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General Development Plan Background Water Resources

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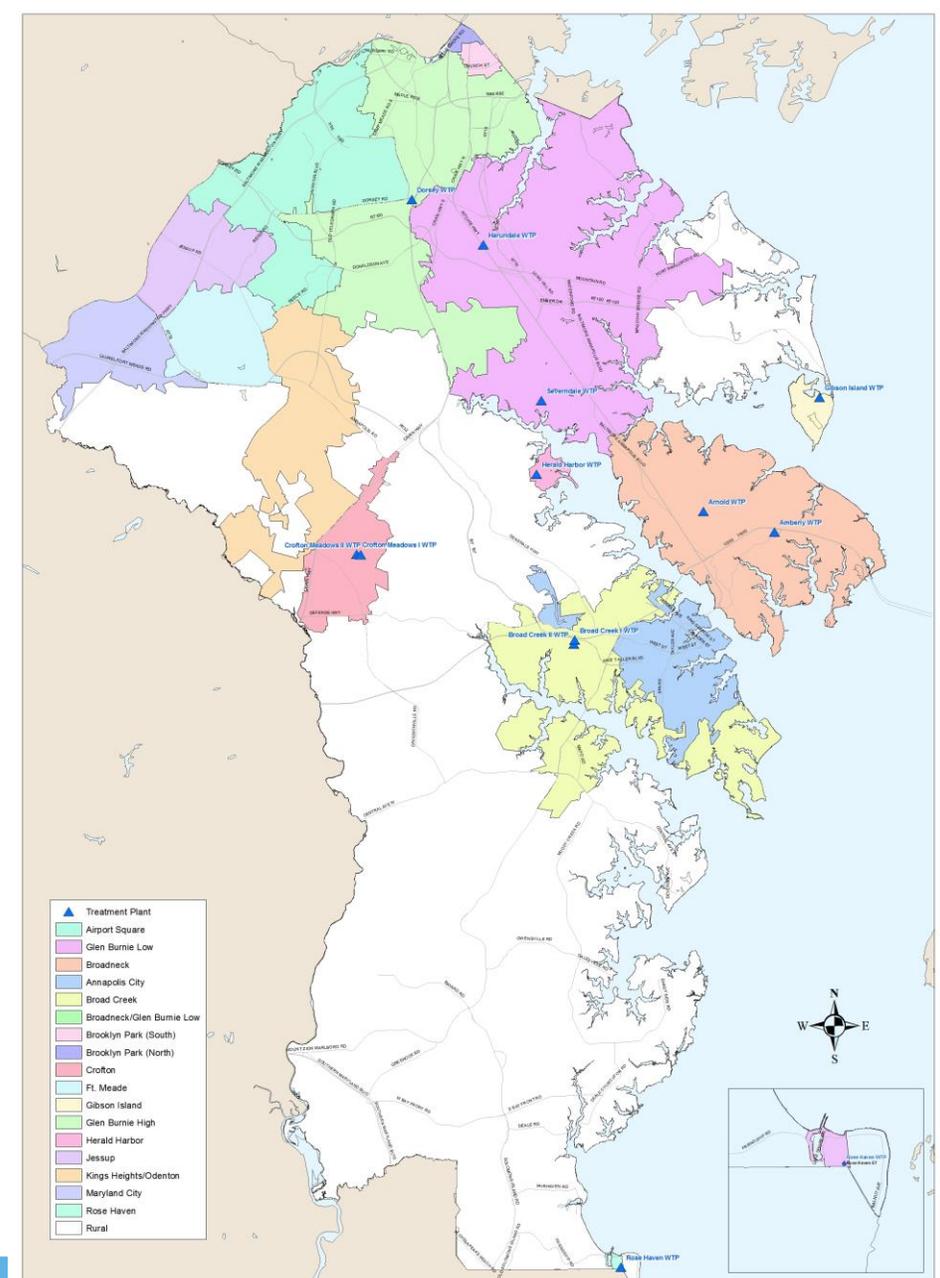
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Public Water Supply System

Anne Arundel County Water Pressure Zones

- The County's water system is divided into 12 pressure zones or service areas
- 8 of the 12 zones are interconnected, which enables the County to transfer water
- Other Areas are served by the City of Annapolis, Fort Meade or are designated as Rural





Public Water Supply System

Anne Arundel County relies almost entirely on groundwater for its municipal water supply.

The County's public water supply system currently has:

- 15 well fields (57 water supply wells)
- Permitted Annual Withdrawal up to 57.7 MGD (annual average).
- The **City of Annapolis** owns and operates its own water supply system: groundwater from 8 deep wells located near the City's water treatment plant.
- The **Fort Meade Military Base** has its own water supply system. 80% surface water from the Little Patuxent River and 20% by groundwater pumped from 6 wells.

- ❖ In 2015:
 - ~ 33.7 (MGD) (average day) and 43.0 MGD (max day) from groundwater sources.
 - ~ 0.8 MGD (average day) and 2.8 MGD (max day) from Baltimore City.

Agreements between Anne Arundel County and Baltimore City provide the rights for the County to purchase up to 32.5 MGD maximum day rate.



Aquifers

The Patuxent, Lower Patapsco, Upper Patapsco, Magothy and Aquia are the aquifers from which the groundwater is withdrawn for the County.

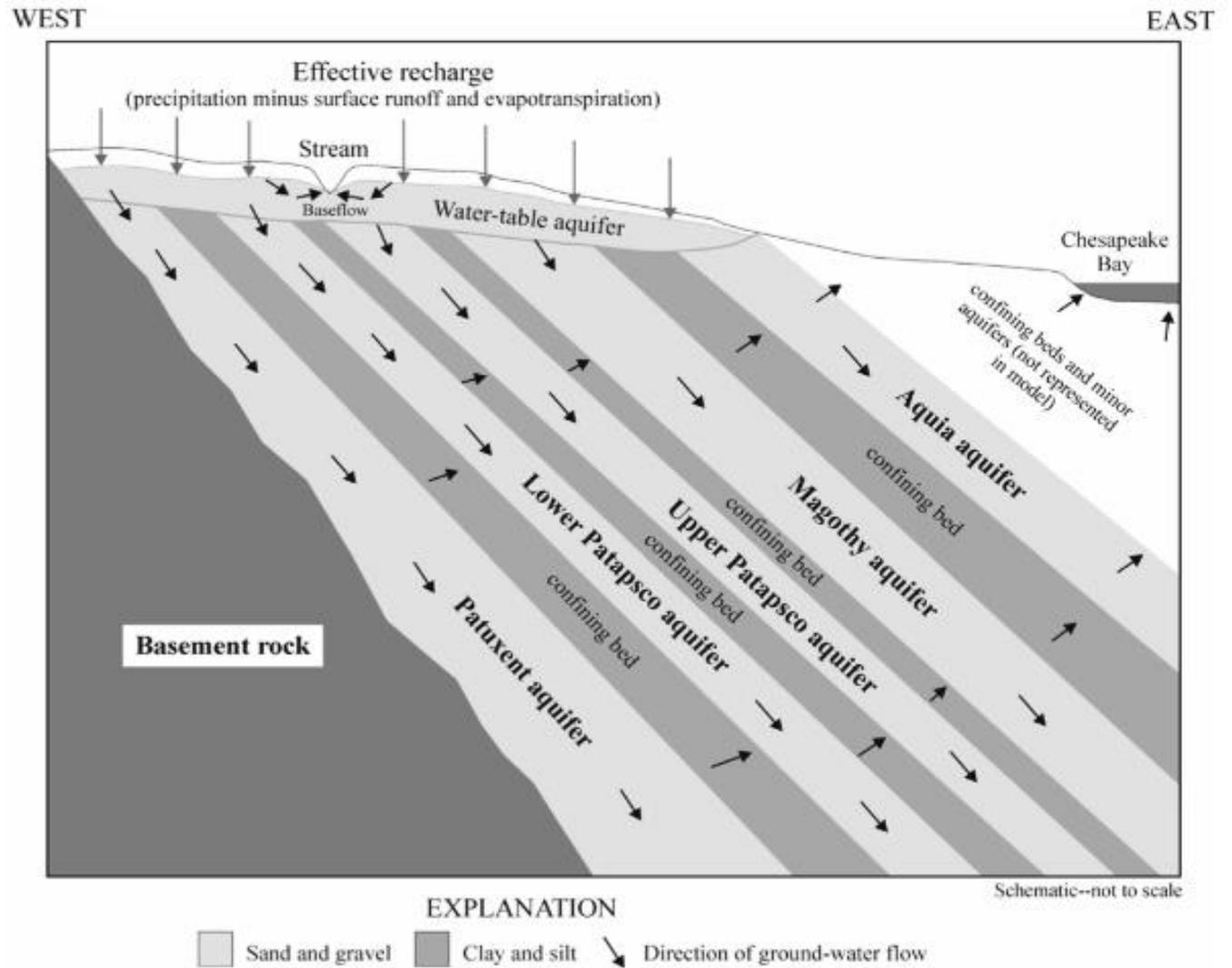
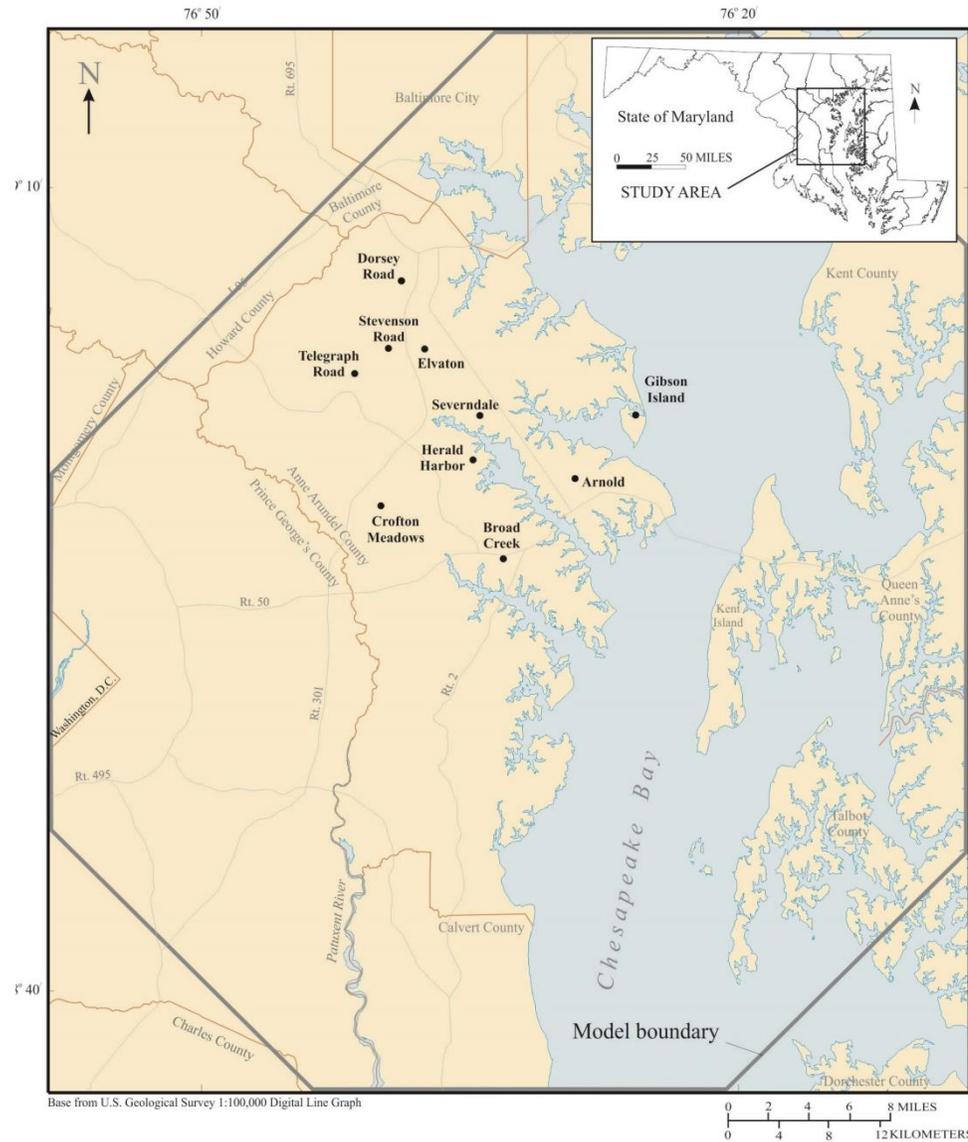
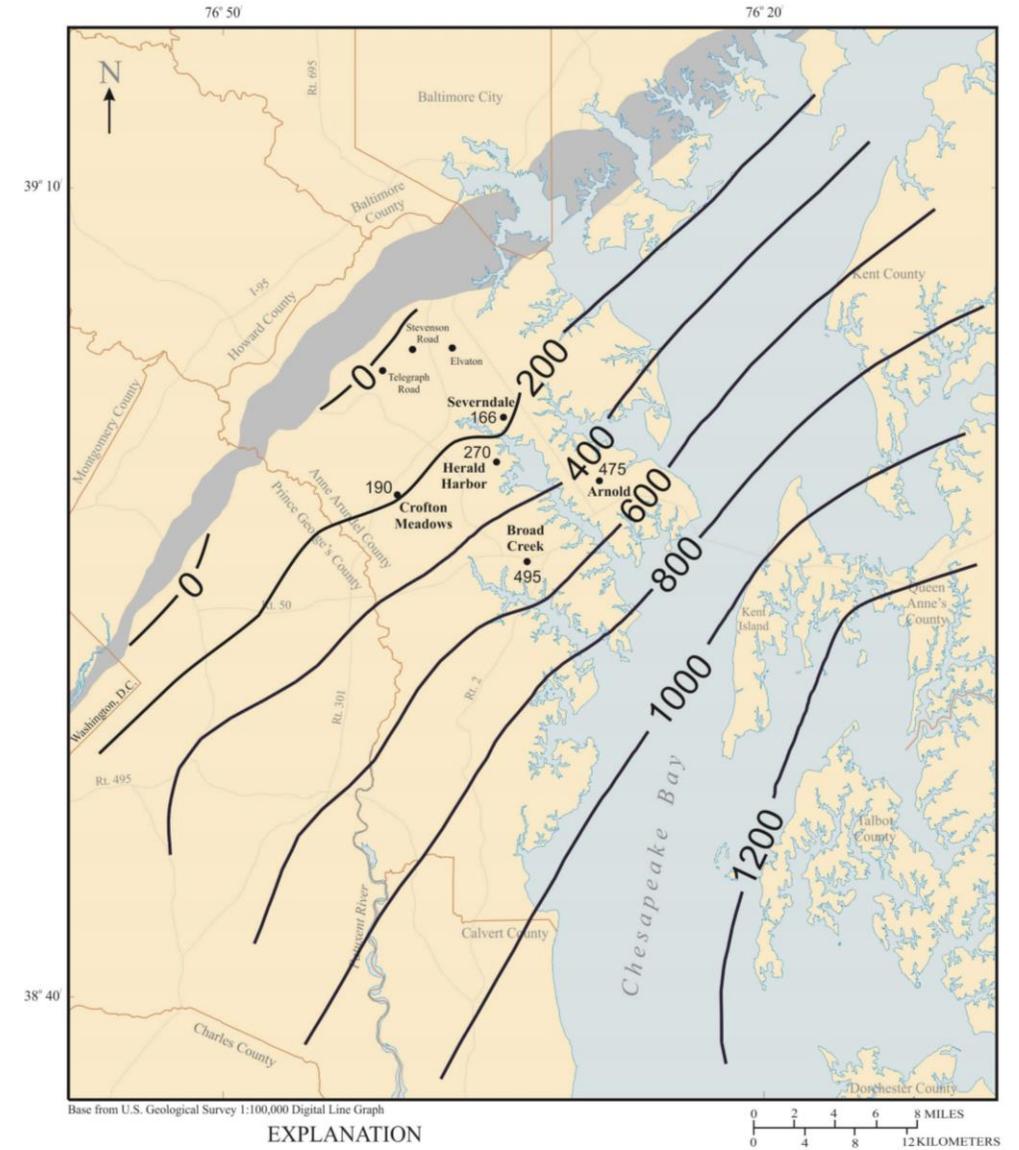


Figure 21. Conceptual model of the ground-water-flow system modeled in Anne Arundel County and surrounding areas.





- EXPLANATION**
- Major well field operated by Anne Arundel County Department of Public Works



- EXPLANATION**
- Outcrop
 - 1200 — Available drawdown, in feet. Contour interval is 200 feet.
 - 495 Anne Arundel County Department of Public Works well field pumping from the Lower Patapsco aquifer system. Number next to symbol is least amount of remaining available drawdown in the well field, in feet.



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Figure 3. Approximate available drawdown remaining in 2015 in the Lower Patapsco aquifer system.

Recent Studies

- *Anne Arundel County Comprehensive Water Strategic Plan (2016)*, Malcolm Pirnie (Arcadis)
- *Effects of Projected (2086) Groundwater Withdrawals on Management Water Levels and Domestic Wells in Anne Arundel County, Maryland (2017)*, Andreasen, D.C, Maryland Geological Survey.
- *Effects of Increased Withdrawals from the Aquia Aquifer on the Mayo Peninsula, Anne Arundel County, Maryland with an Evaluation of Water Quality (2018)*, Gemperline, J.M., VanDerwerker, T.J., and Andreasen, D.C., Maryland Geological Survey.

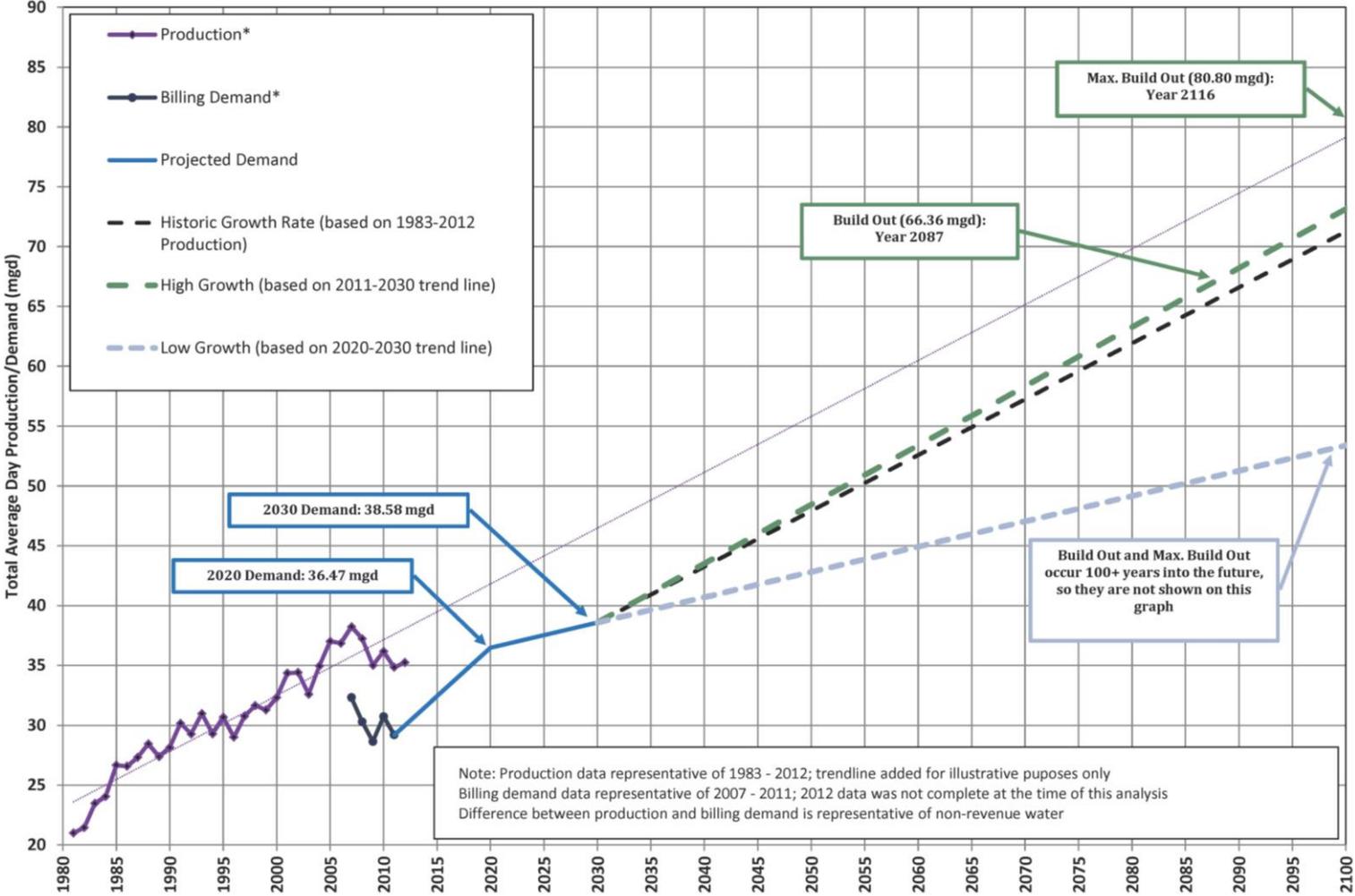


Comprehensive Water Strategic Plan (CWSP)

- ❑ The 2016 CWSP developed baseline (existing 2010 demands), 2020, 2030 and buildout (2087) water demands for the County based on zoning projections. Using the Countywide hydraulic model WaterGEMs for the baseline demands, the study identified existing areas with high pipe velocities and headlosses 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 largescale CIPs were phased over several years based on demand projections and capital budget limitations.



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

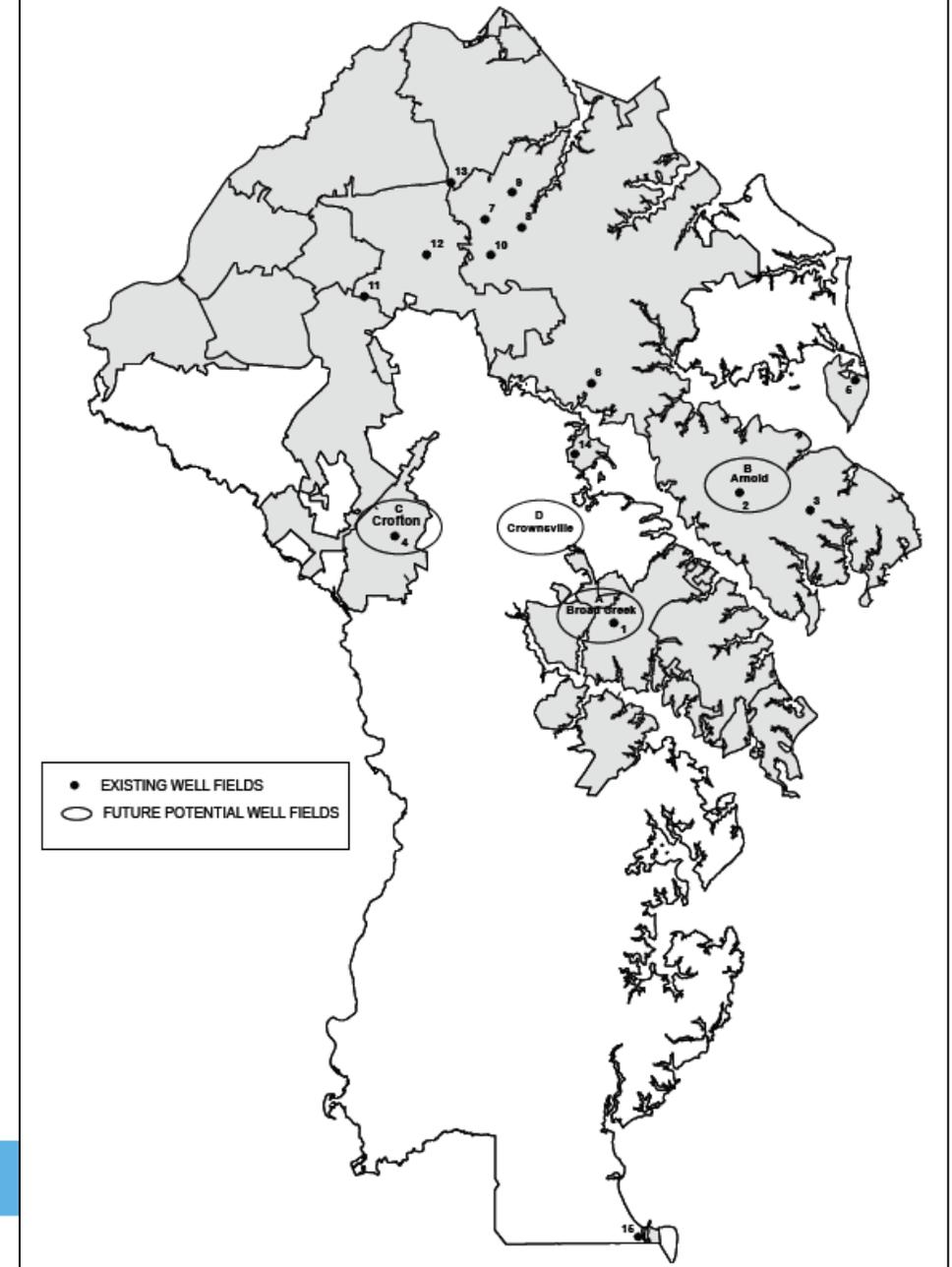


The 2016 CWSP recommended that any major investment in new supply sources be made only within the eastern or southern portions of the County. The approximate locations of the existing and future potential well fields are shown on Figure 5. Future potential well fields are summarized in Table 7.

Table 7: Future Potential Well Fields

Pressure Zones	Well Field (Fig. 6)	Well Field Name	Potential Average Daily Withdrawal (MGD)				
			Patuxent	Lower Patapsco	Upper Patapsco	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	11.5			17.5
Gibson Island (160 zone)	5	Gibson Island			0.2		0.2
Glen Burnie Low (220 zone)	6	Severndale		4	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)	D	Crownsville (remote)	12	8			20
Total			18.9	37.2	10.8	0.1	66.9

Figure 5: Existing and Potential Well Fields

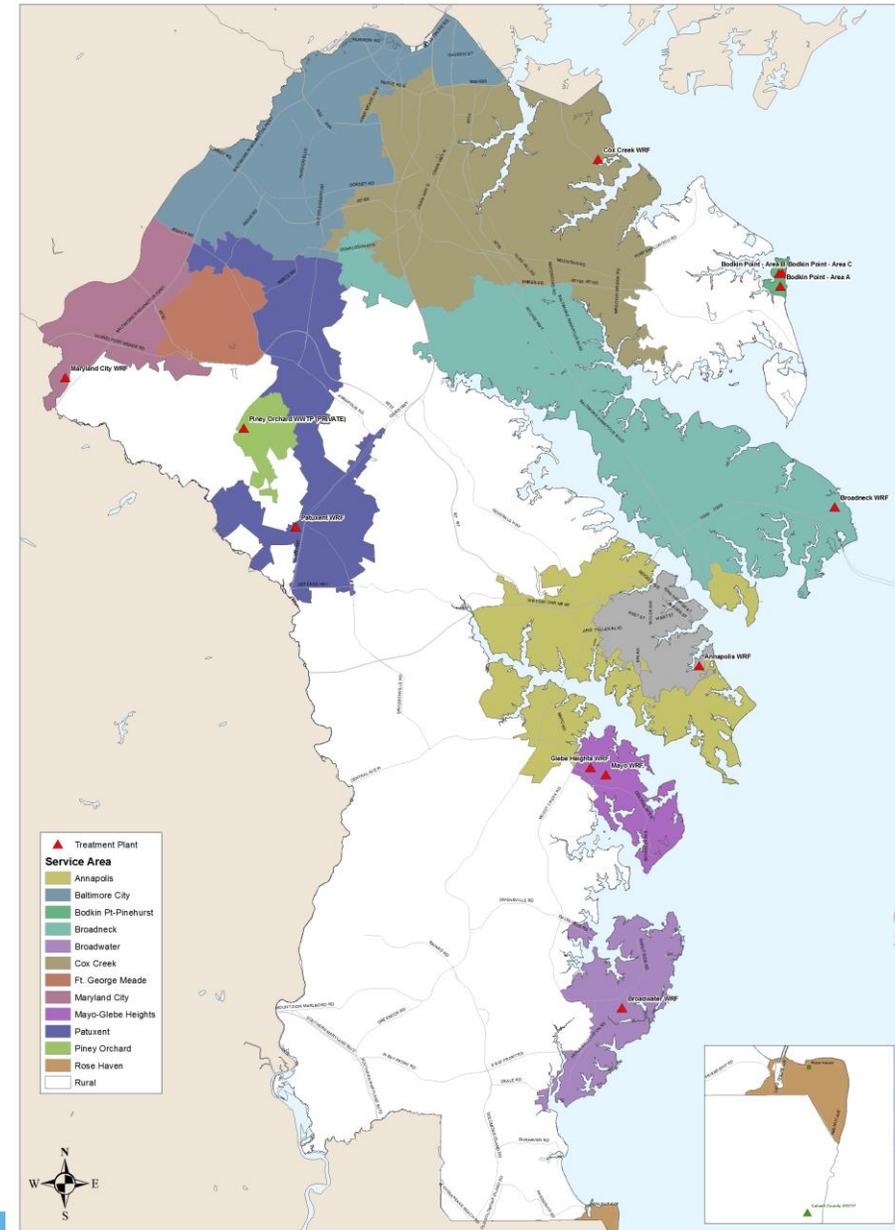


Anne Arundel County Sewer Service Areas

According to the 2017 Water and Sewer Master Plan, the ultimate area to be served by public sewer is approximately 50% of the County.

Of the eleven sewer service areas, eight are served by facilities owned and operated by the County.

Two of the service areas have conveyance systems that are operated and maintained by the County but the treatment facilities are located in neighboring jurisdictions (Baltimore City & Calvert County). Piney Orchard Sewer Service- Private TP)



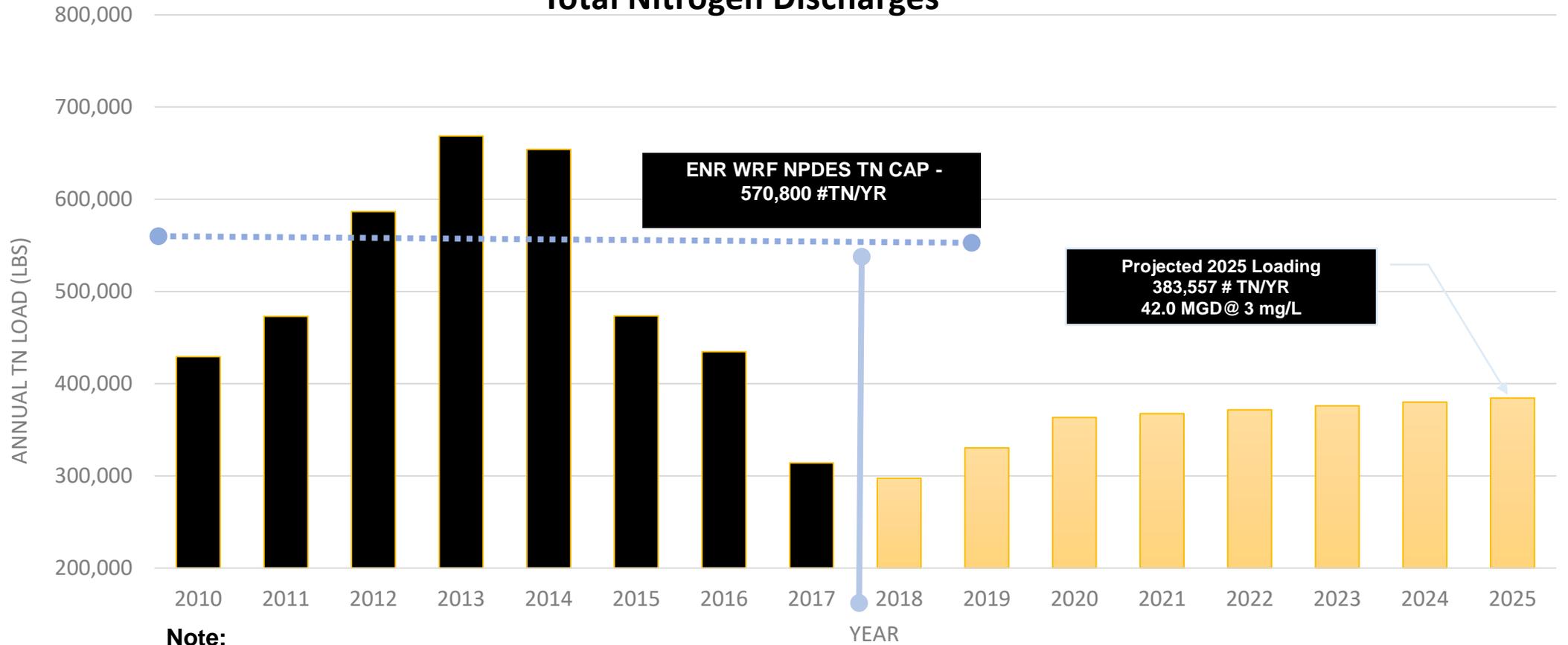
AA County ENR Implementation

Water Reclamation Facility	Estimated Project Cost	Grant Eligibility Determination (MDE/AA)	Process Configuration	Current Status*	Completion Date
Annapolis	\$20 M	83% / 17%	MLE + DN Filters	Complete	June 2015
Broadneck	\$25 M	37% / 63%	Ox Ditch + DN Filters	Complete	October 2017
Broadwater	\$10 M	76% / 24%	Step Feed + DN Filters	Complete	July 2015
Cox Creek	\$140 M	80% / 20%	4-Stage + Membranes	Phase I complete Phase 2 – Under Constr.	4th Quarter 2018
MD City	\$8 M	52% / 48%	4-Stage + Filters	Complete	December 2014
Mayo**	\$44 M	49% / 51%	N/A**	Complete	November 2017
Patuxent	\$13 M	33% / 67%	Ox. Ditch + DN Filters	Complete	September 2015
Total	\$260 M				

** Mayo facility decommissioned and pumped to Annapolis WRF



Anne Arundel County Water Reclamation Facility Total Nitrogen Discharges



Note:

Total Design Flow for 7 major facilities based on 2012 NPDES permits is 46.62 MGD



2018 Performance

2018	January		February		March		April	
	TN	TP	TN	TP	TN	TP	TN	TP
Annapolis	1.70	0.05	2.90	0.09	1.50	0.12	1.48	0.11
Broadneck	1.34	0.02	2.20	0.10	1.50	0.10	2.10	0.10
Broadwater	2.96	0.13	3.49	0.11	3.36	0.04	1.34	0.11
Cox Creek	6.00	0.06	3.60	0.05	1.80	0.04	1.70	0.08
MD City	2.30	0.00	3.10	0.10	1.60	0.00	1.70	0.15
Patuxent	2.50	0.14	3.23	0.24	2.33	0.16	2.08	0.31

April 2018 – all facilities < 2.5 mg/L TN

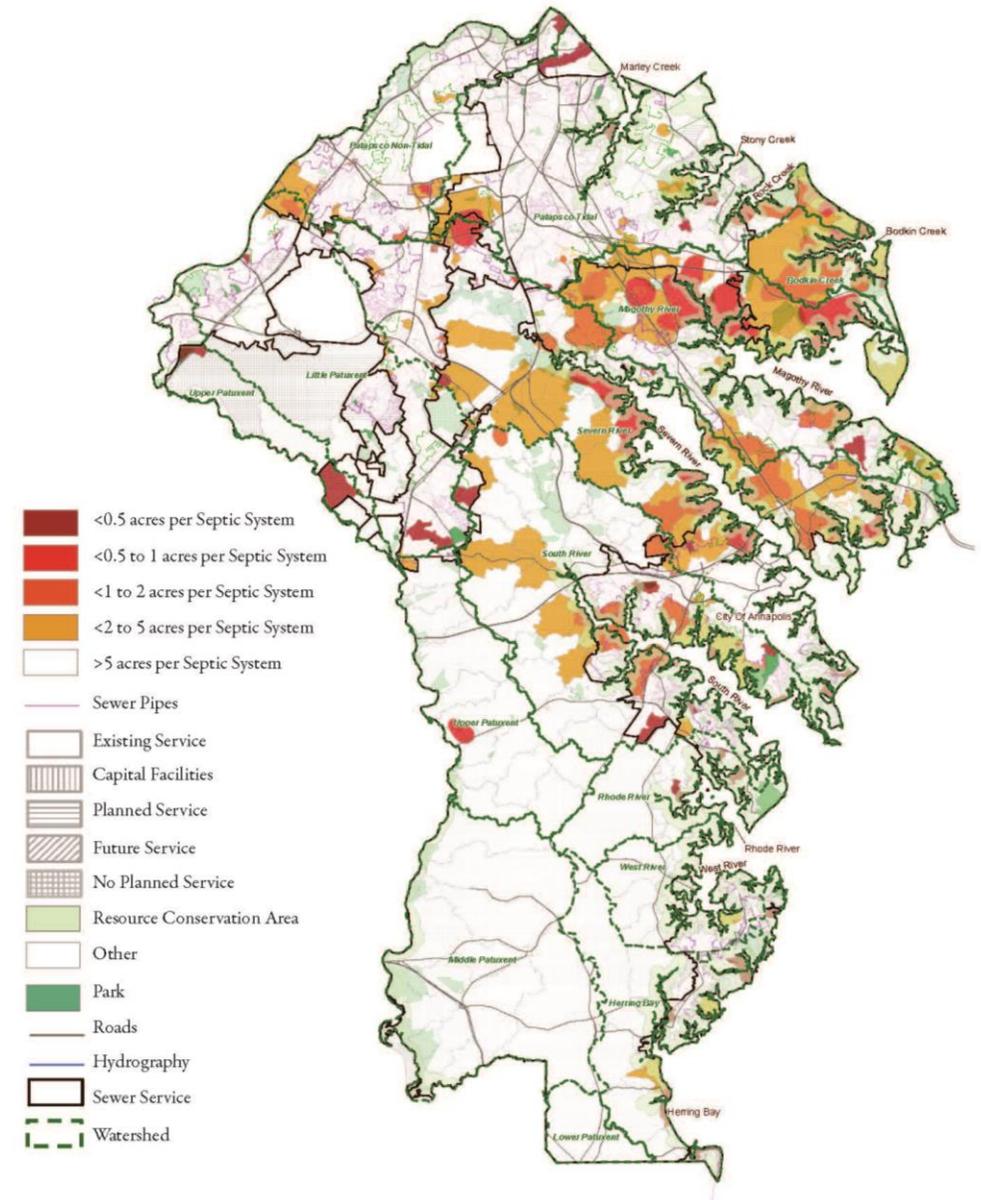


Septic Systems

Anne Arundel County has a total of 41,026 *Onsite Sewer Disposal System (OSDS)*

- 38,708 serving residential properties
- 2,318 serving non-residential properties

Using Maryland Department of the Environment’s (MDE’s) criteria regarding the delivery ratio (DR) of nitrogen to the receiving water (as a function of the septic system’s distance to surface water), it is estimated that septic systems in the County annually contribute approximately 700,000 lbs of TN/ year to the Chesapeake Bay Watershed.



OSDS Nitrogen Loads

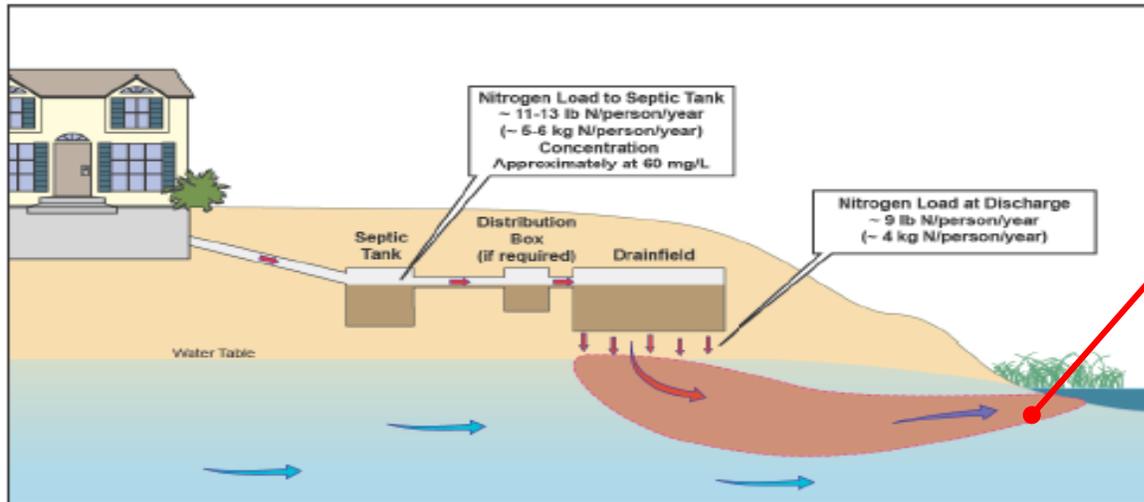


Figure 1. Traditional Onsite System

Average Load for OSDS is between 7 - 19 lbs TN / yr, including delivery ratio

- **Typical septic tank effluent TN concentration approx. 40 mg/L**
- **Treatment plant TN limit 4 mg/L**
- **Recent Broadneck WRF TN Performance**
 - 2017 - 2.13 mg/L
 - 2016 - 2.70 mg/L



When connected, estimated load is reduced to 3 lbs TN / yr; becomes part of reported WRF loading

SOURCE: EPA (2013) A Model Program for Onsite Management in the Chesapeake Bay Watershed, (Adapted)



Septic System Loads

OSDS Evaluation Study and Strategic Plan (2008)

Nitrogen loads were calculated for all existing OSDS Countywide with the study recommending a treatment strategy for each OSDS

The treatment strategies used were:

- Sewer System extensions to ENR Facility
- Cluster wastewater treatment facilities
- Upgrade individual OSDS to BAT
- No near-term action, which consists of low-density, low-nitrogen delivery onsite systems



Recommended Treatment
TN Reduction (lb/yr/ac)

1- Sewer Extensions

- 0.030070 - 4.847343
- 4.847344 - 14.759909
- 14.759910 - 46.879458

2- Cluster Treatment

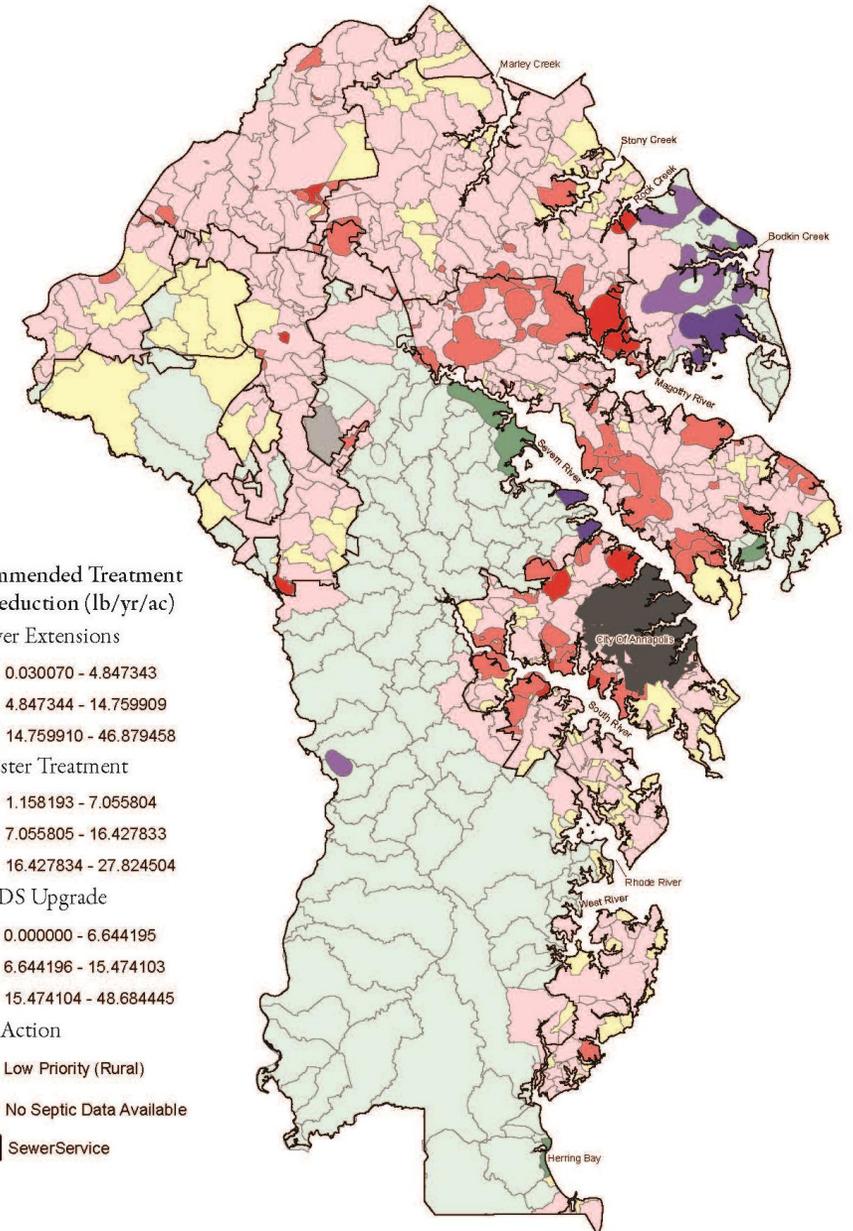
- 1.158193 - 7.055804
- 7.055805 - 16.427833
- 16.427834 - 27.824504

3- OSDS Upgrade

- 0.000000 - 6.644195
- 6.644196 - 15.474103
- 15.474104 - 48.684445

4- No Action

- Low Priority (Rural)
- No Septic Data Available
- SewerService



Septic Task Force

Task Force 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

Task Force Broken into 3 working groups:

- Land Use Working Group
- Fiscal Working Group
- Policy Working Group



ANNE ARUNDEL COUNTY
SEPTIC TASK FORCE
FINAL REPORT

JUNE 2018



Task Force Recommendations (Major Highlights)

1. New Septic Connection Process, Participation Requirement - Mandatory versus Voluntary
2. Develop Prioritization, Focus on High Impact & Cost Effective Locations
3. Cost Sharing & Subsidies, Develop Incentive System
4. Examine Alternatives to Centralized Public Sewer
5. Public Outreach and Education is key, Determine Public Interest/Valuation of Sewer
6. Maintain Consistency with Smart Growth Policies, Consider Impacts Related to Infill Development,
7. Develop Program Budget, Get Long Term Funding Commitments
8. Revenue Approaches (not recommending new separate fee), Explore Financing Timelines



<https://www.aacounty.org/departments/public-works/septic-task-force/index.html>

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Bureau of Utility Operations

24-Hour Emergency Water Services: (410) 222-8400
Billing Inquiries: (410) 222-1144



Bureau of Highways

Northern District: (410) 222-6120
Central District: (410) 222-7940
Southern District: (410) 222-1933
Traffic Lights/Signs: (410) 222-1940



Bureau of Waste Management Services

Bulk Trash Service/Curbside Collections: (410) 222-6100



Bureau of Engineering

General Inquiries: (410) 222-7500



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Questions

