
*Photo by Steve Droter, Chesapeake Bay Program: https://flic.kr/p/2eMDazG*

# Updates to Modeled Sewer and Septic for the Phase 7 Watershed Model

Wastewater Treatment Workgroup Meeting

July 2025

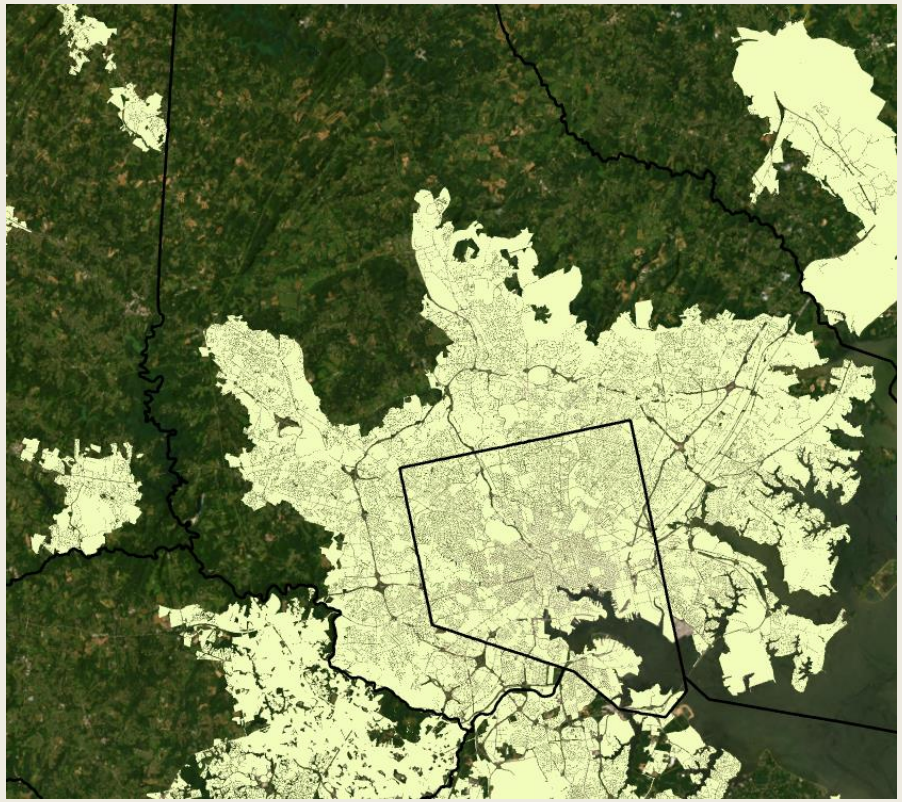
U.S. Department of the Interior
U.S. Geological Survey

Jackie Pickford, Peter Claggett, Michelle Katoski, Labeeb Ahmed, Sarah McDonald, USGS-CBPO

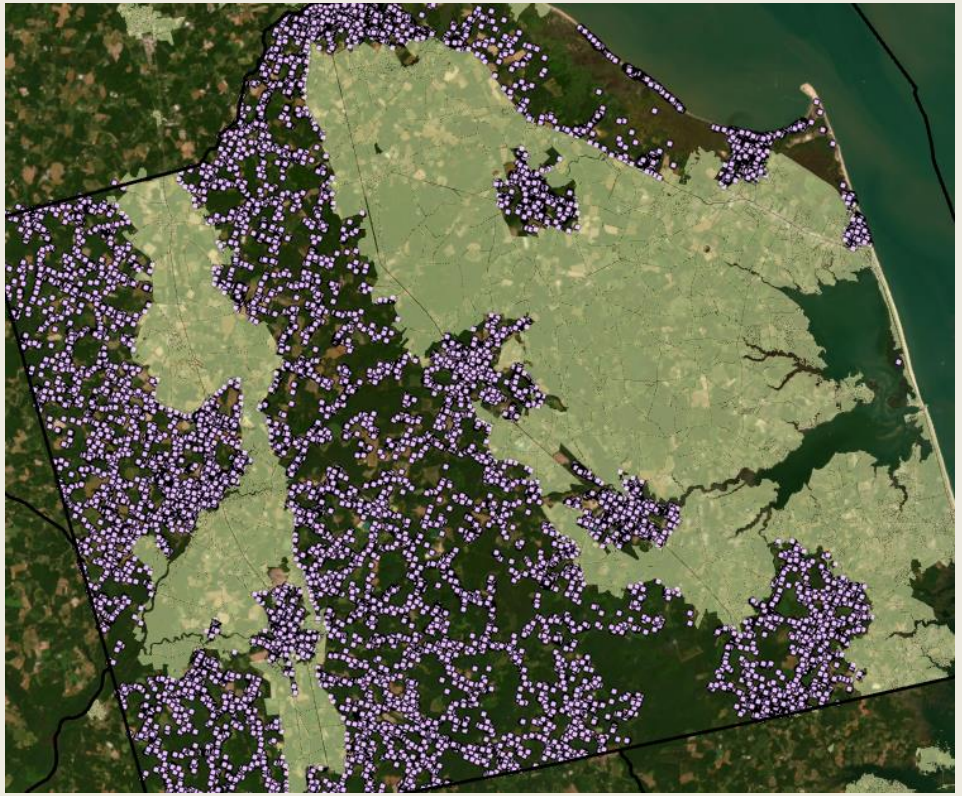
# Overview

I. Intro & Background
II. Updates to Sanitary Sewer Service Area Map
III. Updates to Sewer/Septic Model
IV. Discussion & Questions
V. Decision Items/Approvals

# Decisions Requested



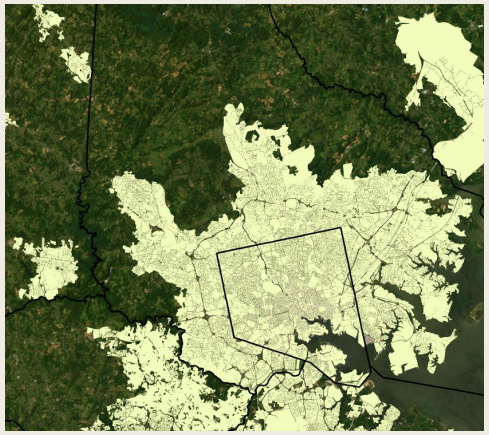
1. Approve Phase 7 sanitary sewer service area.



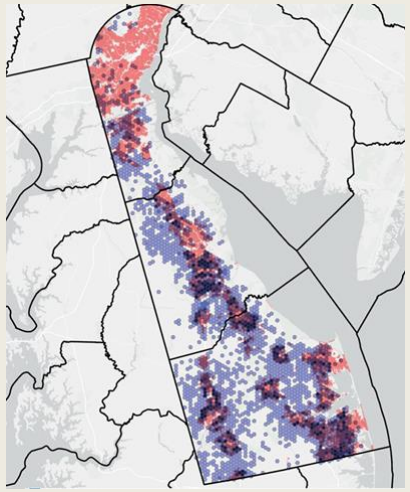
2. Approve the updated methods for the sewer/septic model.

# Background/Context

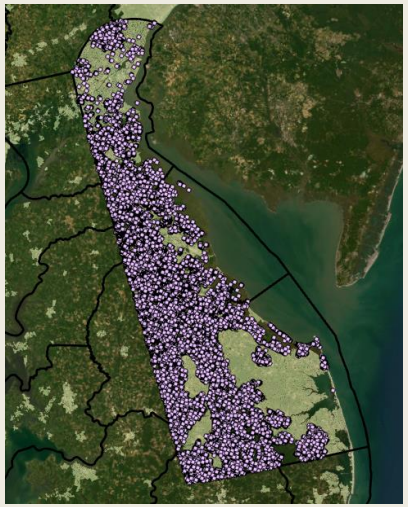
The USGS models septic systems and populations served by sewer and septic within the Chesapeake Bay Watershed from 1985 through future years (e.g., 2050) to inform the Chesapeake Bay Watershed Model and CAST.



Sanitary Sewer Service Area



Chesapeake Bay Land Change Model (CBLCM)



Sewer/Septic Model


Phase 7 Watershed Model/CAST

# Timeline

**Oct - Nov 2024**

Presentations to USWG/WWTWG on initial sewer/septic methods and SSA.

- Members gave feedback on methods & provided local septic data, if available, for validation of the model

**Dec 2024 – Apr 2025**

Incorporated local data into SSA & made updates to the sewer/septic model.

**Apr – May 2025**

Posted SSA data on web viewer for jurisdictions to provide feedback.

- Members gave feedback and provided updated data.

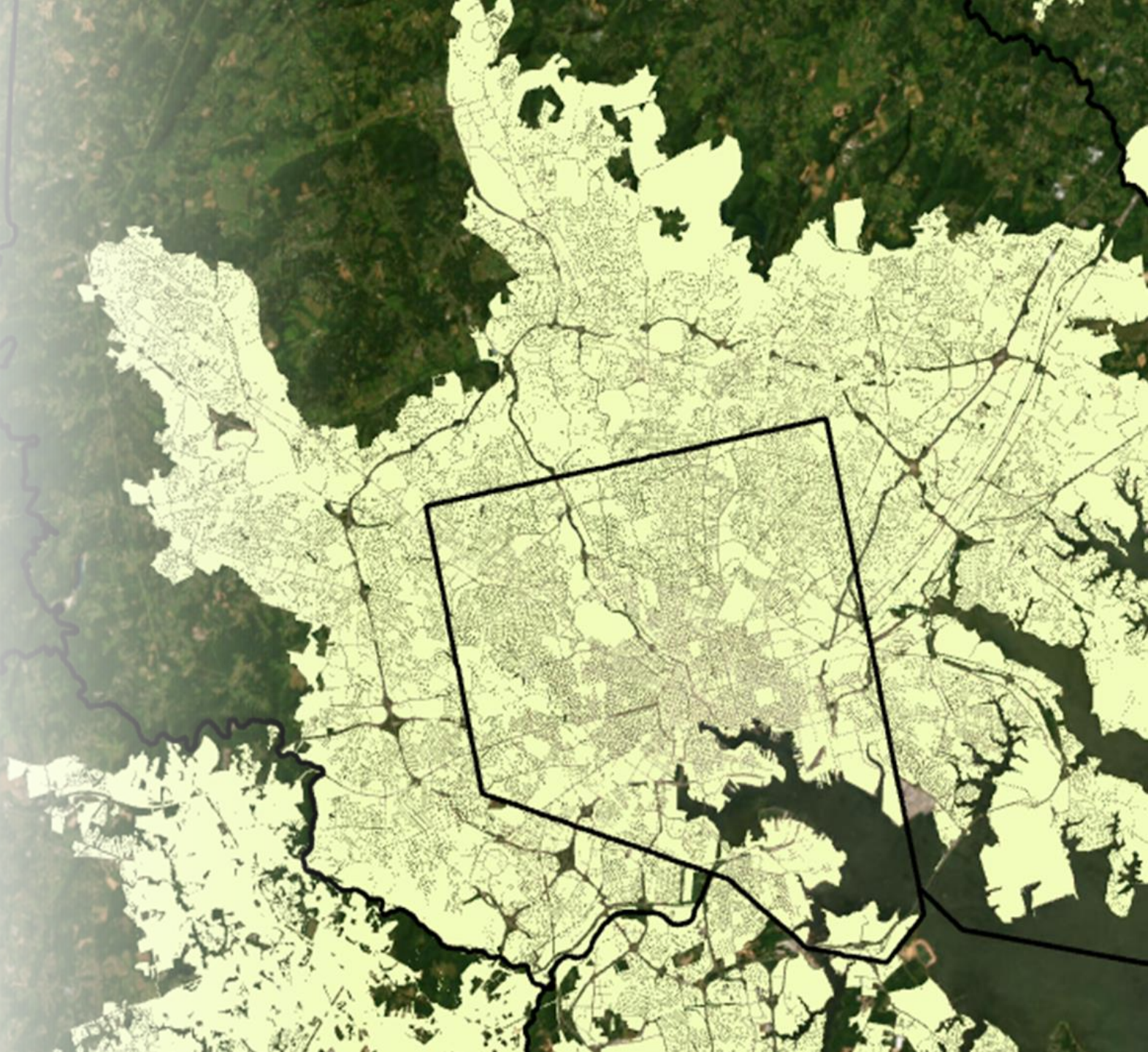
**May – June 2025**

Incorporated updated data into SSA and re-ran model.

**July 2025**

Approval of updated methods and final SSA data.

# I. Sewer Service Area



# Draft Sanitary Sewer Areas Data Review

## Introduction

### Draft Sanitary Sewer Areas

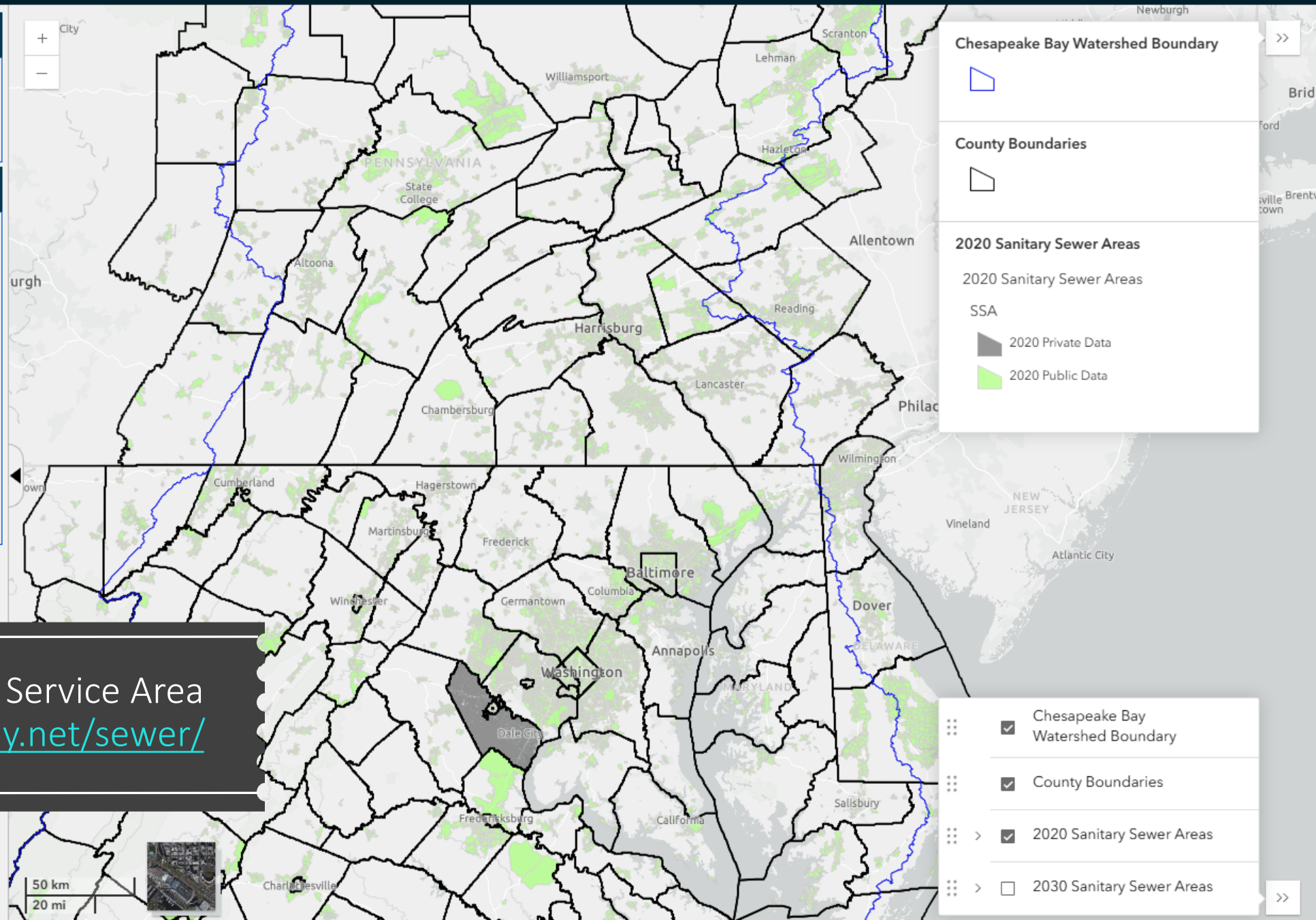
**This application depicts draft sanitary sewer areas for review. Shapefiles of the sewer areas can be downloaded here.**

## Background

This viewer hosts two separate layers showing sanitary sewer service areas (SSAs) for the Chesapeake Bay Watershed. These data will be used in Phase 7 CAST for estimating septic system pollutant loads and for forecasting future land use scenarios for CAST and other CBP applications.

- **Current SSA (2020):** This layer shows sanitary sewer service areas for the year ~2020. Any "future/planned areas" for service beyond the year 2020 are **not** included.
- **Future SSA (2030):** This layer shows expected sanitary sewer service areas for the year 2030. For Maryland, local data was provided for "future/planned" areas of service, which was used to determine areas of service in this layer. For all other states, the sewer service areas are the same as indicated in the 2020 layer.

P7 Sanitary Sewer Service Area
https://gis.chesapeakebay.net/sewer/



# Local Sewer Data Processing

| State | County | Original Data Layer | Layer Details | Methods | Notes |
|---|---|---|---|---|---|
| MD | mary_24000 | "UTIL_Sewer" | GENZ_SWR: Existing (0-2yr), Future Service (10+yr), No Planned Service, Planned Service (2-10 yr) | 2030 SSA: Existing (0-2yr), Planned (2-10yr) | 2025 Maryland state-wide data Source: MDP |
| MD | mary_24000 | "Md_Sewer_Svc_Areas" | GENZ_SWR: Existing (0-2yr), Future Service (10+yr), No Planned Service, Planned Service (2-10 yr) | 2020 SSA: Existing (0-2 yr) | 2018 Maryland state-wide data Source: MDP |
| MD | anne_24003 | "SewerServiceArea" | Sewer_Type: Existing Service, Future Service, No Public Service, Other, Planned Service | 2020 SSA: Included Existing<br>2030 SSA: Included Existing, Future, and Planned | Source: Anne Arundel County |
| MD | balt_24005 | "UTILITY_ssSewerServiceAreas" | boundary of all sewer service areas | 2020 SSA: Included sewer boundary.<br>2030 SSA: Included sewer boundary. | Source: William Merrey |
| | | | SERVICE: Existing, Future, Long<br>WW | 2020 Layer: Included Existing, Priority, WW Treatment<br>2030 Layer: Included Existing, Priority, Future, Long Range, WW Treatment | Source: Carroll County |
| | | | sewered | 2020 SSA: joined all lines and buffered 20m.<br>2030 SSA: joined all lines and buffered 20m. | Source: Cecil County |
| MD | dorc_24019 | "SewerServiceArea" | UCTION (<2 yrs),<br>S-2: PLANNED SERVICE AREA (2-5 yrs),<br>S-3 PROGRAMMED FOR SERVICE (5-10 yrs)<br>1: PROPOSED S-1 | 2020 Layer: Included S-1 (Existing) and S-2 (Planned)<br>2030 Layer: Included S-1 (Existing), S-2 (Planned), S-3 (Programmed), and Proposed S-1 | Source: Dorchester County |

Spreadsheet posted on calendar page with more details about local data and how it was incorporated

# II. Sewer/Septic Model

# Updates to the Sewer/Septic Model

**Phase 6 Method:** modeled septic systems as single detached housing units in *census blocks* that fall outside of sewer service areas.

**Phase 7 Method:** models septic systems as developed *parcels* that fall outside of sewer service areas.

# Proposed Phase 7 Methods: Septic Footprint

Parcels with no buildings or structures are **excluded**

Parcels with buildings *outside* the sewer service area are **included**

Parcels *inside* the sewer service area are **excluded**

**= sewer service area**

**= septic footprint**

Fairfax County, VA

# Proposed Phase 7 Methods: Septic Count

1 septic system per developed parcel

Fairfax County, VA

= **septic systems**

= **sewer service area**

= **septic footprint**

# Proposed Phase 7 Methods: Septic Count

If there's more than one building per parcel, the septic point is located between the two buildings

Hardy County, WV

**= buildings**

**= septic systems**

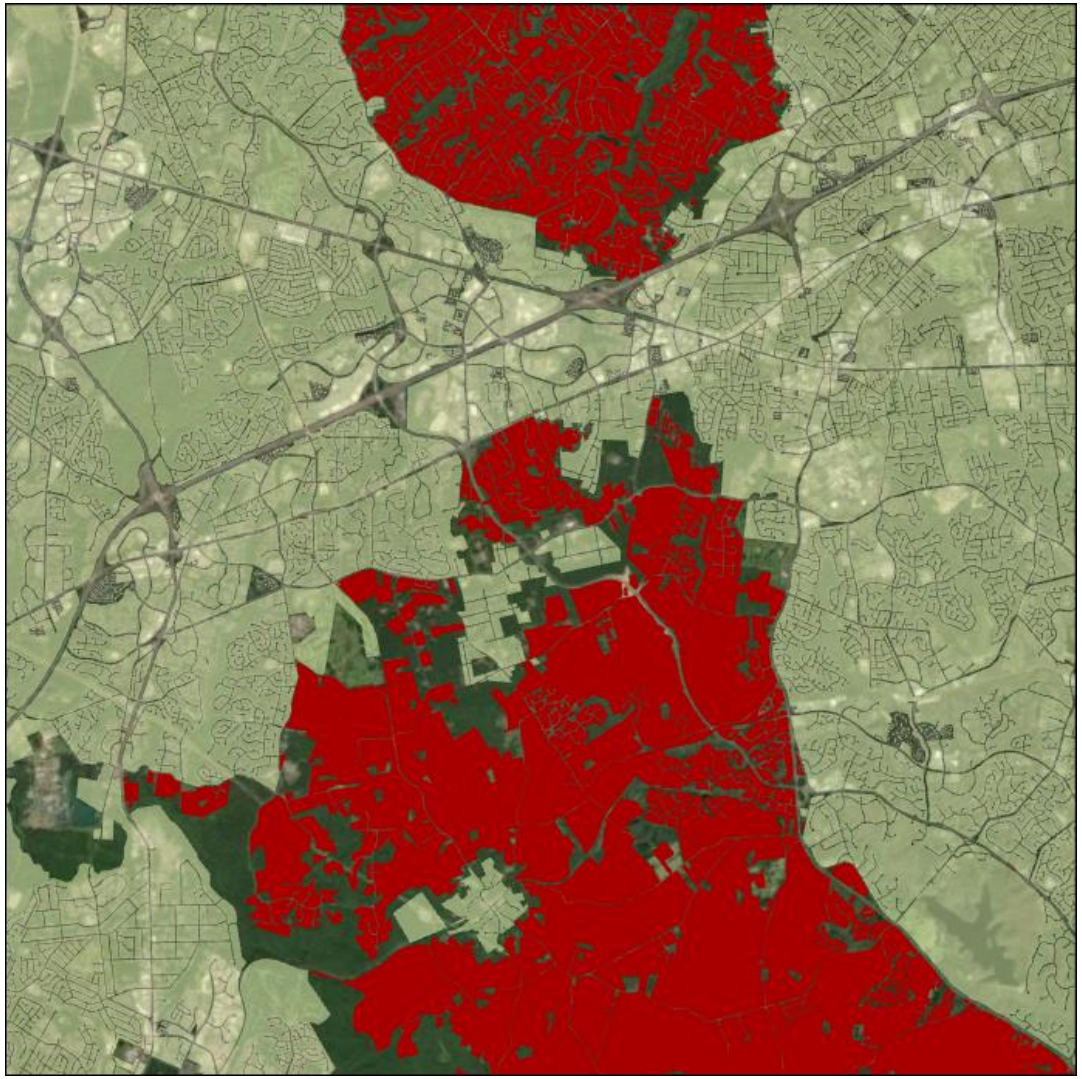
**= sewer service area**

**= septic footprint**

# Proposed Phase 7 Methods: Population on Sewer & Septic

Calculate 2020 baseline population within sewer footprint & within septic footprint using Census Data

Backcast population on sewer & septic based on decennial changes in housing units



Fairfax, VA

= sewer service area

= septic footprint

# DRAFT Septic Count Estimates

| FIPS | State | County | Local Data | Phase 6 | Phase 7 |
|---|---|---|---|---|---|
| 36003 | NY | Allegany | 17,413 | 14,614 | 15,045 |
| 36007 | NY | Broome | 21,392 | 16,781 | 20,092 |
| 36015 | NY | Chemung | 12,675 | 6,747 | 11,137 |
| 36017 | NY | Chenango | 16,349 | 11,971 | 16,621 |
| 36023 | NY | Cortland | 8,964 | 5,608 | 8,408 |
| 36025 | NY | Delaware | 17,367 | 18,061 | 18,671 |
| 36043 | NY | Herkimer | 16,630 | 12,840 | 15,279 |
| 36051 | NY | Livingston | 14,236 | 10,392 | 11,761 |
| 36053 | NY | Madison | 17,878 | 14,296 | 15,047 |
| 36067 | NY | Onondaga | 482,236 | 29,358 | 94,032 |
| 10001 | DE | Kent | 20,802 | 16,454 | 18,464 |
| 10003 | DE | New Castle | 10,428 | 7,551 | 9,027 |
| 10005 | DE | Sussex | 42,655 | 35,270 | 31,677 |
| 54003 | WV | Berkeley | 5,013 | 15,698 | 12,667 |
| 54023 | WV | Grant | 1,050 | 3,636 | 4,189 |
| 54027 | WV | Hampshire | 1,734 | 8,937 | 7,921 |
| 54031 | WV | Hardy | 1,558 | 4,878 | 5,151 |
| 54037 | WV | Jefferson | 404 | 9,924 | 9,799 |
| 54057 | WV | Mineral | 540 | 4,671 | 3,788 |
| 51059 | VA | Fairfax | 21,455 | 9,701 | 15,107 |
| 24005 | MD | Baltimore | 36,180 | 33,479 | 25,631 |

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| 36023 | NY | Cortland | 8,964 | 5,608 | 8,408 |
| 36025 | NY | Delaware | 17,367 | 18,061 | 18,671 |
| 36043 | NY | Herkimer | 16,630 | 12,840 | 15,279 |
| 36051 | NY | Livingston | 14,236 | 10,392 | 11,761 |
| 36053 | NY | Madison | 17,878 | 14,296 | 15,047 |
| 36067 | NY | Onondaga | 482,236 | 29,358 | 94,032 |
| 10001 | DE | Kent | 20,802 | 16,454 | 18,464 |
| 10003 | DE | New Castle | 10,428 | 7,551 | 9,027 |
| 10005 | DE | Sussex | 42,655 | 35,270 | 31,677 |
| 54003 | WV | Berkeley | 5,013 | 15,698 | 12,667 |
| 54023 | WV | Grant | 1,050 | 3,636 | 4,189 |
| 54027 | WV | Hampshire | 1,734 | 8,937 | 7,921 |
| 54031 | WV | Hardy | 1,558 | 4,878 | 5,151 |
| 54037 | WV | Jefferson | 404 | 9,924 | 9,799 |
| 54057 | WV | Mineral | 540 | 4,671 | 3,788 |
| 51059 | VA | Fairfax | 21,455 | 9,701 | 15,107 |
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| 36007 | NY | Broome | 21,392 | 16,781 | 20,092 |
| 36015 | NY | Chemung | 12,675 | 6,747 | 11,137 |
| 36017 | NY | Chenango | 16,349 | 11,971 | 16,621 |
| 36023 | NY | Cortland | 8,964 | 5,608 | 8,408 |
| 36025 | NY | Delaware | 17,367 | 18,061 | 18,671 |
| 36043 | NY | Herkimer | 16,630 | 12,840 | 15,279 |
| 36051 | NY | Livingston | 14,236 | 10,392 | 11,761 |
| 36053 | NY | Madison | 17,878 | 14,296 | 15,047 |
| 36067 | NY | Onondaga | 482,236 | 29,358 | 94,032 |
| 10001 | DE | Kent | 20,802 | 16,454 | 18,464 |
| 10003 | DE | New Castle | 10,428 | 7,551 | 9,027 |
| 10005 | DE | Sussex | 42,655 | 35,270 | 31,677 |
| 54003 | WV | Berkeley | 5,013 | 15,698 | 12,667 |
| 54023 | WV | Grant | 1,050 | 3,636 | 4,189 |
| 54027 | WV | Hampshire | 1,734 | 8,937 | 7,921 |
| 54031 | WV | Hardy | 1,558 | 4,878 | 5,151 |
| 54037 | WV | Jefferson | 404 | 9,924 | 9,799 |
| 54057 | WV | Mineral | 540 | 4,671 | 3,788 |
| 51059 | VA | Fairfax | 21,455 | 9,701 | 15,107 |
| 24005 | MD | Baltimore | 36,180 | 33,479 | 25,631 |

# Outliers Explained: Onondaga, NY

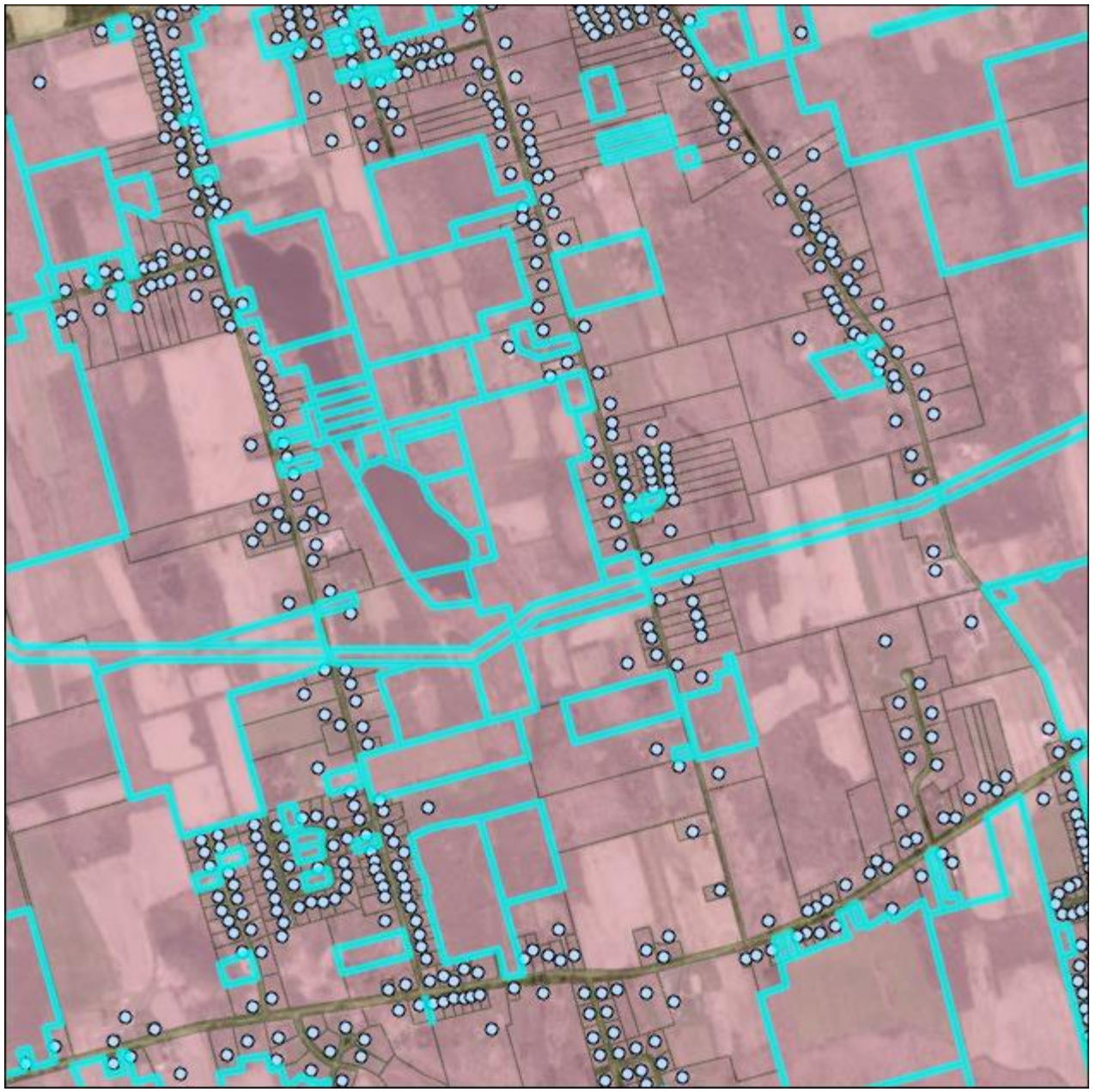
NY local data accounts for *every* parcel within the septic footprint, whereas P7 method only includes *developed* parcels

= P7 septic counts

= NY septic footprint (local data)

= NY parcels not included in our P7 septic counts

| State | County | Local Data | Phase 6 | Phase 7 |
|---|---|---|---|---|
| NY | Onondaga | 482,236 | 29,358 | 94,032 |



Onondaga, New York

# Outliers Explained: West Virginia Counties

WV local data may underrepresent total number of septic systems

= P7 septic counts

= P7 sewer service area

= WV septic permits (local data)

| State | County | Local Data | Phase 6 | Phase 7 |
|---|---|---|---|---|
| WV | Hardy | 1,558 | 4,878 | 5,151 |

Hardy, West Virginia

# Outliers Explained: Baltimore, MD

Baltimore local data accounts for septic systems within the sewer service area & captures more than one septic system per parcel

- = P7 septic counts
- = P7 sewer service area
- = Baltimore County septic system records (local data)

| State | County | Local Data | Phase 6 | Phase 7 |
|---|---|---|---|---|
| MD | Baltimore | 36,180 | 33,479 | 25,631 |

Baltimore County, Maryland

# Outliers Explained: Sussex, DE

DE local data accounts for septic systems within the SSA.

P7 septic counts may underrepresent new development.

= P7 septic counts

= P7 sewer service area

= Sussex septic systems (local data)

| State | County | Local Data | Phase 6 | Phase 7 |
|---|---|---|---|---|
| DE | Sussex | 42,655 | 35,270 | 31,677 |

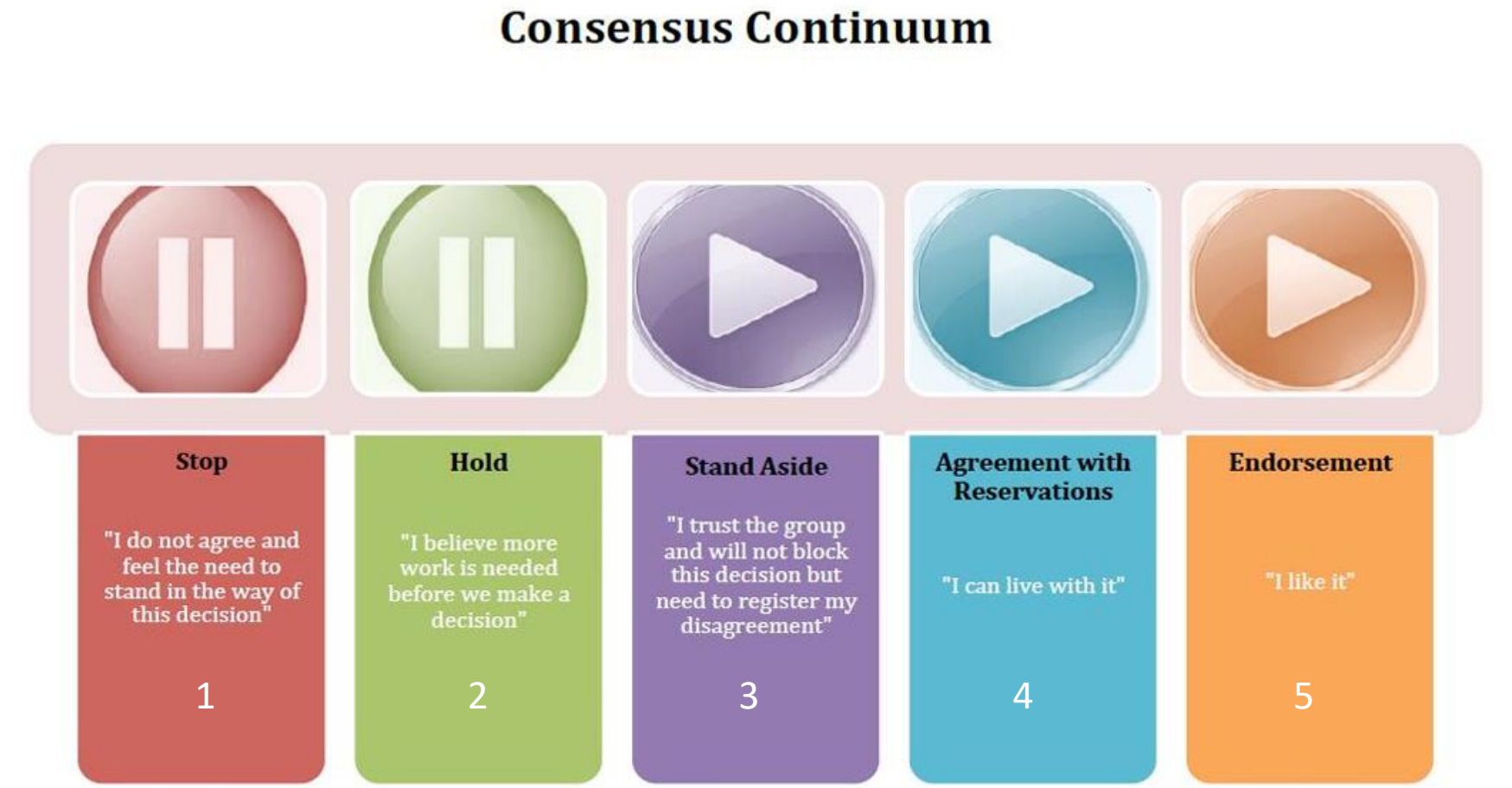
Sussex County, Delaware

DRAFT
Population on Sewer and Septic for 2020

| FIPS | County | Septic Count | | Population on Septic (2020) | | Population on Sewer (2020) | |
|---|---|---|---|---|---|---|---|
| | | Phase 6 | Phase 7 | Phase 6 | Phase 7 | Phase 6 | Phase 7 |
| 36003 | Allegany | 14,614 | 15,045 | 34,988 | 31,234 | 11,681 | 15,222 |
| 36007 | Broome | 16,781 | 20,092 | 38,324 | 64,028 | 154,931 | 134,655 |
| 36015 | Chemung | 6,747 | 11,137 | 15,732 | 32,149 | 69,093 | 51,999 |
| 36017 | Chenango | 11,971 | 16,621 | 28,430 | 35,813 | 19,412 | 11,394 |
| 36023 | Cortland | 5,608 | 8,408 | 13,526 | 22,165 | 34,308 | 24,625 |
| 36025 | Delaware | 18,061 | 18,671 | 40,003 | 31,167 | 5,058 | 13,135 |
| 36043 | Herkimer | 12,840 | 15,279 | 30,312 | 31,353 | 31,881 | 28,770 |
| 36051 | Livingston | 10,392 | 11,761 | 25,084 | 33,360 | 38,419 | 28,474 |
| 36053 | Madison | 14,296 | 15,047 | 34,408 | 41,129 | 36,585 | 26,873 |
| 36067 | Onondaga | 29,358 | 94,032 | 69,630 | 335,751 | 392,213 | 140,765 |
| 10001 | Kent | 16,454 | 18,464 | 42,753 | 64,945 | 134,001 | 116,905 |
| 10003 | New Castle | 7,551 | 9,027 | 19,291 | 45,763 | 537,200 | 524,956 |
| 10005 | Sussex | 35,270 | 31,677 | 85,448 | 94,967 | 139,249 | 142,399 |
| 54003 | Berkeley | 15,698 | 12,667 | 40,394 | 69,404 | 74,840 | 52,672 |
| 54023 | Grant | 3,636 | 4,189 | 7,842 | 8,312 | 3,783 | 2,664 |
| 54027 | Hampshire | 8,937 | 7,921 | 20,168 | 19,453 | 3,230 | 3,640 |
| 54031 | Hardy | 4,878 | 5,151 | 10,450 | 10,271 | 3,409 | 4,025 |
| 54037 | Jefferson | 9,924 | 9,799 | 25,642 | 31,674 | 30,944 | 26,027 |
| 54057 | Mineral | 4,671 | 3,788 | 10,920 | 12,421 | 16,307 | 14,517 |
| 51059 | Fairfax | 9,701 | 15,107 | 26,515 | 61,576 | 1,122,831 | 1,088,730 |
| 24005 | Baltimore | 33,479 | 25,631 | 82,330 | 88,996 | 746,626 | 765,196 |

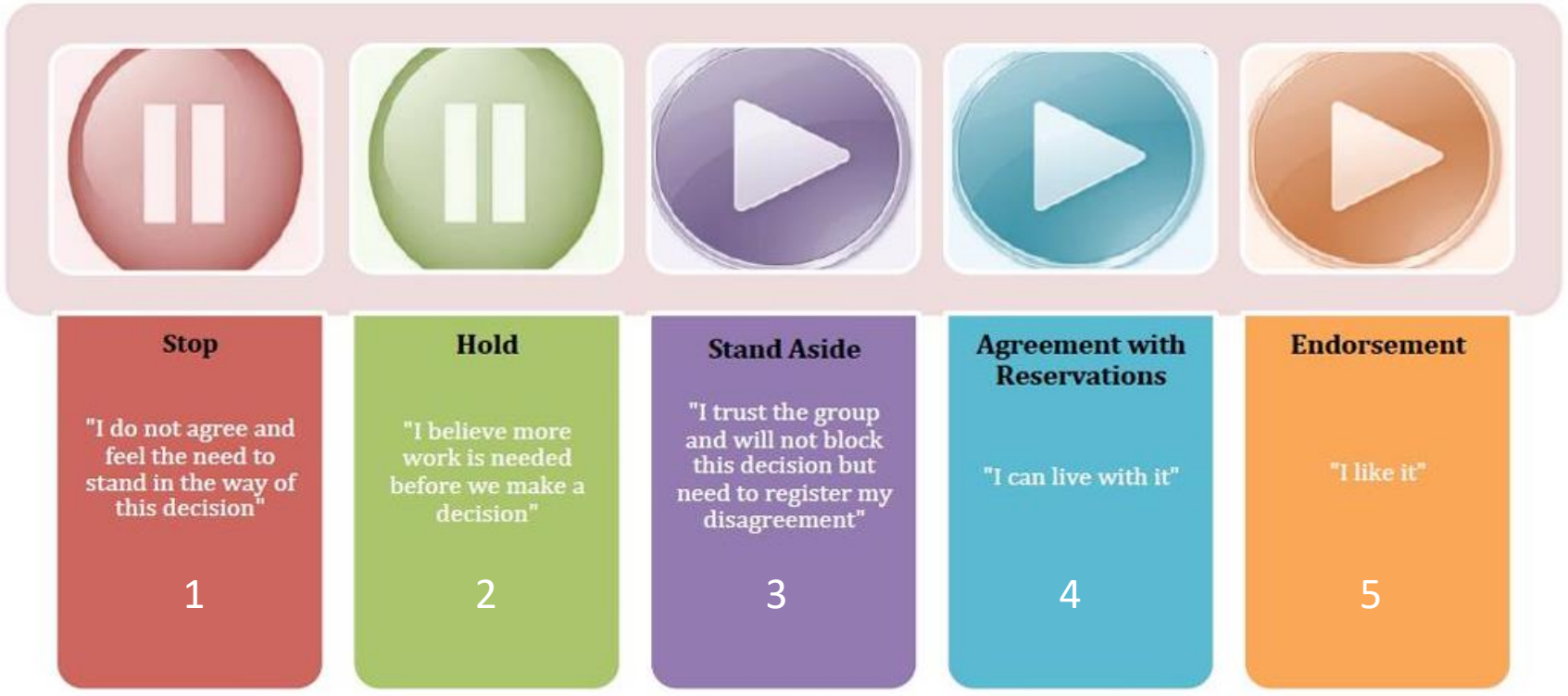

# Discussion/Questions?

**Decision Requested:** Approve the Phase 7 sanitary sewer service area.



**Decision Requested:** Approve the updated methods for the sewer/septic model, which estimates the number of septic systems, population on sewer, and population on septic within the watershed.

## Consensus Continuum




University of Maryland, Center for Leadership & Organizational Change


# Reference Slides

# Jurisdictions with updated sewer service area data for Phase 7

- mary_24000 (Maryland - all counties)
- anne_24003
- balt_24005
- carr_24013
- cici_24015
- dorc_24019
- fred_24021
- harf_24025
- quee_24035
- some_24039
- talb_24041
- kent_10001
- suss_10005
- albe_51003
- ches_51550
- clar_51043
- crai_51045
- culp_51047
- fair_51059
- fall_51610
- fauq_51061
- fred_51630
- glou_51073
- gree_51079
- hamp_51650
- harr_51660
- king_51099
- lexi_51678
- newp_51700
- page_51139
- prin_51153
- rich_51760
- rock_51165
- sale_51775
- shen_51171
- staf_51179
- warr_51187
- winc_51840
- wayn_51820
- york_51199
- berk_42011
- brad_42015
- ches_42029
- clea_42033
- cumb_42041
- lanc_42071
- tiog_42117
- unio_42119
- alle_36003
- broo_36007
- chem_36015
- chen_36017
- cort_36023
- dela_36025
- herk_36043
- livi_36051
- madi_36053
- onon_36067
- west_54000 (West Virginia - counties within the CBW)
- pres_54077
- tuck_54093
- rand_54083
- poca_54075
- gree_54025
- monr_54063

# Acronyms

- CAST: Chesapeake Assessment Scenario Tool
- CBP: Chesapeake Bay Program
- CBLCM: Chesapeake Bay Land Change Model
- CBW: Chesapeake Bay Watershed
- P6: Phase 6 [Watershed Model]
- P7: Phase 7 [Watershed Model]
- SSA: Sewer Service Area
- USGS: United States Geological Survey
- USWG: Urban Stormwater Workgroup