGD to existing.
S-6	H17	Added capital facility upgrades to Patuxent WRF including clarifier rehab, Chlorine Room Renovation (S802367), Dewatering (S800601), & AWT Pilot (X764270).
S-6	H18	Changed planned service sewer pump station for Riverwalk at Crofton subdivision to existing.
S-6	H18	Change from planned service to existing forcemain for Riverwalk at Crofton.
S-6	H18, I18	Added planned gravity service for Riverwalk at Crofton.
S-6	H19	No change to capital facilities service upgrades to Pigeon House SPS
S-6	H19	No change to future service expansion of Pigeon House SPS.
S-6	H19, I19	Added capital facility 4in FM replacement between Pigeon House SPS & Gable Ct.
S-6	I16	No change to capital facilities service upgrades to Storch Property SPS.
S-6	I16	No change to future service expansion of Storch Property SPS.
S-6	I16	Added planned gravity service for Waugh Chapel Bus Ctr Ph 1.
S-6	I16, J17	No change to future service pipe size upgrade per CSSP recommendation.
S-6	I17	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-6	I17, J17	No change to future service pipe size upgrade per CSSP recommendation.
S-6	I18	No change to capital facilities service upgrades to Crofton SPS.
S-6	I18	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-6	I19	Changed from future service to existing.
S-6	J15, J16	No change to existing gravity sewer for Main Street @ Waugh Chapel.
S-6	J17	No change to future service pipe size upgrade per CSSP recommendation.
S-6	J17	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-6	J18	No change to future service pipe size upgrade per CSSP recommendation.
S-6	J18	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-6	N20	Changed capital facilities service upgrades to Heritage Harbor I SPS to existing.
S-7	O20	No change to capital facilities service expansion of Heritage Harbor II SPS.
S-7	O20	No change to future service expansion of Heritage Harbor II SPS.
S-7	P19	No change to future service SPS per CSSP recommendation.
S-7	P19, P20	No change to future service forcemain to service future SPS per CSSP recommendation.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-7	P20	No change to future service upgrades to Broadcreek (DPW & Library) SPS.
S-7	P20	No change to future service SPS per CSSP recommendation.
S-7	P20	Changed capital facilities expansion of Broadcreek (DPW & Library) SPS to existing.
S-7	P20, P21	No change to future service forcemain to service future SPS per CSSP recommendation.
S-7	Q19	No change to future service expansion of General's Hwy (Sam's Club) SPS.
S-7	Q19	Changed capital facilities gravity sewer service for Rolling Knolls to existing.
S-7	Q19	Changed capital facilities sewer force main for Rolling Knolls Elementary SPS to existing.
S-7	Q19	Changed planned service sewer pump station for Rolling Knolls Elementary to existing.
S-7	Q19	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-7	Q20	No change to capital facilities service upgrades to Riva II SPS.
S-7	R16	No change to future service SPS per OSDS Study results.
S-7	R18	No change to future service SPS per OSDS Study results.
S-7	R18	No change to future service forcemain to service future SPS per OSDS Study results.
S-7	R18, R19	No change to future service gravity main per OSDS Study results.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-7	R20	Added capital facility upgrades to Parole SPS.
S-7	S15	No change to future service SPS per OSDS Study results.
S-7	S16	No change to future service SPS per OSDS Study results.
S-7	S16	No change to future service forcemain to service future SPS per OSDS study results.
S-7	S17	No change to future service SPS per OSDS Study results and per CSSP recommendation.
S-7	S18	No change to future service SPS per OSDS Study results.
S-7	S18	No change to future service forcemain to service future SPS per OSDS study results.
S-7	S18, S19	No change to future service forcemain to service future SPS per OSDS study results.
S-7	T17	No change to future service SPS per OSDS Study results.
S-7	T17	No change to future service forcemain to service future SPS per OSDS study results.
S-7	U16	Added capital facility point for Tanglewood II Sewer Petition.
S-7	U16, U17	No change to future service forcemain to service future SPS per OSDS study results.
S-7	U17	No change to future service SPS per OSDS Study results.
S-7	U17	No change to future service expansion of Whispering Woods II SPS

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-7	U17	No change to future service forcemain to service future SPS per OSDS study results.
S-7	U17	No change to future service gravity main per OSDS Study results.
S-7	V16	Changed future service to planned service expansion of Whispering Woods I SPS.
S-7	V19	No change to existing Annapolis Naval Station WRF (Private).
S-7	W17	No change to capital facilities service Route 50 SPS.
S-7	W17	No change to capital facilities service forcemain for planned Route 50 SPS.
S-7	X15	No change to future service expansion of Cape St Claire III SPS.
S-7	X15, X16	No change to future service forcemain for Bay Head Farms SPS.
S-7	X16	No change to future service Bay Head Farms SPS.
S-7	X16	No change to future service expansion of Cape St Claire II SPS.
S-7	Y17	Added Capital Facility upgrades to Broadneck WRF for Digester Demolition (S792709), WAS Pump Room Renovation (S802371), Dewatering (S800601), & Clarifier Rehab (S807401).
S-7	Y17	Added Capital Facility upgrades to Broadneck WRF for Digester Demolition (S792709), WAS Pump Room Renovation (S802371), Dewatering (S800601), & Clarifier Rehab

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
		(S807401).
S-7, S-9	O20, O21	No change to future service forcemain to service future SPS per OSDS Study results.
S-9	O21	No change to future service SPS per OSDS Study results.
S-9	O22	No change to capital facilities service upgrades to Berkshire SPS.
S-9	O22	No change to future service SPS per OSDS Study results.
S-9	O22	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-9	O22	No change to future service forcemain to service future SPS per OSDS Study results.
S-9	O22	No change to future service gravity main per OSDS Study results.
S-9	P21	No change to future service upgrades to Cape St. John I SPS.
S-9	P21	Changed capital facilities service expansion of Cape St. John I SPS to existing.
S-9	P21	No change to future service pipe size upgrade to existing gravity sewer per CSSP recommendation.
S-9	P22	No change to future service Edgewater Beach SPS.
S-9	P22	Changed capital facilities service upgrades to Krapish SPS to existing.
S-9	P22, P23, Q22	No change to future service forcemain for Edgewater Beach SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-9	P23	No change to future service Southdown Shores SPS per sewer study.
S-9	P23	No change to future service forcemain per Southdown Shores Sewer Study.
S-9	Q21	No change to future service SPS per OSDS Study results.
S-9	Q21	Changed planned service sewer pump station for Knights of Columbus Annapolis to existing.
S-9	Q21	No change to future service forcemain to service future SPS per OSDS Study results.
S-9	Q21	No change to planned service forcemain for planned Knights of Columbus SPS.
S-9	Q22	No change to future service SPS per OSDS Study results.
S-9	Q22	No change to future service SPS per CSSP recommendation.
S-9	Q22	No change to future service forcemain to service future SPS per OSDS Study results and CSSP recommendation.
S-9	Q23	Changed capital facilities service upgrades to Holly Road South SPS to existing.
S-9	Q24	No change to future service SPS per CSSP recommendation.
S-9	Q24	No change to future service forcemain to service future SPS per CSSP recommendation.
S-9	R24	Changed capital facilities service to Glebe Heights I SPS to existing.
S-9	R25	No change to capital facilities Glebe Heights Decommission.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-9	R25	Added capital facilities upgrades to Mayo WRF.
S-9	R25	Changed Glebe Hgts I Force Main to existing service.
S-9	R26	No change to future service upgrade to River Club Estates SPS.
S-9	S21	No change to future service SPS per CSSP recommendation.
S-9	S21	No change to future service forcemain to service future SPS per CSSP recommendation.
S-9	S23, S24, S25, T22, T23	Changed capital facilities service forcemain to re-route flow from Mayo WRF to Annapolis WRF to existing.
S-9	S24	No change to capital facilities service upgrade to Loch Haven II SPS
S-9	S24	No change to capital facilities service upgrade to Loch Haven I SPS.
S-9	S25	Changed capital facilities service upgrades to Selby On The Bay II SPS to existing.
S-9	S25	Changed capital facilities service upgrades to Selby On The Bay I SPS to existing.
S-9	S26	Added capital facility upgrades to Turkey Point I SPS.
S-9	S26	Changed capital facilities service upgrades to Holly Hill I SPS to existing.
S-9	T22, U22	Changed capital facilities service forcemain to re-route flow from Mayo WRF to Annapolis WRF to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-9	T23, U23	Added existing Hillsmere VI force main.
S-9	T24	Changed capital facilities service upgrades to Hillsmere II SPS to existing.
S-9	T24	Changed capital facilities service upgrades to Hillsmere IV SPS to existing.
S-9	T24	Changed capital facilities service upgrades to Hillsmere V SPS to existing.
S-9	T26	No change to capital facilities service upgrade to Shoreham Beach I SPS.
S-9	U22	No change to future service expansion of Annapolis Roads SPS.
S-9	U22	No change to capital facilities service upgrades to add dewatering facility to Annapolis WRF. Added Truck Scale Demol (S792709), Headworks Roof Repl (S802368), & Upgrades (S807301/302).
S-9	U23	No change to capital facilities expansion of Hillsmere I SPS.
S-9	U23	No change to capital facilities expansion of Anchorage I SPS.
S-9	U23	Changed capital facilities service upgrades to Hillsmere VII SPS to existing.
S-9	U23	No change to future service pipe size upgrade per CSSP recommendation.
S-9	U24	Changed capital facilities service upgrades to Hillsmere III SPS to existing.
S-9	U25	Changed capital facilities service upgrades to Thomas Point SPS to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-9	V22	No change to capital facilities service upgrades to Bay Ridge II SPS.
S-9	V22	No change to capital facilities service upgrades to Bay Ridge VIII SPS.
S-9	V23	No change to capital facilities service upgrades to Bay Ridge V SPS.
S-9	V23	No change to capital facilities service upgrades to Bay Ridge VI SPS.
S-9	V23	No change to capital facilities service upgrades to Bay Ridge VII SPS.
S-9	V23	Added capital facility upgrades to Bay Ridge I.
S-9	V23	Changed capital facilities service upgrades to Highland Beach 2 SPS to existing.
S-9	V24	No change to capital facilities service upgrades to Arundel on the Bay V SPS.
S-9	V24	Changed capital facilities service upgrades to Arundel on the Bay II SPS to existing.
S-9	V24	Changed capital facilities service upgrades to Arundel on the Bay III SPS to existing.
S-9	V24	Changed capital facilities service upgrades to Arundel on the Bay IV SPS to existing.
S-9	V24	Changed capital facilities service facilities upgrades to Highland Beach 1 SPS to existing.
S-9	V24	Added capital facility replacement of force main for Arundel on the Bay 3.
S-9	V25	No change to capital facilities service upgrades to Arundel on the Bay I SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-9	W23	No change to capital facilities service upgrades to Bay Ridge IX SPS.
S-10	R31	Changed capital facilities service upgrades to Chalk Point SPS to existing.
S-10	R31	Added capital facility replacement of 8in DIP FM from Chalk Pt SPS to MH 10250.
S-10	S-26	No change to capital facilities service upgrades to West Shore II SPS.
S-10	S-26	No change to capital facilities service upgrades to Triton Beach SPS.
S-10	S27	Changed capital facilities service upgrade to Beverly Beach IV SPS to existing.
S-10	S30	No change to future service expansion of Lerch Drive SPS.
S-10	S30	No change to capital facilities service upgrades to West Shady Side SPS.
S-10	S30	Changed capital facilities service upgrades to Ford Road SPS to existing.
S-10	S30	Changed capital facilities service upgrades to Johnson Drive SPS to existing.
S-10	S31	No change to future service Holder Farm SPS.
S-10	S31	No change to future service forcemain to service Holder Farm Subdivision.
S-10	T26	No change to capital facilities service upgrades to West Shore I SPS.
S-10	T27	No change to capital facilities service upgrade to Shoreham Beach II SPS.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-10	T27	Changed capital facilities service upgrade to Beverly Beach II SPS to existing.
S-10	T27	Changed capital facilities service upgrade to Beverly Beach III SPS to existing.
S-10	T30	Changed capital facilities service upgrades to Avalon Shores II SPS to existing
S-10	T31	Changed capital facilities service upgrades to Cedarhurst SPS to existing.
S-10, S-11	S31	No change to future service gravity sewer mains for Holder Farm subdivision.
S-11	Q34	Changed capital facilities service upgrades to Tyler Road SPS to existing.
S-11	Q35	Added planned gravity service.
S-11	R33	No change to future service upgrades to Cape Anne SPS.
S-11	R33	Changed capital facilities service upgrades to Broadwater SPS to existing.
S-11	R33	Changed capital facilities expansion of Cape Anne SPS to existing.
S-11	R33, R34	No change to future service forcemain to service future SPS per CSSP recommendation.
S-11	R34	No change to future service SPS per CSSP recommendation.
S-11	R34	Changed capital facilities service upgrades to Main Street SPS to existing.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

MAP	GRID	Description of Changes
S-11	R34	Changed capital facilities service upgrades to Resthaven SPS to existing.
S-11	S32	Added capital facilities upgrades to Broadwater WRF including Wet Well Coating (S802356), Polymer Repl (S802365), PCS Upgrade (S802363), & Ops Bldg Addtn (S808301).
S-11	S33	Changed capital facilities service upgrades to Dartmouth SPS to existing.
S-11	T31	Changed capital facilities service upgrades to Bay Breeze SPS to existing.
S-11	T31	Added capital facility replacement of 1500ft of 12" force main.

D. Water Facility and Main Changes

Map	Grid	Description of Changes
W-1	H5	No change to future service Ridge Road ET.
W-1	J4	No change to future service Andover ET.
W-1	M3	No change to future service Brooklyn Park BPS.
W-1	M3	Changed location and service category from planned to capital facility service Belle Grove ET (formerly Cedar Tree).
W-1	J2, J3, K3	Changed from capital facility to existing service water main for Hammonds Ferry Rd, Raynor Rd, Oregon Ave, Nursery Rd, Evelyn Ave 8", Fairview Ave.
W-1	M-3, N-3	No change to planned service water main for Cedar Hill.
W-1	L3, L4	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	L3	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	M2	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	H5	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	M4	Changed from capital facility service to existing water main service for West Ordinance Rd.
W-1	K4, L4	Changed from capital facility to existing service water main per recommendation from the 2015 Water Strategic Plan.
W-1	J2, J3	Changed from capital facility to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	M2, M3	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1	M2	Changed from Capital Facility to existing water mains for North County Water Main Improvements. (Belle Grove Rd & 10th Ave)
W-1	M3	No change to capital facility water mains for North County Water Main Improvements. (Bon Air Ave)
W-1	M3	No change to capital facility water mains for North County Water Main Improvements. (Hammonds Ln)
W-1	H4, H5	Changed from future service to planned service water main per recommendation from the 2015 Water Strategic Plan.
W-1	M3	Added planned service water main for 6051 Olson Road & Holy Cross Road.
W-1	H5	Added future service water main interconnection per DPW recommendation.
W-1, W-2	I5, J5, K5, K6, L6	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1, W-2	K4, K5, K6, L6	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1, W-2	L6, M5, M6	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1, W-2	H5	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-1, W-2	H5, H6	Added planned service water main for Liberty Ridge I.
W-1, W-3	P5	Changed from planned to existing water main for Tanyard Cove North subdivision. Spatially adjusted to reflect changes in latest set of plans.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-2	L6	No change to future service Dorsey BPS Expansion.
W-2	L7	No change to future service Dorsey BPS.
W-2	H5	No change to capital facility service water main for Hanover Road corridor.
W-2	H7, H8	No change to future service water main for the 2003 Comprehensive Water Strategic Plan.
W-2	I7, I8	Changed from planned to existing water main south of Dorsey Road along Telegraph Road.
W-2	H9, H10, I10	No change to planned service water main for Crossland Farm (Arend Cora Property) subdivision.
W-2	I9	Changed from planned to existing service water main for Reece Road Property subdivision.
W-2	H9, I9	No change to future service water main per CWSP recommendation.
W-2	N9	Changed from capital facility to future service water main for Hospital Drive.
W-2	I7	Changed from planned to existing service water main for Buckingham Mixed Use Development.
W-2	H9, I9	Changed from capital facility to future service water main for service to the proposed Meade Village ET. Spatial adjustment to remove areas that are now existing.
W-2	L10, M10	Changed from capital facility to existing service water main for the Phirne Rd to Patriot Lane portion of East West transmission main.
W-2	F8	Changed from planned service to existing water main for the Enclave at Arundel Preserve Phase 2.
W-2	H9, H10	No change to planned service water main for Broadstone At Odenton.
W-2	F8, G8	Changed from planned to future service water main for the Arundel Mills Water Study.
W-2	F8	No change to planned service water main for Arundel Preserve Phase 2 Parcel 10.
W-2	L8, L9, M8	No change to capital facility service water main per recommendation from the 2015 Water Strategic Plan.
W-2	L7, L8	Changed from future to capital facility water main for water transmission main - Crain Hwy to Dorsey WTP/BPS as part of East West TM. (2015 WSP).
W-2	L7	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	L8	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	E8	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	H6	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	L9, L10, M10	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	I9	Changed from planned to existing water main for 1023 Reece Road Property.
W-2	F8	Changed from planned to existing water main for Arundel Preserve Phase 2 Infrastructure.
W-2	G8, G9, H9	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	I8, I9, J9	No change to future service water main per recommendation from the 2015 Water Strategic Plan.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-2	J10	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2	I9	Added planned service water main for Wolfepack, LLC.
W-2	E9	Added planned service water main for Parkside Phase 3 & 4.
W-2	H10	Added planned service water main for Reece Road.
W-2	I6	Added planned service water main for Airline Maintenance Facility Site Preparation.
W-2	C10	Added planned service water main for Annapolis Junction Business Park.
W-2	L8, L9, M8	No change to capital facility service water main per recommendation from the 2015 Water Strategic Plan.
W-2	L8, L9, M8	No change to capital facility service water main per recommendation from the 2015 Water Strategic Plan.
W-2, W-3	M8, M9, N9, N10, O10	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2, W-4	M10, N10, O10, O11, N11	Changed from planned to future service water main for connection to 295 pressure zone.
W-2, W-4	N10, N11	Changed from planned to existing water main for Solomon's Choice.
W-2, W-4	L9, L10, L11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2, W-4	H12, I10, I11, I12, J9&10, K9, L9, I10, I11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2, W-4	K8, K9, L8, L9, L10, L11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-2, W-4	A10, A11	Added capital facility water main for Whickey Bottom Road/Howard County water system connector.
W-3	S9	Changed from capital facility to existing service Ft. Smallwood ET.
W-3	P8	No change to future service Freetown ET.
W-3	P5, P6	No change to planned service water main for Tanyard Cove South subdivision. One section is now existing.
W-3	O7	No change to planned service water main for Holly Ridge.
W-3	O7	No change to planned service water main for Woodvale Resubdivision.
W-3	Q6	Changed from future to existing service water main per recommendation from the 2015 Water Strategic Plan.
W-3	P6	No change to planned service water main for Symphony Village at Tanyard Cove.
W-3	P6	Changed from planned to existing service water main for Symphony Village at Tanyard Cove.
W-3	Q6	Changed from capital facility service to existing service water main for Tanyard Springs Lane water main extension.
W-3	P6	No change to planned service water main for Symphony Village at Tanyard Cove.
W-3	O10	No change to future service water main per recommendation from DPW.
W-3	O9, P9	Changed from future to capital facility - Mountain Rd SHA water main relocation. (2015 WSP).

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-3	O9, O10	Changed from planned to existing water main for Creekstone Village multifamily apartment development.
W-3	Q6	Added planned service water main for Chesapeake's Brandon Woods III.
W-3	S10	Added planned service water main for Mountain Road Property.
W-3, W-5	O10, P10, P11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	B12	No change to future service New MD City ET.
W-4	H13	No change to future service Kings Heights II ET.
W-4	L11	No change to future service Millersville WTP.
W-4	D12	No change to future service Laurel Heights BPS.
W-4	M11	No change to future service Shipley's Choice BPS.
W-4	D12	No change to capital facility service Bacontown ET.
W-4	D12	Changed from future to planned service Laurel Heights BPS.
W-4	A10, A11, B10	Changed from planned to existing service water main for Fieldstone subdivision.
W-4	B11	No change to planned service water main for Brockbridge subdivision.
W-4	N10, N11	Changed from planned to existing water main for Solomons Choice.
W-4	H12	No change to planned service water main for The Village at Odenton Station subdivision.
W-4	B11	Changed from planned to capital facility service water main for Bacontown ET connection.
W-4	G11, G12, H12	No change to planned service water main for Berger Square.
W-4	H11	No change to planned service water main for Odenton Town Center at Seven.
W-4	H12	No change to planned service water main for Odenton Town Center subdivision.
W-4	J16	Added existing service water mains for Main Street at Waugh Chapel.
W-4	G15, H15	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	I13, I14	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	B11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	I13	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	H12	Changed from planned service to existing water main for Broadstone at Odenton.
W-4	D12, E12, F12, G12, H12	No change to capital facility service water main per recommendation from the 2015 Water Strategic Plan.
W-4	H13	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	H14, I14	No change to future service water main per recommendation from the 2015 Water Strategic Plan.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-4	N11, N12	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	B11	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4	I15, J15, I16	Changed planned to existing water main for Summerfield Village.
W-4	J-5	Added existing service water main for 810 MD Rt 3 that has not been deployed in the existing layer.
W-4	D12	Added planned service water main for Liberty Valley.
W-4	D12	Added planned service water main for Arundel Gateway Part 1.
W-4	D12	Added planned service water main for Arundel Gateway, Watershed Lot 3R & 3RR.
W-4, W-6	K14, K15, J15, J16	Changed from planned to future service water main for Route 3 corridor.
W-4, W-6	M11-13, L11, L13&14, M15,16,17,N16, N18	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-4, W-6	K14, K15, J15, J16	Changed from future to existing service water main for Route 3 corridor.
W-4, W-6	K14, K15, J15, J16	Changed to planned service from future Service water main for Route 3 corridor.
W-5	S15	No change to future service AA Community College ET.
W-5	X12	No change to future service Gibson Island WTP.
W-5	S14, S15, T15	No change to future service water main per recommendation from the 2015 Water Strategic Plan
W-5	Q14	No change to future service water main per recommendation from the 2015 Water Strategic Plan
W-5	S15	No change to future service water main per recommendation from the 2015 Water Strategic Plan
W-5	X13	Changed from capital facility to existing service water main for Banbury Road.
W-5	Q11	No change to capital facility water main for Magothy Bridge Rd isolation of 24" & 36" WTM.
W-5, W-7	V15, W15, W16	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-5, W-7	S15, S16	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-6	J17	No change to future service Crofton Meadows II Expansion.
W-6	F16	Changed from planned to existing service Two Rivers ET.
W-6	J17	No change to capital facility service Crofton Meadows II Expansion.
W-6	J18	No change to existing service water main. Not yet included in the existing GIS layer.
W-6	I17	No change to existing service water main. Not yet included in the existing GIS layer.
W-6	G16, H16	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-6	I16	No change to future service water main per recommendation from DPW.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-6	I17	No change to capital facility service water main per DPW recommendation.
W-6	G17, H17, H18	No change to 10" planned service water main for Two Rivers Subdivision.
W-6	I-17	Added existing service water main for Two Rivers that has not been deployed in the existing layer.
W-6	G17	Added existing service water main for Two Rivers that has not been deployed in the existing layer.
W-6	H18, I18	Changed from planned to existing service water main for Riverwalk At Crofton.
W-6	I17	Added planned service water main for 1060 Crain Hwy.
W-6	I16, J16	Added planned service water main for Summerfield Village.
W-6	I16	Added planned service water main for Waugh Chapel Business Park.
W-6	I16	Added planned service water main for Waugh Chapel Business Center.
W-7	W16	No change to capital to future service Cape St. Claire ET.
W-7	P20	No change to capital facility service Broad Creek III WTP.
W-7	T16	No change to future service Arnold WTP Expansion.
W-7	P20	No change to future service Broad Creek WTP.
W-7	P20	Changed from future to planned service Heritage Harbor BPS.
W-7	P20	No change to capital facility service Heritage Harbor ET.
W-7	Q19	Changed from capital facility to existing service Generals Hwy ET.
W-7	U16	Changed from future to planned service Arnold WTP Expansion.
W-7	R20	Changed from planned to existing service water main for Parole Office Building.
W-7	U17, U18, V17, W17	Changed from capital facility to existing service water main for St.Margarets/Old Mill Bottom Rd.
W-7	T16	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7	U17, V17	Changed from future to capital facility water main for St. Margarets Road WM - southwest of Old Mill Bottom Rd to existing water main. (2015 WSP).
W-7	T16, U16, V16, W16	No change to future service water main per recommendation from the 2015 Water Strategic Plan - Arnold - Church Rd to Cape St. Claire Rd.
W-7	T16	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7	Q20, P20	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7	W16	Existing service water main for Cape St. Claire that has not yet been deployed in the existing layer.
W-7	P19, Q19	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7	P20	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7	R18	Changed from planned to existing water main for Margaret's Glen.

APPENDIX G. WATER AND SEWER MASTER PLAN MAP CHANGES

Map	Grid	Description of Changes
W-7	T16	Changed from planned to existing water main for Arnold Elementary School.
W-7	U17	Changed from planned to existing water main for 3 & 9 Old Mill Bottom Road Property.
W-7	S19	Added planned service water main for Columbus Club of Annapolis.
W-7	T17, T18, U18	Added future service water main for Montessori International Children's House.
W-7	P19	Added capital facility water main for Heritage Harbour Study.
W-7	P19	Added capital facility Heritage Harbour II BPS.
W-7, W-9	Q20, Q21, Q22, P23	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7, W-9	S21, S22, T22, T23, U22, U23	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-7, W-9	Q21	Changed from capital facility to existing service water main for Coriander Place.
W-9	T22	No change to future service Annapolis Neck ET.
W-9	Q23, Q24	No change to future service water main per recommendation from DPW.
W-9	P23, Q23	No change to future service water main per recommendation from the 2015 Water Strategic Plan.
W-9	O23	No change to future service water main per recommendation from the 2015 Water Strategic Plan.

Appendix H: Methodology for Determining Projected Sewer Flow Demands

The anticipated wastewater flows for each sewer service area (presented in Table 4-2) are based upon flow projections developed with the use of the Wastewater Flow Projection Tool. The Wastewater Flow Projection Tool was originally developed as a key part of the 2007 Comprehensive Sewer Strategic Plan. In 2017 under contract S776702, the County upgraded the Waste Water Flow Projection Tool (WWFPT) to ArcGIS Pro. The updated WWFPT is a "plug-in" to ArcGIS that extends its functionality to allow performing waste water flow projection analysis for use in the County Water and Sewer Master Plan. The new application has much of the same functionality of the original WWFPT, but takes advantage of data sets that were not available in 2007 and is written to operate in the current version of ArcGIS Pro.

The updated WWFPT application, intersects various layers of data including Water/Sewer Billing, Consolidated Property File (CPF), Zoning, Existing Land Use, Parcel Layer, and Transportation Analysis Zone (TAZ) data to determine projected sewer flow demands for each sewer service area in the County.

The intent of flow forecasting for the Comprehensive Sewer Strategic Plan is to develop flows for individual sewer service areas (SSAs) at a subdrainage area or sub-sewer service area (sub-SSA) level that may be served by a small pump station. These flow forecasts are then aggregated to the water reclamation facilities (WRF) sewershed level for each of the WRFs. The intent is to look at a planning horizon of 20 years in 5-year increments. In addition, the County is interested in ultimate buildout conditions as a point of reference.

For buildout conditions, wastewater flow forecasting is done for all County land uses within an SSA boundary, whether or not they are actually connected to the sewer system. The areas that have sewer service are determined as part of the modeling of alternative scenarios for extending sewer service. This allows the County to estimate total flows and loads not only for WRFs but also for septic systems, which will assist with compliance with regulatory programs such as TMDLs and the ENR program.

The determination and analysis of wastewater flows proceeds in the following steps:

- a. Determination of current flows, for each existing sub-SSA spatial unit.
- b. Determination of current land uses where zoning will take precedence, such as vacant, agricultural or open space land that will become developed according to zoning densities; or existing land that will be replaced by land of different density (e.g. redevelopment with higher density, or complete redevelopment such as a Town Center redevelopment).
- c. Determination of buildout flows within existing developed areas, that is handling infill in areas shown as developed according to the 2016 existing land use layer.
- d. Determination of buildout flows in vacant land areas or areas subject to redevelopment, i.e. areas where zoning takes precedence over existing land uses.
- e. Determination of rate of growth within each sub-SSA based on growth in corresponding TAZs.

In conceptual terms, the overall methodology follows the general procedures previously utilized by the County. This involves calculating sewer demands based on flow factors assigned by the zoning category for all such categories found spatially within each sub-SSA. This approach is enhanced by allowing flows in existing developed areas to be based on actual flows from billing records. It is further enhanced by accounting for potential infill development in already developed areas, where the amount of infill is determined based on zoning.

APPENDIX H. METHODOLOGY FOR DETERMINING PROJECTED SEWER FLOW DEMANDS

Current Flows by Sub-Sewer Service Area

This step is carried out in order to allow comparison of aggregated flows from the sub-SSAs to measured flows at pump stations or flow monitoring stations. This exercise allows verification of I/I factors previously used by the County of 100 gpd/acre. Sub-SSAs are overlaid with the County's Consolidated Property File (CPF), and Consumption for those accounts with sewer service code of B or S (both water and sewer, and sewer only) and Commitment Level equal to 1 are totaled.

Areas Where Zoning Takes Precedence over Existing Land Use and Vice Versa

To determine how flows should be calculated for each area, it is important to know whether existing development will remain unchanged or whether it will be largely replaced by higher density development reflected in current County zoning. To conduct this analysis, the GIS layer of existing land use is intersected with current zoning (as well as the sub-SSA, CPF, and timing category layers, as explained later). A matrix of zoning and existing land use has been developed that shows areas where zoning takes precedence over existing land uses and vice versa. The purpose of this matrix is to account for existing land uses where zoning will take precedence in the future, such as vacant land as shown on the land use layer that will become developed as shown on the zoning layer. However, it also shows existing land that will be replaced by land of different density (e.g. redevelopment with higher density, or complete redevelopment such as a Town Center redevelopment). Limits on development density in Resource Conservation Areas (RCA) within the Critical Area overlay district are also taken into account.

Flows for Areas to Be Developed Based on Zoning

In areas where zoning takes precedence, the calculation of wastewater flows are based on application of the lookup tables of flow factors and dwelling units per acre, with factors varying by zoning category.

For residential zoning categories, the calculation is as follows for each zoning area within the sub-SSA:

$$[\text{Area of zoning type (ac)}] \times [\text{dwelling unit density for zoning type (du/ac)}] \times [\text{flow factor (gpd / du)}]$$

For non-residential zoning types, the calculation is as follows for each zoning area within the sub-SSA:

$$[\text{Area of zoning type (ac)}] \times [\text{flow factor (gpd / acre)}]$$

Infill Flows for Buildout within Already Developed Areas

Areas that will not undergo changes due to zoning, that is those where land use takes precedence, may nonetheless show potential increases of the number of properties built and/or connected to sewer service due to infill development and/or changes in percent of properties connected.

For each sub-SSA, and only for each land use type where land use takes precedence over zoning:

- A. Determine total actual sewer flows for all accounts within each land use polygon by totaling consumption by land use type from an overlay of the CPF and the existing land use layer. Sewer flows are given as:
 - i. $[\sum (\text{Consumption of all CPF Accounts within Land Use Polygon with Sewer Service (B or S) and with Commitment Level 1})] \times \text{Sewer Return Factor}$

APPENDIX H. METHODOLOGY FOR DETERMINING PROJECTED SEWER FLOW DEMANDS

- B. Determine the percent of accounts served for each land use polygon, and check that the total number of accounts reflects the zoning density. Increase the number of accounts to reflect the zoning density, only for the fraction of accounts not served.
- C. For the unserved residential accounts, multiply the number of accounts served by the flow factor (gpd/dwelling unit) appropriate for that land use or zoning type.
- D. For nonresidential accounts, estimate flows for the area based on zoning factors (GPD/acre for underlying zoning). Compare that to the total for existing accounts and take the larger value of the two. This essentially means zoning takes precedence if it results in a higher projected flow than current flows.
- E. Sum existing flows with the projected infill flows for each land use type where land use takes precedence over zoning, by SSA.

Extrapolating Flows over Time

The TAZs contain population and employment data for TAZ polygons throughout the County. Data are available in 5-year increments for a planning horizon of 20 years. The procedure for extrapolating rates of growth in flow is to use the rates of growth in population for each 5-year increment. To assign these growth rates to individual sub-SSAs, the area-weighted average rate of growth of overlapping TAZ layers is computed. The process computes flows in any year based on projected growth rates for the 20- year planning horizon, after which growth rates are assumed to continue at the rate of the last 5-year period. The computation checks when growth reaches the build-out flow projection for each sub-SSA thereby allowing a determination to be made of the approximate year of build-out for each sub-SSA.

Data Requirements

A. GIS Layers

The following categories of GIS data layers are needed:

- Current Sewer Service Areas (at the sub-SSA level)
- Existing Land Use
- Water and Sewer Service Categories
- Zoning
- Consolidated Property File (CPF)
- Traffic Analysis Zones (TAZ)

B. Lookup Tables

Data tables or Lookup Tables are needed for the following data:

- Land Use/Zoning Precedence Table
- Flow Factor Table (GPD/DU and GPD/AC), by zoning type
- Density Table (DU/AC), by zoning type
- Sewer Return Factor
- I/I Factor Table (GPD/AC)

Appendix I: Legislation and Approvals

COUNTY COUNCIL OF ANNE ARUNDEL COUNTY, MARYLAND

Legislative Session 2022, Legislative Day No. 10

Bill No. 53-22

Introduced by Ms. Rodvien, Chair
(by request of the County Executive)

By the County Council, May 2, 2022

Introduced and first read on May 2, 2022
Public Hearing set for and held on June 6, 2022
Bill AMENDED and VOTED on June 6, 2022
Bill Expires August 5, 2022

By Order: Laura Corby, Administrative Officer

A BILL ENTITLED

1 AN ORDINANCE concerning: Planning and Development – Master Plan for Water Supply
2 and Sewerage Systems

3
4 FOR the purpose of repealing the Master Plan for Water Supply and Sewerage Systems,
5 2017; adopting the Master Plan for Water Supply and Sewerage Systems, 2022; making
6 this Ordinance subject to approval of the Maryland Department of the Environment;
7 and generally relating to the Master Plan for Water Supply and Sewerage Systems.
8

9 SECTION 1. *Be it enacted by the County Council of Anne Arundel County, Maryland,*
10 That the Master Plan for Water Supply and Sewerage Systems, 2017, as amended, is hereby
11 repealed.
12

13 SECTION 2. And be it further enacted, That the “Anne Arundel County Master Plan
14 for Water Supply and Sewerage Systems, 2022” is hereby amended as follows:

- 15
16 1. On page IV, in line “1.3”, after “Site” insert “Development.”
17
18 2. On page XV, in last paragraph, under the heading “Introduction”, strike “2021
19 update” and substitute “2022 update”.
20
21 3. On page 1-1, in the first paragraph, under the heading “1.1 Goals and Policies”
22 and in the paragraph “U.”, under the heading “1.1.2 Goals and Policies of the Water and
23 Sewer Master Plan”, and on page B-1, in the paragraph under the heading “Allocation of
24 Wastewater and Water Capacity”, in each instance, strike “Environmental” and substitute
25 “Environment”.

EXPLANATION: Underlining indicates matter added to bill by amendment.
~~Strikeover~~ indicates matter removed from bill by amendment.

1 4. On page 1-5, in the second sentence of the first paragraph, under the heading
2 “1.1 Goals and Policies, strike “9-1110” and substitute “9-110”.

3
4 5. On page 3-4, in the chart “Figure 3-2 Average Day Demand Projection (Historic
5 System Production, Demands and Future Growth)”, in the text box beginning with “Build
6 Out Demand”, strike “Atrategic” and substitute “Strategic”.

7
8 6. On pages 4-9 through 4-11, in the Table titled “Table 4.4 Non-County Facilities
9 with Discharges Greater than 5,000 GPD”, in the Column titled “Master Plan Map, (Grid)”,
10 in the row titled “Patuxent”, “Regency Park Assisted Living Facility”, strike “(J15” and
11 substitute “(J15””; in the row titled “Rural”, “Boone’s Mobile Estates, WWTP”, strike “(
12 J32” and substitute “(J32””; in the row titled “Rural”, “Lyons Creek Mobile Home Estates”,
13 strike “(J36)” and substitute “(J36)””; in the row titled “Rural”, “Maryland Manor Mobile
14 Home”, strike “(J29)” and substitute “(J29)”; in the row titled “Rural”, “Millersville
15 Elementary”, strike “(L15L14), and insert “(L15, L14)””; in the row titled “Rural”,
16 “Renditions Golf Course”, strike “(J25)” and substitute “(J25)””; and in the row titled
17 “Rural”, “Southern Hills”, strike “(J24)” and substitute “(J24)”.”


18
19 SECTION 2: 3. *And be it further enacted*, That the “Anne Arundel County Master Plan
20 for Water Supply and Sewerage Systems, 2022”, prepared by the Office of Planning and
21 Zoning, which includes the Master Plan Document and Official 2,000 Scale Maps (Sheets
22 W-1 to W-12 and S-1 to S-12 at the scale of 1 inch equals 2,000 square feet), as amended
23 by this Ordinance, collectively the “Plan”, is hereby adopted.

24
25 SECTION 3: 4. *And be it further enacted*, That a certified copy of the Plan as adopted
26 by this Ordinance, and any amendments, shall be permanently kept on file with the
27 Administrative Officer to the County Council and the Office of Planning and Zoning.

28
29 SECTION 4: 5. *And be it further enacted*, That this Ordinance shall take effect 45 days
30 from the date it becomes law or upon approval of the Maryland Department of the
31 Environment under the authority granted by § 9-507 of the Environment Article of the State
32 Code, whichever is later. If approved, in whole or in part, after the 45 days the approved
33 provisions of this Ordinance shall take effect on the date the notice is received by the Office
34 of Planning and Zoning. If disapproved, in whole or in part, the disapproved portions of
35 this Ordinance shall be null and void without further action by the County Council. The
36 Office of Planning and Zoning, within 5 days after receiving any notice from the Maryland
37 Department of the Environment, shall forward a copy to the Administrative Officer to the
38 County Council.

READ AND PASSED this 6th day of June, 2022

By Order:


Laura Corby
Administrative Officer

PRESENTED to the County Executive for his approval this 8th day of June, 2022



Laura Corby
Administrative Officer

APPROVED AND ENACTED this 9th day of June, 2022

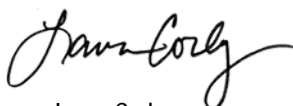


Steuart Pittman
County Executive

EFFECTIVE DATE: July 24, 2022*

*Subject to Section 5 of this bill.

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF
BILL NO. 53-22 THE ORIGINAL OF WHICH IS RETAINED IN THE FILES
OF THE COUNTY COUNCIL.



Laura Corby
Administrative Officer