Technical Report: 2018 water and Sewer inventory

The Richmond Regional Planning District Commission (RRPDC) is a governmental body created by the Virginia General Assembly to coordinate issues of regional concern. Members of the RRPDC include elected officials from the region's nine jurisdictions – Town of Ashland, City of Richmond, and counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, and Powhatan.

Working with the region's local utility directors, RRPDC first documented existing and planned public water and sewer utilities in 2010 as part of a public information brochure. The GIS data layer along with plant capacities and use showing total regional systems capacity at that time serves as a large-scale planning resource indicating development readiness, growth patterns, and economic development potential.

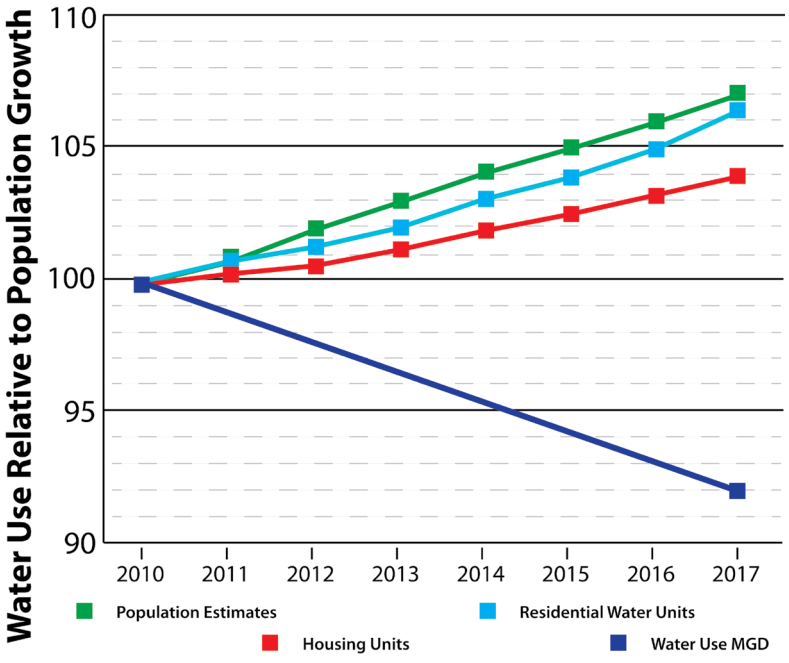
The 2018 Regional Water & Sewer Inventory updates the 2010 map layer making use of the most recent data from the localities. The goal is to provide a summary every five-years with annually updated GIS map layer posted on the agency website www.richmondregional.org.

Water and Sewer in the Region

The 29th Annual Virginia Water and Wastewater Rate Report 2017 prepared by Draper Aden Associates and information from the localities shows a total of 291,263 residential and 23,135 non-residential water units [or connections] are accounted for in the existing public water service area. The total raw water withdrawal capacity in the region is approximately 300 million gallons per day (MGD) with an average daily use estimated to be 121 MGD (or 31%). More than 75 percent of the total permitted water supply is exchanged through contract purchase/sale among the localities within the region. Public sewer service is provided to an equivalent of 270,659 residential and 18,610 non-residential wastewater units according to the 2017 Draper Aden report and data provided by the localities.

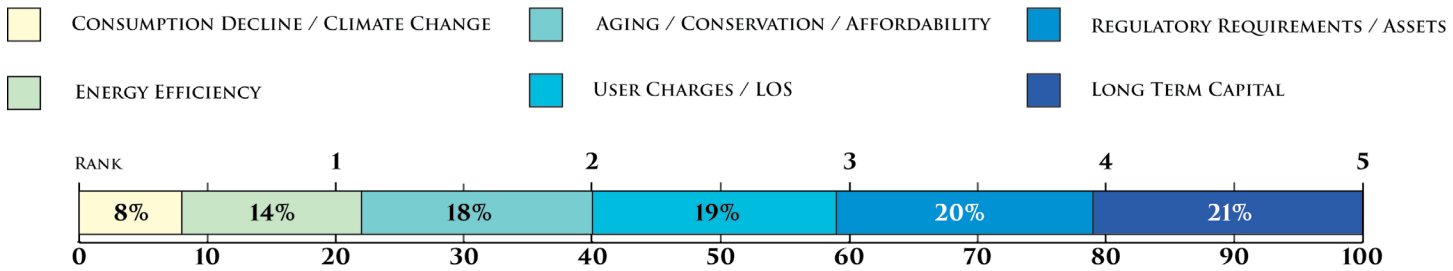
What has changed?

Although the permitted water treatment capacity in the region has increased by approximately 110 MGD, water use has declined by 14 MGD or about 10 percent. This is despite the fact that the region's population according to the U.S. Census has increased by nearly 8.0 percent and the number of housing units by more than 19,000 units for a 3.8 percent increase from 2010 to 2017. The graph to the right shows the declining water consumption relative to increase in population which is common throughout Virginia due to more efficient fixtures and emphasis on conservation.



What Are the Region's Priorities?

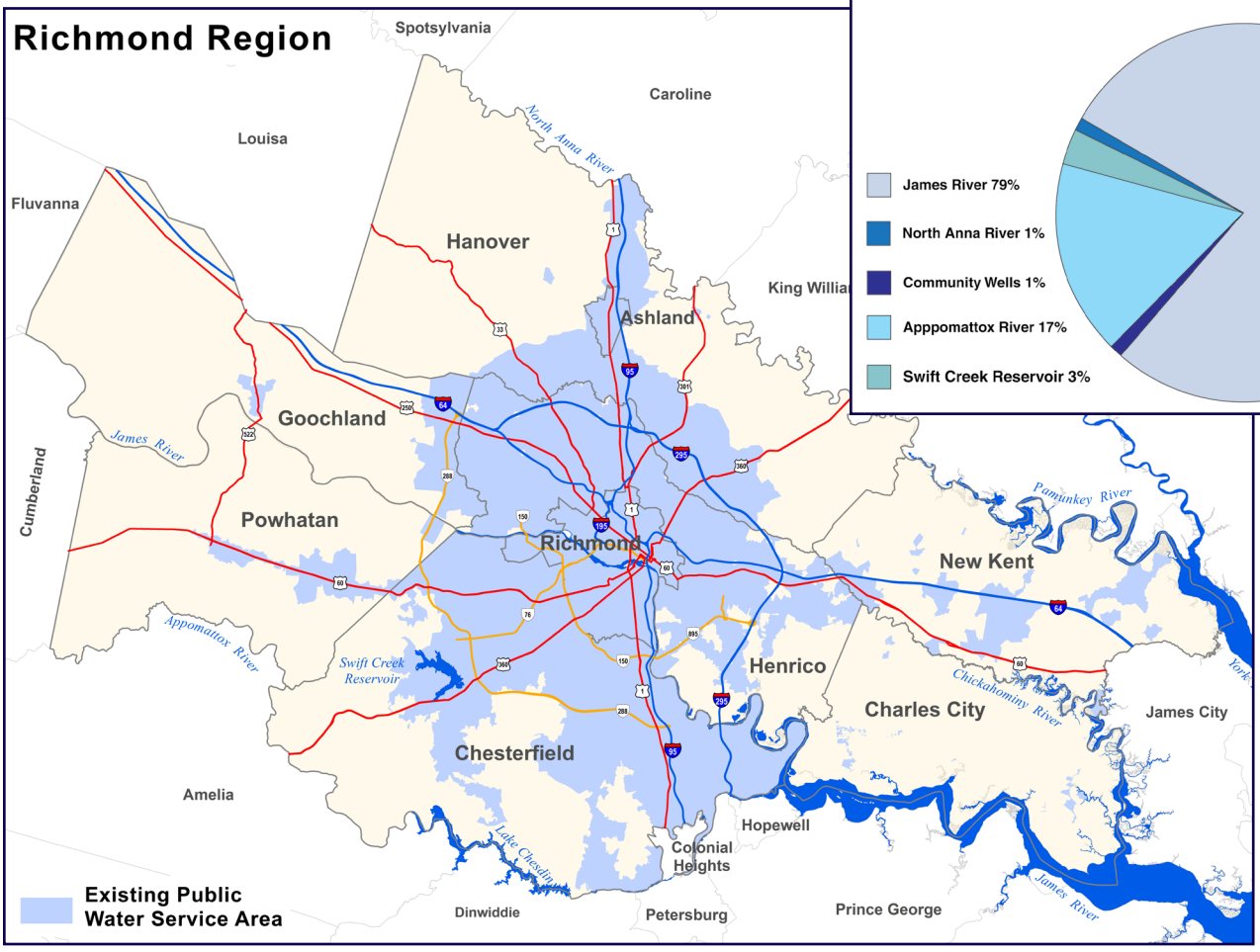
The region's utility system directors were surveyed using the same questions from the Draper Aden survey of utility systems throughout the Commonwealth to provide an indication of the priorities with which they are most concerned or find the most relevant to financial and customer concerns or asset management. Ranked on a 1 to 5 scale with 5 being the most important, the region's utility directors identified the following priorities as depicted below:

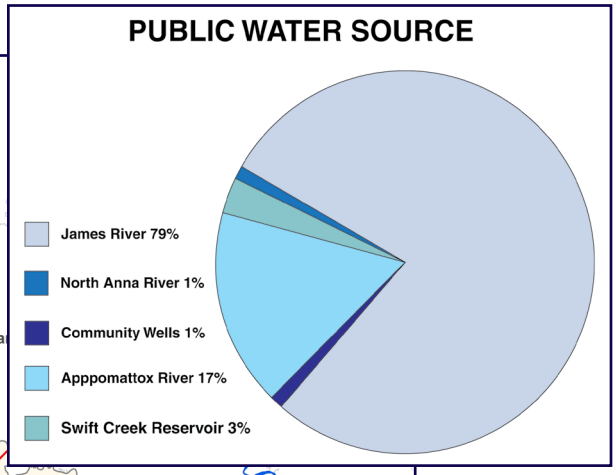


Technical Report: Public water

Surface Water

An estimated 99 percent of public water comes from surface water resources while groundwater withdrawals through community wells make up the remaining 1 percent. This has not changed since 2010, and the James River continues to be the principal source for surface water withdrawals.





Did you know?

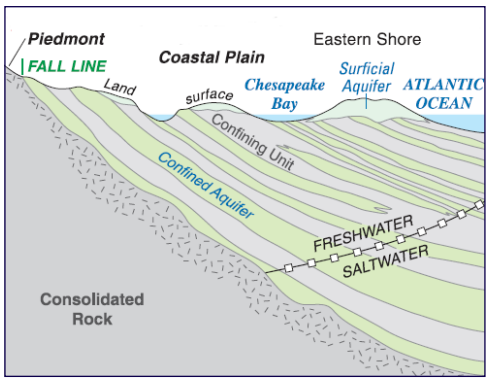
- Even though less than one (1) percent of the region's drinking water comes from ground water sources and serves less than 10 percent of the population, an estimated 60 percent of the land area in the Richmond region is currently dependent on ground water as the primary source.
- A person can live about a month without food, but only about a week without water.
- Less than 1% of the total water produced by public water systems is used for cooking and drinking.
- One gallon of gasoline poured into a lake can contaminate approximately 750,000 gallons of water.
- The volume of water storage required by permit is dictated by daily peak hour demand, often driven higher than normal by summer irrigation. Programming irrigation timers for several short cycles instead of one long cycle more effectively allows water to soak into the ground reducing peak demand and excessive water use.

The James river supplies more than three-quarters of the region's drinking water.

Technical Report: Public water

Ground Water

The land area of the Richmond region is divided by the geological fall line. Generally running parallel to Interstate 95, the fall line divides the region into two physiographic provinces-the Coastal Plain to the east and the Piedmont to the west. Each province displays distinctly different characteristics of geology, topography, and soil types which affect water resources.



Coastal Plain

In the land area east of I-95, domestic and other small capacity community wells draw ground water from a shallow unconfined aquifer system. Major ground water withdrawals of 300,000 gallons per month as permitted by the Virginia Department of Environmental Quality (DEQ) come from a deeper system of confined aquifers whose recharge area extends hundreds of miles into Tidewater. The broad recharge areas of the deep confined aquifers beneath the coastal plain present complex wellhead protection problems. When water infiltrates from the water table shallow aquifers recharge the deep aquifers and pollutants can follow.

Piedmont

The western piedmont area is characterized by gently rolling topography and deeply weathered bedrock, resulting in wide variations in ground water quality and well yields and limited ground water in many locations. The more developed portions of the Piedmont in the Richmond region are served by surface water from the James River.

Water Supply Planning & Conservation

Virginia's largest river basin, the James covers 10,265 square miles and is made up of the Upper, Middle and Lower sub-basins as well as the Appomattox River sub-basin. The Gathright Dam at Lake Moomaw in the Alleghany Highlands headwaters is operated by the U.S. Army Corps of Engineers regulating the quantity of the supply to reduce flood damage downstream, increase low flows for water quality, and create opportunities for water-based recreation.

DEQ is working with localities to update the State Water Resources Plan by the end of 2018, projecting needs to 2040 using the VA Hydro model to link data on withdrawal permits, water supply plans, GW-2 well registrations and drought monitoring/modeling of both surface water and groundwater. The model will also incorporate data from the Virginia Department of Health (VDH) on private well registrations.

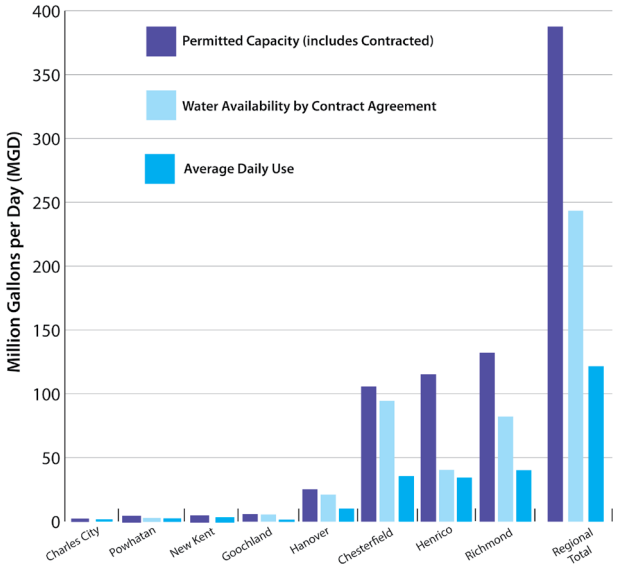
General trends in water withdrawal from 2012 to 2016 indicate total withdrawal has been stable, manufacturing experienced the largest increase, commercial withdrawals increased significantly due to closer reporting of irrigation on golf courses, and surface water withdrawals for agricultural has increased slightly each year..

Key findings are noted in planning for the future:

- The Virginia Coastal Plain Ground Water Initiative has resulted in reductions by 50% of permitted withdrawals from the Potomac Aquifer; focus is on the largest permitted facilities, alternative sources and innovative ways to increase supply over the next 50 years.
- The 2016 Water Resources Plan predicts a net increase of 450 MGD statewide in demand for water by 2040, with greatest potential for negative impacts on the James, Potomac-Shenandoah, and York River basins.

PUBLIC WATER

Permitted Capacity, Intergovernmental Agreements & Average Daily Use



DID YOU KNOW?

An investment of $280 million by Henrico County to construct the Cobbs Creek Reservoir increases the County's drinking water supply by 47 MGD, with 17 MGD available in the future to Henrico and/or its regional partners. The 15 million-gallon impoundment in Cumberland County will augment the flow of the James River by withdrawing water in wet weather and releasing it back in drier months.

Technical Report: Wastewater and Sewer Service

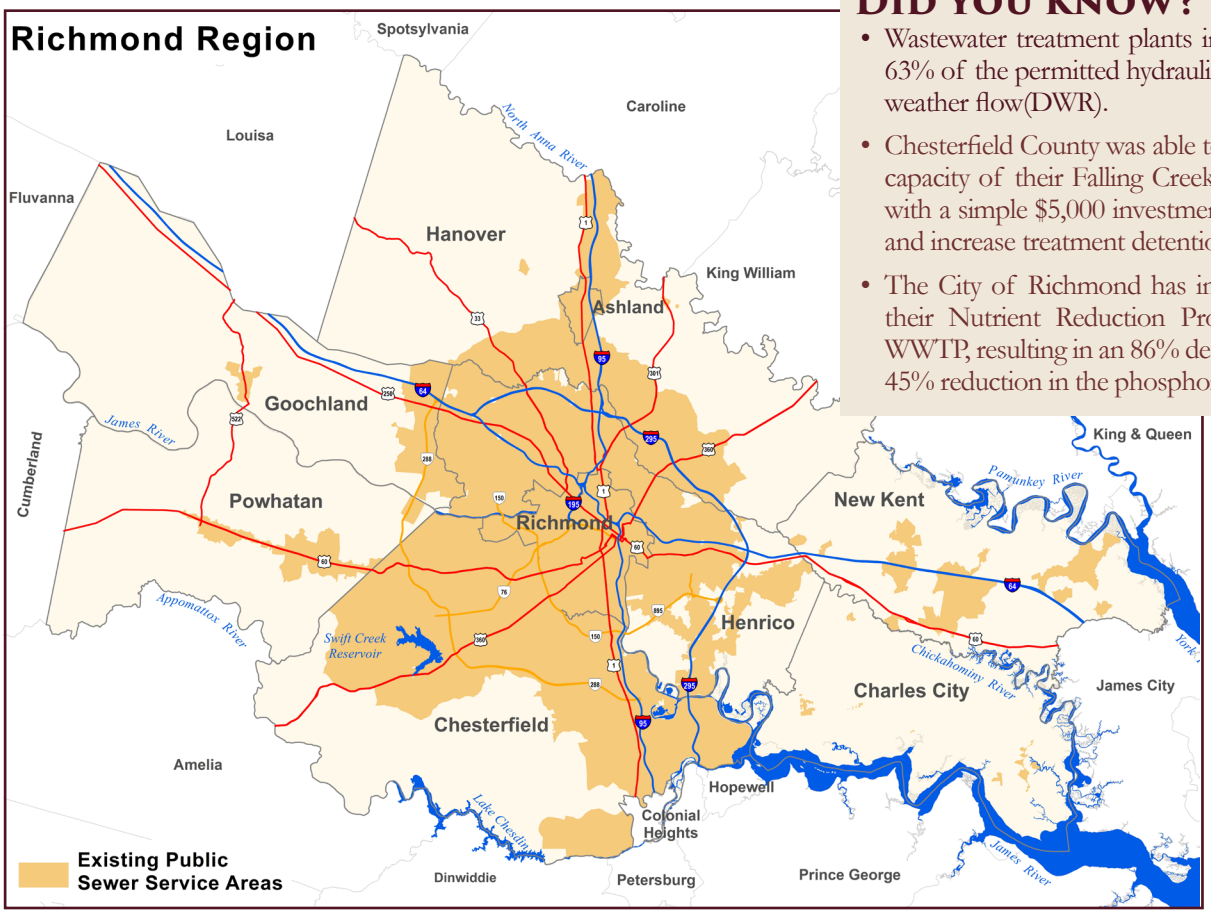
The Richmond region's wastewater treatment capacity is defined both by the physical capacity of the sewerage systems and the limits on pollutant discharge which specifies pounds per year of nitrogen, phosphorus and sediment, allowed to be released from the treatment plants (point-sources).

Permitted hydraulic capacity is the amount of flow that can be accommodated by the sewerage system, consisting of collection lines and treatment plants. The Richmond region is served by 15 public wastewater treatment facilities with a total permitted hydraulic capacity of almost 200 million gallons per day (MGD). This represents an almost 8.0 MGD upgrade in capacity from 2010 with wastewater treatment plant (WWTP) expansions by Chesterfield at Falling Creek, by Hanover at Totopotomoy, and the City of Richmond's WWTP.

Wastewater system capacity is also defined by the total maximum daily load (TMDL) of pollutants that may be discharged into the region's waterways in compliance with the Clean Water Act and Chesapeake Bay Restoration Act requirements. In partnership with local and regional partners, DEQ is currently formulating the Phase III Watershed Implementation Plan (WIP) in response to the Federal EPA's targets for reductions in TMDL. Virginia's Phase III WIP will incorporate waste load allocations in current permits for WWTP in the Richmond region.

Did you know?

- Wastewater treatment plants in the region use about 63% of the permitted hydraulic capacity based on dry weather flow(DWR).
- Chesterfield County was able to increase the hydraulic capacity of their Falling Creek WWTP by 1.9 MGD with a simple $5,000 investment to raise a weir height and increase treatment detention time.
- The City of Richmond has invested $120 million in their Nutrient Reduction Program (NRP) at their WWTP, resulting in an 86% decrease in nitrogen and a 45% reduction in the phosphorous in the James River.



Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA17NOS4190152 of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, under the Coastal Zone Management Act of 1972, as amended.

The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its sub agencies.

The RRPDC thanks the region's Utilities Directors and their staffs for assistance in preparing this report: Charles City County, Chesterfield County, Goochland County, Hanover County, Henrico County, New Kent County, Powhatan County and the City of Richmond.

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