Section 1 | **Existing Sources**

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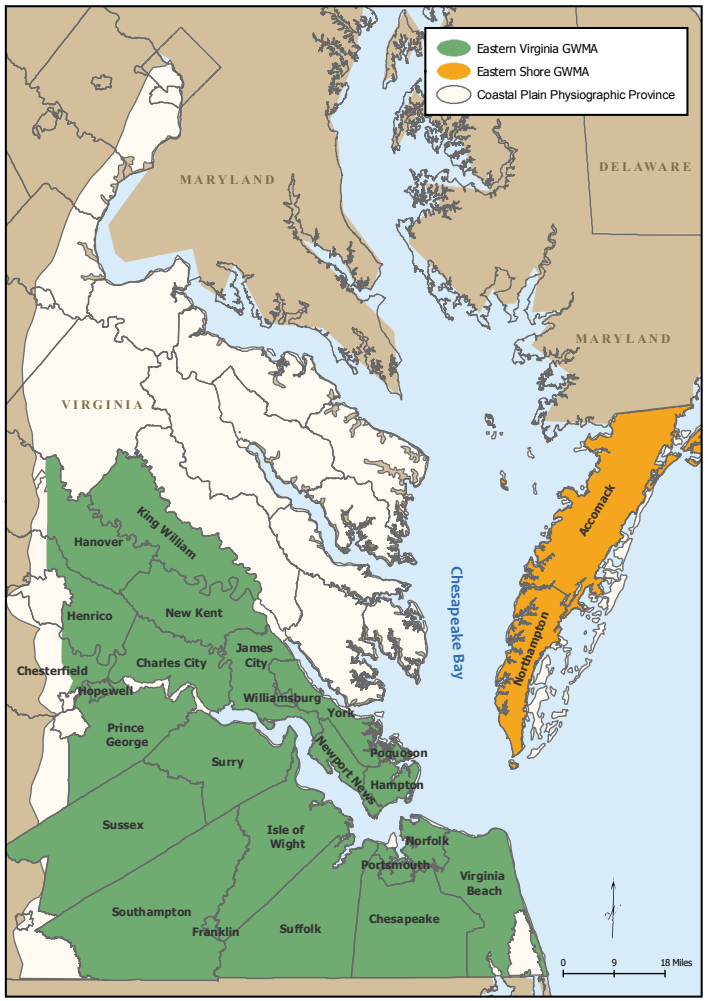
Existing Sources - Introduction

The Local and Regional Water Supply Planning Regulation (9 VAC 25-780-70) requires information regarding the water source(s) that support current water use. The sources can be groundwater, surface water reservoirs, or stream intakes, and in some cases, water is supplied from a combination of sources. This chapter provides information about the water sources and water systems serving the Hampton Roads Region.

The Virginia Department of Health (VDH) and the Virginia Department of Environmental Quality (DEQ) both track water use in the State of Virginia. DEQ's regulations address (1) management of surface water and groundwater resources, (2) impacts on other beneficial uses of streams such as recreation, habitat, fish, etc., (3) water quality issues, and (4) avoiding conflicts between water users. VDH's regulations are focused on protecting public health.

Under the Groundwater Management Act of 1992, ground water resources are managed through a DEQ program regulating groundwater withdrawals from designated Groundwater Management Areas (GWMAs). Virginia has two GWMAs: the Eastern Virginia GWMA and the Eastern Shore GWMA. All of the localities in the Hampton Roads Region, with the exception of Gloucester County, are within the Eastern Virginia GWMA (see Map 1-1). Any groundwater withdrawal in a GWMA greater than 300,000 gallons per month must obtain a Ground Water Withdrawal Permit from DEQ. The permit limits the maximum monthly and yearly withdrawal amounts for the respective well. The monthly amount is an operating constraint that is important for evaluating the system's ability to meet peak demands, which typically occur during summer months. The yearly amount is considered the available supply in the following sections of the report and in evaluations of long-term supply verses demand.

DEQ requires a Virginia Water Protection Permit for surface water withdrawals of more than 300,000 gallons per month. Permittees must report withdrawal information to DEQ. Most surface water withdrawals in the sub-region were established prior to 1989 and are, therefore, exempt from the VWP Permit program. Permits from the VDH are required for the establishment, construction, or operation of any community water system (CWS) or water supply. CWSs are defined as water systems that serve at least 15 residential connections or at least 25 residential consumers for at least 60 days out of the year.



Map 1-1: Virginia Groundwater Management Areas

Existing Sources – Peninsula Sub-Region

The Peninsula sub-region includes the Cities of Hampton, Newport News, Poquoson, and Williamsburg, and the Counties of Gloucester, James City, and York. All localities in the sub-region are located on the York-James Peninsula, with the exception of the County of Gloucester. Gloucester County is located on the Middle Peninsula and is geographically separated from the other sub-region localities by the York River. Gloucester County is unique in that it is a member of the Hampton Roads Planning District as well as the Middle Peninsula Planning District. The total population of the Peninsula sub-region was 512,000 people in 2007. The majority of residents are served by publicly-owned CWSs. However, portions of Gloucester County, James City County, and York County do not have public water service.

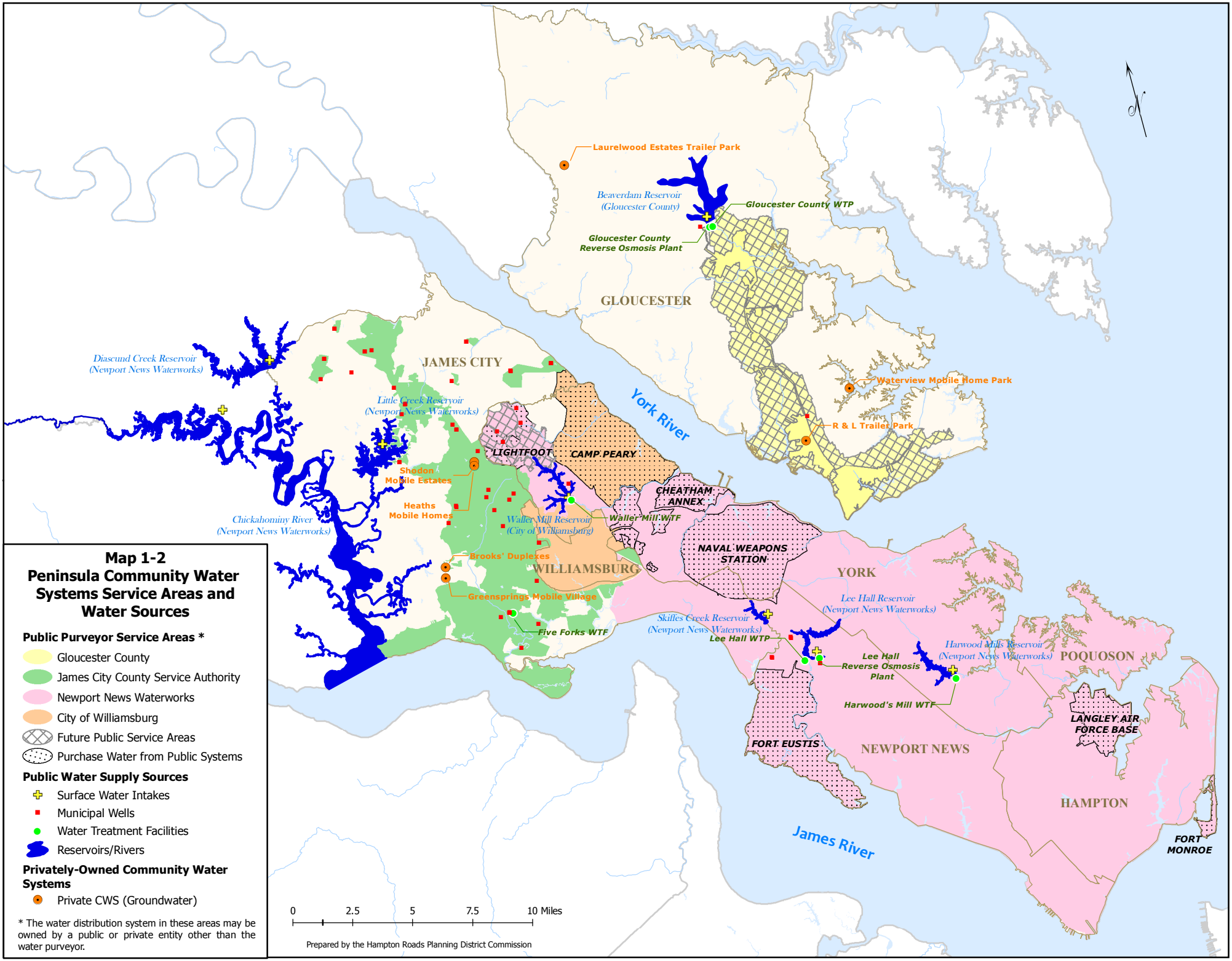
The sub-region is served by 26 CWSs: 11 systems are owned by the municipalities (publicly-owned systems), 8 systems are military base systems or privately-owned systems that are customers of Newport News Waterworks, and the remaining 7 systems are small, privately-owned systems that each serve less than 200 people from groundwater sources. Eight of the publicly-owned CWSs rely solely on groundwater, including seven systems in James City County and one in York County. Three systems, Gloucester County, Newport News Waterworks, and City of Williamsburg, are conjunctive use systems that use both surface water and groundwater. Surface water sources include seven reservoirs and the Chickahominy River. Map 1-2 identifies CWS in the sub-region and their sources and service areas. Map 1-3 shows all of the self-supplied users that withdraw more than 300,000 gallons per month.

In 2001, the Hampton Roads Planning District Commission (HRPDC) conducted a detailed Source Water Assessment Program (SWAP) (August 2002). The HRPDC SWAP assessment found that all surface water sources in the Peninsula sub-region have a high susceptibility to contamination. Most of the groundwater wells in the sub-region were found to have a low susceptibility to contamination.

Per the 1996 Safe Drinking Water Act Amendments, the VDH SWAP Program inventoried drinking water sources and nearby land uses that may impact water quality, including common activities related to residential, industrial, commercial, and agricultural land uses and waste management and transportation facilities. VDH SWAP evaluations (February 15, 2006), which included private systems, identified five private CWSs with wells with a high susceptibility to contamination. Unlike other parts of Hampton Roads, wells in the Peninsula sub-region do not produce water exhibiting elevated concentrations of fluoride.

2007 Peninsula Overview

- 26 publicly-owned CWSs served 478,155 people.
- All surface water sources have a high susceptibility to contamination.
- 7 privately-owned CWSs served 435 people.
- 5 privately-owned CWSs have wells with high susceptibility to contamination.
- 23 active Groundwater Withdrawal Permits.
- 33,384 people were served by private residential wells.
- 54 businesses were served by private business wells withdrawing less than 300,000 gallons per month.
- 7 self-supplied users withdrew more than 300,000 gallons per month of surface water for non-agricultural use.
- 13 self-supplied users withdrew more than 300,000 gallons per month of groundwater for non-agricultural use.
- No agricultural users reported withdrawals of more than 300,000 gallons per month.



Map 1-2
Peninsula Community Water Systems Service Areas and Water Sources

Public Purveyor Service Areas *

- Gloucester County
- James City County Service Authority
- Newport News Waterworks
- City of Williamsburg
- Future Public Service Areas
- Purchase Water from Public Systems

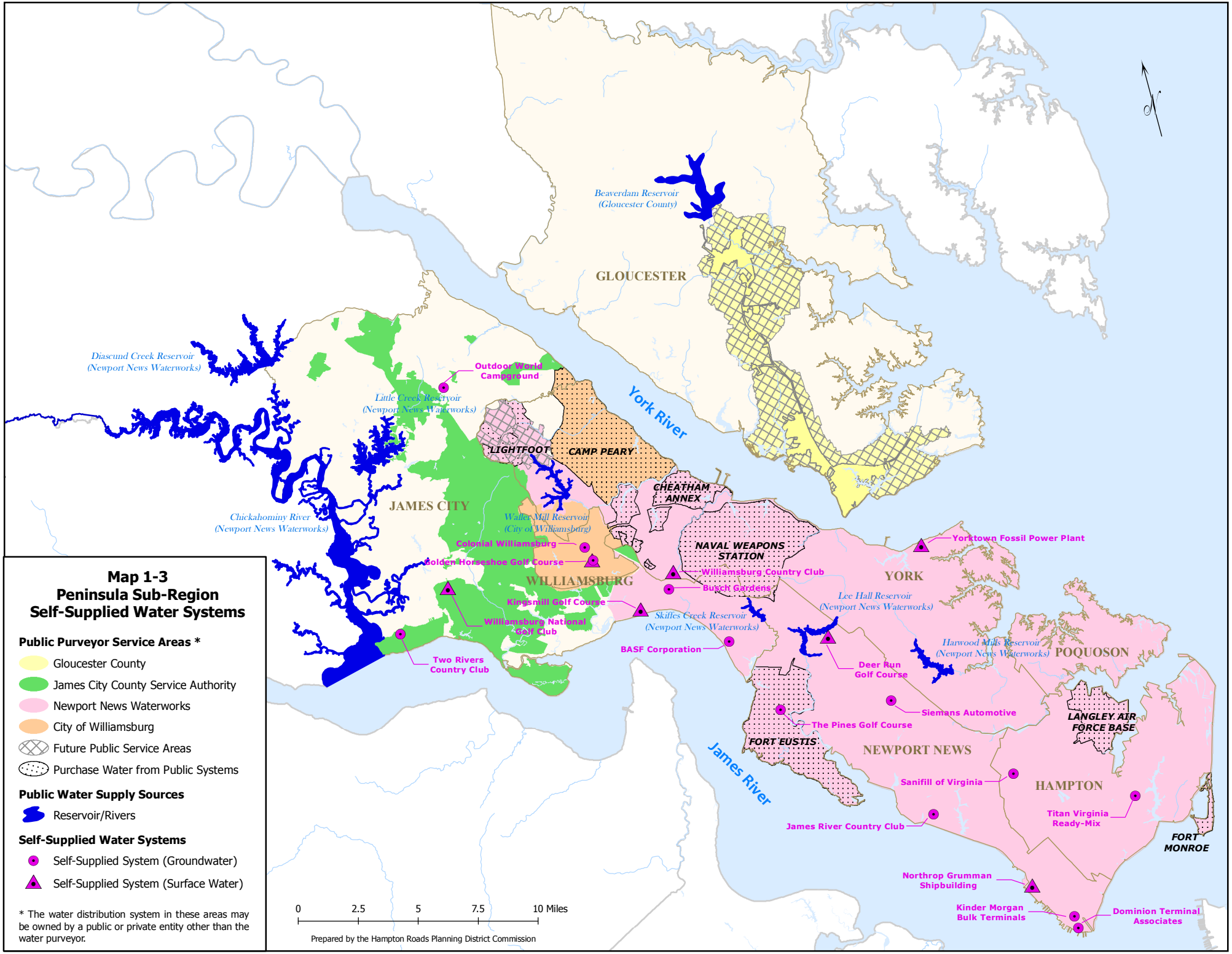
Public Water Supply Sources

- Surface Water Intakes
- Municipal Wells
- Water Treatment Facilities
- Reservoirs/Rivers

Privately-Owned Community Water Systems

- Private CWS (Groundwater)

* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.


Map 1-3
Peninsula Sub-Region
Self-Supplied Water Systems
Public Purveyor Service Areas *
Gloucester County
James City County Service Authority
Newport News Waterworks
City of Williamsburg
Future Public Service Areas
Purchase Water from Public Systems
Public Water Supply Sources
Reservoir/Rivers
Self-Supplied Water Systems
Self-Supplied System (Groundwater)
Self-Supplied System (Surface Water)
* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.
0 2.5 5 7.5 10 Miles
Prepared by the Hampton Roads Planning District Commission
GLOUCESTER
JAMES CITY
WILLIAMSBURG
YORK
POQUOSON
NEWPORT NEWS
HAMPTON
LIGHTFOOT
CAMP PEARY
CHEATHAM ANNEX
NAVAL WEAPONS STATION
FORT EUSTIS
LANGLEY AIR FORCE BASE
FORT MONROE
York River
James River
Beaverdam Reservoir (Gloucester County)
Diascund Creek Reservoir (Newport News Waterworks)
Little Creek Reservoir (Newport News Waterworks)
Chickahominy River (Newport News Waterworks)
Waller Mill Reservoir (City of Williamsburg)
Lee Hall Reservoir (Newport News Waterworks)
Skiffes Creek Reservoir (Newport News Waterworks)
Harwood Mills Reservoir (Newport News Waterworks)
Outdoor World Campground
Colonial Williamsburg
Golden Horseshoe Golf Course
Kingsmill Golf Course
Williamsburg National Golf Club
Two Rivers Country Club
Williamsburg Country Club
Busch Gardens
BASF Corporation
Yorktown Fossil Power Plant
Deer Run Golf Course
Siemans Automotive
The Pines Golf Course
Sanifill of Virginia
James River Country Club
Titan Virginia Ready-Mix
Northrop Grumman Shipbuilding
Kinder Morgan Bulk Terminals
Dominion Terminal Associates

York-James Peninsula

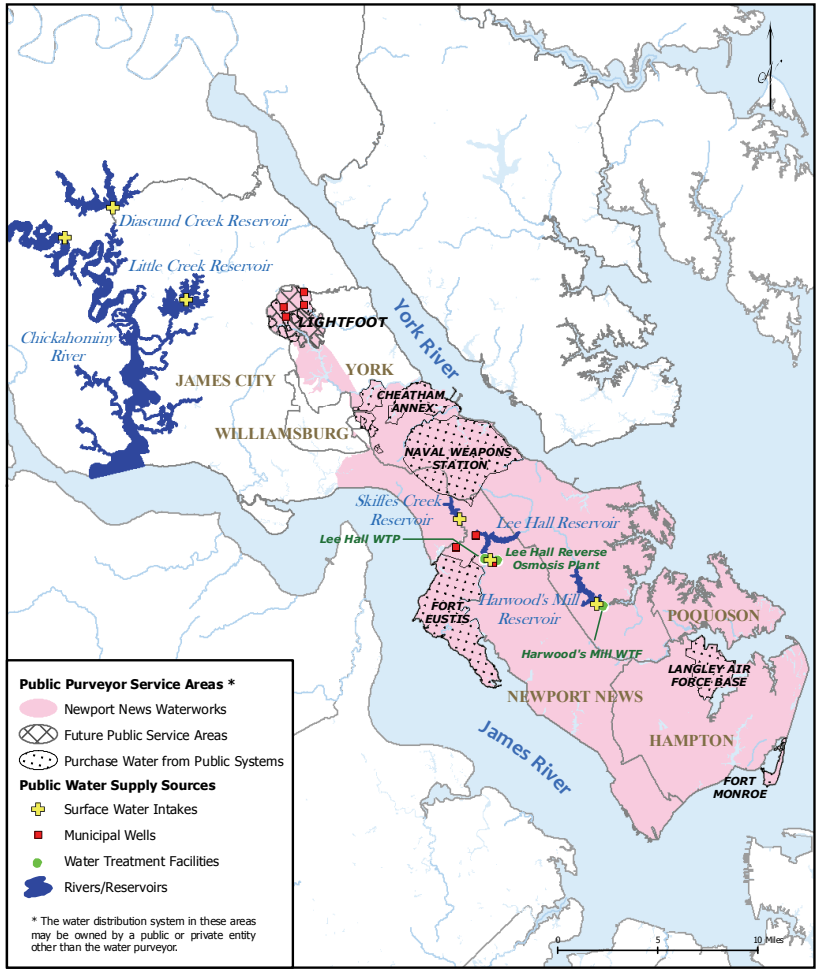
Cities of Hampton, Newport News, Poquoson, and York County: Publicly-Owned Community Water Systems

Newport News Waterworks (NNWW) provides water service to approximately 400,000 people in the Peninsula sub-region with a combination of withdrawals from the Chickahominy River, five reservoirs, and groundwater resources. The NNWW service area includes the entire cities of Newport News, Hampton, and Poquoson. NNWW also serves a small portion of James City County and most of York County, including several military installations (Yorktown Naval Weapons Station and Cheatham Annex).

NNWW has agreements to also sell bulk water to the James City Service Authority (JCSA) and the City of Williamsburg. JCSA can obtain an annual average of 4 million gallons per day (mgd) of treated water from NNWW and may receive up to 5 mgd of treated water in a calendar year, if available, upon written notice to NNWW based on specific criteria in their contract (see Attachment 1). The contract term is from 2009 to 2050 with automatic renewals. Williamsburg can purchase a combined total of 2 mgd of raw water and/or treated water measured as a yearly average. Williamsburg may purchase up to 2.5 mgd in a calendar year if the useable reservoir capacity of the NNWW system is at or above the typical drawdown cycle. Additional details are described in their contract.

The primary source of drinking water for the NNWW system is surface water. NNWW operates two water treatment plants (WTP): Lee Hall WTP and Harwood's Mill WTP. When available, water is pumped from the Chickahominy River above Walker's Dam and transferred to reservoirs for storage. NNWW has five reservoirs: Lee Hall Reservoir, Harwood's Mill Reservoir, Skiffe's Creek Reservoir, Little Creek Reservoir, and Diascund Creek Reservoir. NNWW uses groundwater as the secondary source of water. Wells withdraw brackish groundwater that is treated at the Lee Hall Reverse Osmosis Plant. Surface water and groundwater are treated separately, then blended together at the Lee Hall WTP before distribution. NNWW also operates the Harwood's Mill WTP, which only treats surface water. Map 1-4 shows the locations of NNWW's treatment plants, sources, and service areas.

Map 1-4: Newport News Waterworks Service Area and Water Sources



The Chickahominy River is in the James River Basin. The drainage area of the intake is 301 square miles and the average river flow is 180 mgd. The surface water withdrawal permit restricts NNWW from pumping when the river stage at Walker's Dam is below elevation 3.00 feet. NNWW withdrawals from the Chickahominy River may be suspended when tidal influences occur and downstream chlorides are elevated, as during drought conditions, to avoid drawing high chloride water into the intake.

The five NNWW reservoirs are geographically spread out across the sub-region. The following list describes the reservoirs from north to south:

- Diascund Reservoir, at the border of James City County and New Kent County, has a drainage area of 45 square miles and the available storage for 3.5 billion gallons of raw water.
- Little Creek Reservoir is located in James City County. The drainage area is 4.6 square miles and the storage available for water supply is 7.5 billion gallons of raw water.
- Skiffe's Creek Reservoir is located at the border of James City County and Newport News. The drainage area is approximately 6 square miles and the storage available for water supply is 230 million gallons of raw water.
- Harwood's Mill Reservoir is located in the southern portion of York County. The drainage area is 8.6 square miles and the storage available for water supply is 850 million gallons of raw water.
- Lee Hall Reservoir is located in the northern portion of Newport News. The drainage area is 14.5 square miles and the storage available for water supply is 880 million gallons of raw water.

The NNWW Lee Hall well field is located in the northern portion of Newport News just west of the Lee Hall Reservoir. The well field includes six deep wells in the Potomac Aquifer. The shallowest screen interval is from 505 to 530 feet below ground surface and the deepest is 1126 to 1131 feet below ground surface. The well field is

Photo: Skiffe's Creek Reservoir, HRPDC

permitted to withdraw 7 mgd, which produces 5.7 mgd of drinking water after losses during the reverse osmosis treatment process.

The water available from the NNWW surface water sources was evaluated by a private consultant in 2000. The yield of the wells is based on the total permitted annual withdrawal minus the losses associated with the reverse osmosis treatment process. See Table 1-1 for additional details.

Table 1-1: Newport News Waterworks Water Supply

Source Description	Raw Water (mgd)	Water Loss Description	Water Losses (mgd)	Finished Water (mgd)
Five reservoirs, Chickahominy River intake	54.8	1% loss to production processes	0.4	54.4
Brackish wells	7.0	20% loss to reverse osmosis	1.4	5.7
Total Supply	61.8		1.8	60.0

The HRPDC SWAP (August 2002) determined that the Chickahominy River and NNWW reservoir system have high susceptibility to contamination. However, NNWW has purchased land around the reservoirs and the conservation of those buffer areas reduces the likelihood of water quality problems in the reservoirs. Section 3: Existing Resources has additional information and maps of these buffers. All of the groundwater wells were determined to have a low susceptibility to contamination.

York County transferred ownership of the Lightfoot/Skimino and Banbury Water System (Lightfoot System) to NNWW in 2009. The water system is located in the northwest portion of York County. The system has 275 residential connections and significant commercial water users such as the Williamsburg Community Hospital and Great Wolf Lodge (indoor water park).

Photo: Lee Hall Reservoir, HRPDC

The Lightfoot System has four wells ranging from 280 to 320 feet deep. The system has a DEQ Ground Water Withdrawal Permit for 0.63 mgd. It is still operated as a stand-alone system but the distribution system will eventually be connected to NNWW's main system.

Newport News Waterworks Service Area: Privately-Owned Community Water Systems

Five CWSs within the NNWW service area serve military installations: Yorktown Naval Weapons Station, Cheatham Annex, Fort Monroe, Langley Air Force Base, and Fort Eustis. None of these systems has a raw water source or treatment facilities. Each of these systems has a retail service account with NNWW and is not obligated by minimum or maximum contract purchases.

There are six privately-owned CWSs in York County that own distribution systems but do not have any raw water sources (see Map 1-5). York County purchases the water from NNWW for these six systems. Aqua Virginia owns the three CWSs that serve the neighborhoods of Carver Gardens, Nelson Park, and York Terrace. Mountain Lake owns York Public Utilities. Two systems, Hubbards Lane and Queens Lake, formerly purchased water from the City of Williamsburg Waller Mill WTP; in August 2009, these systems began purchasing water from NNWW.

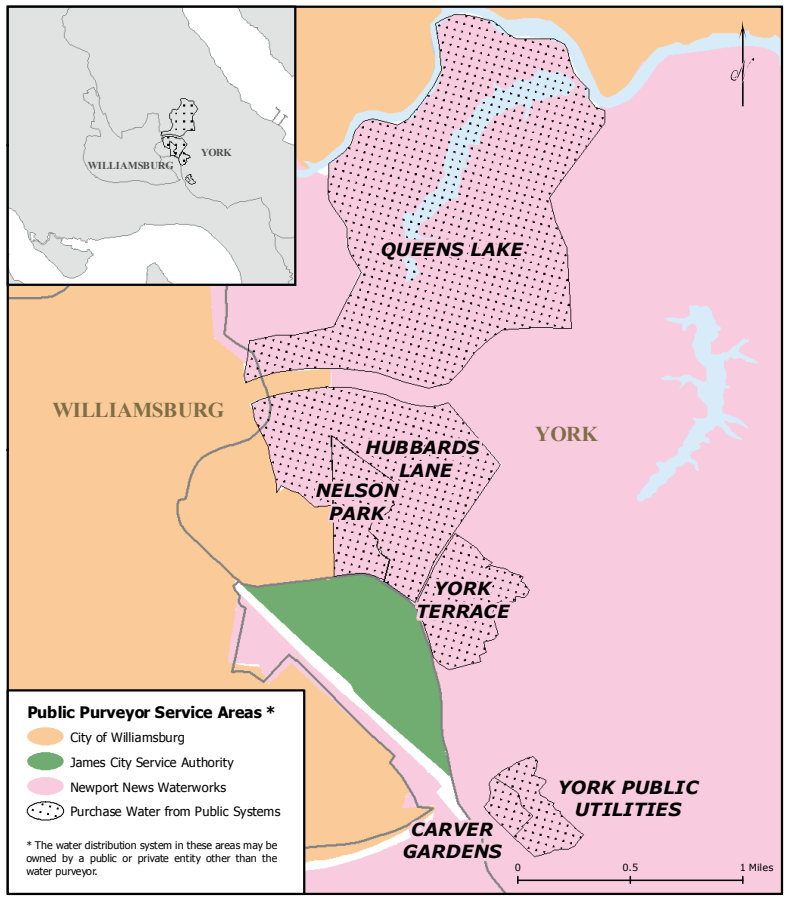
Newport News Waterworks Service Area: Self-Supplied Water Systems

There are approximately 3,200 people in York County that have domestic wells that provide water for their individual residences. Domestic well withdrawals in York County are from shallow aquifers: Yorktown-Eastover Aquifer (74%) and Piney Point Aquifer (26%) (Pope, USGS, 2007). A list of businesses with wells withdrawing less than 300,000 gallons per month is included in Appendix A. All of the domestic wells are located outside the CWS service areas.

In 2007, 11 self-supplied water systems withdrew more than 300,000 gallons per month of either surface water or groundwater in the NNWW service area. Four additional users, James River Country Club (surface water), Thomas Jefferson National Accelerator Lab (groundwater), and Williamsburg Pottery Factory A & B Systems (groundwater), have reported water use exceeding the permitting threshold for at least one year between 2002-2009 but did not exceed the threshold in 2007.

The Yorktown Fossil Power Plant is the largest self-supplied system in the NNWW service area. The facility withdraws water from the York River. The Yorktown Refinery uses reclaimed water from Hampton Roads Sanitation District (HRSD). In August 2010, Western Refining Inc. announced the refinery would be closing.

Map 1-5: Privately-Owned CWS, Newport News Waterworks Service Area



The following list describes each self-supplied water user (see Map 1-6 and Table 1-2):

- **Deer Run Golf Course:** Withdraws surface water for irrigation.
- **Dominion Terminal Associates-Pier 11:** Withdraws groundwater for dust suppression; 2 wells are approximately 730 feet deep.

- **James River Country Club:** Withdraws groundwater for irrigation; 6 wells are shallow, 2 wells are 700 and 720 feet deep.
- **Kinder Morgan Bulk Terminal – Pier IX:** Withdraws groundwater for dust suppression; 7 wells are approximately 30 feet deep, 1 well is 900 feet deep.
- **Northrop Grumman Shipbuilding:** Withdraws surface water for industrial cooling water.
- **Sanifill of Virginia – Big Bethel Landfill**: Withdraws groundwater for dewatering under the landfill liner; 7 wells are between 10 and 50 feet deep.
- **Siemens Automotive – Newport News:** Withdraws ground-water for industrial cooling water for automotive electronic/electrical systems; 7 wells are between 30 and 70 feet deep.
- **The Pines Golf Course – Fort Eustis:** Withdraws groundwater for irrigation; 1 well is 510 feet deep.
- **Titan Ready Mix Plant – Rip Rap Road:** Withdraws groundwater for concrete production; 3 wells are between 105 and 175 feet deep.
- **Williamsburg Country Club:** Withdraws surface water from a private lake for irrigation.
- **Yorktown Fossil Power Plant:** Withdraws surface water from the York River for cooling water.

Map 1-6: Self-Supplied Water Users in the Newport News Waterworks Service Area

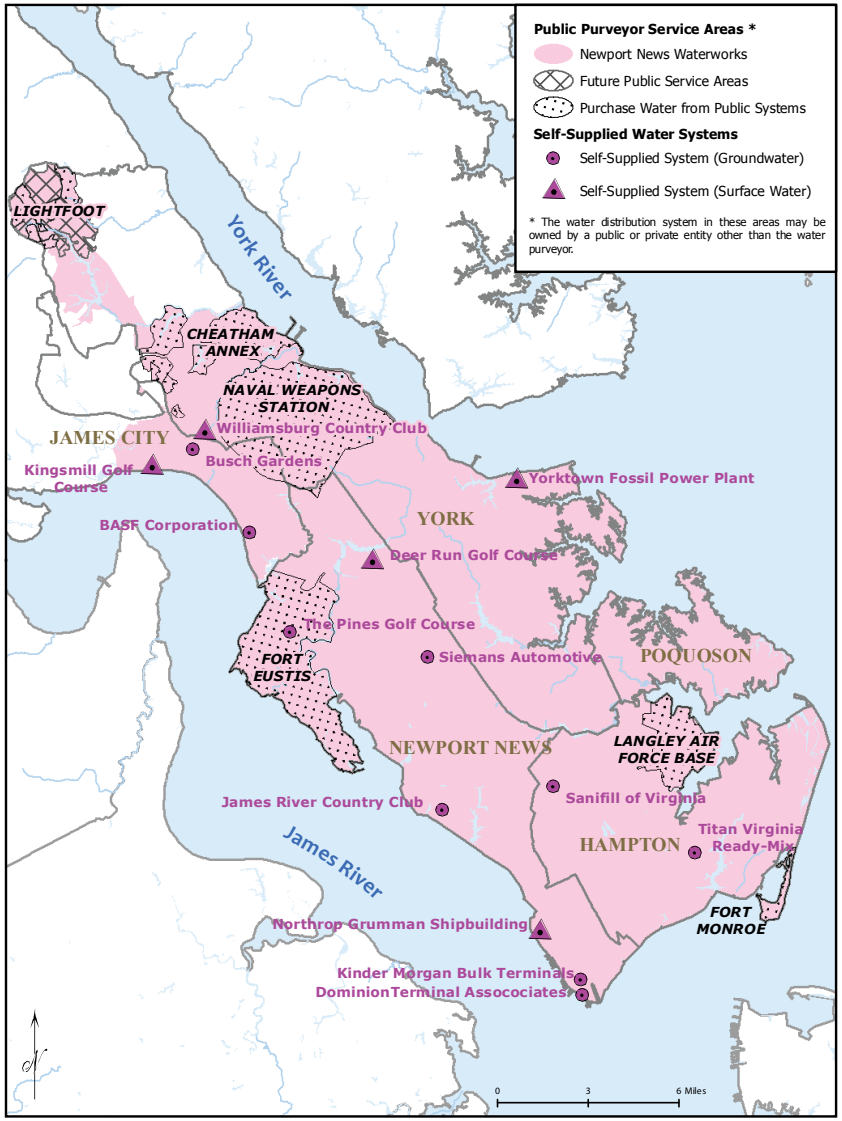


Table 1-2: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in the Newport News Waterworks Service Area

Water User Name	Source Water	Type of Use	Within CWS Service Area	Groundwater Withdrawal Permit* (mgd)
Deer Run Golf Course[1]	Lee Hall Reservoir	Commercial	Yes	NA
Dominion Terminal Associates – Pier 11[1]	Groundwater	Manufacturing	Yes	0.15
James River Country Club[1]	Groundwater	Commercial	Yes	0.03*
Kinder Morgan Bulk Terminal – Pier IX Terminal Company[1]	Groundwater	Manufacturing	Yes	0.12
Northrop Grumman Shipbuilding[1]	James River	Industrial	Yes	NA
Sanifill of Virginia – Big Bethel Landfill[2]	Groundwater	Commercial	Yes	0.19**
Siemens Automotive – Newport News[1]	Groundwater	Manufacturing	Yes	0.11
The Pines Golf Course – Fort Eustis[1]	Groundwater	Commercial	Yes	0.33*
Titan Ready Mix Plant – Rip Rap Road[2]	Groundwater	Manufacturing	Yes	0.02
Williamsburg Country Club[3]	Golf Course Lake	Commercial	Yes	NA
Yorktown Fossil Power Plant[3]	York River	Power	Yes	Virginia Water Protection Permit (2007 use estimate = 817 mgd)

NA = Not applicable
*Permitted annual withdrawal
**Permit application submitted but not issued as of July 2010
[1] Located in the City of Newport News.
[1] Located in the City of Newport News.
[2] Located in the City of Hampton
[3] Located in York County

James City County: Publicly-Owned Community Water Systems

James City Service Authority (JCSA) operates 7 CWSs that provide water to approximately 46,000 people. All seven systems rely on groundwater. The service areas are shown on Map 1-7. JCSA's Central System is the largest system serving almost 45,000 people. Newport News Waterworks provides water to about 8,000 people in James City County.

In 2007, JCSA's Central System had 24 wells ranging from a depth of 241 to 1277 feet. In 2010, 5 of the 24 wells were no longer in use. Deep wells in the Central System withdraw brackish water that is treated by reverse osmosis at the Five Forks Water Treatment Facility. Other wells withdraw fresh water, which does not require treatment to reduce salinity.

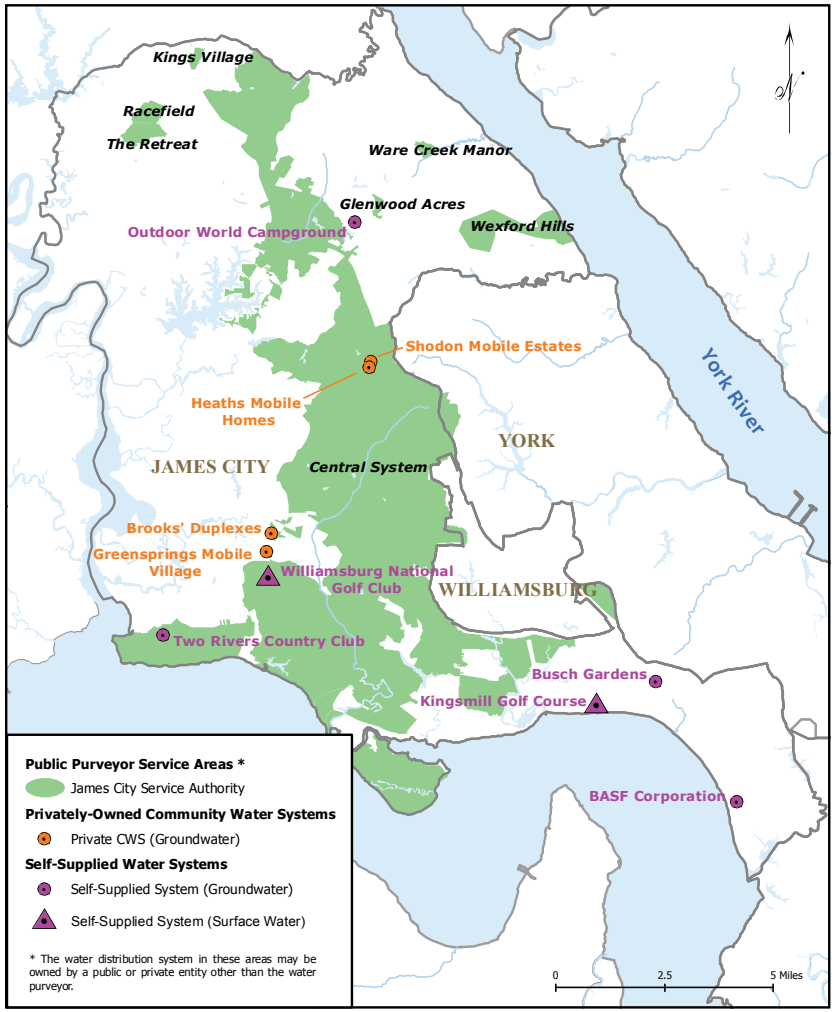
JCSA operates six additional CWSs. These systems are much smaller than the Central System in terms of population served and number of wells. The wells withdraw fresh water from the Chickahominy-Piney Point Aquifer, which is 200 to 300 feet below ground surface. A disinfectant is added to the groundwater before it enters the distribution systems. These six CWSs are described below:

- **Glenwood Acres System**: The system has 33 connections, with approximately 82 people served. There is 1 well with a depth of 272 feet.

- **Kings Village System:** The system has 49 connections, with approximately 121 people served. There are 2 wells with depths of 250 and 268 feet.

- **Racefield System:** The system has 36 connections, with approximately 89 people served. There are 2 wells with depths of 228 and 300 feet.

Map 1-7: James City Service Authority Service Area, Privately-Owned Community Water Systems, and Self-Supplied Users



- **Retreat System**: The system has 47 connections, with approximately 116 people served. There is 1 well at a depth of 230 feet.

- **Ware Creek Manor System**: The system has 64 connections, with approximately 158 people served. There are 2 wells with depths of 275 and 280 feet.

- **Wexford Hills System**: The system has 135 connections, with approximately 333 people served. There are 2 wells with depths of 306 and 315 feet.

JCSA holds DEQ Ground Water Withdrawal Permits for each of its seven CWSs, which are not interconnected. The permitted amount by system is listed in Table 1-3. The total permitted withdrawal amount is 8.9 mgd, and approximately 0.96 mgd is consumed during production processes. Additionally, JCSA may obtain an annual average of 4 to 5 mgd of treated water from NNWW. Beyond 2010, JCSA plans to expand its service area with the construction of an eighth CWS to be supplied by two new wells.

Table 1-3: 2007 James City Service Authority Publicly-Owned Community Water Systems

Water System	Total Permitted Withdrawal (mgd)	Production Losses	Finished Water
Central System	8.830	0.960	7.870
Glenwood Acres	0.010	0.00	0.010
Kings Village	0.015	0.00	0.015
Racefield	0.019	0.00	0.019
The Retreat	0.023 (draft permit)	0.00	0.023
Ware Creek Manor	0.013	0.00	0.013
Wexford Hills	0.032	0.00	0.032
JCSA Systems Total	**8.942**	**0.960**	**7.982**
NNWW Contract			**4.0 to 5.0**

James City County: Privately-Owned Community Water Systems

There are four privately-owned CWSs in James City County. The smallest system serves 35 people; the largest serves 200 people. Three of the four private systems are located within the service area of the JCSA's public CWSs (see Map 1-7). Only one system, Greensprings Mobile Village, is outside JCSA's service area. Shodon Mobile Estates is the only system that has a DEQ Ground Water Withdrawal Permit. The VDH has limited information about the other three systems. All of the wells in the privately-owned systems were determined to have a high susceptibility to contamination by the VDH SWAP evaluations (February 15, 2006).

- **Shodon Mobile Estates**: The system serves about 150 people. There are 2 wells at depths of 283 and 298 feet, which correspond to the Chickahominy-Piney Point aquifer. The total permitted withdrawal is 10,000 gallons per day (0.010 mgd).

- **Brooks Duplexes**: The system serves 35 people. There is 1 well with a depth of 463 ft. The VDH system capacity is 3,333 gallons per day (0.003 mgd).

- **Greensprings Mobile Village**: The system serves about 200 people. There are two wells but the depths are not known. The VDH system capacity is 34,400 gallons per day (0.034 mgd). The system capacity is three times higher than the threshold requiring a DEQ Ground Water Withdrawal Permit (0.1 mgd). The system does not have a permit and may not require one if actual withdrawals are less than 0.01 mgd.

- **Heath Mobile Homes**: The system serves approximately 40 people. There is 1 well with a depth of 290 feet. The VDH system capacity is 15,000 gallons per day (0.015 mgd). The system capacity is higher than the threshold requiring a DEQ Ground Water Withdrawal Permit (0.1 mgd). The system does not have a permit and may not require one if actual withdrawals are less than 0.01 mgd.

James City County: Self-Supplied Water Systems

There are approximately 7,224 people in James City County that are served by private wells at their residence. Private well withdrawals from various aquifers are estimated to be as follows (Pope, USGS, 2007): 11% Yorktown-Eastover Aquifer, Piney Point Aquifer (28%), Aquia Aquifer (47%), and Potomac Aquifer (14%).

A list of businesses with wells withdrawing less than 300,000 gallons per month is included in Appendix A. Most of the residential use is located outside a publicly-owned CWS.

In 2007, 6 self-supplied users in James City County reported withdrawals of more than 300,000 gallons of water per month for non-agricultural purposes (see Table 1-4). Two of the users withdraw surface water, and four users withdraw groundwater. The following list describes the six large self-supplied users.

- **BASF Corporation:** Facility has been closed as of July 2010, however, the DEQ Ground Water Withdrawal Permit remains active. Water was formerly used in manufacturing of acrylic fibers. The 5 wells are between 510 and 545 feet deep, corresponding to the Potomac aquifer.
- **Busch Gardens Williamsburg:** Withdraws groundwater for water rides and irrigation. The system's 2 wells are approximately 530 feet deep, corresponding to the Potomac aquifer.
- **Outdoor World Campground:** Withdraws groundwater to provide potable water to campers.
- **Kingsmill Golf Course**: Withdraws surface water for irrigation from three private ponds.
- **Two Rivers Country Club**: Withdraws groundwater for irrigation.
- **Williamsburg National Golf Courses**: Withdraw surface water for irrigation from Powhatan Creek.

Busch Gardens Williamsburg, Colonial Golf Course, and Williamsburg Pottery Factory have reported withdrawals over

Table 1-4: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in James City County

Water User Name	Source Water	Type of Use	Within PWS Service Area	Groundwater Withdrawal Permit* (mgd)
BASF Corporation[1]	Groundwater	Manufacturing	Yes	3.55
Busch Gardens Williamsburg[1]	Groundwater	Commercial	Yes	0.13
Outdoor World Campground	Groundwater	Commercial	No	Application submitted
Kingsmill Golf Course[1]	Busch Gardens Lake, Wareham's Pond, Kingsmill Pond	Commercial	Yes	NA
Two Rivers Country Club	Groundwater	Commercial	Yes	0.20
Williamsburg National Golf Course	Powhatan Creek	Commercial	Yes	NA

*Total Permitted Withdrawal
[1] System is physically located within the portion of James City County served by Newport News Waterworks, not James City Service Authority.
NA =Not Applicable

300,000 gallons per month for at least one year from 2002-2009, but did not exceed the threshold in 2007. The Williamsburg Pottery Factory has a DEQ Ground Water Withdrawal Permit for 0.018 mgd. All of the systems are located within the JCSA's service areas except the Colonial Golf Course.

There are no reported withdrawals of more than 300,000 gallons of water per month for agricultural purposes.

City of Williamsburg: Publicly-Owned Community Water Systems

The City of Williamsburg operates a CWS which provides water to approximately 13,800 people. The service area includes the city and the Camp Peary military installation (see Map 1-8). Williamsburg's source water includes Waller Mill Reservoir, a deep well, and raw or treated water purchases from Newport News Waterworks.

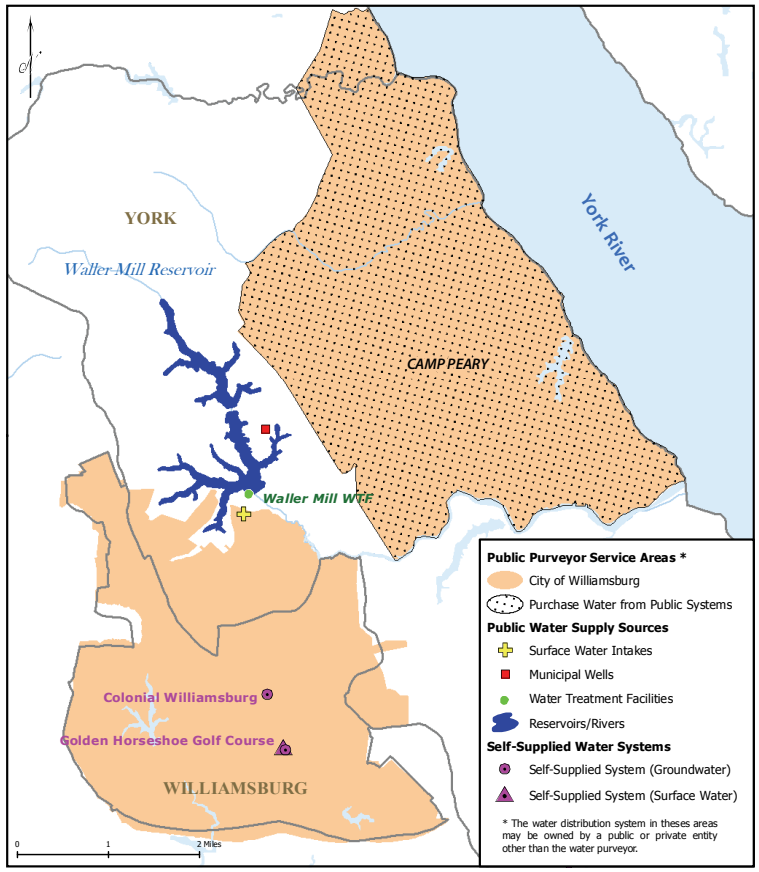
Waller Mill Reservoir is located at the border of Williamsburg and York County. The drainage area is approximately seven square miles and the available storage is 1,500 million gallons of raw water. The City's 500-ft deep well is located adjacent to the reservoir. Williamsburg has a DEQ Ground Water Withdrawal Permit for 707,000 gallons per day (0.71 mgd). The City's permit renewal application, submitted prior to 2005, is being processed by DEQ.

The HRPDC SWAP (August 2002) found that Waller Mill Reservoir has a high susceptibility to contamination and that Williamsburg's well has a low susceptibility to contamination. The available water supply of the Williamsburg conjunctive system was evaluated by a private consultant in 2007. The system yield is 5.14 mgd of raw water. The analysis included the reservoir, permitted groundwater withdrawals, and a maximum purchase of 2 mgd of raw water from Newport News Waterworks.

City of Williamsburg: Privately-Owned Community Water Systems

No privately-owned CWSs are located in the City of Williamsburg. The city formerly provided treated water to two privately-owned CWSs located in York County. In August 2009, the residential subdivisions of Hubbards Lane and Queens Lake began purchasing water from Newport News Waterworks.

Map 1-8: Williamsburg Service Area and Self-Supplied Users



City of Williamsburg: Self-Supplied Water Systems

There are no self-supplied residences in the City of Williamsburg. All residential water use is supplied by the publicly-owned CWS. Some commercial uses have private wells. A list of businesses with wells withdrawing less than 300,000 gallons per month is included in Appendix A.

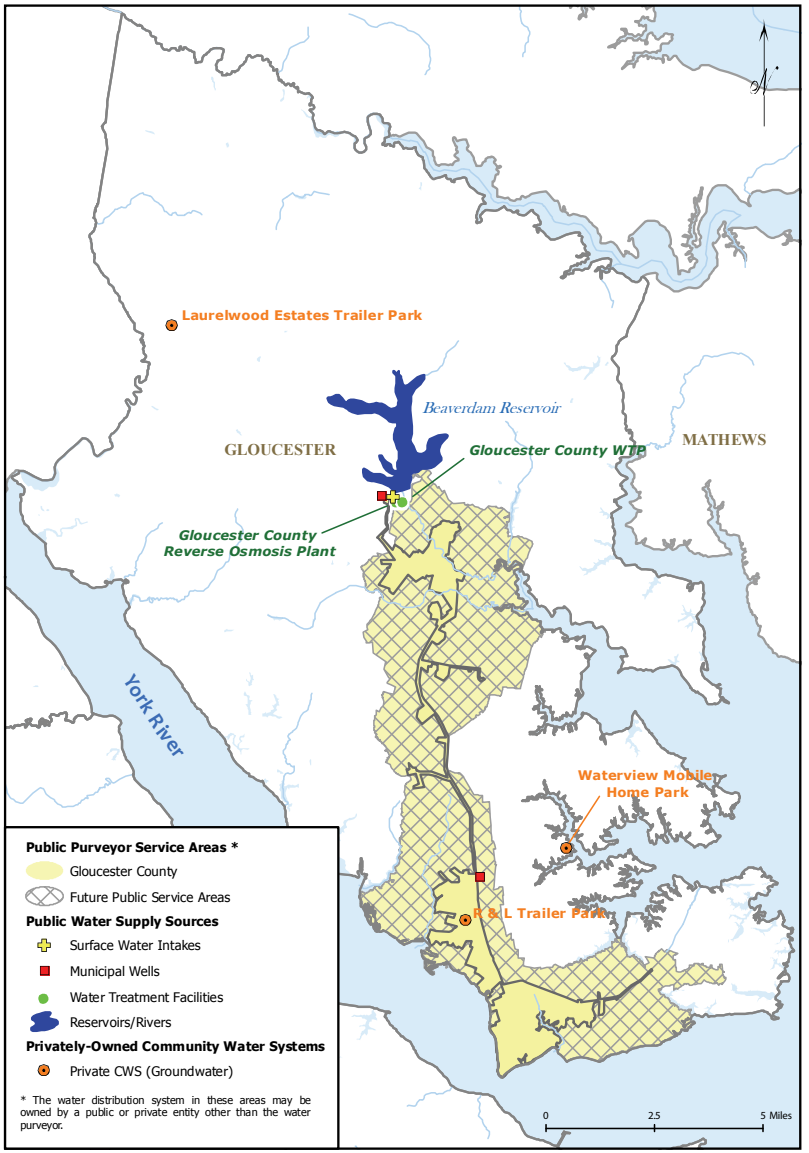
In 2007, 2 self-supplied users in Williamsburg reported withdrawing more than 300,000 gallons of water per month for non-agricultural purposes. The Golden Horseshoe Golf Course withdraws irrigation water from a well screened in the Potomac aquifer and two on-site ponds. Colonial Williamsburg has a DEQ Ground Water Withdrawal Permit to withdraw 1.844 mgd from the Potomac aquifer. Colonial Williamsburg uses the groundwater as cooling water for chillers and heat pumps. All of these self-supplied users are located within the service area of the Williamsburg water system. There are no reported withdrawals of more than 300,000 gallons of water per month for agricultural purposes.

Middle Peninsula

Gloucester County: Publicly-Owned Community Water Systems

Gloucester County operates a CWS which provides water to approximately 12,700 people. The service area primarily runs along Route 17 with many customers in the center of the county and a few neighborhoods in the southern portion of the county. The county has identified expansion areas that would significantly increase the service area of the publicly-owned CWS. The expansion area is shown on Map 1-9 as the hatched area.

Map 1-9: Gloucester County Service Area and Privately-Owned Community Water Systems



Gloucester's source water includes Beaverdam Reservoir and two deep wells which yield brackish water that must be treated by reverse osmosis to reduce salinity. Beaverdam Reservoir is located in the central portion of Gloucester County. The drainage area is approximately 24 square miles and the storage available for water supply is 5 million gallons of raw water. The 2 wells are between 1500 and 1600 feet deep. Gloucester County is not within the Eastern Virginia GWMA, so a DEQ Ground Water Withdrawal Permit is not required for the wells.

The HRPDC SWAP (August 2002) found that Beaverdam Reservoir has a high susceptibility to contamination and that Gloucester's wells have a low susceptibility to contamination.

The water system's yield is 4.0 mgd of raw water and 3.5 mgd of treated water. The analysis of the available water supply included the reservoir, groundwater withdrawals, and limitations of the reverse osmosis treatment plant.

Gloucester County: Privately-Owned Community Water Systems

There are three privately-owned CWSs in Gloucester County. The systems are not located within the service area of the public CWS. All of the wells in the privately-owned systems were determined to have a high susceptibility to contamination by the VDH SWAP evaluations (February 16, 2006).

- **Laurelwood Estates Trailer Park:** The system serves about 175 people. There are two wells at depths of 619 and 670 feet, which corresponds to the Potomac aquifer. The VDH permitted system capacity is 30,000 gpd (0.030 mgd).
- **R&L Trailer Park:** The system serves 45 people. There are two wells at depths of 109 and 119 feet, which corresponds to the Yorktown-Eastover aquifer. The VDH system capacity is 6,300 gallons per day (0.006 mgd).
- **Waterview Mobile Home Park:** The system serves about 80 people. There are three wells but only two in service. The depths of the active wells are 88 and 80 feet, corresponding to the Yorktown-Eastover aquifer. The VDH system capacity is 10,400 gallons per day (0.010 mgd).

Gloucester County: Self-Supplied Water Systems

There are approximately 23,000 people in Gloucester County that rely on private wells at their residences to provide potable water. Withdrawals in the county are primarily from shallow aquifers: Yorktown-Eastover Aquifer (94%) and the Piney Point Aquifer (6%) (Pope, USGS, 2007). A list of businesses with wells withdrawing less than 300,000 gallons per month is included in Appendix A. There are no reported withdrawals of more than 300,000 gallons of water per month for non-agricultural or agricultural purposes.

Photo: Beaverdam Reservoir, HRPDC

Existing Sources - Southside Sub-Region

The Southside sub-region includes the Cities of Chesapeake, Norfolk, Portsmouth, Suffolk, and Virginia Beach. Each of the cities have dense population centers, yet the Cities of Chesapeake, Suffolk, and Virginia Beach also have rural areas. The sub-region is served by 15 publicly-owned CWSs, which provided water to a total of 974,450 people in 2007. The majority of the sub-region's population is served by publicly-owned CWSs with raw water sources that include aquifers, reservoirs, Lake Gaston, and the Northwest, Blackwater and Nottoway Rivers.

Most of the publicly-owned water systems in the sub-region are conjunctive systems that use both surface water and groundwater. The raw water safe yields of these systems have been analyzed in previous technical reports and permit applications. These studies are typically based on the VDH's definition of safe yield for a complex reservoir system. Safe yield is the minimum withdrawal rate available to withstand the worst drought of record in Virginia since 1930. Safe yield defines the available water supply for these systems.

There are small systems in the sub-region that only use groundwater. For those systems, the available water supply is assumed to be the total permitted, annual average withdrawal based on their DEQ Ground Water Withdrawal Permits. If the system is very small and does not require a DEQ Ground Water Withdrawal Permit, the safe yield is assumed to be equal to the VDH permitted system capacity. The total available raw water supply for publicly-owned CWSs in the sub-region is 199 mgd. For further discussion about yield and demand, see the Statement of Need section.

In 2001, HRPDC conducted a detailed Source Water Assessment Program (SWAP). The HRPDC SWAP (August 2002), found that all surface water sources in the Southside sub-region have a high susceptibility to contamination. All groundwater wells serving publicly-owned CWSs were determined to have a low susceptibility to contamination. The only significant water quality problem in the sub-region is naturally occurring elevated levels of fluoride in groundwater. As of 2010, the City of Suffolk's Holland CWS is under a Fluoride Consent Order by VDH due to elevated levels of fluoride (see Section 3, Existing Resources for more information). A plan is underway to reduce fluoride in the Holland CWS to a level below the regulatory limit.

Nine privately-owned CWSs also operate in the sub-region. The systems all rely on groundwater. The combined available water supply of these systems is 1.2 mgd. In 2007, the systems served a total of 7,490 people. Per the 1996 Safe Drinking Water Act Amendments, the VDH SWAP Program inventoried drinking water sources and nearby land uses that may impact water quality, including common activities related to residential, industrial, commercial, and agricultural land uses and waste management and transportation facilities. According to the VDH SWAP evaluations (February 15, 2006), seven privately-owned CWSs have a well or wells with a high susceptibility to contamination. As of 2010, three privately-owned CWSs in Suffolk and two systems in Chesapeake were under a Fluoride Consent Order by VDH. Map 1-10 shows the Southside sub-region's CWS service areas and sources.

2007 Southside Overview

- 15 publicly-owned CWS served 974,450 people.
- 9 privately-owned CWS served 7,490 people.
- Private residential wells served approximately 57,000 people.
- 12 self-supplied users withdrew more than 300,000 gallons per month of surface water for non-agricultural purposes.
- 26 self-supplied users withdrew more than 300,000 gallons per month of groundwater for non-agricultural purposes.
- 3 self-supplied users withdrew more than 300,000 gallons per month of groundwater and/or surface water for agricultural purposes.

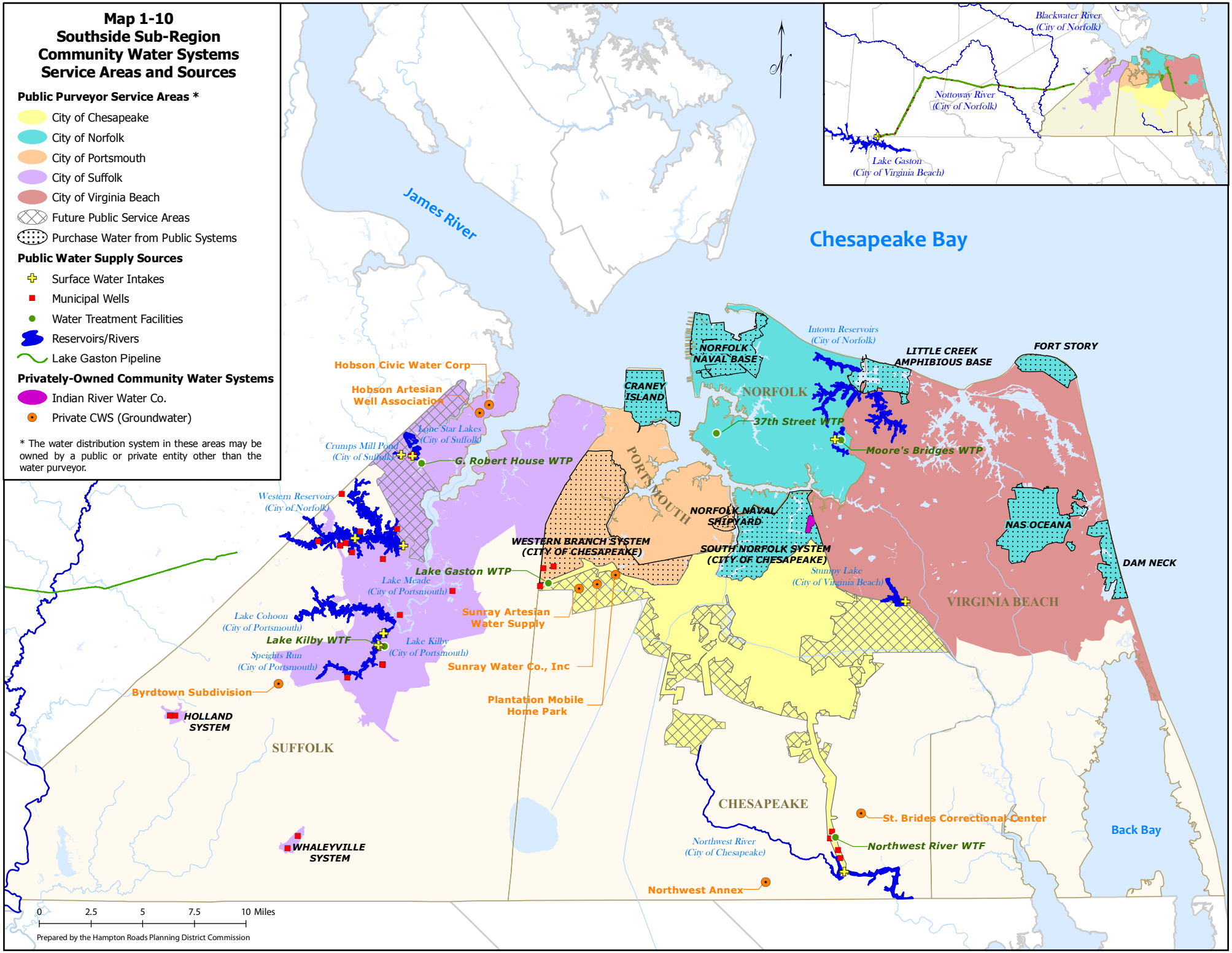
Photo: Stumpy Lake, HRPDC

The Southside sub-region has many self-supplied water users. These users range from residences with private wells to large commercial or agricultural operations with large withdrawals from wells or surface water sources. An estimated 57,000 people were served by private residential wells and 78 businesses were served by private wells in 2007. Map 1-11 shows the sub-regions' self-supplied water users.

DEQ requires users that withdraw more than 300,000 gallons per month of surface water or groundwater to report withdrawal information. The threshold for a Ground Water Withdrawal Permit and a Virginia Water Protection Permit for surface water withdrawal is 300,000 gallons per month. Most surface water withdrawals in the sub-region were established prior to 1989 and are, therefore, exempt from the permit program.

Southside Sub-Region: Water Contracts

Several publicly-owned CWSs in the Hampton Roads region purchase water from other systems in the region. The purchases are explained in more detail in the sections that follow. Table 1-5 summarizes the contract terms.


Map 1-10
Southside Sub-Region
Community Water Systems
Service Areas and Sources
Public Purveyor Service Areas *
City of Chesapeake
City of Norfolk
City of Portsmouth
City of Suffolk
City of Virginia Beach
Future Public Service Areas
Purchase Water from Public Systems
Public Water Supply Sources
Surface Water Intakes
Municipal Wells
Water Treatment Facilities
Reservoirs/Rivers
Lake Gaston Pipeline
Privately-Owned Community Water Systems
Indian River Water Co.
Private CWS (Groundwater)
* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.
Blackwater River (City of Norfolk)
Nottoway River (City of Norfolk)
Lake Gaston (City of Virginia Beach)
James River
Chesapeake Bay
Intown Reservoirs (City of Norfolk)
NORFOLK NAVAL BASE
LITTLE CREEK AMPHIBIOUS BASE
FORT STORY
CRANEY ISLAND
NORFOLK
37th Street WTP
Moore's Bridges WTP
Hobson Civic Water Corp
Hobson Artesian Well Association
Lone Star Lakes (City of Suffolk)
Crumps Mill Pond (City of Suffolk)
G. Robert House WTP
PORTSMOUTH
Western Reservoirs (City of Norfolk)
NORFOLK NAVAL SHIPYARD
NAS OCEANA
DAM NECK
WESTERN BRANCH SYSTEM (CITY OF CHESAPEAKE)
SOUTH NORFOLK SYSTEM (CITY OF CHESAPEAKE)
Stumpy Lake (City of Virginia Beach)
Lake Gaston WTP
Lake Meade (City of Portsmouth)
VIRGINIA BEACH
Sunray Artesian Water Supply
Lake Cohoon (City of Portsmouth)
Lake Kilby WTF
Lake Kilby (City of Portsmouth)
Speights Run (City of Portsmouth)
Sunray Water Co., Inc
Byrdtown Subdivision
Plantation Mobile Home Park
HOLLAND SYSTEM
SUFFOLK
CHESAPEAKE
St. Brides Correctional Center
Back Bay
Northwest River (City of Chesapeake)
Northwest River WTF
WHALEYVILLE SYSTEM
Northwest Annex
0 2.5 5 7.5 10 Miles
Prepared by the Hampton Roads Planning District Commission

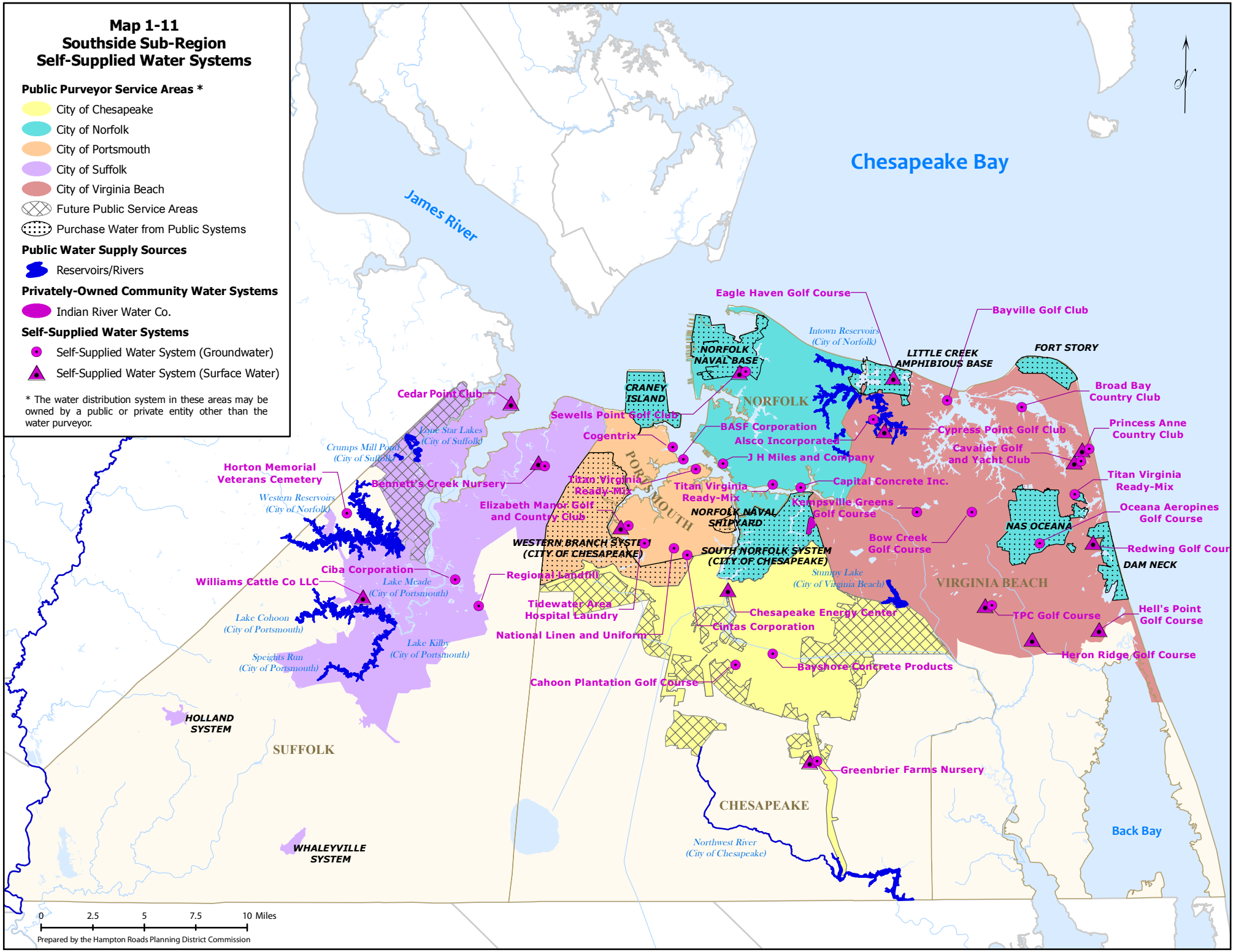

Map 1-11
Southside Sub-Region
Self-Supplied Water Systems
Public Purveyor Service Areas *
City of Chesapeake
City of Norfolk
City of Portsmouth
City of Suffolk
City of Virginia Beach
Future Public Service Areas
Purchase Water from Public Systems
Public Water Supply Sources
Reservoirs/Rivers
Privately-Owned Community Water Systems
Indian River Water Co.
Self-Supplied Water Systems
Self-Supplied Water System (Groundwater)
Self-Supplied Water System (Surface Water)
* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.
Chesapeake Bay
James River
Eagle Haven Golf Course
Bayville Golf Club
Intown Reservoirs (City of Norfolk)
NORFOLK NAVAL BASE
LITTLE CREEK AMPHIBIOUS BASE
FORT STORY
CRANEY ISLAND
NORFOLK
Broad Bay Country Club
Cedar Point Club
Sewells Point Golf Club
Lone Star Lakes (City of Suffolk)
Cogentrix
BASF Corporation
Alsco Incorporated
Cypress Point Golf Club
Princess Anne Country Club
Crumps Mill Pond (City of Suffolk)
J H Miles and Company
Cavalier Golf and Yacht Club
Horton Memorial Veterans Cemetery
Bennett's Creek Nursery
Titan Virginia Ready-Mix
PORTSMOUTH
Titan Virginia Ready-Mix
Capital Concrete Inc.
Titan Virginia Ready-Mix
Western Reservoirs (City of Norfolk)
Elizabeth Manor Golf and Country Club
Kempsville Greens Golf Course
Oceana Aeropines Golf Course
NORFOLK NAVAL SHIPYARD
NAS OCEANA
WESTERN BRANCH SYSTEM (CITY OF CHESAPEAKE)
Bow Creek Golf Course
Redwing Golf Course
SOUTH NORFOLK SYSTEM (CITY OF CHESAPEAKE)
DAM NECK
Ciba Corporation
Regional Landfill
Stumpy Lake (City of Virginia Beach)
Williams Cattle Co LLC
Lake Meade (City of Portsmouth)
VIRGINIA BEACH
Tidewater Area Hospital Laundry
Chesapeake Energy Center
TPC Golf Course
Hell's Point Golf Course
Lake Cohoon (City of Portsmouth)
Cintas Corporation
National Linen and Uniform
Lake Kilby (City of Portsmouth)
Heron Ridge Golf Course
Speights Run (City of Portsmouth)
Bayshore Concrete Products
Cahoon Plantation Golf Course
HOLLAND SYSTEM
SUFFOLK
Greenbrier Farms Nursery
CHESAPEAKE
Back Bay
Northwest River (City of Chesapeake)
WHALEYVILLE SYSTEM
0
2.5
5
7.5
10 Miles
Prepared by the Hampton Roads Planning District Commission

Table 1-5: Southside Sub-Region Water Sales

Water Seller	Water Buyer	Community Water System Name	Contract or Agreement Terms	Raw or Finished
Norfolk	Chesapeake	Northwest River System	Contractually obligated to purchase minimum 7 mgd	Raw
Norfolk	Chesapeake	South Norfolk System	Minimum purchase is 2 mgd	Finished
Norfolk	Norfolk Navy Installations	Norfolk Naval Base	Unrestricted volume by contract	Finished
Norfolk	Virginia Beach	City of Virginia Beach	Norfolk treats and wheels Lake Gaston water in accordance with a cost of service contract	Finished
Norfolk	Virginia Beach Military Installations (wheeled by Virginia Beach)	Fort Story – US Army Little Creek – US Navy Oceana – US Navy Dam Neck – US Navy	Unrestricted volume by contract	Finished
Norfolk	Portsmouth Navy Installation	Craney Island (fire suppression)	Unrestricted amount Rate by ordinance	Raw
Norfolk	Western Tidewater Water Authority: Suffolk – 75%, Isle of Wight – 25%	Suffolk Main System, Newport Development Service District, Windsor Development Service District	2014 – 3mgd Increases 1 mgd every other year (15 mgd max)	Raw
Norfolk	Portsmouth	City of Portsmouth	Pre-negotiated rate for up to 10 mgd, if available during droughts	Raw
Portsmouth	Chesapeake	Western Branch System	Contractually obligated to purchase 4.0 mgd, 5 mgd in 2020	Finished
Portsmouth	Norfolk Naval Ship Yard	Norfolk Naval Ship Yard – US Navy	Unrestricted/commercial account	Finished
Portsmouth	City of Suffolk	Suffolk Main System	2.54 mgd	Finished
WTWA	Isle of Wight County	Suffolk Main System	6.76 mgd	Finished

City of Chesapeake: Publicly-Owned Community Water Systems

The City of Chesapeake operates three publicly-owned CWSs and two WTPs. See Map 1-12 for a visual of the service areas. The 3 systems served a total population of 174,590 people in 2007. Table 1-6 further summarizes the sources for the three systems. They rely on groundwater, surface water, and purchases of raw and treated water. The systems' raw water safe yield is 21 mgd. The safe yield includes the Northwest River withdrawals and groundwater withdrawals. Purchased water is not included. The HRPDC SWAP (August 2002) found that all surface water sources had a high susceptibility to contamination. All of the groundwater wells were determined to have a low susceptibility to contamination.

Northwest River System

The Northwest River System is the City's largest system, serving approximately 102,430 people in 2007. The system uses water from several sources: an intake on the Northwest River, groundwater, and raw water purchased from the City of Norfolk. Two WTPs serve the system: Northwest River WTP and the Lake Gaston WTP.

The intake on the Northwest River is permitted by the U.S. Army Corps of Engineers (Corps), which allows the City to withdraw up to 10 mgd from the river. The permit requires stringent water quality control monitoring when the daily average withdrawal reaches 6 mgd, and the withdrawals must be reduced as necessary to avoid violation of water quality standards. The Northwest River is slightly affected by tidal action and at times saltwater may reach the intake site. The permit states that the City must cease withdrawing water if (1) the chloride content of the raw water exceeds 250 parts per million (ppm), (2) the monitoring near the mouth of the North Landing River indicates salinities over 7.5% seawater equivalency, or (3) sufficient environmental degradation is evident as determined by state agencies or the Corps. This permit is subject to permanent cancellation or modification at any time if it is determined that the withdrawal of water has resulted in environmental degradation. Prior to receiving the permit, the City had to provide the Corps with a contingency plan that assures a continued supply of water to its customers in the event the permit is cancelled.

Map 1-12: City of Chesapeake Sources and Service Area, Privately-Owned Water Systems, and Self-Supplied Water Systems

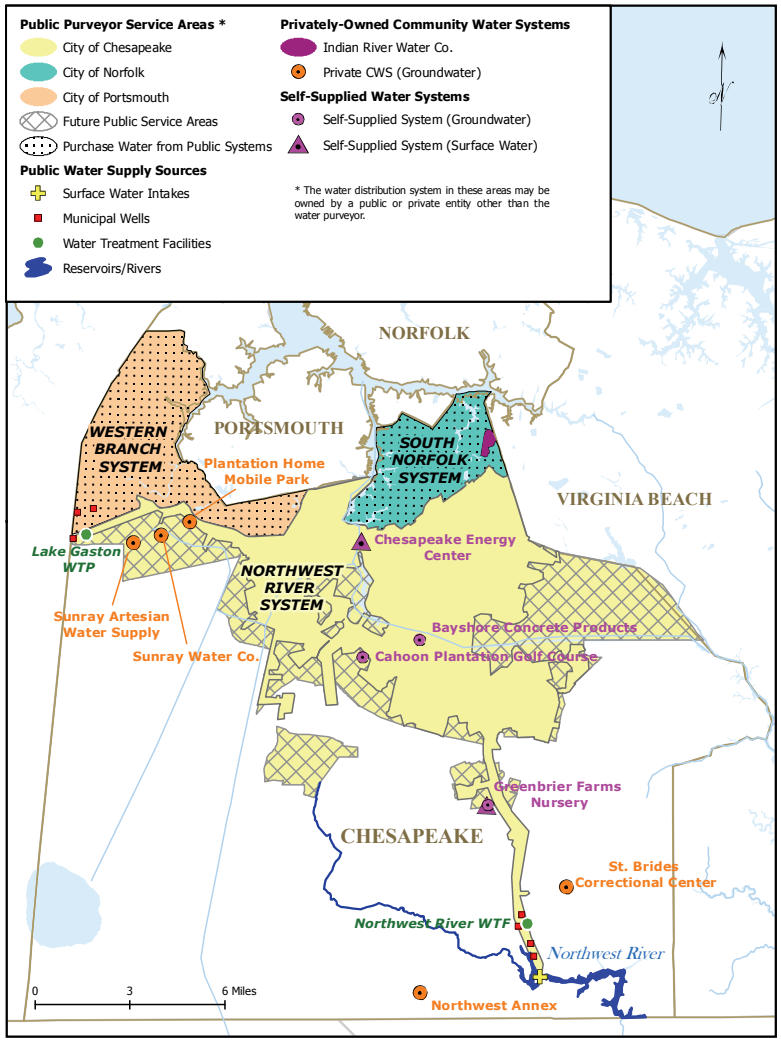


Table 1-6: 2007 Chesapeake Publicly-Owned CWSs

System	Population Served	Source	Limitations	Available Water Supply
Northwest River	102,434	Northwest River	Army Corps of Engineers: Maximum 10 mgd	28 mgd raw water + 6 mgd treated water
		4 Northwest River Wells	DEQ Ground Water Withdrawal Permit: 11.0 mgd	
		3 Western Branch Wells		
		Raw water purchase from Norfolk	Contract: 7 mgd	
South Norfolk	33,512	Finished water purchase from Norfolk	Contract: Minimum 2 mgd	
Western Branch	38,640	Finished water purchase from Portsmouth	Contract Minimum 4 mgd	

The second source for the Northwest River System is four Northwest River wells and three Western Branch wells. All of the wells are under one DEQ Ground Water Withdrawal Permit. The wells are screened in the Potomac Aquifer, which is the deepest aquifer in the Virginia Coastal Plain. The Northwest River wells are adjacent to the river and are permitted to withdraw 5 mgd. The water is brackish and must be treated by reverse osmosis to remove the salinity. The Western Branch wells are located across the City. The permitted withdrawals for the Western Branch wells are 3 mgd for Western Branch Well #1, and 3 mgd for Western Branch Well #3 and Well #4 combined. Water withdrawn from the Western Branch wells is pumped to the Lake Gaston WTP and provides natural fluoridation. Western Branch Well #4 is also called the Aquifer Storage and Recovery (ASR) well. The ASR well began operating in 1989. Treated water from the Northwest River WTP is injected into the ASR well for storage to meet peak demands. Only the "bubble" of injected water is withdrawn from the ASR well.

The Northwest River System also purchases raw water from the City of Norfolk. Currently, the City of Chesapeake purchases 7 mgd of raw water from the City of Norfolk's Western Reservoirs (located in the City of Suffolk). The City of Chesapeake treats the water at its Lake Gaston WTP. The In-Town Lakes, located in the Deep Creek area of western Chesapeake, are operated to provide emergency, short-term backup supply of water for the Lake Gaston WTP. The In-Town Lakes store a 30-day supply of water for the system and are primarily used to store water while the membranes at the treatment plant are cleaned and repaired.

The City of Chesapeake will have an additional water source for the Northwest River System within the next five years. The City has a contract with Virginia Beach for one-sixth (10 mgd) of the Lake Gaston permitted withdrawal. Additional infrastructure including a raw water pipeline from the Western Branch pump station to Chesapeake's treatment plant must be constructed to allow the City to use the 10 mgd from Lake Gaston. The City estimates the finished water yield for this project will be 8.5 mgd. Approximately 15% of the raw water yield is lost in the production processes at the Lake Gaston WTP. See Table 1-6 for a summary of the Northwest River System.

South Norfolk System

The South Norfolk System, owned by the City of Chesapeake, serves the portion of the City north of Military Highway and east of the Southern Branch of the Elizabeth River. The system served approximately 33,512 people in 2007. The only water source for this system is finished water purchased from the City of Norfolk's Moores Bridges WTP. The contract with the City of Norfolk

stipulates that the City of Chesapeake must "take or pay" for 2 mgd monthly, which means the City must pay for a minimum of 2 mgd even if total use is less than 2 mgd. The contract term is from January 1, 2003 to December 31, 2042. Norfolk has the ability to supply the system with 4 mgd. The average annual amount of water purchased for the South Norfolk System was 2.69 mgd in 2007.

Western Branch System

The Western Branch System, owned by the City of Chesapeake, serves the portion of the City north of Military Highway and west of the Southern Branch of the Elizabeth River. The system served 38,640 people in 2007. Finished water is purchased for the system from the City of Portsmouth's Lake Kilby WTP. The term of the contract is from January 1, 1990 to December 31, 2026 and stipulates that the City of Chesapeake must take or pay for 4 mgd in 2010. The take or pay amount increases to 5 mgd in 2020. Approximately 474 Chesapeake residents also buy water directly from the City of Portsmouth.

City of Chesapeake: Privately-Owned Community Water Systems

Six privately-owned CWSs operate in the City of Chesapeake. In 2007, the systems served a total of 7,250 people. All of the systems use groundwater. The Indian River System is located within the City's South Norfolk System service area. The other privately-owned systems are outside of the City's service area. The Plantation Mobile Home Park and two Sunray Systems are in the City's Franchise Area, where city service may be offered in the future. The St. Bride's Correctional Center and U.S. Navy's Northwest Annex are in the southern portion of the City and will not be incorporated into the City's service area within the foreseeable future. The total available water supply of these systems equals 1.16 mgd.

The Indian River Co. and St. Bride's Correctional Center are the only systems that hold DEQ Ground Water Withdrawal Permits. The Navy owns and operates a system of nine active wells and two treatment plants to supply water to the Northwest Annex Naval Support Activity. The system capacity is permitted at 0.35 mgd by VDH. The withdrawals exceed the threshold for a DEQ groundwater permit; however, the Navy has claimed sovereign immunity from the Ground Water Management Act and has not applied for a permit.

As of 2010, the Indian River Co., Plantation Mobile Home Park and Sunray Artesian Water Supply systems were under a Fluoride Consent Order from VDH. Four of the six privately-owned systems in Chesapeake have a well or wells with a high susceptibility to contamination. See Table 1-7 for a summary of Chesapeake's privately–owned systems.

City of Chesapeake: Self-Supplied Water Systems

In 2007, an estimated 33,600 people were served by private residential wells and 11 businesses had their own well. Seven businesses use less water than the DEQ reporting threshold. All of the residential use and four of the businesses are located outside a CWS service area.

Non-Agricultural: The Chesapeake Energy Center is the only non-agricultural, self-supplied user that reported withdrawing more than 300,000 gallons of surface water in 2007. The Energy Center withdraws from the Southern Branch of the Elizabeth River. The system's maximum intake capacity is 633.6 mgd. The Energy Center does not hold a DEQ Virginia Water Protection Permit. The water is used in the cooling tower of the coal plant. See Map 1-12 for the location of the Energy Center, and Table 1-8 for a summary.

In 2007, 2 non-agricultural self-supplied systems reported withdrawing more than 300,000 gallons per month of groundwater: Bayshore Concrete Products and Cahoon Plantation Golf Course. Both systems hold DEQ Ground Water Withdrawal Permits and their respective sources and uses are described as follows:

- **Bayshore Concrete Products:** Uses groundwater for concrete production. The 4 wells are between 45 and 95 feet deep and withdraw water from the Yorktown-Eastover Aquifer.

- **Cahoon Plantation Golf Course:** Uses groundwater for irrigation. The 4 wells are between 110 and 118 feet deep and withdraw water from the Yorktown-Eastover Aquifer.

The three non-agricultural, self-supplied systems are located within the City of Chesapeake's publicly-owned CWS service area. See Map 1-12 for the locations and Table 1-8 for a summary.

Agricultural: Greenbrier Farms Nursery (see Map 1-12) is the only self-supplied agricultural user that reported withdrawing more than 300,000 gallons per month of groundwater or surface water. The farm holds a DEQ Ground Water Withdrawal Permit.

Table 1-7: 2007 Privately–Owned CWSs in Chesapeake

System	Population Served	Well Depth	Groundwater Withdrawal Permit (mgd)	VDH System Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Indian River Co.	1,500	5 wells: 65 – 94 (ft)	0.24	0.16	High Under Fluoride Consent Order
Naval Support Activity NW Annex	2,200	9 wells: 90 – 124 (ft)	No	0.35	Low
Plantation Mobile Home Park	95	NI	No	0.02	No wellhead assessment Under Fluoride Consent Order
Sunray Artesian Water Supply	100	NI	No	0.01	High
Sunray Water Co	60	NI	No	0.01	High Under Fluoride Consent Order
VDOC – Saint Brides Correctional Center	3,291	4 wells: 105 – 160 (ft)	0.53	0.32	2 wells high 1 well low 1 well unknown

NI = no information

Table 1-8: 2007 Self-Supplied Use > 300,000 gallons/month in Chesapeake

Business	Source Water	Type of Use	Within CWS Service Area	Groundwater Withdrawal Permit (mgd)
Bayshore Concrete Products	Groundwater	Manufacturing	Yes	0.023
Cahoon Plantation Golf Course	Groundwater	Commercial	Yes	0.17
Chesapeake Energy Center	Southern Branch Elizabeth River	Fossil Power	Yes	Not applicable
Greenbrier Farms Nursery	Groundwater	Agriculture	No	0.24

Photo: Northwest River, www.kayakvb.com, Paul Perusse

Photo: Northwest River Park, courtesy of the City of Chesapeake Parks and Recreation

City of Norfolk: Publicly-Owned Community Water System

The City of Norfolk operates one CWS that serves the entire City (see Map 1-13). The system includes two WTPs: 37th Street WTP and Moores Bridges WTP. The city has multiple sources of raw water: Western Reservoirs (Western Branch Reservoir, Lake Prince, and Lake Burnt Mills), Intown Reservoirs (Lake Smith, Lake Lawson, Little Creek Reservoir, Lake Whitehurst, and Lake Wright), Blackwater River, Nottoway River, and four deep wells. The VDH operating permit for the City of Norfolk includes both WTPs and the raw water sources listed above. The VDH permitted system capacity for the entire Norfolk system is 136 mgd. The raw water safe yield, or available water supply, for the system is 92.5 mgd. The HRPDC SWAP (August 2002) found that Norfolk's surface water reservoirs have a high susceptibility to contamination, and the wells were determined to have a low susceptibility to contamination.

Norfolk sells water to several CWSs within the Hampton Roads region. By 2038, these contracts obligate approximately 24 mgd of Norfolk's safe yield to other systems in the region. See Table 1-9 for more details. Water sales are summarized below:

- Norfolk sells finished and raw water to the City of Chesapeake.
- Norfolk sells finished water to the Navy installations in Norfolk and Virginia Beach.
- Norfolk sells raw water to the Navy for fire suppression at Craney Island in Portsmouth.
- Contracts are in place to sell water to the Cities of Portsmouth and Virginia Beach during drought conditions.
- Norfolk will begin selling water to the Western Tidewater Water Authority in 2014.

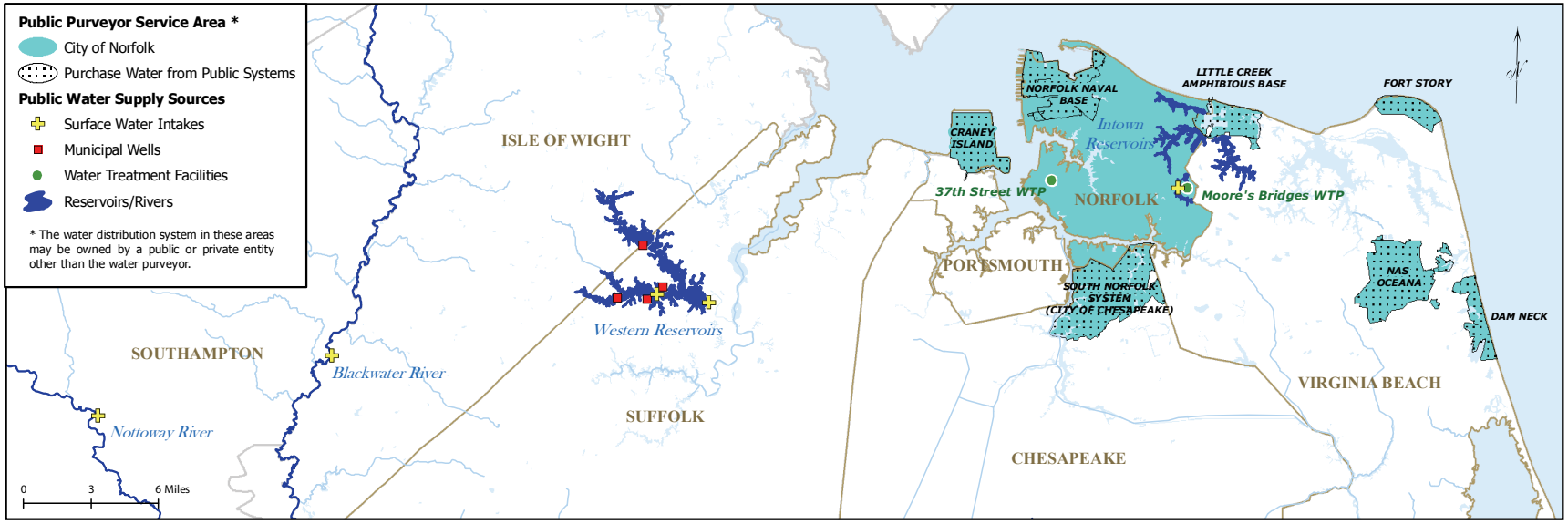
Norfolk and Virginia Beach have a unique agreement; Norfolk wheels and treats the entire water supply for Virginia Beach. The Lake Gaston water owned by Virginia Beach is discharged from the Lake Gaston pipeline into Lake Prince (located in the City of Suffolk) which is part of Norfolk's Western Reservoirs. The Lake Gaston water blends with the City of Norfolk's water sources and is treated at Norfolk's WTP.

No privately–owned water systems operate in Norfolk.

Table 1-9: 2007 City of Norfolk - Contracts for Water Sales

(All figures in mgd)

Buyer	Raw Water	Finished Water	Contract Period	Contract Terms
City of Chesapeake – Northwest River System	7.0	0.0	1/1/2003 - 12/31/2042	Norfolk provides minimum of 7 mgd which Chesapeake must take or pay for.
City of Chesapeake – South Norfolk System	0.0	2.0	1/1/2003 - 12/31/2042	Norfolk provides minimum of 2 mgd monthly, which Chesapeake must take or pay for.
Western Tidewater Water Authority (City of Suffolk and Isle of Wight County)	15.0	0.0	7/1/2009 - 6/30/2048	In 2014, Norfolk provides 3 mgd. Amount increases by 1 mgd every other year (maximum contracted amount of 15 mgd).
Total Contract Obligations for Norfolk	**22.0**	**2.0**		



Map 1-13: City of Norfolk Sources and Service Area

Western Reservoirs

The Western Reservoirs are comprised of three interconnected reservoirs: Lake Prince, Lake Burnt Mills, and Western Branch Reservoir. The bodies of water are located mainly within the City of Suffolk, but also extend into Isle of Wight County. The combined drainage area is approximately 66 square miles and the storage available for water supply is 13.2 billion gallons of raw water. The City of Norfolk Department of Utilities recently completed a $13 million rehabilitation project for Lake Burnt Mills Dam, including reconstruction of the spillway and embankments and installation of a new intake structure and outlet pipe to the Western Branch Reservoir.

Water from the Blackwater and Nottoway Rivers also supply the Western Reservoirs. Raw water pumped from the rivers is discharged into the headwaters of Lake Prince. There are no permit limits for withdrawing water from the Blackwater and Nottoway Rivers.

Additionally, Norfolk has four deep wells that also supplement the Western Reservoirs. Three wells discharge directly into Lake Prince and one discharges into Lake Burnt Mills. The four wells are permitted under one DEQ Ground Water Withdrawal Permit for 15.94 mgd.

Virginia Beach's water from the Lake Gaston pipeline, which is discharged into Lake Prince, and Norfolk's water from the Western Reservoirs is pumped to the Moores Bridges WTP and the 37th Street WTP (see Table 1-10). The Moores Bridges WTP has served the Norfolk system since construction in 1899. The 37th Street WTP, located on the west side of Norfolk, was constructed in 1920 and provides water to the western half of the City as well as to Norfolk Naval Base. The Moores Bridges and 37th Street WTPs have a combined rated capacity of 136 mgd.

Table 1-10: 2007 Norfolk Publicly-Owned CWSs

System	Reservoir	Reservoir sources	Safe Yield
Norfolk	Western Reservoirs	Lake Prince	92.5 mgd
		Lake Burnt Mills	
		Western Branch Reservoir	
		Blackwater River	
		Nottoway River	
		4 wells	
	Intown Reservoirs	Lake Lawson	
		Lake Smith	
		Little Creek Reservoir	
		Lake Whitehurst	
		Lake Wright	

Intown Reservoirs

The Intown Reservoirs are comprised of five interconnected bodies of water: Lake Lawson, Lake Smith, Little Creek Reservoir, Lake Whitehurst, and Lake Wright. The bodies of water are located in the Cities of Norfolk and Virginia Beach. Lake Wright is the terminal reservoir, where water is withdrawn for treatment at the Moores Bridges WTP. The combined drainage area is approximately 14 square miles and the storage available for water supply is 1.9 billion gallons of raw water.

The other CWS in the City is the Norfolk Naval Base System, which purchases water from the City of Norfolk. The Naval Base is a commercial customer and does not have a contract with minimum or maximum purchase amounts.

Photo: Nottoway River, www.dcr.virginia.gov

Photo: Lake Whitehurst, HRPDC

City of Norfolk: Self-Supplied Water Systems

Non-Agricultural: In 2007, 2 golf-courses reported withdrawing more than 300,000 gallons per month of surface water. Both use the water for irrigation and both are located within Norfolk's publicly-owned CWS service area. Map 1-14 and Table 1-11 summarize the self-supplied water systems in Norfolk.

There are 5 self-supplied, non-agricultural users who reported withdrawing more than 300,000 gallons per month of groundwater in 2007. The systems all hold DEQ Ground Water Withdrawal Permits and are all located within Norfolk's public water system service area.

- **JH Miles and Company – Norfolk Processing Plant:** Groundwater is used for seafood processing. The well is 900 feet deep, corresponding to the Potomac aquifer.
- **Capital Concrete Incorporated – Stapleton Street Plant:** Groundwater is used for concrete production. The 2 wells are 104 and 105 feet deep, corresponding to the Yorktown-Eastover aquifer.
- **Titan Virginia Ready-Mix LLC:** Groundwater is used for concrete production. The 3 wells are between 42 and 95 feet deep, corresponding to the Yorktown-Eastover aquifer.
- **US Navy-Norfolk Naval Base, Sewells Point Golf Course:** Groundwater is used for irrigation. The 5 wells are 40 feet deep, corresponding to the water table aquifer. Surface water from an irrigation pond is also used.
- **Eagle Haven Golf Course:** Surface water is used for irrigation. Course is located on Little Creek Amphibious Base, Virginia Beach. Base is served by Norfolk's water supply.

Agricultural: There are no agricultural users that withdraw more than 300,000 gallons per month of water, nor are there residences or businesses served by private wells.

Map 1-14: Self-Supplied Water Systems in Norfolk

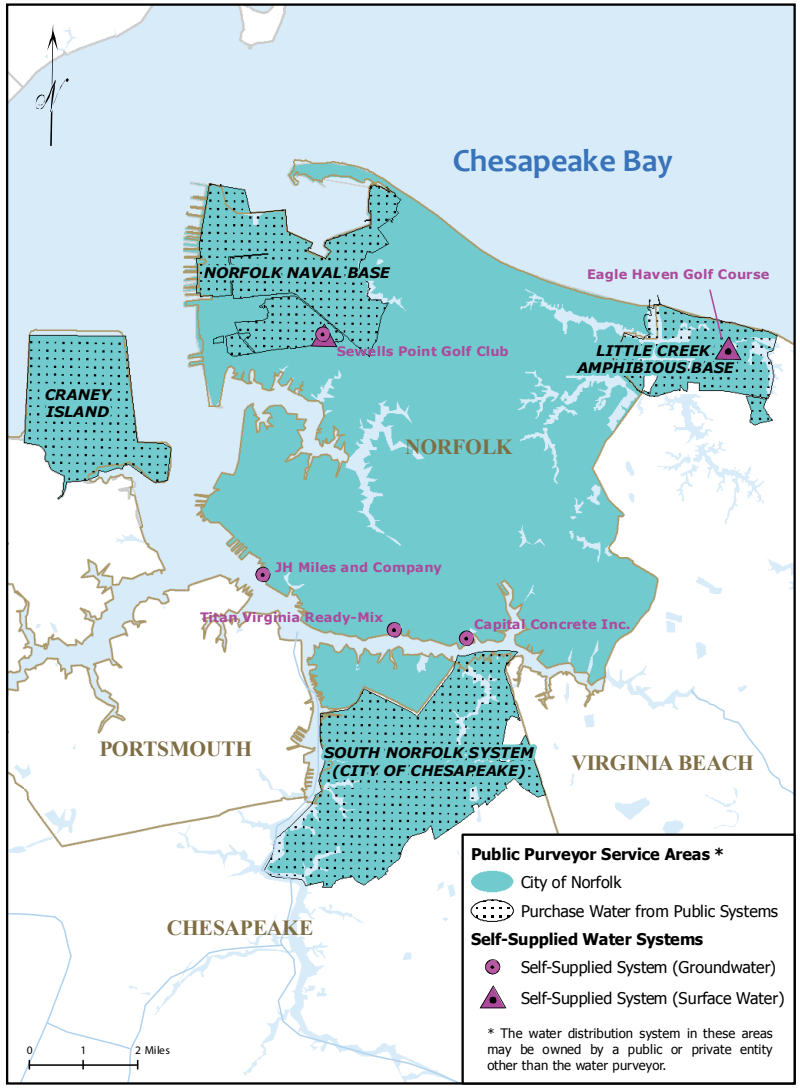


Table 1-11: 2007 Self-Supplied Use > 300,000 gallons per month in Norfolk

Business	Source Water	Type of Use	Within CWS Service Area	Groundwater Withdrawal Permit (mgd)
Capital Concrete Incorporated	Groundwater	Manufacturing	Yes	0.027
Eagle Haven Golf Course, NAB Little Creek	Lake	Commercial	Yes	Not applicable
J.H. Miles and Company	Groundwater	Manufacturing	Yes	0.225
Sewells Point Golf Course	Groundwater& Ponds	Commercial	Yes	0.038
Titan Virginia Ready-Mix, LLC	Groundwater	Commercial	Yes	0.025

City of Portsmouth: Publicly-Owned Community Water System

The City of Portsmouth operates one CWS that serves the entire City (see Map 1-15). Portsmouth's system has multiple sources of raw water: Lake Meade, Lake Cahoon, Speights Run, Lake Kilby, and five deep wells. The four surface water reservoirs are interconnected and located in the City of Suffolk. The combined drainage area of the reservoirs is 64.2 square miles and the total storage available for water supply is approximately 4.1 billion gallons. Additionally, there is an emergency pumpover from Norfolk's Lake Prince into Lake Cahoon and Lake Meade. The VDH permitted treatment capacity for the entire Portsmouth System is 38.5 mgd. The four interconnected reservoirs have a raw water safe yield of 19.1 mgd.

Of the City's five wells, two are production wells and three are drought relief wells. Production well #1 is pumped into Lake Kilby and the Lake Kilby Treatment Plant. Production well #2 is also pumped to the treatment plant. The production wells are utilized to supplement the surface water supply. The raw water is blended to maintain a ratio of 25% groundwater to 75% surface water. The addition of groundwater adds natural fluoride and alkalinity and reduces the creation of disinfection byproducts. All five wells are screened in the Potomac Aquifer. As of 2009, the City had submitted a DEQ Ground Water Withdrawal Permit application for the five wells. The draft withdrawal permit requests 5.4 mgd for the production wells and 6.22 mgd for the drought wells. The city is currently withdrawing groundwater based on a historic use certificate.

Surface water and groundwater are treated at the Lake Kilby WTP located near the reservoirs in the City of Suffolk. The system's raw water safe yield, or available water supply, is 24.7 mgd. The drought wells and pumpover from Norfolk's Lake Prince are not considered in the estimate of yield.

The HRPDC SWAP (August 2002) found that Portsmouth's surface water reservoirs have a high susceptibility to contamination. All of the groundwater wells were determined to have a low susceptibility to contamination.

The City of Portsmouth sells water to Chesapeake's Western Branch System, the City of Suffolk's Main System, and approximately 474 residents in the City of Chesapeake. These contracts obligate Portsmouth to provide a minimum of 6.5 mgd of treated water in 2010. Table 1-12 summarizes the contract terms.

Map 1-15: City of Portsmouth Sources and Service Area

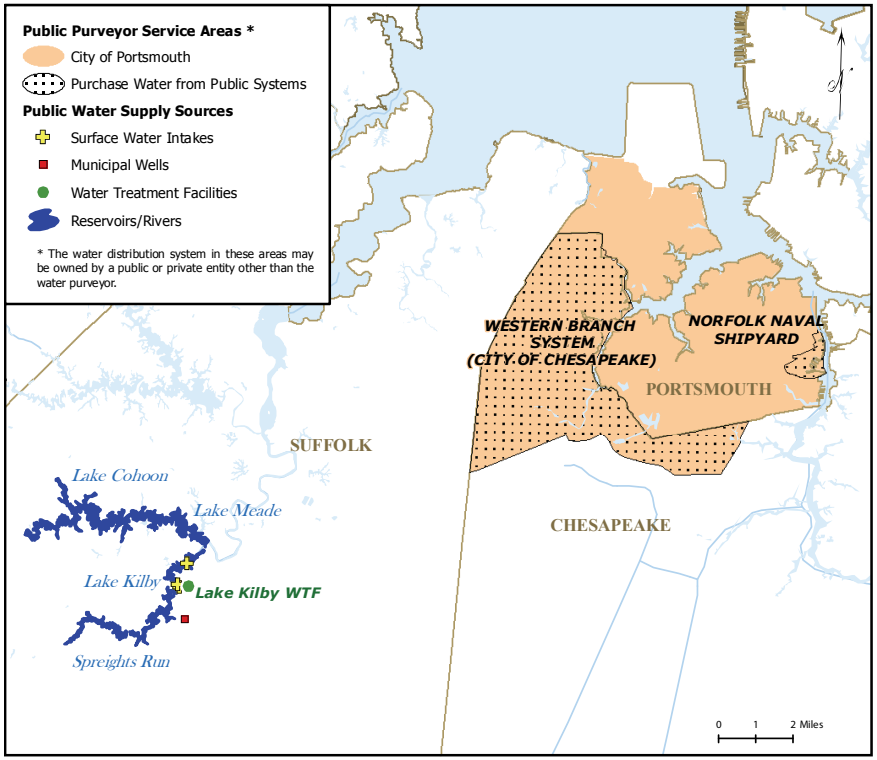


Table 1-12: 2007 City of Portsmouth – Contracts for Water Sales

Buyer	Finished Water (mgd)	Contract Period	Contract Terms
Chesapeake Western Branch System	3.0	1/1/1990 – 12/31/2026	2007 Minimum 3 mgd 2010 increase to 4 mgd 2020 increase to 5 mgd
City of Suffolk	2.54	8/27/1997 – 12/31/2040	2.54 mgd

The only other CWS in Portsmouth is the Norfolk Naval Shipyard. The system is served by the City of Portsmouth and does not have its own source water or treatment facility. The system has a typical commercial account with the City of Portsmouth and does not have a minimum or maximum contracted purchase. The population served by this system is included in Portsmouth's population served. No privately-owned CWSs operate in the City.

City of Portsmouth: Self-Supplied Water Systems

Non-Agricultural: The Elizabeth Manor Golf Course is the only non-agricultural user that reported withdrawing more than 300,000 gallons of surface water per month in 2007. The golf course withdraws from a pond and also holds a DEQ Ground Water Withdrawal Permit.

Six non-agricultural users reported withdrawing more than 300,000 gallons per month of groundwater in 2007. The surface water and groundwater users are all located within Portsmouth's public water system service area.

- **BASF:** The business is closed but is providing steam to neighboring business. Groundwater is withdrawn from 2 wells that are approximately 700 feet deep, corresponding to the Potomac aquifer.
- **Cintas Corporation:** Groundwater is used for washing textiles. The well is 700 feet deep, corresponding to the Potomac aquifer.
- **Cogentrix Virginia Leasing Corporation:** Water is used for boiler feed. Groundwater is withdrawn from 7 wells that are between 600 and 1300 feet deep, corresponding to the Potomac aquifer.
- **Elizabeth Manor Golf and Country Club:** Groundwater is used for irrigation. The 3 wells are between 40 and 45 feet deep, corresponding to the Yorktown-Eastover aquifer. Surface water from a pond is also used for irrigation.

Photo: Lake Meade, HRPDC

- **Tidewater Area Central Hospital Laundry:** Water is used for washing textiles. The well is 660 feet deep, corresponding to the Potomac aquifer.
- **Titan Virginia Ready-Mix:** Groundwater is used for concrete production. The well is 697 feet deep, corresponding to the Potomac aquifer.

Agricultural: No agricultural users reported withdrawing more than 300,000 gallons per month in 2007.

Map 1-16 and Table 1-13 summarize self-supplied CWS in Portsmouth.

Map 1-16: Self-Supplied Water Systems in Portsmouth

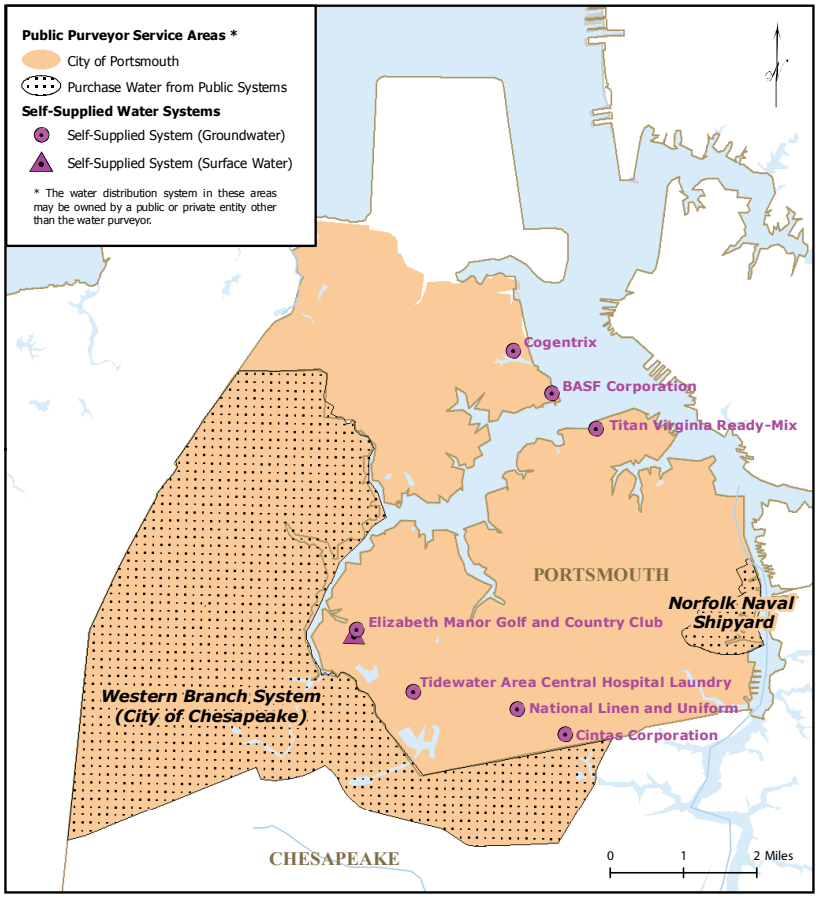


Table 1-13: 2007 Self-Supplied Use > 300,000 gallons/month in Portsmouth

Business	Source Water	Type of Use	Within PWS Service Area	Groundwater Withdrawal Permit (mgd)
BASF	Groundwater	Manufacturing	Yes	0.42
Cintas Corporation	Groundwater	Manufacturing	Yes	0.06
Congentrix Virginia Leasing Corporation	Groundwater	Fossil Power	Yes	2.6
Elizabeth Manor Golf Course	Groundwater & Ponds	Commercial	Yes	0.05
Tidewater Area Central Hospital Laundry Inc.	Groundwater	Commercial	Yes	0.12
Titan Virginia Ready-Mix, LLC	Groundwater	Manufacturing	Yes	0.01

City of Suffolk: Publicly-Owned Community Water System

The City of Suffolk operates three CWSs. The Main System has the largest service area. In 2007, the system provided water for 64,600 people. The Whaleyville System and Holland System are much smaller in comparison, and both serve about 500 people each. Suffolk's safe yield, or available water supply, is 9.68 mgd, which includes the Main, Whaleyville and Holland systems, but does not include the treated water purchased from Portsmouth. Table 1-14 summarizes the systems.

The HRPDC SWAP (August 2002) indicates that the Main System's surface water sources have a high susceptible to contamination. The VDH SWAP evaluation (February 15, 2006) indicates the wells have a low susceptibility to contamination. As of 2010, the Holland system is under a Fluoride Consent Order by VDH. The City has been working with VDH to address the fluoride levels.

In April 1998, the City of Suffolk and the County of Isle of Wight formed the Western Tidewater Water Authority (WTWA) for the purpose of "acquiring, financing, constructing, leasing, operating and maintaining facilities for the production, impoundment, treatment and transmission of water on a cooperative, regional basis" (Western Tidewater Regional Water Agreement, 2009).

The Authority's water supply, which is distributed through Suffolk's Main System, comes from multiple sources:

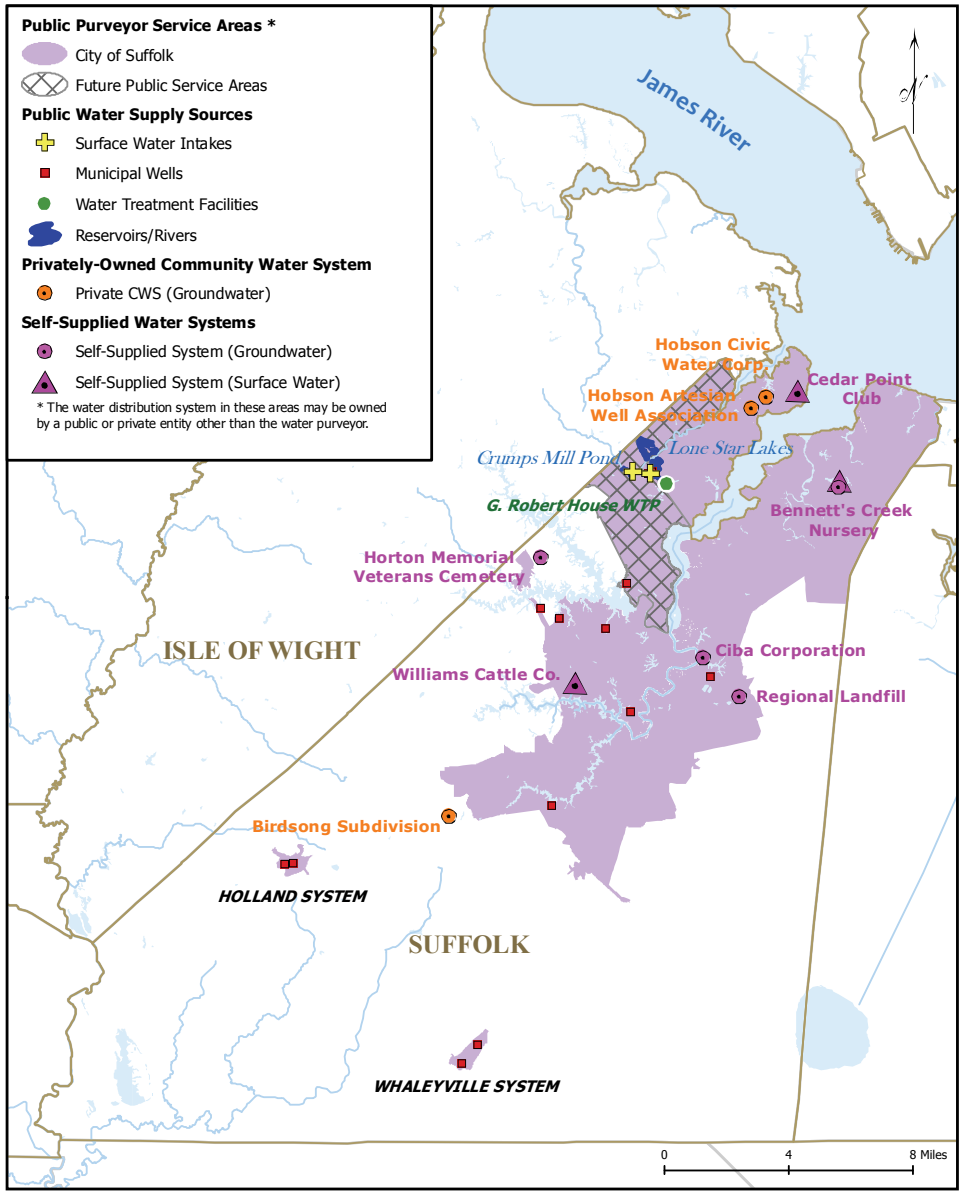
- Suffolk's contract with the City of Portsmouth for 2.54 mgd of treated water;
- Suffolk's 1.20 mgd safe yield of raw surface water from Lone Star Lakes and Crumps Mill Pond;
- Suffolk's 3 production wells and the Authority's production well that are all permitted under one DEQ Ground Water Withdrawal Permit for 8.30 mgd held by the WTWA; and
- WTWA's contract with Norfolk (begins 2014- 2048) for 3 mgd and increasing to 15 mgd over time.

The surface water and groundwater listed above is treated at the G. Robert House WTP. The finished water purchased from Portsmouth is connected to the distribution system at Portsmouth's Lake Kilby WTP, which is located in the City of Suffolk. The location of the reservoirs, wells and treatment plant are shown on Map 1-17. The WTWA reserves 25% of the available water supply for Isle of Wight County (3.01 mgd in 2007) and 75% for Suffolk (9.03 mgd in 2007).

Table 1-14: 2007 Suffolk Publicly-Owned Community Water System

System	Population Served	Source	Permit or Contract
Main	64,600	4 production wells	DEQ Ground Water Withdrawal Permit = 8.3 mgd
		Lone Star Reservoir	VDH permitted capacity/ safe yield = 1.2 mgd
		Crumps Mill Pond Reservoir	
		Finished water purchased from Portsmouth	2.54 mgd of treated water
		6 emergency wells	DEQ Ground Water Withdrawal Permit = 0.045 mgd
Holland	500	Groundwater	DEQ Ground Water Withdrawal Permit = 0.044 mgd
Whaleyville	500	Groundwater	DEQ Ground Water Withdrawal Permit = 0.097 mgd

Map 1-17: City of Suffolk Sources and Service Area, Privately-Owned Water Systems, and Self-Supplied Water Systems



Main System

The City of Suffolk's Main System is currently supplied by the sources listed above: four production wells that are permitted under one DEQ Ground Water Withdrawal Permit held by the WTWA; two reservoirs; and finished water purchased from the City of Portsmouth.

Suffolk owns Lone Star Lakes Reservoir and Crumps Mill Pond Reservoir, which are located in the northwest portion of the City. The two bodies of water have a combined drainage area of 7.75 square miles in the James River watershed and on-stream storage of 375 million gallons. The combined raw water safe yield of the two reservoirs is 1.2 mgd.

Photo: Lone Star Lakes, Suffolk Parks and Recreation

Four production wells supply the Main System: EDR, Reids Ferry, Crittenden, and Fluoride well. All the wells withdraw groundwater from the Potomac aquifer, which is the deepest aquifer. The total permitted withdrawal from the four wells is 8.3 mgd. The Main system is also has six emergency wells. The additional annual permitted withdrawal for the emergency wells is 0.045 mgd to allow the wells to be maintained.

The surface water and groundwater for Suffolk's Main System are treated at the G. Robert House WTP. Withdrawals from the EDR, Reids Ferry, and Crittenden wells are processed in treatment systems to reduce fluoride levels, then blended with withdrawals from the Fluoride well and Suffolk's treated surface water and finished water purchased from Portsmouth. The current capacity for Suffolk's Main System is 9.5 mgd. The combined capacity of Suffolk's Main System and the water purchased from Portsmouth is 12.04 mgd. Based on the WTWA agreement, Suffolk's portion of the available water supply is 9.03 mgd.

Holland System

The City of Suffolk's Holland System relies on groundwater. The system has a DEQ Ground Water Withdrawal Permit for 44,000 gallons per day (0.044 mgd), which is the system's available water supply. The two wells withdraw groundwater from the Potomac aquifer, which is the deepest aquifer. As of 2010, the Holland System was under a Fluoride Consent Order by VDH.

Whaleyville System

The City of Suffolk's Whaleyville System also relies on groundwater. The DEQ Ground Water Withdrawal Permit is for 97,000 gallons per day (0.097 mgd) from Robertson School Well #3 and Tower Well #4. Both wells withdraw groundwater from the Aquia aquifer. The VDH SWAP evaluations (February 15, 2006) indicates that the wells have a low susceptibility to contamination.

City of Suffolk: Privately-Owned Community Water Systems

Three privately-owned CWSs operate in Suffolk (see Table 1-15). The systems all use groundwater. The Hobson Village and Hobson Mt. Lebanon systems are located in the northern portion of Suffolk's Main System service area. Each of these systems has one deep well (over 500 feet below ground surface). The third privately-owned CWS, Birdsong (formerly Byrdtown), is located outside of the City of Suffolk's service area. It is a small system with one deep well. None of these privately-owned systems require a DEQ Ground Water Withdrawal Permit. The systems' available water supply is 41,600 gpd (0.042 mgd). In 2007, the systems each served between 70 and 100 people. As of 2010, the Hobson Village and Hobson Mt. Lebanon systems were under a VDH Fluoride Consent Order.

Table 1-15: Privately-owned CWS in Suffolk

System	VDH Permitted Capacity
Hobson Village	11,200 gpd
Hobson Mt. Lebanon	13,600 gpd
Birdsong	16,800 gpd

City of Suffolk: Self-Supplied Water Systems

In 2007, an estimated 20,164 people were served by private residential wells and 11 businesses were served approximately 1,600 people from their own source wells. All of the residences and four businesses are located outside a publicly-owned CWS service area.

Non-Agricultural: Cedar Point Golf Course was the only self-supplied, non-agricultural user in 2007 that reported withdrawing more than 300,000 gallons per month of surface water. Cedar Point Golf Course withdraws from a lake and does not hold a DEQ Virginia Water Protection Permit. The golf course is located within the City of Suffolk's CWS service area.

Three self-supplied, non-agricultural users reported withdrawing more than 300,000 gallons per day of groundwater in 2007. All the systems hold a DEQ Ground Water Withdrawal Permit. Two of the users are located within the City of Suffolk's CWS service area.

- **Albert G. Horton, Jr. Veterans Cemetery:** Groundwater is used for irrigation. The 3 wells are between 475 and 520 feet deep, corresponding to the Potomac aquifer.
- **Ciba Specialty Chemicals:** Groundwater is used in the industrial process. The well is 884 feet deep, corresponding to the Potomac aquifer.
- **SPSA Regional Landfill:** Groundwater is withdrawn to dewater under the landfill liner. Water must be pumped out from under the liner until there is enough weight on the liner to keep it from being pushed up by the groundwater. 4 wells are about 20 feet deep and 1 well is 650 feet deep. The deep well withdraws groundwater from the Potomac aquifer.

Agricultural: In 2007, 2 agricultural users reported withdrawing more than 300,000 gallons of water per month. Williams Cattle Company relies on farm ponds and Bennetts Creek Nursery has both ponds and wells. Table 1-16 summarizes the self-supplied use in Suffolk.

City of Virginia Beach: Publicly-Owned Community Water System

The City of Virginia Beach operates one CWS. In 2007, the system provided water to 403,000 people. The city does not own any water treatment facilities. Instead, the City of Norfolk treats and wheels all of Virginia Beach's source water in accordance with a cost of service contract between the two localities. There are no privately-owned CWSs in the City.

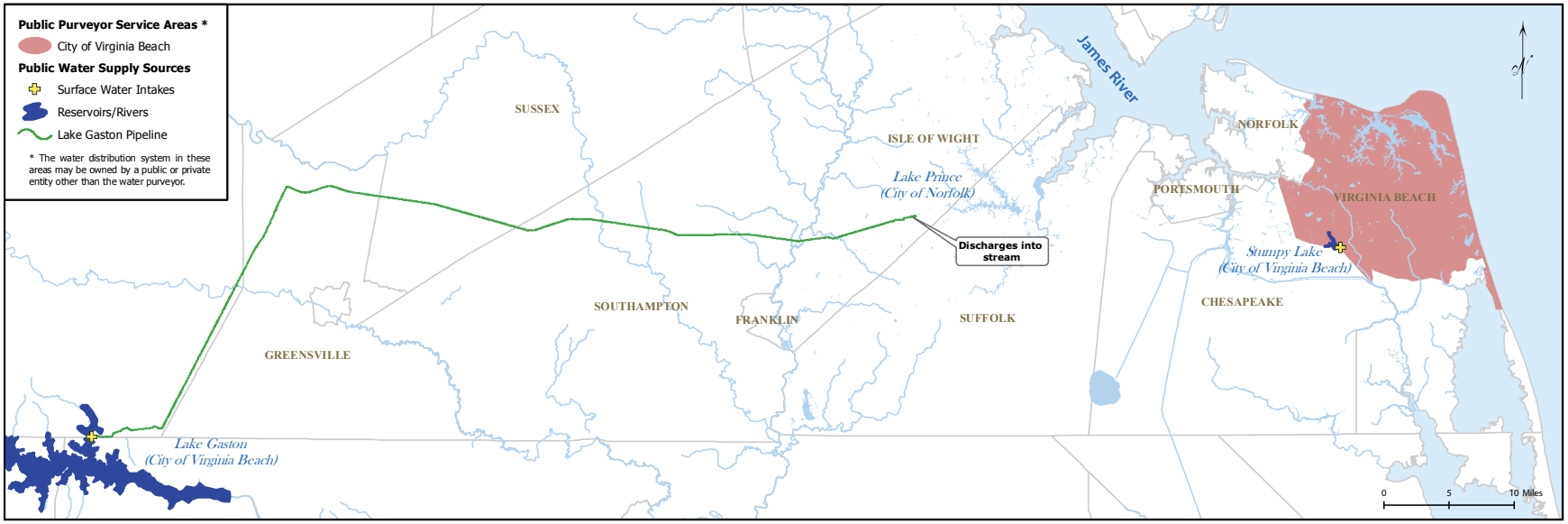
The City of Virginia Beach holds a permit from the U.S. Army Corps of Engineers to withdraw 60 mgd from Lake Gaston, located along the Virginia border with North Carolina (see Map 1-18). The Lake Gaston pipeline transports the water from Lake Gaston to Norfolk's Lake Prince, which is located in Isle of Wight County. The City of Chesapeake is a partner in the project and will receive 10 mgd of the 60 mgd in the future.

The HRPDC SWAP (August 2002) found that Lake Gaston and the City of Norfolk's reservoir systems have a high susceptibility to contamination. Norfolk's groundwater wells, which are pumped into Lake Prince, have a low susceptibility to contamination.

Virginia Beach also owns Stumpy Lake, located along the border with Virginia Beach and Chesapeake. The lake serves as an emergency water source. The City of Norfolk provides treatment if withdrawals from Stumpy Lake are needed. The total available raw water supply for Virginia Beach is 51.3 mgd.

There are four CWSs within Virginia Beach that serve military installations: Dam Neck, Little Creek Amphibious Base, NAS Oceana, and Fort Story. These systems do not have their own source water or treatment facilities; water service is contracted with the City of Norfolk. The Navy is not obligated to minimum or maximum contracted purchases.

Map 1-18: City of Virginia Beach Sources and Service Area



City of Virginia Beach: Self-Supplied Water Systems

In 2007, approximately 5,000 people were served by private residential wells and 42 businesses had their own water source. Twenty-four businesses were identified by VDH and do not use enough water to exceed the DEQ reporting threshold. Nearly all of the residential use is located outside a publicly-owned CWS service area. Approximately half of the businesses are located within a publicly-owned CWS service area.

Non-Agricultural: In 2007, 7 self-supplied, non-agricultural users reported withdrawing more than 300,000 gallons per month of surface water. All of the users are golf courses that are located within the City of Virginia Beach's CWS service area.

As for non-agricultural groundwater withdrawals, 9 self-supplied users reported withdrawing more than 300,000 gallons per month in 2007. These users all hold DEQ Ground Water Withdrawal Permits. All nine users are located within Virginia Beach's CWS service area. Seven of the nine users are golf courses, three of which also withdraw surface water. There are two commercial and manufacturing groundwater users:

- **Servitex Division of Alsco:** Groundwater is used for washing textiles. The company has three wells. The depth of only one well is known. It is 75 feet deep, corresponding to the Yorktown-Eastover aquifer.
- **Titan Ready Mix Oceana Plant:** Groundwater is used for concrete production. The one well is 142 feet deep, corresponding to the Yorktown-Eastover aquifer.

Map 1-19 shows the locations of self-supplied CWS in Virginia Beach and Table 1-17 contains the permitted amounts by user.

Agricultural: No agricultural users reported withdrawing more than 300,000 gallons per month of groundwater or surface water in 2007.

Map 1-19: Self-Supplied Water Systems in Virginia Beach

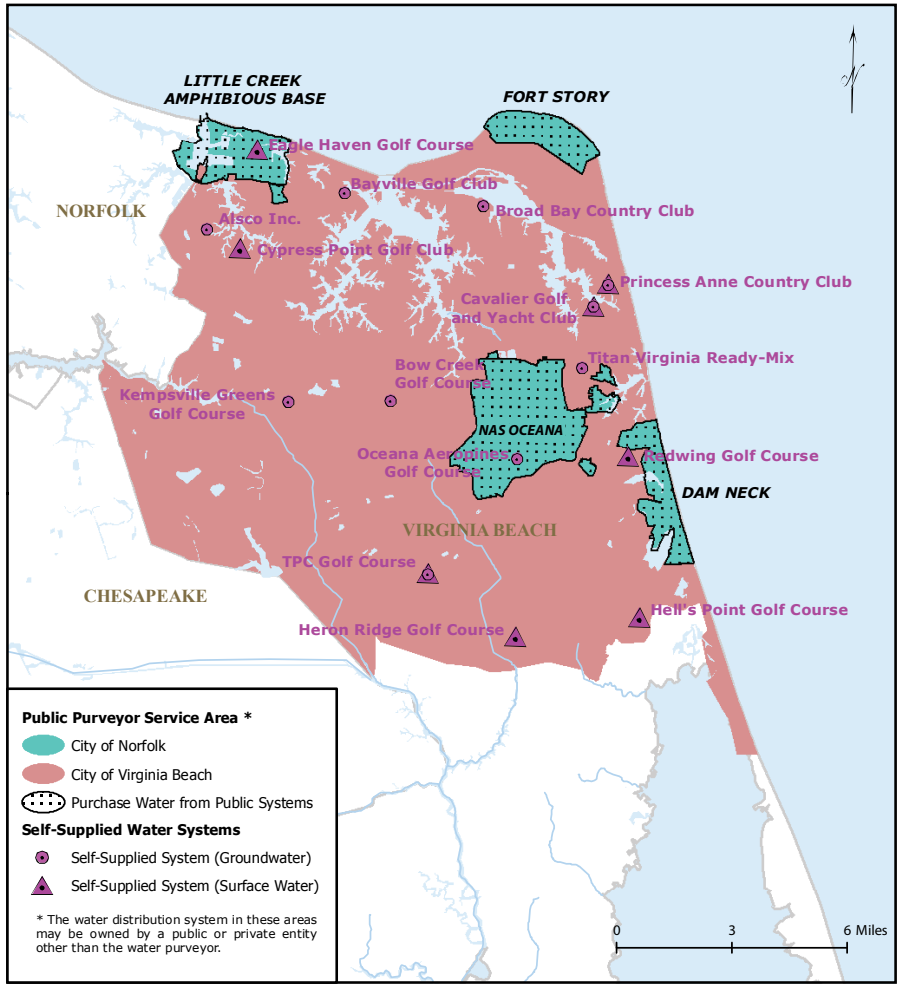


Table 1-17: 2007 Self-Supplied Use > 300,000 gallons/month in Virginia Beach

User	Source Water	Type of Use	Within PWS Service Area	Groundwater Withdrawal Permit (mgd)
Bayville Golf Club	Groundwater	Commercial	Yes	0.04
Bow Creek Golf Course	Groundwater	Commercial	Yes	Applied for permit
Broad Bay Country Club	Groundwater	Commercial	Yes	0.05
Cavalier Golf & Yacht Club	Lake & Groundwater	Commercial	Yes	0.06
Cypress Point Golf Course	Pond	Commercial	Yes	Not applicable
Hell's Point Golf Course	Lake	Commercial	Yes	Not applicable
Heron Ridge Golf Course	Lake	Commercial	Yes	Not applicable
Kempsville Greens Golf Course	Groundwater	Commercial	Yes	0.03
Oceana Golf Course	Groundwater	Commercial	Yes	0.30
Princess Anne Country Club	Pond & Groundwater	Commercial	Yes	0.07
Redwing Golf Course	Lake	Commercial	Yes	Not applicable
Servitex Division of Alsco	Groundwater	Commercial	Yes	0.05
Titan Ready Mix Oceana Plant	Groundwater	Manufacturing	Yes	0.01
TPC Golf Course	Lakes & Groundwater	Commercial	Yes	0.22

Existing Sources - Western Tidewater Sub-Region

The Western Tidewater sub-region includes the City of Franklin; Counties of Isle of Wight, Southampton, and Surry; and Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor. The largest population center is the City of Franklin. The sub-region is mostly rural with scattered, small population centers. The majority of the population is served by private residential wells.

In 2007, the USGS completed the report *Private Domestic-Well Characteristics and the Distribution of Domestic Withdrawals among Aquifers in the Virginia Coastal Plain* (Pope, McFarland, and Banks, 2008). This report examines groundwater use by private residential wells. The study estimates the number of wells and the number of people served in each locality. Aquifer depths are identified by locality and there are estimates of the number of wells that withdraw groundwater from each aquifer.

The sub-region is served by 24 CWSs. The systems served a total of 28,000 people in 2007. All but one of the systems relies on groundwater. The combined available water supply of the publicly-owned CWSs is 9.81 mgd. The available water supply is calculated by taking the sum of all the total permitted annual withdrawals set by DEQ Ground Water Withdrawal Permits, or if a system does not have a withdrawal permit, the permitted system capacity determined by VDH. The available surface water is determined by the terms of the contracts. For further discussion about the available water supply and demands, see "Section 4, Projected Water Demands" and "Section 6, Statement of Need."

Per the 1996 Safe Drinking Water Act Amendments, the VDH SWAP Program inventoried drinking water sources and nearby land uses that may impact water quality, including common activities related to residential, industrial, commercial, and agricultural land uses and waste management and transportation facilities. According to the VDH SWAP evaluations (February 15, 2006), 11 of the publicly-owned systems have a well or wells with a high susceptibility to contamination. In 2010, 4 publicly-owned CWSs were under a Fluoride Consent Order by VDH due to elevated levels of fluoride: Town of Smithfield, Carrsville, Smithfield Heights, and Gatling Pointe (which receives water from the Town of Smithfield). As of December 2010, the Carrsville and Smithfield Heights systems were no longer under the consent order. At low levels, fluoride can help prevent tooth decay, but children drinking water containing more than 2 milligrams per liter (mg/l) of fluoride may develop cosmetic discoloration of their permanent teeth (dental fluorosis). The four systems have been working with VDH to find alternatives to address the high fluoride levels.

In 2007, 40 privately-owned CWSs in the sub-region served a total population of 7,221 people. Most of these systems are located outside a publicly-owned CWS service area and serve less than 100 residences. The systems all rely on groundwater. The combined available water supply of the 40 privately-owned CWSs is 1.22 mgd. According to the VDH SWAP evaluations (February 15, 2006), 30 of the systems have a well or wells with a high susceptibility to contamination. As of 2010, 13 privately-owned CWSs were under a Fluoride Consent Order by VDH. Map 1-20 shows the location and service areas of CWSs in the sub-region.

Photo: Isle of Wight County Farm, HRPDC

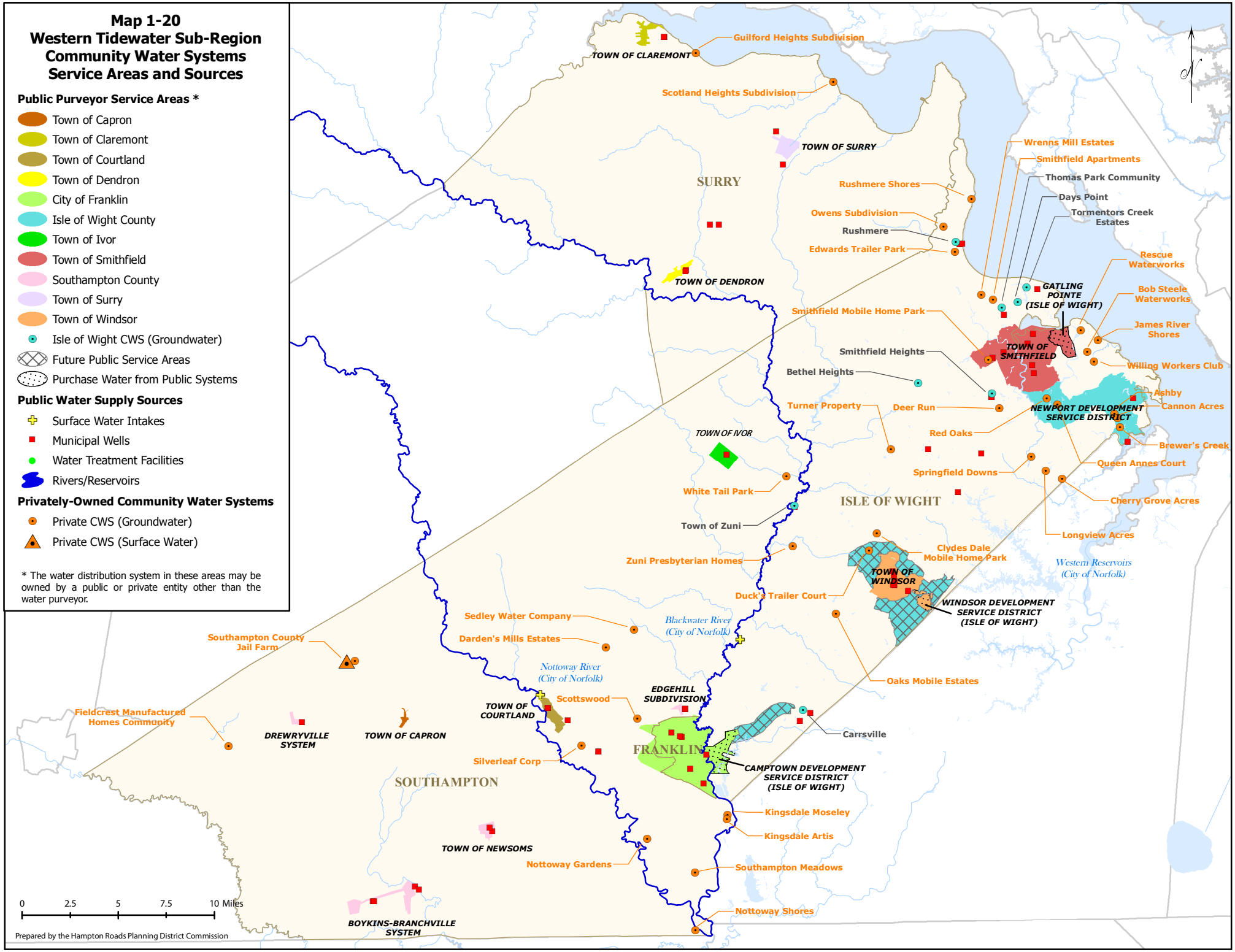
The Western Tidewater sub-region has many self-supplied water users. These users range from residences with private wells to commercial or agricultural operations with large monthly withdrawals from wells or ponds. Virginia Water Withdrawal Regulation (9 VAC 25-200-10, et seq.) requires reporting for any withdrawal whose daily average withdrawal exceeds 300,000 gallons per month (10,000 gpd), with the exception of crop irrigation. Reporting of crop irrigation applies to withdrawals exceeding one million gallons in any single month. The accuracy of withdrawal reporting to DEQ and VDH is not known, and therefore it cannot be assumed that water use included in this report is a complete account of all water use in the Western Tidewater Sub-Region.

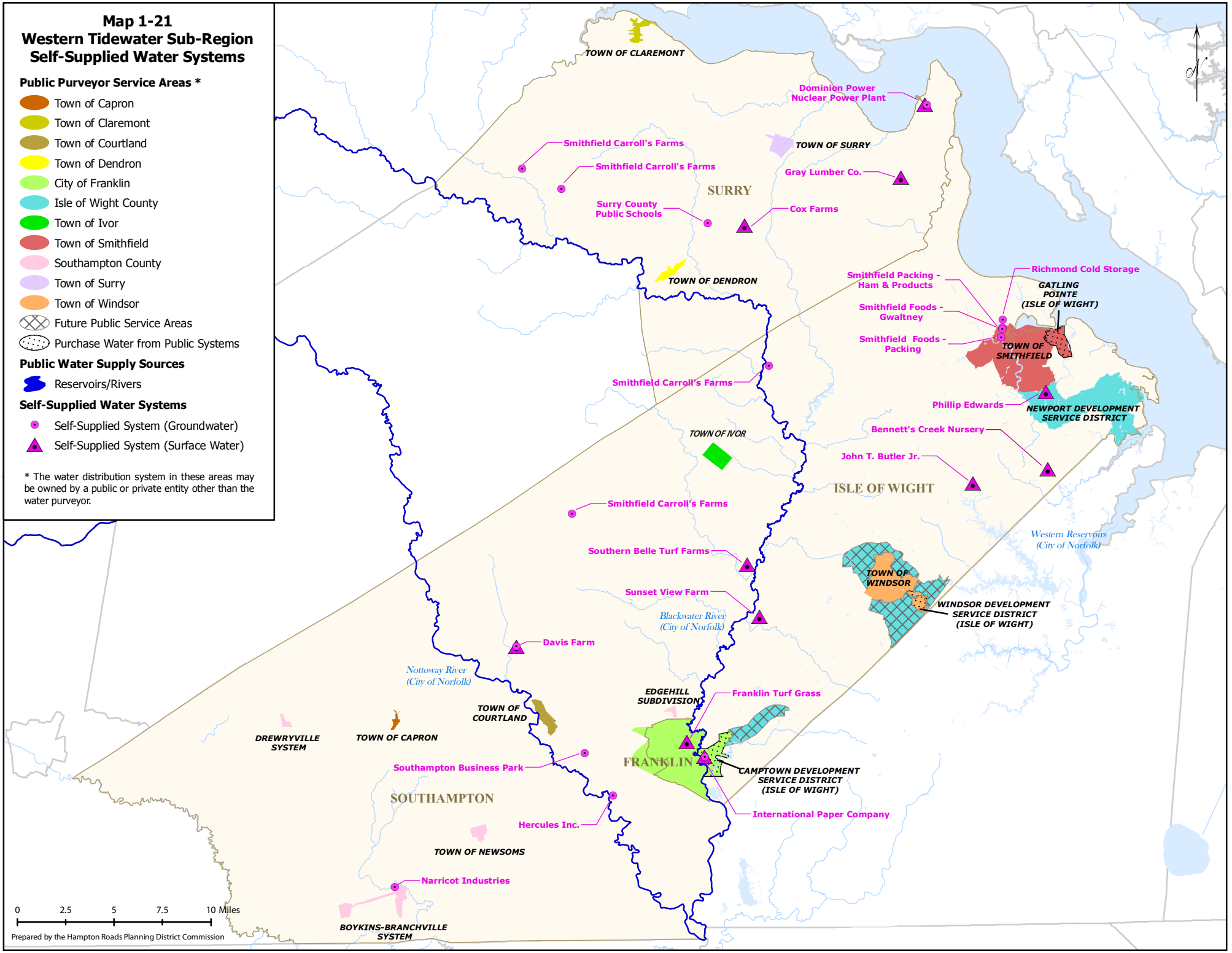
The regulatory threshold for applicability of the DEQ Ground Water Withdrawal Permit Program and Virginia Water Protection Permit Program for surface water withdrawals is also 300,000 gallons per month. Many of the surface water users in the Hampton Roads Region are exempt from the Virginia Water Protection Permit Program because withdrawals were established prior to 1989.

Map 1-21 shows the locations of the self-supplied users that withdraw more than 300,000 gallons per month.

2007 Western Tidewater Overview

- 24 publicly-owned CWS served 28,000 people.
- All but one of the publicly-owned CWS relies on groundwater.
- 11 publicly-owned CWS have wells with high susceptibility to contamination.
- 4 publicly-owned CWS were under Fluoride Consent Orders.
- 40 privately-owned CWS served 7,220 people.
- 13 privately-owned CWS were under Fluoride Consent Orders.
- 34,160 people were served by private residential wells.
- 58 businesses are self-supplied with wells or surface water sources.
- 2 self-supplied users reported withdrawing more than 300,000 gallons per month of surface water for non-agricultural use.
- 10 self-supplied users reported withdrawing more than 300,000 gallons per month of groundwater for non-agricultural use.
- 13 self-supplied users reported withdrawals of more than 300,000 gallons per month of groundwater and/or surface water for agricultural use.


Map 1-20
Western Tidewater Sub-Region
Community Water Systems
Service Areas and Sources
Public Purveyor Service Areas *
Town of Capron
Town of Claremont
Town of Courtland
Town of Dendron
City of Franklin
Isle of Wight County
Town of Ivor
Town of Smithfield
Southampton County
Town of Surry
Town of Windsor
Isle of Wight CWS (Groundwater)
Future Public Service Areas
Purchase Water from Public Systems
Public Water Supply Sources
Surface Water Intakes
Municipal Wells
Water Treatment Facilities
Rivers/Reservoirs
Privately-Owned Community Water Systems
Private CWS (Groundwater)
Private CWS (Surface Water)
* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.
Guilford Heights Subdivision
TOWN OF CLAREMONT
Scotland Heights Subdivision
TOWN OF SURRY
SURRY
Rushmere Shores
Owens Subdivision
Rushmere
Edwards Trailer Park
TOWN OF DENDRON
Wrenns Mill Estates
Smithfield Apartments
Thomas Park Community
Days Point
Tormentors Creek Estates
Rescue Waterworks
GATLING POINTE (ISLE OF WIGHT)
Bob Steele Waterworks
Smithfield Mobile Home Park
James River Shores
TOWN OF SMITHFIELD
Smithfield Heights
Bethel Heights
Willing Workers Club
Ashby
Turner Property
Deer Run
NEWPORT DEVELOPMENT SERVICE DISTRICT
Cannon Acres
TOWN OF IVOR
Red Oaks
Brewer's Creek
Queen Annes Court
Springfield Downs
White Tail Park
ISLE OF WIGHT
Cherry Grove Acres
Town of Zuni
Longview Acres
Clydes Dale Mobile Home Park
Zuni Presbyterian Homes
Western Reservoirs (City of Norfolk)
TOWN OF WINDSOR
Duck's Trailer Court
WINDSOR DEVELOPMENT SERVICE DISTRICT (ISLE OF WIGHT)
Sedley Water Company
Blackwater River (City of Norfolk)
Southampton County Jail Farm
Darden's Mills Estates
Oaks Mobile Estates
Nottoway River (City of Norfolk)
EDGEHILL SUBDIVISION
Scottswood
TOWN OF COURTLAND
Fieldcrest Manufactured Homes Community
DREWRYVILLE SYSTEM
TOWN OF CAPRON
Carrsville
FRANKLIN
Silverleaf Corp
CAMPTOWN DEVELOPMENT SERVICE DISTRICT (ISLE OF WIGHT)
SOUTHAMPTON
Kingsdale Moseley
Kingsdale Artis
TOWN OF NEWSOMS
Nottoway Gardens
Southampton Meadows
Nottoway Shores
BOYKINS-BRANCHVILLE SYSTEM
0
2.5
5
7.5
10 Miles
Prepared by the Hampton Roads Planning District Commission


Map 1-21
Western Tidewater Sub-Region
Self-Supplied Water Systems
Public Purveyor Service Areas *
Town of Capron
Town of Claremont
Town of Courtland
Town of Dendron
City of Franklin
Isle of Wight County
Town of Ivor
Town of Smithfield
Southampton County
Town of Surry
Town of Windsor
Future Public Service Areas
Purchase Water from Public Systems
Public Water Supply Sources
Reservoirs/Rivers
Self-Supplied Water Systems
Self-Supplied System (Groundwater)
Self-Supplied System (Surface Water)
* The water distribution system in these areas may be owned by a public or private entity other than the water purveyor.
TOWN OF CLAREMONT
Dominion Power Nuclear Power Plant
TOWN OF SURRY
Smithfield Carroll's Farms
Smithfield Carroll's Farms
Gray Lumber Co.
SURRY
Surry County Public Schools
Cox Farms
TOWN OF DENDRON
Smithfield Packing - Ham & Products
Richmond Cold Storage
GATLING POINTE (ISLE OF WIGHT)
Smithfield Foods - Gwaltney
Smithfield Foods - Packing
TOWN OF SMITHFIELD
Smithfield Carroll's Farms
Phillip Edwards
NEWPORT DEVELOPMENT SERVICE DISTRICT
TOWN OF IVOR
Bennett's Creek Nursery
John T. Butler Jr.
ISLE OF WIGHT
Smithfield Carroll's Farms
Western Reservoirs (City of Norfolk)
Southern Belle Turf Farms
TOWN OF WINDSOR
Sunset View Farm
WINDSOR DEVELOPMENT SERVICE DISTRICT (ISLE OF WIGHT)
Blackwater River (City of Norfolk)
Davis Farm
Nottoway River (City of Norfolk)
EDGEHILL SUBDIVISION
Franklin Turf Grass
TOWN OF COURTLAND
DREWRYVILLE SYSTEM
TOWN OF CAPRON
FRANKLIN
CAMPTOWN DEVELOPMENT SERVICE DISTRICT (ISLE OF WIGHT)
Southampton Business Park
SOUTHAMPTON
International Paper Company
Hercules Inc.
TOWN OF NEWSOMS
Narricot Industries
BOYKINS-BRANCHVILLE SYSTEM
0 2.5 5 7.5 10 Miles
Prepared by the Hampton Roads Planning District Commission

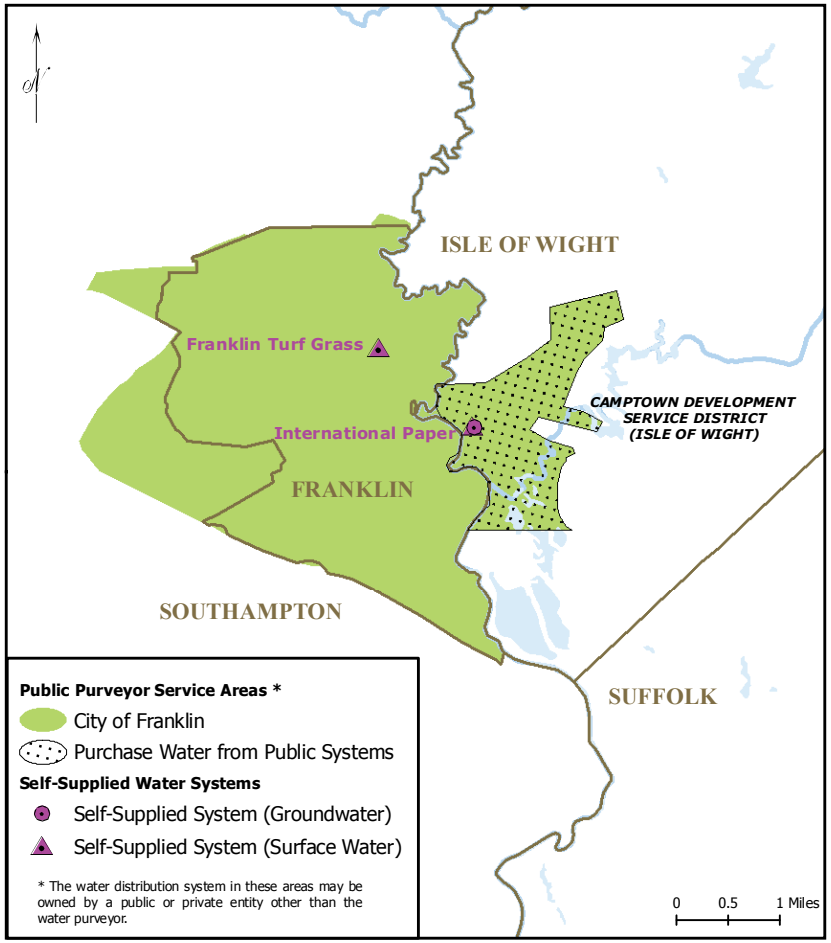
City of Franklin

The City of Franklin operates one publicly-owned CWS that served 9,000 people in 2007 (see Map 1-22). The population served includes the City's total population, two neighborhoods in Southampton County, and Isle of Wight County's Camptown Development Service District. The City of Franklin has an agreement with Isle of Wight County to supply the Camptown Development Service District with 0.20 mgd of treated water. The contract was signed in 1998 and has a one year automatic renewal until Isle of Wight County or the City of Franklin gives notice of termination.

Franklin's four wells are permitted under one DEQ Ground Water Withdrawal Permit for 2.88 mgd, which equals the City's available water supply. All 4 wells are over 400 feet deep and withdraw from the Potomac aquifer. The VDH SWAP evaluations (February 15, 2006) indicate that all the wells have a low susceptibility to contamination. There are no privately-owned CWSs or private residential wells in the City of Franklin.

Franklin Turfgrass Inc, a sod turf farm, is the only large self-supplied user in the City of Franklin. The farm withdraws approximately 0.6 mgd of water annually from the Blackwater River and the Nottoway River for irrigation. The International Paper mill and Hercules Incorporated are located in Franklin's service area but outside the city limits. Both facilities have very large groundwater withdrawals.

Map 1-22: City Of Franklin Service Area and Self-Supplied Water Systems



Isle of Wight County: Publicly-Owned Community Water Systems

In 2007, Isle of Wight County operated 12 water systems, 11 of which are publicly-owned CWSs that served a total population of 4,625 people. The remaining system provides water to an industrial park and does not supply any residences; therefore, it is not considered a CWS. The County systems are geographically separate and none of the distribution systems are connected. The VDH SWAP evaluations (February 15, 2006) indicate that six of the publicly-owned CWSs have a well or wells that are highly susceptible to contamination. The Gatling Pointe system, which receives water from Smithfield, is under a Fluoride Consent Order from VDH.

The 2007 available water supply for Isle of Wight County's 11 publicly-owned CWSs was approximately 3.40 mgd plus the water available to the Gatling Pointe subdivision, which is limited by the amount of water available from Smithfield and not by a DEQ Ground Water Withdrawal Permit or contract agreement.

The County has established three development service districts (DSD): Camptown DSD, Windsor DSD, and the Newport DSD (see Map 1-23). The County's long range land use plan is for the three designated Districts to host the majority of new residential, commercial and industrial growth. All three of the Districts purchase water from outside the County through water agreements (see Table 1-18).

The Camptown DSD is located along the eastern border of the City of Franklin. The County has an agreement with the City of Franklin to purchase up to 225,565 gallons per day (0.23 mgd) of treated water for the Camptown DSD. The contract between the City of Franklin and Isle of Wight County is a three year contract that started in 1998 and is automatically renewed each year until one of the parties gives notice of termination. The County has a plan to build a reverse osmosis WTP to serve the Camptown DSD. The county acquired a DEQ Ground Water Withdrawal Permit in 2002 for 0.98 mgd which would be treated at the proposed reverse osmosis plant.

Map 1-23: Isle of Wight County Development Service Districts

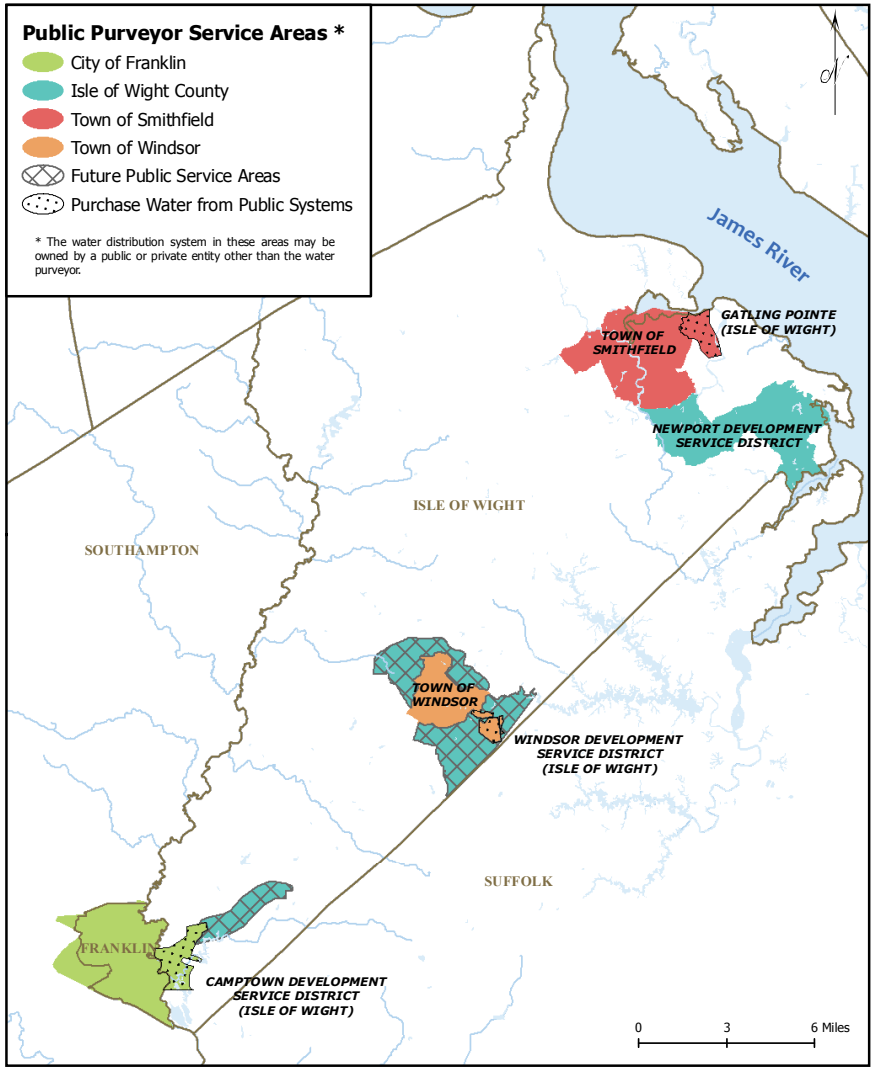


Table 1-18: 2007 Isle of Wight County Water Agreements*

Seller/ Source	Purchaser	System	Contract or Agreement Terms	Raw or Treated Water
Windsor	Isle of Wight County	Windsor DSD	0.204 mgd	Treated
Franklin	Isle of Wight County	Camptown DSD	0.20 mgd	Treated
Suffolk Portsmouth	Western Tidewater Water Authority*	Newport DSD	3.01 mgd maximum reserved for Isle of Wight County (on-going contract)	Treated
Smithfield	Gatling Pointe Subdivision	Gatling Pointe Subdivision	Residents billed by Isle of Wight County	Treated
Western Tidewater Authority	Isle of Wight County	Suffolk Main System	6.76 mgd	Finished

* Western Tidewater Water Authority has a contract with the City of Norfolk to purchase 3 mgd starting in 2014. The amount increases 1 mgd every other year until the contract ends in 2048. Max purchase is 15 mgd, split between Isle of Wight and Suffolk.

DSD = Development Service District

However, the county has not obtained approval to discharge the reverse osmosis concentrate to the City of Franklin's wastewater treatment plant. As of July 2010, the County has not withdrawn any groundwater under the Camptown permit.

The Windsor DSD is located around the Town of Windsor. The DSD water system is currently not a CWS because it only serves the industrial park. The population residing within the DSD area is either served by the Town of Windsor or private residential wells. In 1996, the County signed an agreement with the Town of Windsor to provide water for the Windsor DSD. In 2004, the agreement was amended such that the Town provides 224,400 gallons per day (0.224 mgd) of treated water. Until the DSD service area is expanded, the purchased water only serves the industrial park. The contract between the Town of Windsor and Isle of Wight County does not have an expiration date. The County plans to terminate the contract with the Town of Windsor and connect the Windsor DSD to Suffolk's Main System. This would allow the County to save money by using more of the water it paid to reserve in the Western Tidewater Water Authority agreement. There is also some uncertainty about whether the Town of Windsor would have enough water to serve the Windsor DSD if the town's industrial parks continue to build out.

The Newport DSD is located along the southeast border of the Town of Smithfield, and receives 1.0 mgd of treated water from the City of Suffolk WTP. Isle of Wight County has an agreement with the City of Suffolk through the Western Tidewater Water Authority (WTWA) which ensures that the Newport DSD will have adequate water supplies through 2048.

In April 1998, the WTWA was formed between the City of Suffolk and Isle of Wight County for the purpose of "acquiring, financing, constructing, leasing, operating and maintaining facilities for the production, impoundment, treatment and transmission of water on a cooperative, regional basis" (see Attachment 1). WTWA's supply is comprised of four wells, a contract between the City of Suffolk and the City of Portsmouth for 2.54 mgd of treated water, and 1.20 mgd of raw surface water from the City of Suffolk reservoirs. WTWA holds a DEQ Ground Water Withdrawal Permit for 8.30 mgd, which includes three of Suffolk's production wells and one WTWA well. The surface water and groundwater for Suffolk's Main System is treated at the G. Robert House WTP. The finished water purchased from Portsmouth enters the distribution system at Portsmouth's Lake Kilby WTP, which is located in the City of Suffolk.

The WTWA reserves 25% of the current safe yield for Isle of Wight County (3.01 mgd) and 75% for Suffolk (9.03 mgd). In 2007, Isle of Wight County used approximately 0.3 mgd. WTWA signed a contract to purchase additional water from the City of Norfolk in

2009. See "Existing Sources – Southside Sub-Region, City of Suffolk: Publicly-Owned Community Water Systems" for more information.

In 2007, Isle of Wight County owned 11 CWSs. The Newport and Camptown DSDs were discussed previously. The remaining nine systems are relatively small water systems (see Map 1-24 and Table 1-19). In late 2010, the County purchased the infrastructure for the Queen Anne's Court system (shown on Map 1-24 as a private CWS) and connected the system to the WTWA source.

The Gatling Pointe subdivision is the only system that purchases water from the Town of Smithfield instead of pumping water from neighborhood wells. The Gatling Pointe system is under a Fluoride Consent Order from VDH. Water use in Gatling Pointe is metered by Smithfield and the residents are billed by Isle of Wight County. The subdivision is connected to Smithfield's water distribution system. New infrastructure would have to be built for the County to provide water service to Gatling Pointe.

Each of the other eight publicly-owned systems serves a neighborhood or a few subdivisions that are clustered together. Each system has one to three wells. The wells and distribution systems are not connected to each other. The smallest system, Bethel Heights, served 23 people in 2007. The largest system, Smithfield Heights, served 572 people that year. Most of the wells are over 400 feet deep and withdraw groundwater from the Potomac aquifer. In 2007, two systems held DEQ Ground Water Withdrawal Permits. The most significant water quality issue for these systems is the natural occurrence of high concentrations of fluoride.

Map 1-24: Isle of Wight County Community Water Systems

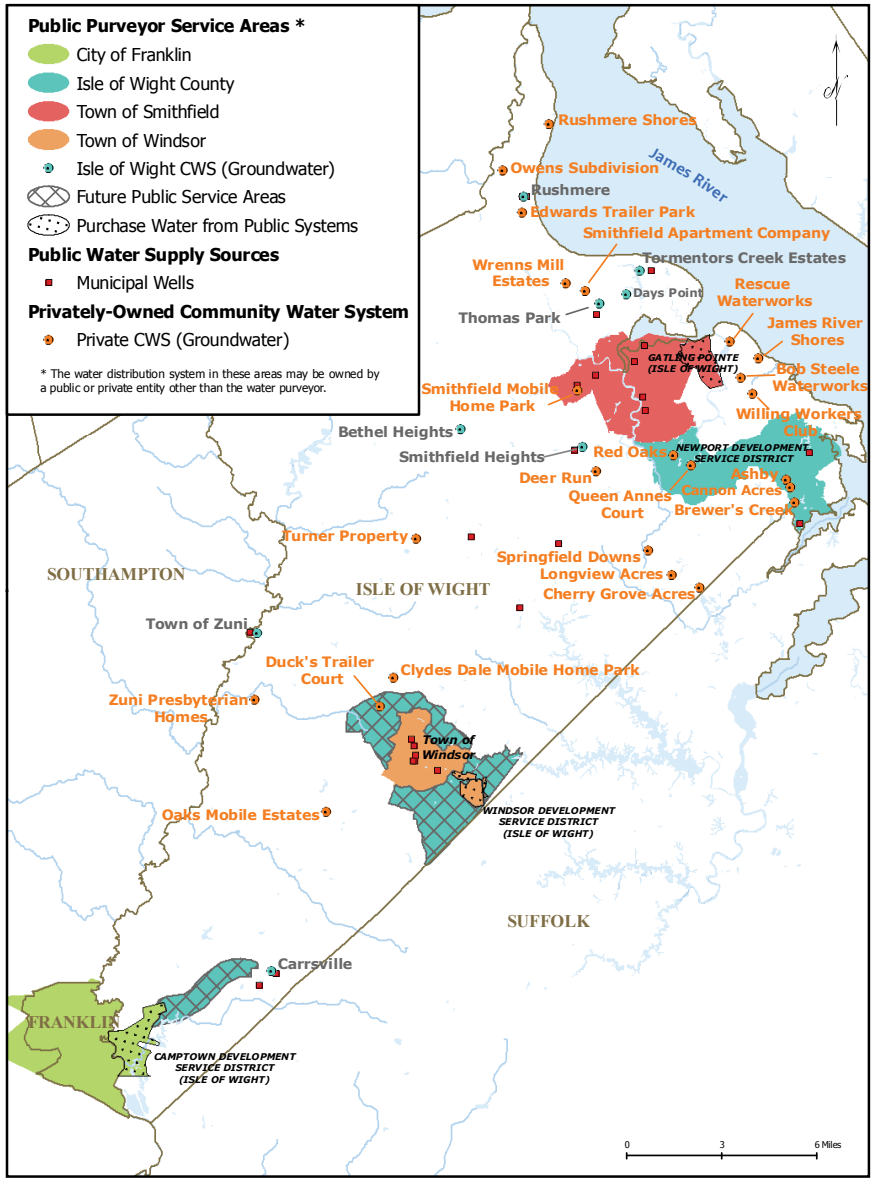


Table 1-19: 2007 Isle of Wight County Publicly-Owned Water Systems

System	Population Served	Well Depth	Groundwater Withdrawal Permit* (mgd)	VDH System Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Camptown DSD CWS	900	NA	Held by City of Franklin	NA	NA
Newport DSD CWS	1,284	NA	Held by WTWA	NA	NA
Windsor DSD	No residential use	NA	Held by Town of Windsor	NA	NA
Bethel Heights CWS	23	450	No	0.01	Low
Carrsville CWS	500	2 wells 240 (ft) & NI	0.02*	0.05	High
Days Pointe Subdivision CWS	268	446 (ft)	0.02*	0.03	High
Gatling Pointe Subdivision CWS	480	NA	Held by Town of Smithfield	NA	Smithfield under Fluoride Consent Order
Rushmere – Burwell's Bay CWS	276	3 wells – 440 (ft)	0.04	0.04	Low - 2 wells NI - 1 well
Smithfield Heights – Sandy Mount Manor CWS	572	3 wells 400 – 495 (ft)	0.03**	0.07	High - 2 wells NI - 1 well
Thomas Park CWS	150	490 (ft)	No	0.02	Low
Tormentor Creek Estates CWS	72	460 (ft)	No	0.01	High
Zuni CWS	100	NI	NA	0.01	High

Note: In late 2010, Isle of Wight County purchased the Queen Anne's Court CWS (formerly a private system) and connected the system to the WTWA source.
* Total Permitted Annual Amount
** Permits were issued in 2008.
NA = not applicable
NI = no information
mgd = million gallons per day

Isle of Wight County: Privately-Owned Community Water Systems

There are 25 privately-owned CWSs operating within Isle of Wight County (see Table 1-20). The systems served approximately 4,275 people in 2007. Only six of the systems are located within a publicly-owned CWS service area. Map 1-24 shows the five private CWS located within the Newport DSD service area: Red Oaks Mobile Home Community, Ashby Subdivision, Cannon Acres, Brewer's Creek Subdivision, and Queen Anne's Court. The sixth system is located in the Town of Smithfield. In 2010, the Queen Anne's Court system was acquired by Isle of Wight County.

The Ducks Trailer Court system is located within the Windsor DSD's future service area. The remaining 18 privately-owned CWSs serve populations located in Isle of Wight County's rural areas.

All of the privately-owned systems rely on groundwater. Four of the systems hold DEQ Ground Water Withdrawal Permits to withdraw more than 300,000 gallons per month. The SWAP evaluations (February 15, 2006) indicate that 21 of the systems have a well or wells with a high susceptibility to contamination; 13 of the systems are under a Fluoride Consent Order from VDH (see Table 1-20).

Lawne's Point is a privately owned subdivision under construction as of 2010. The subdivision has the capacity to include 155 homes. In 2007, four homes were served by one well. Because of the small number of customers, Lawne's Point was not permitted by VDH as a publicly-owned CWS in 2007. It is expected that by 2020 the system will be permitted to serve as a publicly-owned CWS. In 2010 Lawne's Point applied for a DEQ Ground Water Withdrawal Permit for an average of 44,932 gallons per day (0.045 mgd).

The available water supply from privately-owned CWSs in Isle of Wight County is approximately 0.52 mgd. The estimate does not include the available capacity of three systems for which the VDH permitted capacity is not known. The available water supply is the sum of the DEQ Ground Water Withdrawal Permit limits, or if under DEQ's permit threshold, the VDH permitted system capacity.

Photo: Lawne's Point, www.loopnet.com

Table 1-20: 2007 Privately-Owned Community Water Systems in Isle of Wight County

System	Population Served	Well Depth	Groundwater Withdrawal Permit (mgd)	VDH Permitted Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Ashby Subdivision	470	3 wells 483 – 830 (ft)	0.06	0.04	Low
Bob Steele Waterworks	62	450 (ft)	No	0.007	High, Fluoride Consent Order
Brewer's Creek	125	2 wells 923 – 430 (ft)	0.03	0.03	High
Cannon's Acres	52	500 (ft)	No	0.021	High, Fluoride Consent Order
Cherry Grove Acres	108	589 (ft)	No	0.02	High, Fluoride Consent Order
Clydes Dale Mobile Home Park	600	2 wells 400 (ft)	0.04	0.04	High
Deer Run	104	440 (ft)	No	0.02	High, Fluoride Consent Order
Duck's Trailer Court	83	440 (ft)	No	NI	High
Edwards Trailer Park	140	NI	No	NI	High
James River Shores	132	450 (ft)	No	0.012	High, Fluoride Consent Order
Lawne's Point[1]	10	NI	No	NA	NI
Longview Acres	120	420 (ft)	No	0.02	High Fluoride Consent Order
Oaks Mobile Estates Trailer Court	150	550 (ft)	No	NI	High
Owen's Subdivision	116	465 (ft)	No	0.02	Low
Queen Anne's Court[2]	125	2 wells 420-470 (ft)	No	0.03	High, Fluoride Consent Order
Red Oaks Mobile	386	NI	No	0.05	High for all
Rescue Waterworks	203	2 wells 515 (ft) & NI	0.01	0.03	High, Fluoride Consent Order
Rushmere Shores	276	2 wells 410-440 (ft)	No	0.02	High for all
Smithfield Apartment Company	138	412 (ft)	No	0.014	High, Fluoride Consent Order
Smithfield Mobile Home Park	107	450 (ft)	No	0.014	High, Fluoride Consent Order
Springfield Downs Subdivision	120	450 (ft)	No	0.02	High, Fluoride Consent Order
Turner Property	60	440 (ft)	No	0.01	High
Willing Workers Club	29	NI - 1 well (ft)	No	0.01	High, Fluoride Consent Order
Wrenn's Mill Estates	372	2 wells 406-440 (ft)	No	0.08	Low
Zuni Presbyterian	70	NI	No	0.01	Low

1. System was not a community water system in 2007 but is expected to be permitted as a CWS in the next ten years.
2. System was purchased by Isle of Wight County in late 2010 and connected to the WTWA source.

NA = Not applicable | NI = No information | GWWP = Groundwater Withdrawal Permit (annual amount) | mgd = million gallons per day

Isle of Wight County: Self-Supplied Water Systems

In 2007, an estimated 16,420 people, which does not include the Towns of Windsor and Smithfield, were served by private residential wells. In Isle of Wight County, domestic wells withdraw groundwater from the following aquifers: water table (6%), Yorktown-Eastover (20%), Aquia (7%), and Potomac (66%) (Pope, 2007). Of the 15 businesses with their own wells, 9 businesses were identified by VDH and do not use enough water to exceed the DEQ reporting threshold. Six of the businesses are located within a publicly-owned CWS service area. Map 1-25 shows the location of self-supplied water systems in the County.

Non-Agricultural: The International Paper Franklin Mill Plant is the only self-supplied, non-agricultural surface water user that reported withdrawing more than 300,000 gallons per month in 2007 (see Table 1-21). The 2007 estimated annual withdrawal by the mill from the Blackwater River for paper processing is 4.2 mgd. The withdrawal is exempt from the DEQ Virginia Water Protection Permit Program. The plant closed in June 2010.

Two self-supplied non-agricultural users reported withdrawing more than 300,000 gallons per month of groundwater in 2007: International Paper Franklin Mill Plant and Richmond Cold Storage Incorporated. All of the businesses hold DEQ Ground Water Withdrawal Permits and withdraw groundwater from the Potomac aquifer. The following list describes each user. Table 1-21 provides additional information.

- **International Paper:** Formerly withdrew groundwater and surface water for paper processing (plant closed in June 2010). The system's 16 wells are between 515 and 910 feet deep.
- **Richmond Cold Storage:** Withdraws groundwater for evaporative cooling, fire protection, and public water supply. The system's well is 500 feet deep.

Map 1-25: Self-Supplied Water Systems in Isle of Wight County

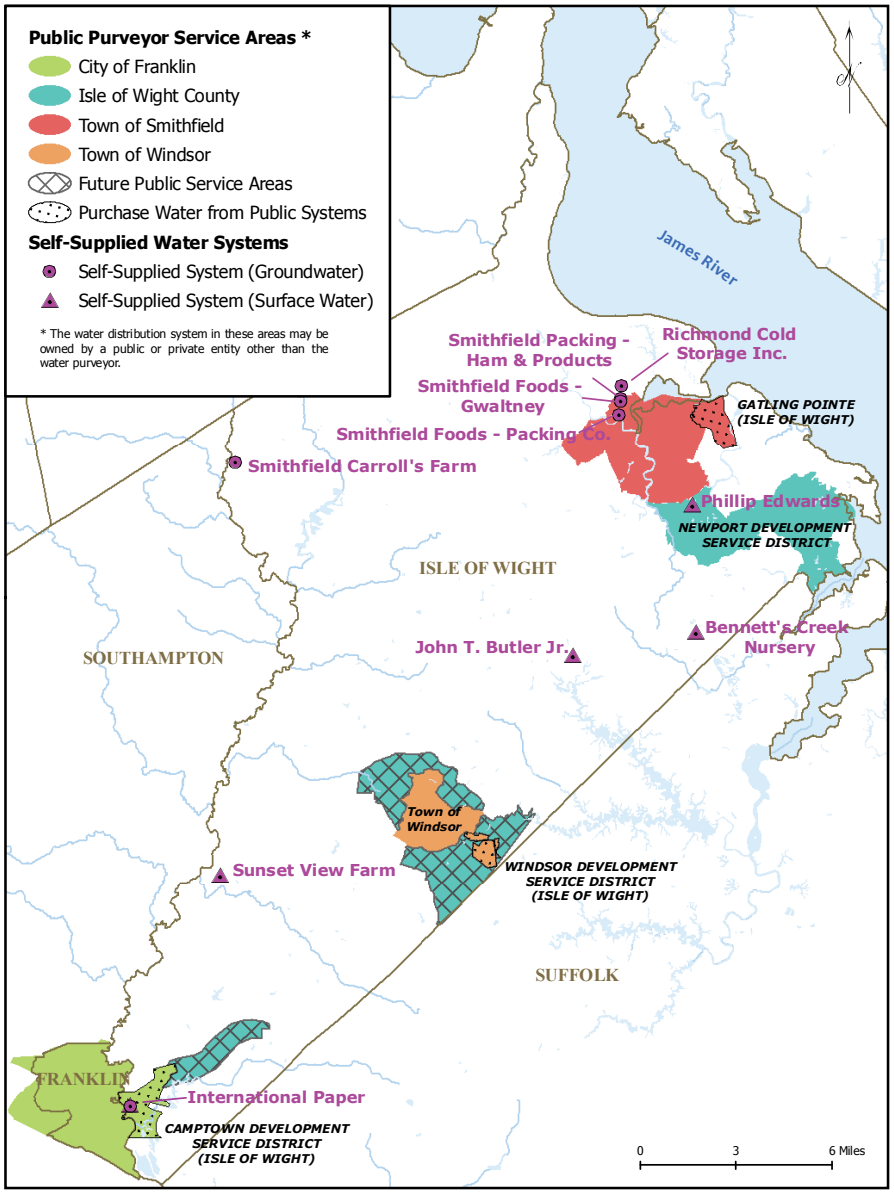


Table 1-21: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Isle of Wight County

Business	Source Water	CWS Service Area	# of Wells	GWWP (mgd)
International Paper Franklin Mill Plant	Blackwater River	Camptown DSD	NA	NA
International Paper Franklin Mill Plant	Groundwater	Camptown DSD	16	36.68
Richmond Cold Storage Incorporated	Groundwater	No	1	0.03

NA = Not applicable
GWWP = Groundwater Withdrawal Permit (annual amount)
mgd = million gallons per day

Table 1-22: 2007 Agricultural Self-Supplied Use > 300,000 gallons/month in Isle of Wight County

Business	Source Water	Within CWS Service Area
Bennett's Creek Wholesale Nursery	Pond	No
Murphy Brown LLC – Smithfield Carroll's Farms 1-5	Groundwater	No
John T Butler, Jr	Pond	No
Philip Edwards	Pond	Newport DSD
Sunset View Farm	Blackwater River	No
Southern Belle Turf	Blackwater River	No

Agricultural: Six self-supplied agricultural users reported withdrawing more than 300,000 gallons per month of surface water in 2007 (see Table 1-22). Many of the surface water users withdraw from private farm ponds while two users withdraw from the Blackwater River. Isle of Wight Farms is the only groundwater user that reported exceeding the threshold. The farm holds a DEQ Ground Water Withdrawal Permit to withdraw a total of 0.15 mgd from 10 wells.

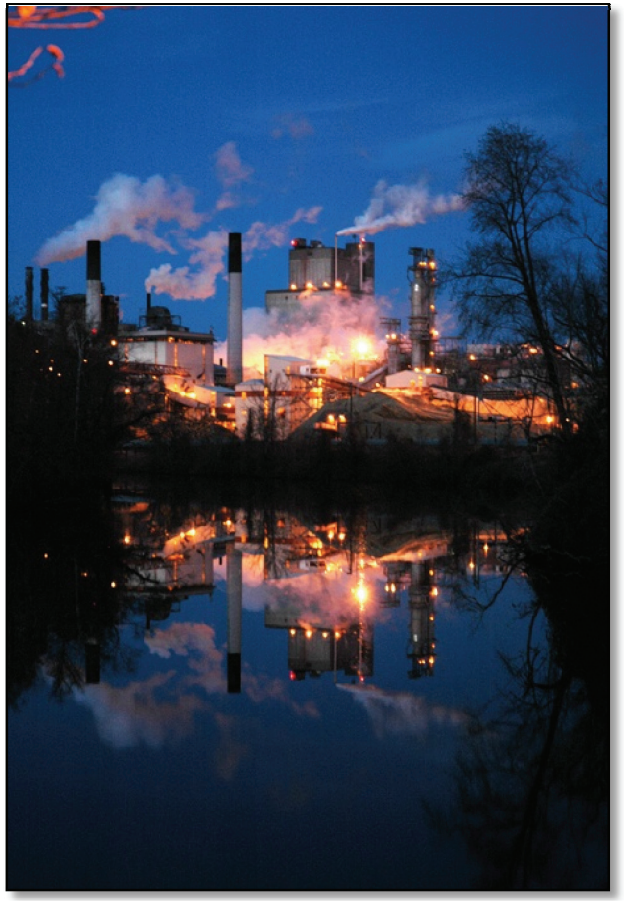
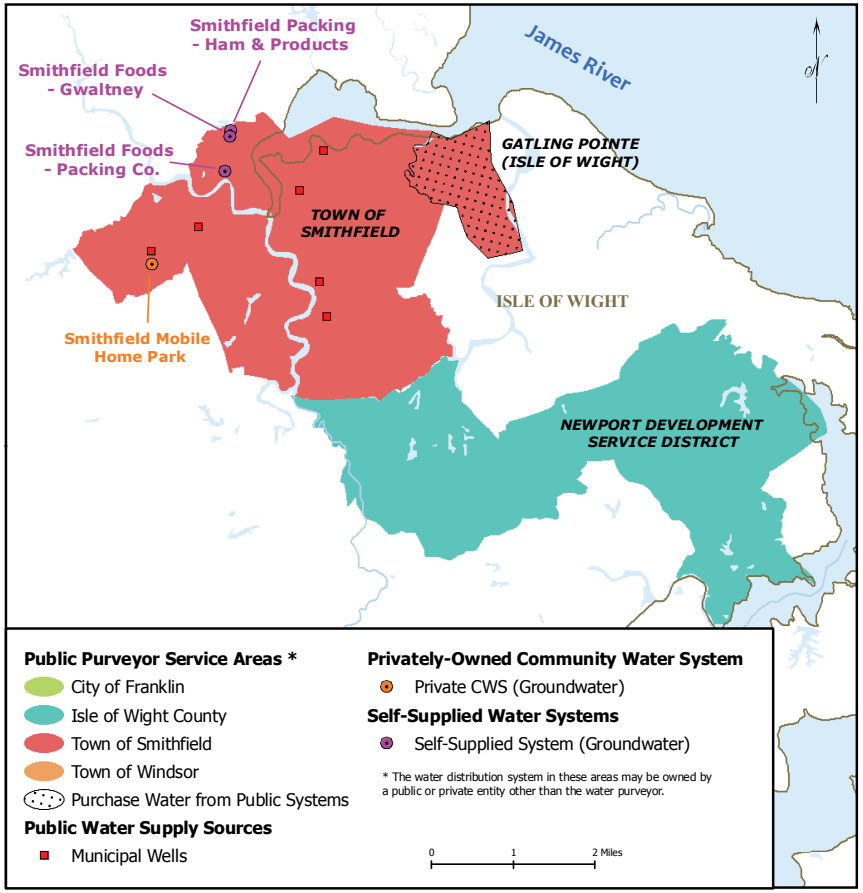


Photo: International Paper Franklin Mill Plant, HRPDC

Town of Smithfield: Publicly-Owned Community Water System

The Town of Smithfield operates one publicly-owned CWS that served approximately 7,200 people in 2007 (see Map 1-26), which includes the population served in the Gatling Pointe CWS. Gatling Pointe is located in Isle of Wight County, not the Town of Smithfield.

Map 1-26: Town of Smithfield Publicly-Owned Community Water System Service Area and Self-Supplied Water Systems



The town's seven permitted wells are between 400 and 1010 feet deep and withdraw from the Potomac Aquifer. The VDH SWAP evaluations (February 15, 2006) indicate that five of the town's wells are highly susceptible to contamination (see page 1-43 for discussion of VDH SWAP program). All wells are permitted under one DEQ Ground Water Withdrawal Permit for 1.40 mgd, which is the Town's available water supply. The Town also has an observation well in addition to the permitted production wells.

The Town is gradually phasing out the regular use of all but one of its wells. The remaining six wells will be used for emergency purposes. As of 2007, two of the permitted wells were not in use through 2010.

As of 2010, the Town has been under a Fluoride Consent Order from VDH. Smithfield is constructing a reverse osmosis water treatment plant that will remove fluoride from the groundwater. Construction of the plant is expected to be completed in October 2011.

Town of Smithfield: Privately-Owned Community Water Systems

One privately-owned CWS operates in the Town of Smithfield (see Map 1-26). The system is located within the service area of the Town's publicly-owned CWS and, in 2007, served a total population of 107 people. The system relies on groundwater, and it is also connected to the Town's publicly-owned CWS. The connection to the Town's publicly-owned CWS provides the Smithfield Mobile Home Park CWS with an alternate source of water in the event of an emergency. A valve must be manually actuated in the field to initiate flow through the system connection. The system is not required to have a DEQ Ground Water Withdrawal Permit. The VDH SWAP evaluations (February 15, 2006) indicate that the well serving the system has a high susceptibility to contamination. In 2007, the available water supply for the system was approximately 0.01 mgd.

Town of Smithfield: Self-Supplied Water Systems

In 2007, 237 people were served by private residential wells, and one business owned its own well. Three self-supplied non-agricultural users reported withdrawing more than 300,000 gallons per month of groundwater in 2007: Smithfield Foods Incorporated - Gwaltney, Smithfield Foods Incorporated - Packing Company, Smithfield Packing Co. Incorporated - Ham and Products Division (see Table 1-23). All of the businesses hold DEQ Ground Water Withdrawal Permits and withdraw groundwater from the Potomac aquifer. The system's 8 wells are between 400 and 565 feet deep. They are all located within Smithfield's CWS service area (see Map 1-26).

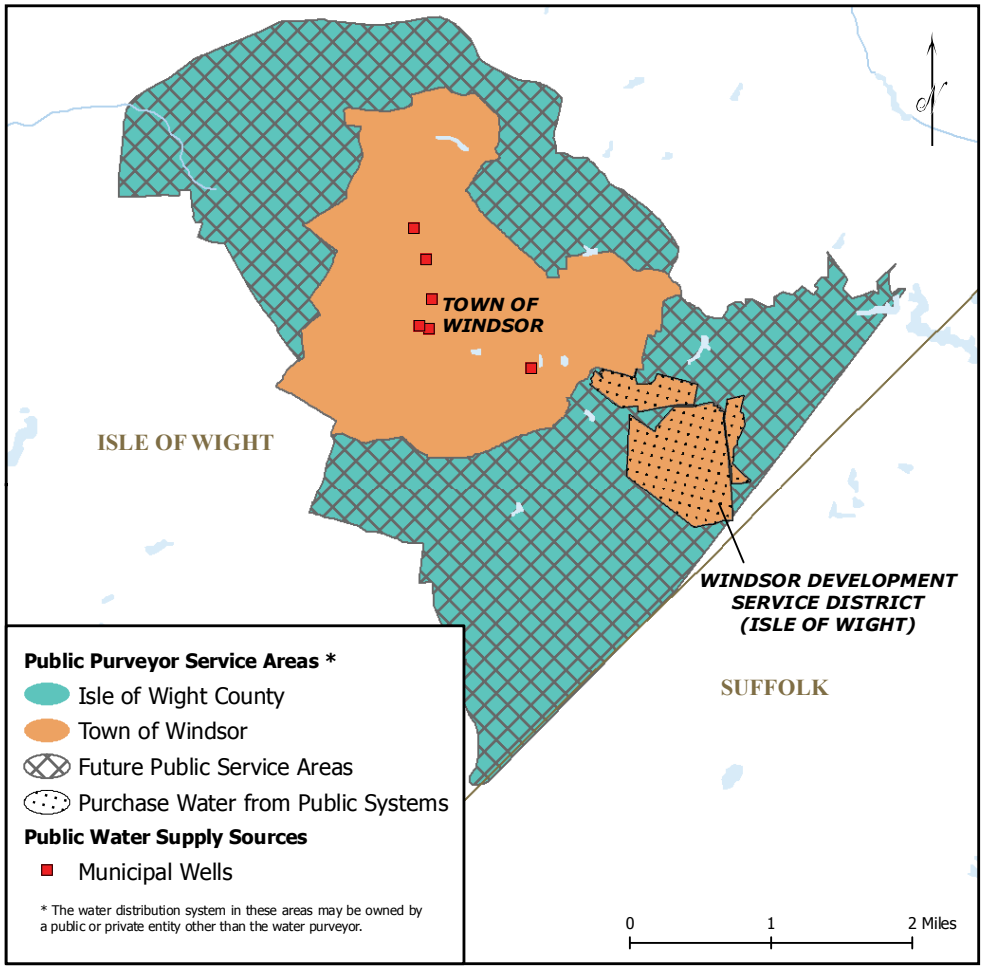
Table 1-23: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in the Town of Smithfield

Business	Source Water	CWS Service Area	# of Wells	Groundwater Withdrawal Permit(mgd)
Smithfield Foods Incorporated – Gwaltney	Groundwater	Town of Smithfield	3	1.56
Smithfield Foods Incorporated – Packing Company	Groundwater	Town of Smithfield	4	2.45
Smithfield Foods Packing Co. Inc – Ham and Products Division	Groundwater	Town of Smithfield	1	0.03

Town of Windsor: Publicly-Owned Community Water System

The Town of Windsor operates one publicly-owned CWS that served 2,300 people in 2007 (see Map 1-27). The town also sells water to Isle of Wight County to serve the County's Windsor DSD system.

Map 1-27: Town of Windsor Publicly-Owned Community Water System Service Area

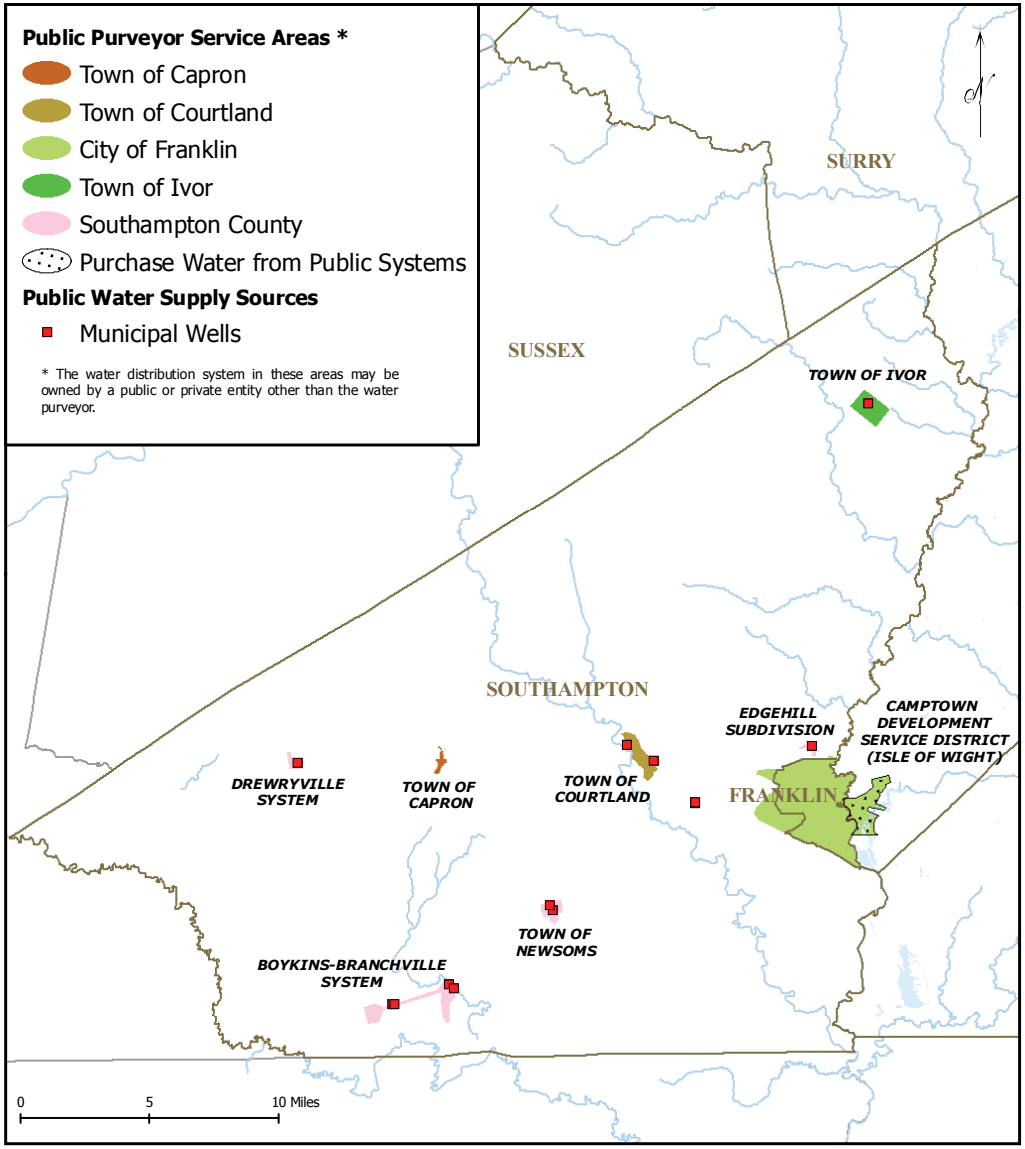


Per the 1996 agreement, amended in 2004, the Town of Windsor provides 224,400 gallons per day (0.224 mgd) of treated water to the County's Windsor DSD (see Table 1-18). All water use within the Windsor DSD is attributed to the existing industrial park. The contract between the Town of Windsor and Isle of Wight County does not have an expiration date. The County may eventually terminate the contract with the Town of Windsor and connect the Windsor DSD to Suffolk's Main System.

The Town of Windsor's six wells are permitted under one DEQ Ground Water Withdrawal Permit for 0.54 mgd, which is the Town's available water supply. The wells are around 400 feet deep and withdraw from the Potomac Aquifer. The VDH SWAP evaluations (February 15, 2006) indicate that four of the town's six wells have a high susceptibility to contamination. As of June 2011, 2 wells are in use and 4 have been abandoned.

There are no privately-owned CWSs in the town. In 2007, 188 people were served by private residential wells and one school had its own well. The wells are all located outside the Town's publicly-owned CWS service area. The Town of Windsor does not have any self-supplied water systems using more than 300,000 gallons per month of water.

Map 1-28: Southampton County, Capron, Courtland, Ivor Publicly-Owned Community Water Systems



Southampton County: Publicly-Owned Community Water Systems

Most of Southampton County is sparsely populated which makes CWSs impractical. Only 45% of the county residents are served by CWSs. Southampton County operates four publicly-owned CWSs that served a total population of 2,330 people in 2007. The four systems serve Newsoms, Boykins-Branchville, Drewryville, and Edgehill (see Map 1-28 and Table 1-24).

Three of the systems hold DEQ Ground Water Withdrawal Permits. The County operates 10 wells that are between 240 and 358 feet deep and withdraw groundwater from the Potomac aquifer. The available water supply for Southampton County's publicly-owned CWSs is 0.4 mgd. The available water supply is the sum of the DEQ Ground Water Withdrawal Permit limits, or if under the permit threshold, the VDH permitted system capacity.

The Incorporated Towns of Capron, Courtland and Ivor each operate publicly-owned CWSs. The three systems served a total of 1,830 people in 2007. The systems are geographically spread out and serve small population centers. All of the systems either have a Groundwater Permit or have requested a permit. See Map 1-28 and Table 1-24 for a summary of the public systems.

Town of Capron

The Town of Capron's publicly-owned CWS served 144 people in 2007. The system serves the town's residents and three areas outside of the town limits: Rockspring Road, Cary's Bridge Road, and Meadow Street. The system's VDH permitted system capacity is

60,000 gallons per day (0.06 mgd). The 2 wells are between 200 and 300 feet deep and withdraw groundwater from the Potomac aquifer. The VDH SWAP evaluations (February 15, 2006) indicate that the system's two wells have a high susceptibility to contamination. In 2007, the Town of Capron applied for a DEQ Ground Water Withdrawal Permit for 0.03 mgd.

Town of Courtland

The Town of Courtland's publicly-owned CWS served 1,270 people in 2007. The system's three wells are between 200 and 250 feet deep and withdraw groundwater from the upper portion of the Potomac aquifer. The system's VDH permitted system capacity is 0.35 mgd.

In 2003, the Town began the application process to renew and expand its permit. However, in 2005, the Town entered into a Consent Order with VDH to reduce fluoride in the Town's drinking water system. Courtland requested that DEQ suspend the application process while the Town prepared to study alternatives for fluoride abatement. In 2007, a test well was drilled, and low-fluoride water was found several hundred feet deeper than current withdrawals.

Later in 2007, VDH approved a preliminary engineering report that outlined the proposal for a new well facility to replace the Town's existing facilities. The new facility proposed includes two new production wells, and the abandonment of the existing wells. The Town submitted a groundwater withdrawal application for 0.17 mgd in February 2009. In 2010, the Town was still monitoring the fluoride levels of the existing wells and had seen a decrease in fluoride levels over time. The Town is in a transition period while it monitors the fluoride level and determines whether new wells need to be drilled. The VDH SWAP evaluations (February 15, 2006) do not include susceptibly ratings for the system's three wells.

Town of Ivor

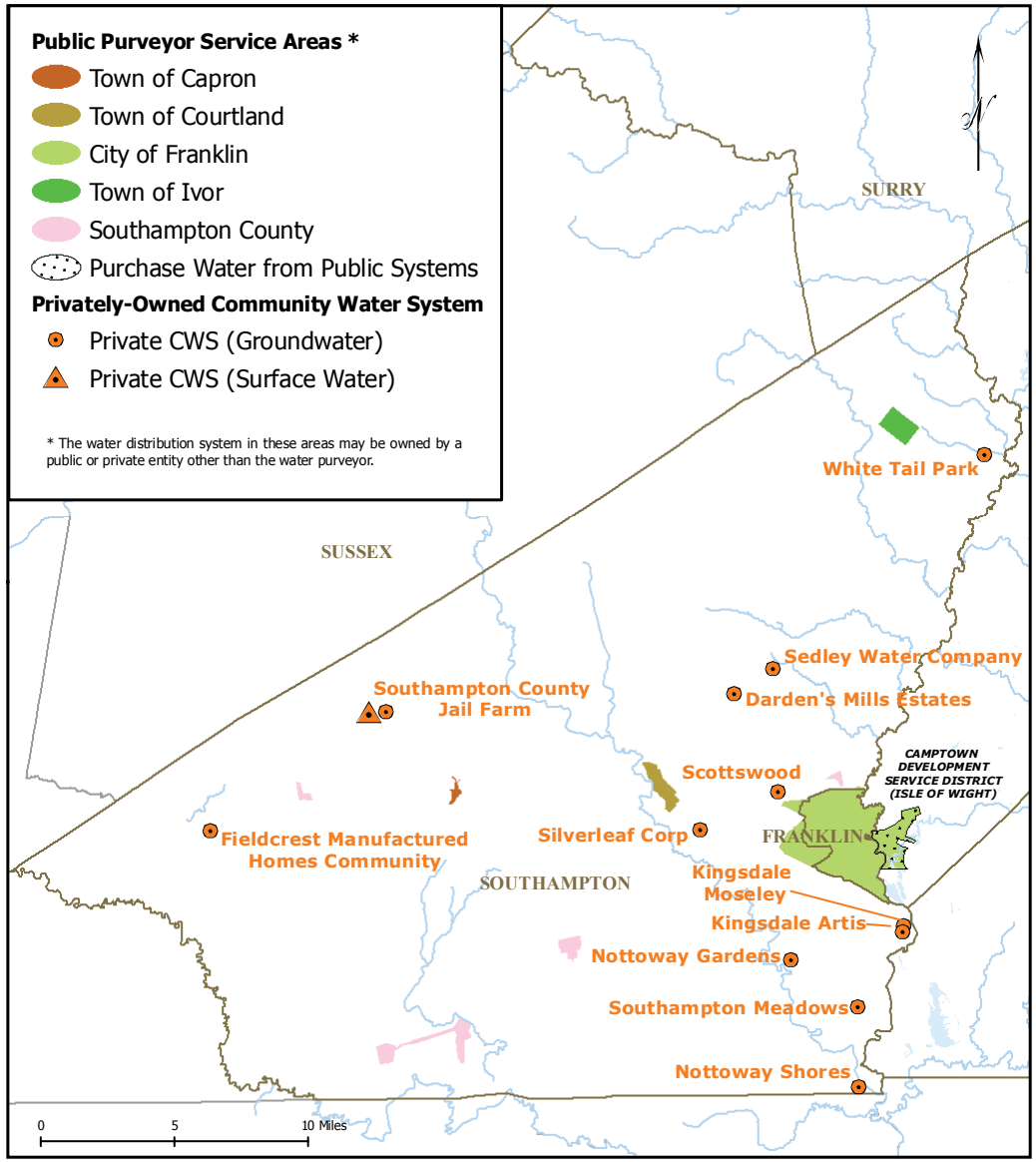
The Town of Ivor's publicly-owned CWS served 395 people in 2007, which included 325 people within the town limits and 70 people with residences along adjacent roadways in Southampton County. The system's VDH permitted system capacity is 0.28 mgd.

Table 1-24: 2007 Publicly-Owned Community Water Systems in Southampton County

System	Population Served	Well Depth	Groundwater Withdrawal Permit* (mgd)	VDH System Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Southampton County- Boykins-Branchville	1,405	3 wells 280-305 (ft)	0.24	0.46	NI
Southampton County- Drewryville	155	240 (ft)	0.02	0.02	High
Southampton County- Edgehill	230	3 wells 320-360 (ft)	No	0.03	Low
Town of Newsoms	538	2 wells 331-358 (ft)	0.19	0.09	NI
Town of Capron	144	2 wells 221-290 (ft)	No*	0.06	High
Town of Courtland	1,270	3 wells 228-242 (ft)	No*	0.35	High, Fluoride Consent Order
Town of Ivor	395	3 wells 318-516 (ft)	No*	0.28	Low - 2 wells, High - 1 well

* Total Permit Annual Amount
NI = no information
mgd = million gallons per day

Map 1-29: Privately-Owned Community Water Systems in Southampton County



Ivor did not apply for a groundwater permit until 2007. The Town was granted a historic based DEQ Ground Water Withdrawal Permit for 0.054 mgd in November 2008. The system's three wells are 300 to 500 feet deep and withdraw groundwater from the Potomac aquifer. The VDH SWAP evaluations (February 15, 2006) determined that two of the system's three wells have a low susceptibility to contamination. The third well has a high susceptibility to contamination.

Southampton County: Privately-Owned Community Water Systems

Thirteen privately-owned CWSs operate in Southampton County (see Map 1-29 and Table 1-25). These systems are all located outside public water systems service areas. The systems served a total population of 2,630 people in 2007. All the systems rely on groundwater. Five of the systems hold DEQ Ground Water Withdrawal Permits. Eight of the systems have a well or wells with a high susceptibility to contamination. The available water supply from the 13 privately-owned CWSs in Southampton County was approximately 0.65 mgd in 2007.

Table 1-25: 2007 Privately-Owned Community Water Systems in Southampton County

System	Population Served	Well Depth	Groundwater Withdrawal Permit* (mgd)	VDH System Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Darden's Mill Estates	100	2 wells314 (ft)	No	0.04	High
Fieldcrest Manufactured Home Community	130	NI	No	0.01	High
Kingsdale Subdivision (Artis)	80	180 (ft)	No	0.01	High
Kingsdale Subdivision (Mosely)	40	188 (ft)	No	0.02	High
Nottoway Gardens	200	160 (ft)	No	0.03	Low
Nottoway Shores	104	250 (ft)	No	0.01	Low
Scottswood Subdivision	400	3 wells 380-388 (ft)	0.05	0.07	High
Sedley	486	2 wells 305-306 (ft)	0.03	0.08	Low
Silverleaf Mobile Home Park	134	2 wells 333-363 (ft)	No	0.04	High
Southampton Correctional Complex	1,500	5 wells 155 – 230 (ft)	0.30	0.37	Low - 1 High - 2
Southampton County Jail Farm	100	146 (ft)	No	NI	Low
Southampton Meadows Mobile Home Park	500	2 wells 182-195 (ft)	0.09	0.14	Low – 1 High - 1
White Tail Park	356	320 (ft)	0.01	0.04	Low

*Total Permited Annual Amount
NI = No information
mgd = million gallons per day

Southampton County: Self-Supplied Water Systems

In 2007, approximately 11,500 people were served by private residential wells. In Southampton County, domestic wells withdraw groundwater from the following aquifers: water table (20%), Yorktown-Eastover (4%), Aquia (2%), and Potomac (74%) (Pope, 2007). Twenty-two businesses had their own wells in 2007, six of which were located inside the service area of a publicly-owned CWS. Sixteen businesses were identified by VDH as not using enough water to exceed the DEQ reporting threshold.

Non-Agricultural: Three non-agricultural self-supplied users reported withdrawing more than 300,000 gallons per month of groundwater in 2007: Hercules Incorporated, Narricot Industries Incorporated, and Agri-Business Industrial Park. Valley Proteins Incorporated's water use was below the reporting threshold in 2007 but the company holds a DEQ Ground Water Withdrawal Permit for 0.04 mgd. There are no reported withdrawals greater than 300,000 gallons per month of surface water. The locations of these water users are on Map 1-30, and Table 1-26 provides more details.

- **Agri-Business Industrial Park:** The Park withdraws groundwater for predominantly potable commercial use. As of 2010 the commercial space was mostly unoccupied. The system's 2 wells are between 350 and 400 feet deep and withdraw from the Potomac Aquifer.
- **Hercules Incorporated:** Hercules withdraws groundwater for the production of paper chemicals and resins. Most of the water is used for non-contact cooling; the remaining water is used for processing and wastewater treatment. The system's 4 wells are between 540 and 715 feet deep and withdraw from the Potomac Aquifer.
- **Narricot Industries Incorporated:** Narricot withdraws groundwater for the production process of dye and automotive seatbelt webbing. The system's 2 wells are between 290 and 320 feet deep and withdraw from the Potomac Aquifer.
- **Valley Proteins Incorporated:** Valley Proteins withdraws groundwater for the production of animal feed and pet food ingredients. The system's well is 190 feet deep and withdraws from the Potomac Aquifer.

Table 1-26: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Southampton County

Business	Source Water	Type of Use	Within CWS Service Area	# of Wells	Groundwater Withdrawal Permit* (mgd)
Agri Business Industrial Park	Groundwater	Commercial	No	2	0.3
Hercules Incorporated	Groundwater	Manufacturing	Yes	4	6.67
Narricot Industries Incorporated	Groundwater	Manufacturing	Yes	2	0.15

* Total Permitted Annual Amount
mgd = million gallons per day

Agricultural: In Southampton County, two agricultural self-supplied users reported withdrawing more than 300,000 gallons per month of groundwater and/or surface water in 2007. See Map 1-30 and Table 1-27 for more details.

Map 1-30: Self-Supplied Water Systems in Southampton County

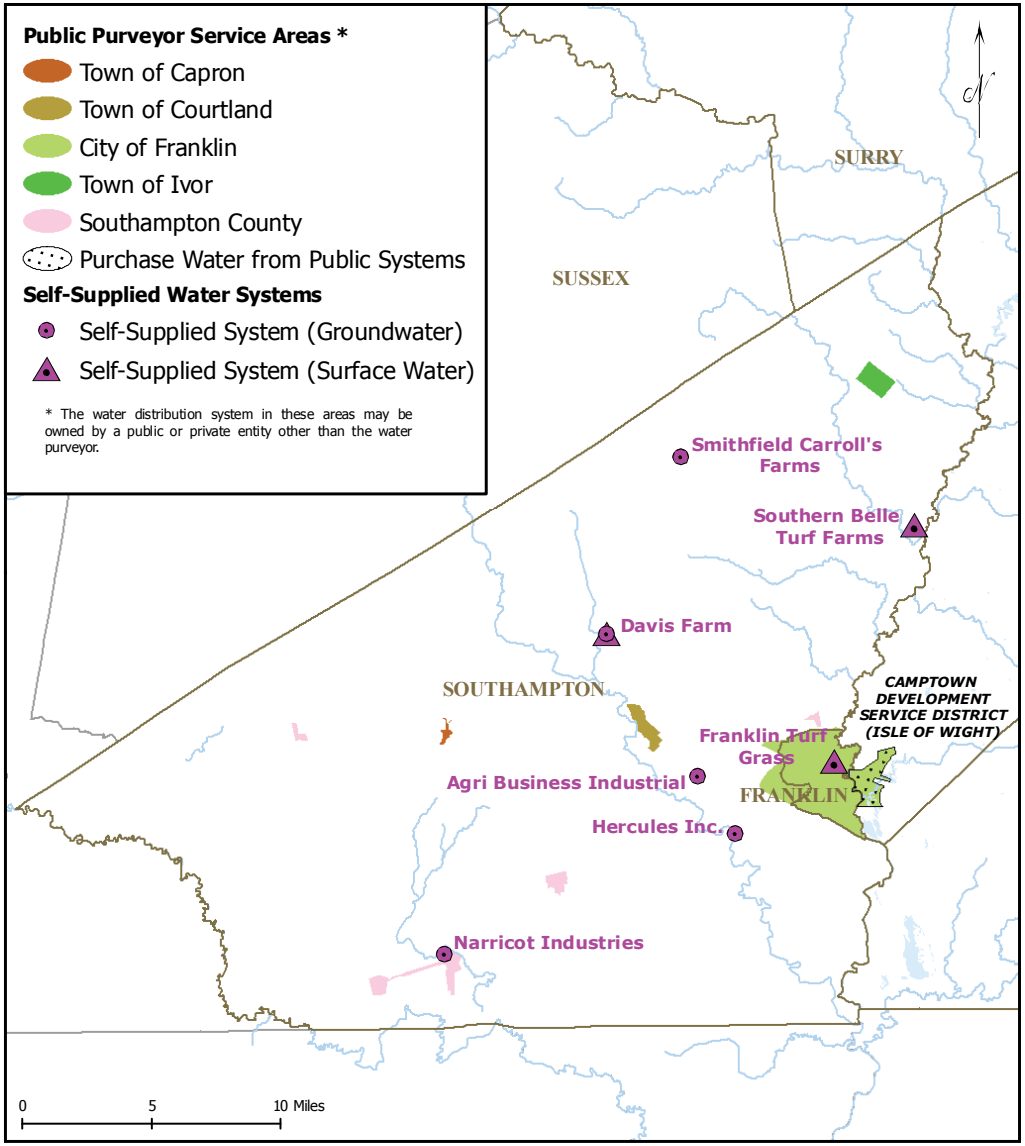


Table 1-27: 2007 Agricultural Self-Supplied Use > 300,000 gallons/month in Southampton County

Business	Source Water	Within CWS Service Area	Groundwater Withdrawal Permit* (mgd)
Davis Farm	Groundwater	No	No Permit
Davis Farm	Nottoway River 4 ponds	No	NA
Smithfield Carroll's Farm	Groundwater	No	0.08

* Total Permitted Annual Amount
NA = Not applicable
mgd = million gallons per day

Surry County: Publicly-Owned Community Water Systems

Surry County is a rural, sparsely populated community. The County does not operate any CWSs. The County owns two wells that serve the County's schools. The wells are permitted under a DEQ Ground Water Withdrawal Permit for 0.01 mgd. The incorporated towns of Claremont, Dendron and Surry are the population centers in the county. Each town owns and operates a CWS that relies solely on groundwater. The towns are all geographically isolated, and none of the distribution systems are connected. See Map 1-31 and Table 1-28 for more details on the publicly-owned CWSs in Surry County.

Town of Claremont

The Town of Claremont's publicly-owned CWS served 343 people in 2007, which includes the Town's population and some areas in the county along the James River. The Town holds a DEQ Ground Water Withdrawal Permit for 46,800 gallons per day (0.047 mgd) which also defines the system's available water supply. The Town's two wells are both 400 feet deep and withdraw groundwater from the Potomac aquifer. The VDH SWAP evaluations (February 15, 2006) indicate that one of the wells has a high susceptibility to contamination while the second well has a low susceptibility.

Town of Dendron

The Town of Dendron's publicly-owned CWS served 375 people in 2007, which included the Town's population and some areas immediately adjacent to the Town. The existing water system was constructed in the 1970's and upgraded in the 1980's. Based on a 2008 survey, there are a total of approximately 180 residences, commercial customers, government buildings, and churches in the service area. Approximately 50 of these residences have chosen to use their existing private wells and not connect to the community system. The well depth is only known for one of the two wells. The well is 510 feet deep and withdraws groundwater from the Potomac aquifer. The Town of Dendron did not request a historic use DEQ Ground Water Withdrawal Permit until recently. In 2008, the Dendron system received a permit for 24,400 gallons per day (0.02 mgd) which also defines the system's available water supply. The VDH SWAP evaluations (February 15, 2006) indicate that the wells have a high susceptibility to contamination.

Town of Surry

The Town of Surry's publicly-owned CWS served approximately 400 people in 2007, which included surrounding businesses and residences in the County (see Map 1-31). The system has two active wells at 475 and 495 feet deep which withdraw groundwater from the Potomac aquifer. The system's VDH permitted system capacity is 0.12 mgd. The Town submitted a DEQ Ground Water Withdrawal Permit application in 2007 for 97,000 gallons per day (0.097 mgd), but subsequently decided to request a historic use based permit for 59,000 gallons per day (0.059 mgd). The historic use permit was approved in 2010 and defines the system's safe yield of 0.059 mgd. The VDH SWAP evaluations (February 15, 2006) indicate that the wells have a high susceptibility to contamination.

Map 1-31: Publicly and Privately-Owned Community Water Systems in Surry County

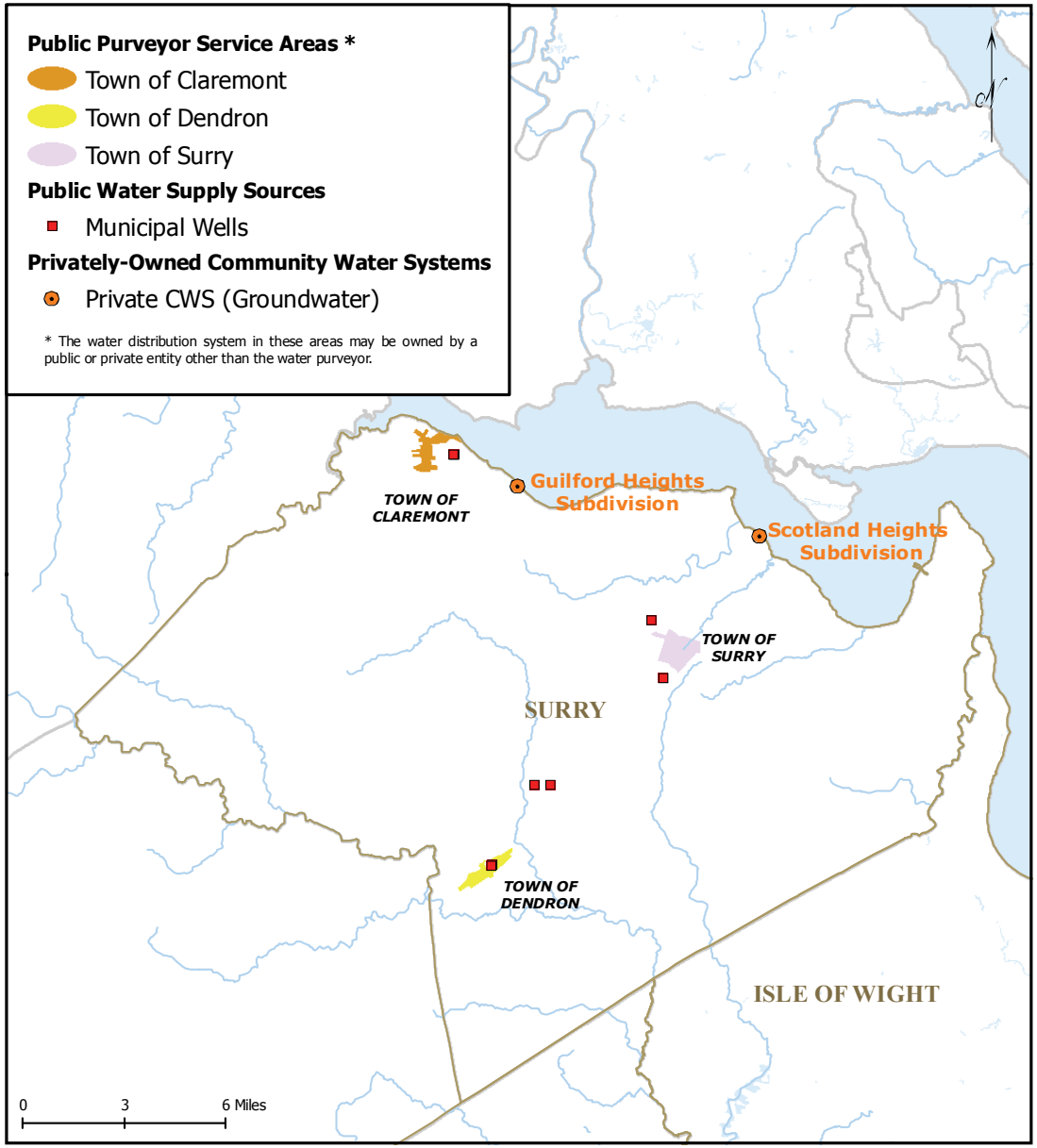


Table 1- 28: 2007 Publicly-Owned Community Water Systems in Surry County

System	Population Served	Well Depth	Groundwater Withdrawal Permit* (mgd)	VDH Permitted Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Town of Claremont	343	2 wells 400-403 (ft)	0.047	0.05	High – 1 Low - 1
Town of Dendron	375	2 wells 510 (ft),NI	0.024	0.02	High
Town of Surry	400	2 wells 479-495 (ft)	0.059	0.12	High

* Total Permitted Annual Amount
NI = no information
mgd = million gallons per day

Table 1-29: 2007 Privately-Owned Community Water Systems in Surry County

System	Population Served	Well Depth	Groundwater Withdrawal Permit* (mgd)	VDH Permitted Capacity (mgd)	VDH SWAP Evaluated Susceptibility to Contamination
Guilford Heights	150	600 (ft)	No	0.03	High
Scotland Heights	168	332 (ft)	No	0.02	High

* Total Permitted Annual Amount
mgd = million gallons per day

Surry County: Privately-Owned Community Water System

Two privately-owned CWSs operate in Surry County. Both the Guilford Heights and the Scotland Heights systems are located in rural areas along the James River (see Map 1-32). Each system serves less than 200 people. The systems rely on groundwater and withdraw from the Potomac aquifer. The available water supply from the two systems is 0.05 mgd. The VDH SWAP evaluations (February 15, 2006) determined that the wells are highly susceptible to contamination.

Surry County: Self-Supplied Water Systems

In 2007, approximately 5,800 people in the county were served by private residential wells. Based on the USGS study of domestic wells, the private wells in Surry County withdraw from the following aquifers: Yorktown-Eastover (61%), Aquia (5%), and Potomac (34%). Eleven businesses were served by private wells. Seven businesses do not use enough water to exceed the DEQ reporting threshold but they were identified by VDH. The residences and businesses are located outside a publicly-owned CWS service area.

Non-Agricultural Surface Water Use: The Dominion Power Nuclear Power Plant in Surry is the only non-agricultural self-supplied user in Surry County that reported withdrawing more than 300,000 gallons per month of surface water in 2007 (see Map 1-32 and Table 1-30). The plant withdraws water from the James River. The system's design capacity is a maximum daily withdrawal of 2,535 mgd, and the system's 2007 annual water use is estimated at 1,774 mgd. The plant is exempt from the Virginia Water Protection Permit Program Regulation since the withdrawal began before July 1, 1989.

Non-Agricultural Groundwater Use: In addition to the surface water withdrawals by the Dominion Power Nuclear Power Plant, the plant holds a DEQ Ground Water Withdrawal Permit to withdraw 0.42 mgd from nine wells. Surry County Public Schools is the only other groundwater user that reported withdrawals exceeding the threshold. Surry County holds a DEQ Ground Water Withdrawal Permit to withdraw 0.01 mgd from two wells. See Map 1-32 and Table 1-30 for more information.

- **Dominion Power Nuclear Power Plant:** Dominion Power withdraws water from the James River for use as cooling water. Most of the water is discharged back into the James River. The system also withdraws groundwater from nine wells that are between 380-480 feet deep and withdraw groundwater from the Potomac Aquifer. Some of the groundwater is for potable use, but the majority of the plant's groundwater withdrawals are demineralized and used to produce steam-generated electricity. As much as possible, this process reuses and recycles water, but some volume is lost during the industrial process. Water is also consumed by appurtenant activities including air emissions control and fire control.
- **Surry County:** The County holds a DEQ Ground Water Withdrawal Permit for 0.01 mgd for the County's public schools. The system's two wells are 380 feet and 481 feet deep and withdraw water from the Potomac Aquifer.

Agricultural: Four self-supplied agricultural users reported withdrawals of more than 300,000 gallons per month of surface/groundwater in 2007. Two of the users hold DEQ Ground Water Withdrawal Permits (see Table 1-31).

Map 1-32: Self-Supplied Water Systems in Surry County

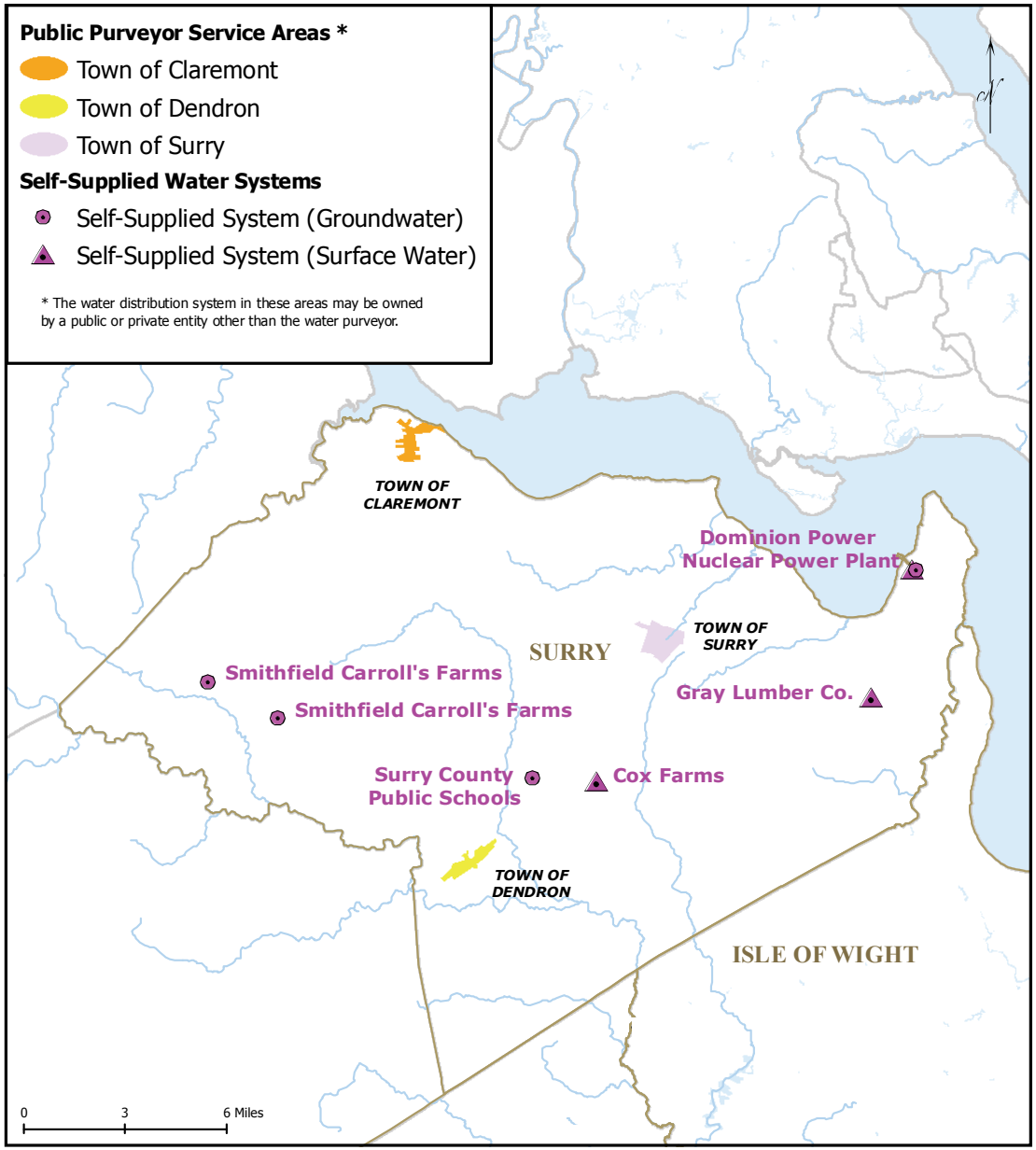


Table 1-30: 2007 Non-Agricultural Self-Supplied Use > 300,000 gallons/month in Surry County

Business	Source Water	Type of Use	Within CWS Service Area	# of Wells	Groundwater Withdrawal Permit* (mgd)
Dominion Power Nuclear Power Plant	James River	Nuclear Power	No	NA	NA
Dominion Power Nuclear Power Plant	Groundwater	Nuclear Power	No	9	0.42
Surry County Public Schools	Groundwater	Commercial	No	2	0.01

* Total Permitted Annual Amount
NA = not applicable
mgd = million gallons per day

Table 1-31: 2007 Self-Supplied Agricultural Use > 300,000 gallons/month in Surry County

User	Source Water	Within CWS Service Area	Groundwater Withdrawal Permit* (mgd)
Cox Farm	5 Ponds	No	NA
Gray Lumber Company – Bacons Castle Farm	Lake	No	NA
Smithfield Carroll's Surry Farms 9, 10, 21	Groundwater	No	0.1
Smithfield Carroll's Surry Farms 16-17	Groundwater	No	0.06

* Total Permitted Annual Amount
NA = not applicable
mgd = million gallons per day