ROANOKE VALLEY-ALLEGHANY REGIONAL COMMISSION

REGIONAL WATER SUPPLY PLAN

Counties of Bedford, Botetourt, Franklin and Roanoke,
Cities of Roanoke and Salem, and the
Towns of Boones Mill, Buchanan, Fincastle, Rocky Mount, Troutville and Vinton

Roanoke Valley Alleghany Regional Commission

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2.0 EVALUATION OF EXISTING WATER SUPPLY

2.1 Existing Water Sources

The homes, businesses and other water users in the region receive water from a variety of sources including: public water systems, public and private wells, springs, stream or river intakes, and reservoirs. As required by the Regulation[1], current information on existing water sources in the region is presented in the following sections.

A map showing the locations of the public community water systems in the region is included as Figure 2.1A. A map showing the locations of the private community water systems in the region is included as Figure 2.1B.

[1] 9 VAC 25-780-70 requires the following information on existing water sources.

Figure 2.1A: Map Showing the Locations of the Public Community Water Systems in the Region.

Figure 2.1B: Map Showing the Locations of the Private Community Water Systems in the Region.

2.1.1 Bedford County

Existing water sources in Bedford County include public community water systems owned and operated by the Bedford County Public Service Authority (BCPSA), as well as privately owned community water systems. There are three major public community water systems operated by the BCPSA: Forest and New London System, High Point Water Treatment Plant (WTP), and Stewartsville Consecutive. The Forest and New London system serves the eastern portion of the county using water purchased from the City of Lynchburg. The High Point WTP serves the southern portion of the county and utilizes water from Smith Mountain Lake. Stewartsville Consecutive serves the western portion of the county using water purchased from the Western Virginia Water Authority (WVWA). In addition, the BCPSA operates 11 smaller community water systems which rely on groundwater wells.

There are also 15 private community water systems utilizing groundwater in Bedford County and one private community water system utilizing a surface water reservoir. Finally, there are homes and businesses within the County that are served by individual groundwater wells. These wells are generally limited in capacity and vary in quantity throughout the year. A map showing the public community water systems in Bedford County is presented as Figure 2.1.1.

Figure 2.1.1: Map Showing the Public Community Water Systems in Bedford County.

2.1.2 Botetourt County

Existing water sources in Botetourt County include nine public community water systems owned by Botetourt County and operated by the Botetourt County Department of Public Facilities and Programs. The majority of the community water systems within the county are private community water systems. All of the community water systems, both public and private, use groundwater wells as a water supply source. Finally, there are homes and businesses within the County that are served by individual groundwater wells. These wells are generally limited in capacity and vary in quantity throughout the year. A map showing the public community water systems in Botetourt County is presented as Figure 2.1.2.

Figure 2.1.2: Map Showing the Public Community Water Systems in Botetourt County.

2.1.3 Franklin County

Existing water sources in Franklin County include public community water systems owned by Franklin County and operated by the WVWA and the Town of Ferrum as well as private community water systems. The public community water system owned by Franklin County is served by groundwater wells as well as water purchased from the BCPSA and the Town of Rocky Mount. The Town of Ferrum community water system is served by groundwater wells. In addition, all of the private community water systems rely on groundwater wells as a water supply source. Finally, there are homes and businesses within the County that are served by individual groundwater wells. These wells are generally limited in capacity and vary in quantity throughout the year. A map showing the public community water systems in Franklin County is presented as Figure 2.1.3.

Figure 2.1.3: Map Showing the Public Community Water Systems in Franklin County.

2.1.4 Roanoke County

Existing water sources in Roanoke County include public community water systems owned and operated by the WVWA as well as privately owned community water systems. The WVWA owns and operates three public community water systems using surface water reservoirs: Carvins Cove Water Treatment Facility (WTF), Falling Creek WTF, and Spring Hollow WTF. The WVWA also operates Crystal Spring WTF, a public community water system using a spring. The WVWA also purchases water from the City of Salem to supply the Andrew Lewis Place community water system. In addition, all of the private community water systems as well as two public community water systems rely on groundwater wells as a water supply source. Finally, there are homes and businesses within Roanoke County that are served by individual groundwater wells. These well are generally limited in capacity and vary in quantity throughout the year. A map showing the public community water systems in Roanoke County and City owned and operated by the WVWA is presented as Figure 2.1.4.

Figure 2.1.4: Map Showing the Public Community Water Systems in Roanoke County.

2.1.5 City of Roanoke

Existing water sources in the City of Roanoke include public community water systems owned and operated by the WVWA as well as privately owned community water systems. The WVWA owns and operates three public community water systems using surface water reservoirs: Carvins Cove WTF, Falling Creek WTF, and Spring Hollow WTF. The WVWA also operates the Crystal Spring WTF, a public community water system using a spring. The WVWA also purchases water from the City of Salem to supply the Andrew Lewis Place community water system. A map showing the public community water systems in the City of Roanoke and Roanoke County owned and operated by the WVWA is presented as Figure 2.1.4.

2.1.6 City of Salem

Existing water sources in the City of Salem include a public community water system owned and operated by the City of Salem as well as a private community water system using groundwater. The City of Salem owns and operates the City of Salem WTP. In addition, the Springfield Waterworks is a private community water system that relies on groundwater wells as a water supply source. Finally, there are homes and businesses within the City that are served by individual groundwater wells. These wells are limited in capacity and vary in quantity throughout the year. A map showing the public community water systems in the City of Salem is presented as Figure 2.1.6.

Figure 2.1.6: Map Showing the Public Community Water Systems in the City of Salem.

2.1.7 Town of Boones Mill

Existing water sources in the Town of Boones Mill include one public community water system owned and operated by the Town. Water is supplied to residents by the Town of Boones Mill community water system. This community water system relies on groundwater as a water supply source. A map showing the public community water systems in the Town of Boones Mill is presented as Figure 2.1.7.

Figure 2.1.7: Map Showing the Public Community Water Systems in the Town of Boones Mill.

2.1.8 Town of Buchanan

Existing water sources in the Town of Buchanan include one public community water system owned and operated by the Town. Water is supplied to residents by the Town of Buchanan community water system. This community water system relies on groundwater as a water supply source. A map showing the public community water systems in the Town of Buchanan is presented as Figure 2.1.8.

Figure 2.1.8: Map Showing the Public Community Water Systems in the Town of Buchanan.

2.1.9 Town of Fincastle

Existing water sources in the Town of Fincastle include one public community water system owned by the Town. Water is supplied to residents by the Town of Fincastle community water system. This community water system relies on groundwater as a water supply source. A map showing the public community water systems in the Town of Fincastle is presented as Figure 2.1.9.

Figure 2.1.9: Map Showing the Public Community Water Systems in the Town of Fincastle.

2.1.10 Town of Troutville

Existing water sources in the Town of Troutville include a public community water system owned by the Town. Water is supplied to residents by the Town of Troutville community water system. This community water system relies on groundwater for a water supply. A map showing the public community water systems in the Town of Troutville is presented as Figure 2.1.10.

Figure 2.1.10: Map Showing the Public Community Water Systems in the Town of Troutville.

2.1.11 Town of Rocky Mount

Existing water sources in the Town of Rocky Mount include one public community water system owned by the Town. Water is supplied to residents by the Rocky Mount WTP, which is a community water system using a stream intake. A map showing the public community water systems in the Town of Rocky Mount is presented as Figure 2.1.11.

Figure 2.1.11: Map Showing the Public Community Water Systems in the Town of Rocky Mount.

2.1.12 Town of Vinton

Existing water sources in the Town of Vinton include a public community water system owned by the Town. Water is supplied to residents by the Town of Vinton community water systems, which uses groundwater for a water supply source. The Falling Creek Estates community water system, which utilized groundwater for a water supply source, was connected to the Town of Vinton community water system in 2008. A map showing the public community water systems in the Town of Vinton is presented as Figure 2.1.12.

Figure 2.1.12: Map Showing the Public Community Water Systems in the Town of Vinton.

2.2 Community Water Systems Using Groundwater[2]

2.2.1 Bedford County

Many of the community water systems in Bedford County, both publicly and privately owned, rely on groundwater. The public community water systems owned by the BCPSA include the following: Forty Acres Subdivision, Gross Point Subdivision, Hillcrest Subdivision, Lake Estates Subdivision, Meadow Run Mobile Home Park (MHP), Mountain View Shores Subdivision, Stallion Run Estates/Quesenberry MHP, Valley Mills Crossing, and Woodhaven Nursing Home.

The following community water systems are privately owned: Cedar Hills MHP, Harbor Ridge Subdivision, Hardy Road MHP (sections one and two), Mariners Landing Subdivision, Paradise Point Estates, Timber Ridge Subdivision, Twin Oaks MHP, Virginia Ridge Subdivision, The Waterways Subdivision, Big Island, Harbour Heights Subdivision, Montvale Water Company, Inc., and Ramsey's MHP. Each is discussed below.

2.2.1.1 Forty Acres Subdivision

Forty Acres Subdivision is a public community water system owned and operated by the BCPSA. This community water system consists of one drilled 6-inch well. The well was drilled to a depth of 320 feet and cased to a depth of 52 feet. The yield was estimated at approximately 18 gallons per minute (gpm). The water is pumped to a ground storage tank with a 10,000 gallon capacity. The design capacity of this community water system is limited to 36 residential connections or 14,400 gallons per day (gpd). This community water system was connected to the High Point WTP in August 2008.

2.2.1.2 Gross Point Subdivision

Gross Point Subdivision is a public community water system owned and operated by the BCPSA. This community water system consists of three drilled 6-inch wells. Well No. 2 was drilled to a depth of 255 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 14 gpm. Well No. 3 was drilled to a depth of 360 feet.

[2] 9 VAC 25-780-70 B.

No other well construction information was available. The yield was estimated at approximately 13 gpm. Well No. 4 was drilled to a depth of 340 feet and cased and grouted to a depth of 75 feet. The yield was estimated at approximately 48 gpm. The water from the three wells is pumped into a 30,000 gallon atmospheric-type tank and a 30,000 gallon pressure tank. These tanks have a combined total effective storage of 40,000 gallons. The water is treated to remove iron and manganese with three 36 inch diameter filters. The filters can treat up to 64 gpm. The design capacity for this system is limited to 200 equivalent residential connections (ERCs) or 80,000 gpd. This community water system was connected to High Point WTP in August 2008.

2.2.1.3 Hillcrest Subdivision

Hillcrest Subdivision is a public community water system owned and operated by the BCPSA. The system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 97 feet. No other well construction information was available. The yield was estimated at approximately 17.5 gpm. Well No. 2 was drilled to a depth of 180 feet. No other well construction information was available. The yield was estimated at approximately 23.5 gpm. The water is pumped into two 220 gallon pressure tanks with an effective storage of 147 gallons. The design capacity of the system is limited to the 34 existing mobile home connections.

2.2.1.4 Lake Estates Subdivision

Lake Estates Subdivision is a public community water system owned and operated by the BCPSA. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 185 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 30 gpm. Well No. 2 was drilled to a depth of 180 feet and cased and grouted to a depth of 54 feet. The yield was estimated at approximately 38 gpm. The system also includes two booster pumps with a combined capacity of 184 gpm. The system includes an atmospheric-type storage tank and a pressure tank with a combined effective storage capacity of 20,663 gallons. The design capacity of the system is 103 ERCs or 41,200 gpd. This community water system was connected to High Point WTP in August 2008.

2.2.1.5 Meadow Run MHP

Meadow Run MHP is a public community water system owned and operated by the BCPSA. This system consists of one drilled 6-inch well. No well construction or yield information was available. System storage consists of two 86 gallon pressure tanks with an effective storage capacity of 57 gallons. The design capacity of the system is limited to the 14 mobile home connections.

2.2.1.6 Mountain View Shores

Mountain View Shores is a public community water system owned and operated by the BCPSA. This system consists of four drilled 6-inch wells. The yield for Well No. 2 was estimated at 40 gpm but no other well information was available. Well No. 4 was drilled to a depth of 360 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 35 gpm. Well No. 5 was drilled to a depth of 320 feet and cased and grouted to a depth of 56 feet. The yield was estimated at approximately 33 gpm. Well No. 6 was drilled to a depth of 320 feet and cased and grouted to a depth of 68 feet. The yield was estimated at approximately 36 gpm. Water pumped from Wells No. 5 and No. 6 is treated for iron and manganese by two greensand filters. Water is stored in a 100,000 gallon standpipe. The design capacity of this system is unknown.

2.2.1.7 Stallion Run Estates/Quesenberry MHP

Stallion Run Estates/Quesenberry MHP is a public community water system owned and operated by the BCPSA. This system consists of one 6-inch well. The well was drilled to a depth of 225 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 12 gpm. The system includes three 120-gallon pressure tanks. The design capacity of the system is limited to the 17 existing connections.

2.2.1.8 Valley Mills Crossing

Valley Mills Crossing is a public community water system owned and operated by the BCPSA. The system consists of one 6-inch drilled well. The well was drilled to a depth of 300 feet and cased and grouted to a depth of 110 feet. The yield was estimated at approximately 16 gpm. The system includes an atmospheric tank with an effective storage capacity of 6,020 gallons. The design capacity of the system is limited to 30 ERCs or 12,000 gpd.

2.2.1.9 Woodhaven Nursing Home

Woodhaven Nursing Home is a public community water system owned and operated by the BCPSA. The system consists of one 6-inch well. The well was drilled to a depth of 213 feet and cased and grouted to a depth of 173 feet. The yield was estimated at approximately 143 gpm. The water is chlorinated with the addition of a liquid hypochlorite solution. Water is stored in a 30,000 gallon atmospheric-type standpipe with an effective storage capacity of 24,875 gallons. The design capacity of the system is limited to 49,750 gpd.

2.2.1.10 Cedar Hills MHP

Cedar Hills MHP is a private community water system owned and operated by Mr. Charles Hammer. This system consists of two 6-inch wells. Well No. 1 was drilled to a depth of 200 feet and cased to a depth of 60 feet. The yield was estimated at approximately 30 gpm. Well No. 2 was drilled to a depth of 300 feet and cased to a depth of 60 feet. The yield was estimated at approximately 10 gpm. The water is pumped to a 2,000 gallon pressure tank with an effective storage capacity of 667 gallons. The design capacity of the system is limited to the 33 existing mobile home connections.

2.2.1.11 Harbor Ridge Subdivision

Harbor Ridge Subdivision is a private community water system owned by Mr. William F. Trinkle and operated by Terry and Ruthie Dooley. This system consists of one 6-inch well. Well No. 1 was drilled to a depth of 220 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 34 gpm. The water is stored in a 6,000 gallon atmospheric storage tank as well as a 2,500 gallon pressure tank. The system has an effective storage capacity of 6,833 gallons. A chlorinator is used to add chlorine to the water as a disinfectant. The design capacity of the system is limited to 34 ERCs or 13,600 gpd.

2.2.1.12 Hardy Road MHP, Section I

Hardy Road MHP, Section I is a private community water system owned by Mr. D. J. Cooper. This system consists of two 6-inch drilled wells. No well construction information was available. The yield for Well No. 1 was estimated at approximately 1-2 gpm. The yield for Well No. 2 was estimated at approximately 25 gpm. The water is stored in a 7,500 gallon concrete reservoir as well as four 120 gallon pressure tanks. The design capacity of the system is limited to the 43 existing connections.

2.2.1.13 Hardy Road MHP, Section II

Hardy Road MHP, Section II is a private community water system owned by Mr. D. J. Cooper. This system consists of two 6-inch drilled wells. No well construction information was available for Well No. 1; however, the yield was estimated at approximately 2 gpm. Well No. 5 was drilled to a depth of 205 feet and cased and grouted to a depth of 54 feet. The yield was estimated at approximately 60 gpm. System storage consists of a 10,000 gallon storage tank and five 44 gallon pressure tanks. The design capacity of the system is limited to the 66 existing connections.

2.2.1.14 Mariners Landing Subdivision

Mariners Landing Subdivision is a private community water system owned by J. W. Development, Inc. and is operated by Mr. Jeff Burdett. This system consists of five 6-inch wells. Well No. 5 was drilled to a depth of 320 feet and cased and grouted to a depth of 92 feet. The yield was estimated at approximately 25 gpm. Well No. 7 was drilled to a depth of 320 feet and cased and grouted to a depth of 98 feet. The yield was estimated at approximately 76 gpm. Well No. 8 was drilled to a depth of 405 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 5 gpm. Well No. 9 was drilled to a depth of 405 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 28 gpm. Well No. 10 was drilled to a depth of 365 feet and cased and grouted to a depth of 74 feet. The yield was estimated at approximately 17 gpm. The combined yield was estimated at approximately 151 gpm or 117,600 gpd. System storage consists of a 35,000 gallon and a 105,000 gallon atmospheric standpipe as well as a 2,500 gallon hydropneumatic tank. The total effective storage for the system is 136,633 gallons. The design capacity of the system is limited to 294 ERCs or 117,600 gpd.

2.2.1.15 Paradise Point Estates

Paradise Point Estates is a private community water system owned by Paradise Point Corporation and operated by Mr. Thomas J. Hughes. This system consists of one 6-inch well. The well was drilled to a depth of 425 feet and cased and grouted to a depth of 80 feet. The yield was estimated at approximately 12 gpm. The system contains a 6,000 gallon storage tank as well as a 1,000-gallon hydropneumatic tank. The effective storage is approximately 6,333 gallons. Soda ash is added for corrosion control and sodium hypochlorite is added for disinfection. The design capacity of the system is limited to the 24 existing residential connections.

2.2.1.16 Timber Ridge Subdivision

Timber Ridge Subdivision is a private community water system owned by Mayfore Water Company, Inc. This system consists of one 6-inch well. The well was drilled to a depth of 110 feet and was cased and grouted to a depth of 100 feet. The yield was estimated at approximately 26 gpm. The system contains a 10,000-gallon ground storage tank and a 500-gallon pressure tank. The system has an effective storage of approximately 10,166 gallons. The design capacity of the system is limited to 49 connections.

2.2.1.17 Turner Stone Park (Formerly Peaksview MHP)

Turner Stone Park is a private community water system owned by Mr. James E. Owen. This system consists of seven drilled wells, flow meters, an atmospheric-type tank, two centrifugal booster pumps, a hydropneumatic tank, a cartridge filtration vessel, and distribution system. Well A is a 6-inch well drilled to a depth of 405 feet in October 1997. The well was cased and grouted to a depth of 51 feet. A 48 hour yield and drawdown test performed simultaneously with Well C in November 1997 indicated a well yield of approximately 10 gpm. Well B is a 6-inch well drilled to a depth of 305 feet in December 1998. The well was cased and grouted to a depth of 58 feet. A 48 hour yield and drawdown test performed simultaneously with Well D in December 1998 indicated a well yield of approximately 18 gpm. Well C is a 6-inch well drilled to a depth of 305 feet in October 1997. The well was cased and grouted to a depth of 52 feet. A 48 hour yield and drawdown test performed simultaneously with Well A in November 1997 indicated a well yield of approximately 26 gpm. Well D is a 6-inch well drilled to a depth of 305 feet in December 1998. The well was cased and grouted to a depth of 58 feet. A 48 hour yield and drawdown test performed simultaneously with Well B in December 1998 indicated a well yield of approximately 10 gpm. Well 1B is a 6-inch well drilled to a depth of 400 feet in March 1985. The well is cased and grouted to a depth of 52 feet. A 48 hour yield and drawdown test performed in August 1991 indicated a well yield of approximately 30 gpm. Well 4 is a 6-inch well drilled to a depth of 300 feet in July 1985. The well is cased and grouted to a depth of 60 feet. A 48 hour yield and drawdown test performed in September 1991 indicated a well yield of approximately 8 gpm. Well 6 is a 6-inch well drilled to a depth of 300 feet. The well is cased and grouted to a depth of 52 feet. A 48 hour yield and drawdown tested performed in September 1991 indicated a well yield of approximately 26 gpm. Each well is enclosed in a cinderblock structure with a metal roof.

The design capacity of the system is 41,200 gpd and is limited based on storage capacity.

2.2.1.18 Twin Oaks MHP

Twin Oaks MHP is a private community water system owned by Alice Leonard. This system consists of one 6-inch well. The well was drilled to a depth of 205 feet and cased and grouted to a depth of 86 feet. The yield was estimated at approximately 20 gpm. The system contains a 2,000-gallon pressure tank with an effective storage capacity of 667 gallons. The design capacity of the system is limited to the 15 existing mobile home connections.

2.2.1.19 Virginia Ridge Subdivision

Virginia Ridge Subdivision is a private community water system owned and operated by the Virginia Ridge Water Company, Inc. The system consists of one 6-inch well. The well was drilled to a depth of 590 feet and cased and grouted to a depth of 65 feet. The yield was estimated at approximately 90 gpm. Hypochlorite and orthophosphate are added to the water for disinfection. Water is stored in a 102,785 gallon storage tank. The design capacity of the system is limited to 49 ERCs.

2.2.1.20 The Waterways Subdivision

The Waterways Subdivision is a private community water system owned by the Waterways Property Owners Association. The system consists of two 6-inch wells. Well No. 7 was drilled to a depth of 280 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 22 gpm. Well No. 8 was drilled to a depth of 380 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 25 gpm. Iron and manganese is removed using two 36-inch diameter pressure sand filters. The water is stored in two atmospheric tanks with capacities of 11,000 gallons and 10,800 gallons as well as one 2,500-gallon pressure tank. The total effective storage is 22,633 gallons. The design capacity of the system is limited to 84 ERCs or 33,600 gallons.

2.2.1.21 Others

Big Island, Cherry Hill Estates, Harbour Heights Subdivision, Montvale Water Company, Inc., and Ramsey's MHP are private community water systems using groundwater; however, no information was available for these water systems.

2.2.2 Botetourt County

All of the public community water systems utilizing groundwater in Botetourt County are owned by the County and operated by the BCPFP. Botetourt County owns and operates nine community water systems utilizing groundwater. They include the following: Cedar Ridge, Cloverdale, Forest Lake, Glen Wilton, Greenfield, Griffith Park, Tinker View Gardens, Wetherwood, and Williamsburg Court. The following community water systems are privately owned: Apple Tree, Ashley Plantation, Bethel Ridge, Blue Ridge Community, Blue Ridge Heights, Botetourt Forest, British Woods, Brookfield, Cave Creek Assisted Living Facility, Dal-Nita Hills, Dale Court, Daleville, Eagle Rock, Heatherstone Subdivision, Hollins MHP, Keswick Farms, Mount Joy Mobile Village, Mountain Crest, Oakwood/Oakcrest Forest/Parkview, Rainbow Forest, Santillane, Sommersby, Stratford Place, White Oaks Estates, and Willowbrook MHP. Each is discussed below.

2.2.2.1 Cedar Ridge

Cedar Ridge is a public community water system owned by Botetourt County and operated by the BCPFP. This community water system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 300 feet and cased and grouted to a depth of 78 feet. The yield was estimated at approximately 55 gpm. Well No. 2 was drilled to a depth of 325 feet and cased and grouted to a depth of 62 feet. The yield was estimated at approximately 60 gpm. The water is stored in a 25,250 gallon atmospheric-type storage tank. The design capacity of the system is limited to 50,400 gpd.

2.2.2.2 Cloverdale/Vista Park

Cloverdale is a public community water system owned by Botetourt County and operated by the BCPFP. This community water system consists of the Cloverdale and Vista Park service areas. The Cloverdale portion of the system consists of a 500,000 gallon storage tank (Hardee's Tank) and a metered connection with the Town of Troutville. Botetourt County is allotted up to 33,333 gpd through this metered connection.

The Vista Park portion of the system consists of one drilled 6-inch well. The well was drilled to a depth of 128 feet and cased and grouted to a depth of 102.2 feet. The yield was estimated at approximately 125 gpm. The water is pumped from the well into a membrane filtration system. The filtration system consists of two Memcor filtration units that run simultaneously. Following filtration, water flows toward a chlorine contact tank, where a chlorine solution is injected into the water for disinfection. Water is then pumped to a 464,000 gallon storage tank (Hollins Tank). The total storage capacity for the entire system is 964,000 gallons. The design capacity of the entire system is limited to 133,000 gpd.

2.2.2.3 Forest Lake

Forest Lake is a public community water system owned by Botetourt County and operated by the BCPFP. This system consists of two springs and one drilled 6-inch well.

The total flow of the two springs, based on historical low flow, is approximately 104 gpm. The well was drilled to a depth of 600 feet and cased and grouted at a depth of 189 feet. The yield was estimated at approximately 30 gpm. A chlorine solution is added to the water for disinfection. Water is stored in four reservoirs and tanks with a combined effective storage of 285,000 gallons. The design capacity of the system is limited to 174,000 gpd.

2.2.2.4 Glen Wilton

Glen Wilton is a public community water system owned by Botetourt County and operated by BCPFP. This community water system consists of two drilled 8-inch wells and one drilled 6-inch well. Well No. 1 is an 8-inch well drilled to a depth of 597 feet and cased to a depth of 81 feet. The yield was estimated at approximately 42 gpm. Well No. 2 is an 8-inch well drilled to a depth of 220 feet and cased to a depth of 81 feet. The yield was estimated at approximately 50 gpm. Well No. 3 is a 6-inch well drilled to a depth of 325 feet and cased and grouted to a depth of 103 feet. The water is pumped from the wells into the treatment building where chlorine is injected into the water. The water has a detention time of approximately 1.5 minutes before being filtered through a 36-inch diameter pressure filter. After filtration, water is pumped to a 61,280 gallon storage tank. The design capacity of the system is limited to 72,000 gpd.

2.2.2.5 Greenfield

Greenfield is a public community water system owned by Botetourt County and operated by the BCPFP. This community water system consists of two drilled 10-inch wells. Well No. 3 was drilled to a depth of 560 feet and cased and grouted to a depth of 249 feet. The yield was estimated at approximately 525 gpm. Well No. 4 was drilled to a depth of 600 feet and cased to a depth of 207 feet. The yield was estimated at approximately 250 gpm. Chlorine is injected into the water before being pumped to a 1.0 MG storage tank. The design capacity of the system is limited to 620,000 gpd.

2.2.2.6 Griffith Park

Griffith Park is a public community water system owned and operated by the BCPFP. This community water system consists of one drilled 6-inch well. The well was drilled to a depth of 185 feet and cased and grouted to a depth of 51 feet. The yield was estimated at approximately 37 gpm. Iron and manganese are sequestered with the addition of an orthophosphate/polyphosphate blend and chlorine bleach is added for disinfection. Water is stored in a 10,000 gallon atmospheric type steel tank and a 1,500 gallon pressure tank with a combined effective storage capacity of 10,500 gallons. The design capacity of the system is limited to 8,400 gpd.

2.2.2.7 Tinkerview Gardens

Tinkerview Gardens is a public community water system owned by Botetourt County and operated by the BCPFP. This system consists of two drilled 6-inch wells. Well No. 2 was drilled to a depth of 111 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 12 gpm. Well No. 3 was drilled to a depth of 185 feet and cased and grouted to a depth of 63 feet. The yield was estimated at approximately 100 gpm. The water is stored in a 50,000 gallon storage tank and a pressure tank with an effective storage capacity of 667 gallons. The design capacity of the system is limited to 224 residential connections.

2.2.2.8 Wetherwood

Wetherwood is a public community water system owned by Botetourt County and operated by the BCPFP. No information on the Wetherwood water system was available.

2.2.2.9 Williamsburg Court

Williamsburg Court is a public community water system owned by Botetourt County and operated by the BCPFP. This system consists of four drilled 6-inch wells. Well No.1 was drilled to a depth of 343 feet and cased and grouted to a depth of 78 feet. The yield was estimated at approximately 11 gpm. Well No. 2 was drilled to a depth of 210 feet and cased and grouted to a depth of 145 feet. The yield was estimated at approximately 33 gpm. Well No 4 was drilled to a depth of 265 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 15 gpm. Well No. 5 was drilled to a depth of 505 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 6.0 gpm. The water is stored in two atmospheric type tanks and one pressure tank with a combined effective storage capacity of 21,830 gallons. The design capacity of the system is limited to 44,000 gpd.

2.2.2.10 Apple Tree

Apple Tree is a private community water system owned by Aqua Virginia, Inc. This community water system consists of twelve drilled wells. No well construction information was available for the twelve wells. The Birchwood Well has an estimated yield of approximately 45 gpm. Mountain View Wells Nos. 3, 4, 5, and 6 have estimated yields of approximately 55 gpm, 35 gpm, 90 gpm, and 100 gpm, respectively. Apple Tree Wells Nos. 6 and 8 have an estimated yield of approximately 90 gpm and 85 gpm, respectively. The Runaway Village Well has an estimated yield of approximately 18 gpm. The Rosemae Gardens Well has an estimated yield of approximately 11.5 gpm. The Highland Manor Wells Nos. 2 and 3 have estimated yields of approximately 6.0 gpm and 90 gpm, respectively. Finally, the Carolyn Well has an estimated yield of approximately 100 gpm. Chlorine is added to the Birchwood Well and Highland Manor Wells for disinfection. Water is stored in eight atmospheric type tanks with a combined storage of 290,000 gallons as well as four hydropneumatic tanks with a combined effective storage capacity of 3,055 gallons. The design capacity of the system is limited to 213,000 gpd.

2.2.2.11 Ashley Plantation

Ashley Plantation is a private community water system owned and operated by the Central Water Company, Inc. This system consists of two drilled 6-inch wells and one drilled 8-inch well. Well No. 3 is a 6-inch well drilled to a depth of 550 feet and cased and grouted to a depth of 243 feet. The yield was estimated at approximately 100 gpm. Well No. 4 is a 6-inch well drilled to a depth of 625 feet and cased and grouted to a depth of 365 feet. The yield was estimated at approximately 55 gpm. Well No. 5 is an 8-inch well drilled to a depth of 597 feet and cased and grouted to a depth of 168 feet. The yield was estimated at approximately 90 gpm. Chlorine is added to the water for disinfection. Water is stored in the Ashley Tank, which has an effective storage capacity of 213,000 gallons. The design capacity of the system is limited to 196,000 gpd.

2.2.2.12 Bethel Ridge

Bethel Ridge is a private community water system owned by Bethel Ridge, Inc. This system consists of two drilled 6-inch wells. Well No. 1 was reportedly drilled to a depth of 180 feet. No other well construction information was available. The yield was estimated at approximately 3 gpm. Well No. 2 was reportedly drilled to a depth of 285 feet. No other well construction information was available. The yield was estimated at approximately 12 gpm. The water is stored in two 86 gallon pressure tanks with an effective storage of 57.3 gallons. The design capacity for the system is limited to 55 residents and staff.

2.2.2.13 Blue Ridge Community

Blue Ridge Community is a private community water system owned by the Blue Ridge Water Agency, Inc. This system consists of one drilled 6-inch well. The well was drilled to a depth of 305 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 25 gpm. The water is stored in a 10,000 gallon standpipe storage tank. The design capacity of the system is limited to 50 residential connections.

2.2.2.14 Blue Ridge Heights

Blue Ridge Heights is a private community water system owned by Aqua Source, Inc. This system consists of three drilled 6-inch wells. Well No. 1 was drilled to a depth of 250 feet and cased and grouted to a depth of 90 feet. The yield was estimated at approximately 15 gpm. Well No. 2 was drilled to a depth of 250 feet and cased and grouted to a depth of 90 feet. The yield was estimated at approximately 5 gpm. Well No. 6 was drilled to a depth of 380 feet and cased and grouted to a depth of 163 feet. The yield was estimated at approximately 65 gpm. The water from Well No. 1 is chlorinated. The water is stored in a 22,500 gallon standpipe as well as one 86 gallon and two 119 gallon pressure tanks. The design capacity of the system is limited to 45,216 gpd.

2.2.2.15 Botetourt Forest

Botetourt Forest is a private community water system owned by the Botetourt Forest Water Corporation. This system consists of one drilled 6-inch well. The well was drilled to a depth of 200 feet and cased and grouted to a depth of 115 feet. No well yield information was available. The water is stored in a 15,000 gallon standpipe as well as a 1,900 gallon pressure tank. The design capacity of the system is limited to 50 residential connections.

2.2.2.16 British Woods

British Woods is a private community water system owned by the British Woods Water Company. This system consists of one drilled 6-inch well. The well was drilled to a depth of 380 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 60 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 50,000 gallon steel ground level tank. The design capacity of the system is limited to 20,000 gpd.

2.2.2.17 Brookfield

Brookfield is a private community water system owned by the Bildel Corporation. This system consists of one drilled 6-inch well. Well No. 3 was drilled to a depth of 460 feet and cased and grouted to a depth of 210 feet. The yield was estimated at approximately 35 gpm. A chlorine solution is added to the water for disinfection. The water is stored in an atmospheric type storage tank with an effective storage capacity of 95,000 gallons and a pressure tank with an effective storage of 1,667 gallons. The design capacity of the system is limited to 19,600 gpd.

2.2.2.18 Cave Creek Assisted Living Facility

Cave Creek Assisted Living Facility is a private community water system owned by Jo Ella John. This system consists of one drilled 6-inch well. The well was drilled to a depth of 147 feet. No other well construction information was available. The yield was estimated at approximately 12 gpm. A chlorine solution is added to the water for disinfection. The water is stored in two 80 gallon and one 14 gallon pressure tanks with a combined effective storage of 58 gallons. The design capacity of the system is limited to the existing 75 residents and staff.

2.2.2.19 Dal-Nita Hills

Dal-Nita Hills is a private community water system owned by the H_20 Company, Inc. This system consists of one drilled 6-inch well. The well was drilled to a depth of 400 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 20 gpm. A chlorine solution is added to the water for disinfection. The water is stored in an 18,900 gallon atmospheric type storage tank. The design capacity of the system is limited to 15,600 gpd.

2.2.2.20 Dalecourt

Dalecourt is a private community water system owned by the Dalecourt Water Corporation. This community water system consists of one drilled 6-inch well. The well was drilled to a depth of 119 feet and cased and grouted to a depth of 35 feet. The yield was estimated at approximately 30 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 315 gallon pressure tank with an effective storage capacity of 105 gallons. The design capacity of the system is limited to 15 residential service connections.

2.2.2.21 Daleville

Daleville is a private community water system owned by the Daleville Water Company. This system consists of one drilled 6-inch well and a connection to Botetourt County's Wetherwood System. The well was drilled to a depth of 245 feet and cased grouted to a depth of 60 feet. The yield was estimated at approximately 33 gpm. The water is stored in a 10,000 gallon steel standpipe. The design capacity for the system is based on the Wetherwood system capacity. No information on Botetourt County's Wetherwood system was available at the time of this report.

2.2.2.22 Eagle Rock

Eagle Rock is a private community water system owned by the Eagle Rock Water Co., Inc. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 385 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 60 gpm. Well No. 2 was drilled to a depth of 245 feet and cased and grouted to a depth of 54 feet. The yield was estimated at approximately 33 gpm. Chlorine is added to the water for disinfection. The water is stored in a 20,000 gallon storage tank. The design capacity of the system is limited to 100 ERCs or 40,000 gpd.

2.2.2.23 Heatherstone Subdivision

Heatherstone Subdivision is a private community water system owned by the Botetourt Forest Water Corporation. This system consists of two drilled 6-inch wells. Well No.1 was drilled to a depth of 245 feet and cased and grouted to a depth of 166 feet. The yield was estimated at approximately 60 gpm. Well No. 2 was drilled to a depth of 350 feet and cased and grouted to a depth of 338 feet. The yield was estimated at approximately 60 gpm. A chlorine solution is added to the water for disinfection. The total effective storage for the system is 17,700 gallons. The design capacity of the system is limited to 36,800 gpd.

2.2.2.24 Hollins MHP

Hollins MHP is a private community water system owned by the Franklin Investments, LLC. This system consists of one drilled well. No well construction or yield information is available for the well. A chlorine solution is added to the water for disinfection. The system contains four 86 gallon and two 275 gallon pressure tanks with a total effective storage of 665 gallons. The design capacity of the system is limited to 73 existing connections.

2.2.2.25 Keswick Farms

Keswick Farms is a private community water system owned by the H_2O Company, Inc. This system consists of one drilled 6-inch well. The well was drilled to a depth of 445 feet and cased and grouted to a depth of 89 feet. A chlorine solution is added to the water for disinfection. The water is stored in a 25,000 gallon steel ground storage tank. The design capacity of the system is limited to 16,000 gpd.

2.2.2.26 Mount Joy Mobile Village

Mount Joy Mobile Home Village is a private community water system owned by Apex Properties. This system consists of one drilled 6-inch well. No well construction or yield information was available. The system contains four 86 gallon hydropneumatic tanks with an effective storage capacity of 115 gallons. A chlorine solution is added to the water for disinfection. The design capacity of the system is limited to 25 existing mobile home connections.

2.2.2.27 Mountain Crest

Mountain Crest is a private community water system owned by the Mountain Crest Water Company, Inc. This system consists of one drilled 6-inch well. Well No. 1 was drilled to a depth of 525 feet and cased and grouted to a depth of 380 feet. The yield was estimated at approximately 15.2 gpm. A chlorine solution is added to the water for disinfection. The water is stored in an atmospheric type storage tank with an effective storage capacity of 64,431 gallons. The design capacity of the system is limited to 12,160 gpd.

2.2.2.28 Oakwood/Oakcrest Forest/Parkview

Oakwood/Oakcrest Forest/Parkview is a private community water system owned by the AquaSource, Inc. This system consists of three drilled 6-inch wells. Well No. 1 was drilled to a depth of 270 feet and cased and grouted to a depth of 221 feet. The yield was estimated at approximately 50 gpm. Well No. 2 was drilled to a depth of 405 feet and cased and grouted to a depth of 237 feet. The yield was estimated at approximately 45 gpm. Well No. 4 was drilled to a depth of 600 feet and cased and grouted to a depth of 126 feet. The yield was estimated at approximately 39 gpm. The water is stored in four atmospheric tanks and two hydropneumatic tanks with a total effective storage capacity of 71,000 gallons. The design capacity of the system is limited to 106,000 gpd.

2.2.2.29 Rainbow Forest

Rainbow Forest is a private community water system owned by AquaSource, Inc. This system consists of six drilled wells. Well No. 1 is an 8-inch well drilled to a depth of 255 feet and cased and grouted to a depth of 55 feet. The yield was estimated at approximately 100 gpm. Well No. 2 is a 6.5-inch well drilled to a depth of 260 feet and cased and grouted to a depth of 90 feet. The yield was estimated at approximately 150 gpm. Well No. 4 is a 7-inch well drilled to a depth of 405 feet and cased and grouted to a depth of 57 feet. The yield was estimated at approximately 43 gpm. Well No. 5 is a 12-inch well drilled to a depth of 500 feet and cased and grouted to a depth of 84 feet. The yield was estimated at approximately 185 gpm. Well No. 6 is a 6-inch well drilled to a depth of 275 feet and cased and grouted to a depth of 163 feet. The yield was estimated at approximately 34 gpm. Well No. 7 a 6-inch well drilled to a depth of 255 feet and cased and grouted to a depth of 175 feet. The yield was estimated at approximately 40 gpm. The water is stored in eight atmospheric type tanks and one pressure tank with a combined effective storage capacity of 135,000 gallons. The design capacity for the system is limited to 269,000 gpd.

2.2.2.30 Santillane

Santillane is a private community water system owned by the Santillane Water Company, Inc. This community water system consists of one drilled 8-inch well. Well No. 1 was drilled to a depth of 470 feet and cased and grouted to a depth of 220 feet. A chlorine solution is added to the water for disinfection. The water is stored in an atmospheric type storage tank with an effective storage capacity of 145,000 gallons. The design capacity of the system is limited to 164,000 gpd or 49 connections.

2.2.2.31 Sommersby

Sommersby is a private community water system owned by the Sommersby Development Corporation. This community water system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 368 feet and cased and grouted to a depth of 105 feet. The yield was estimated at approximately 220 gpm. Well No. 2 was drilled to a depth of 155 feet and cased and grouted to a depth of 105 feet. The yield was estimated at approximately 90 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 95,305 gallon atmospheric type storage tank as well as a hydropneumatic tank with an effective storage capacity of 667 gallons. The design capacity of the system is limited to 68,000 gpd.

2.2.2.32 Stratford Place

Stratford Place is a private community water system owned by the AquaSource, Inc. This community water system consists of two drilled 8-inch wells. Well No. 1 was drilled to a depth of 350 feet and cased and grouted to a depth of 135 feet. The yield was estimated at approximately 30 gpm. Well No. 2 was drilled to a depth of 400 feet and cased and grouted to a depth of 142 feet. A chlorine solution is added to the water from well No. 1 for disinfection. The water is stored in a 33,000 gallon ground storage reservoir. The design capacity of the system is limited to 112 ERCs.

2.2.2.33 White Oaks Estates

White Oaks Estates is a private community water system owned by Blue Ridge Heights Corporation. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of approximately 374 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 85 gpm. Well No. 2 was drilled to a depth of approximately 265 feet and cased and grouted to a depth of 185 feet. A chlorine solution is added to the water from well No. 2 for disinfection. The water is stored in a 60,000 gallon concrete reservoir. The design capacity of the system is limited to 120,000 gpd.

2.2.2.34 Willowbrook MHP

Willowbrook MHP is a private community water system owned by Apex Properties. This system consists of one drilled 5-inch well. The well was drilled to a depth of 131 feet and cased and grouted to a depth of 108 feet. A chlorine solution is added to the water for disinfection. The water is stored in a bladder tank with an effective storage capacity of approximately 41 gallons. The design capacity of the system is limited to the 22 existing connections.

2.2.3 Franklin County

Many of the community water systems, both publicly and privately owned, rely on groundwater. On November 5, 2009, Franklin County became a member of the WVWA. The Boardwalk, Commerce Center, Water's Edge, Waterfront Sections II-IX, Waterfront Sections I and XI, and Windmere Point are public community water system in Franklin

County using groundwater and are now operated by the WVWA. In addition, Franklin County owns and operates three recreation parks (Waid Park, LARC Field Recreation Park, and Recreation Park). These parks are considered non-community systems by VDH; however, they have been included in this section since the County includes the parks in their water system. The Town of Ferrum water supply is a public community water system utilizing groundwater and is owned and operated the Ferrum Water and Sewage Authority (FWSA). The following community water systems are privately owned: Alton Park, Arrington Trailer Court, Bernard's Landing, Boxwood Green, Brown's Mobile Home Court, Cherokee Hills, Contentment Island, Deer Creek Estates, Fork Mountain Adult Rest Home, Franklin Acres, Frederick Acres, Hales Point Subdivision, Highland Lake Subdivision, Idlewood Shores, Key Lakewood Subdivision, Lakeshore Terrace, Lakewood Forest Subdivision, Long Island Estates, Lynville On The Lake, Park Place, Ridgecrest Subdivision, Riverbay Subdivision, Starwood Subdivision, Striper's Landing, Teel Brooke Estates, The Meadows (Glad Hill Apartments), Twin Coves Subdivision, Walnut Run, Waverly Subdivision, Weatherwood Subdivision, Westlake Water Company, Windy Gap Mountain Village, Cedar Ridge Subdivision, and Fox Chase Subdivision. Each is discussed below.

2.2.3.1 Boardwalk

The Boardwalk is a public community water system owned and operated by the WVWA. This system consists of one drilled 8-inch well. Well No. 3 was drilled to a depth of 500 feet. No other well construction information was available. The yield was estimated at approximately 80 gpm. Treatment is provided by feeding an orthophosphate chemical to the water to sequester iron and manganese. The water is stored in a 75,000 gallon atmospheric type storage tank with an effective storage capacity of 36,900 gallons. The design capacity of the system is limited to 49 ERCs or 19,600 gpd.

2.2.3.2 Commerce Center

The Commerce Center is a public community water system owned and operated by the WVWA. This community water system consists of three 6-inch drilled wells. According to the Falwell Corporation's Commonwealth of Virginia Water Well Completion Report, Well A was drilled to a depth of 465 feet and cased and grouted to a depth of 51 feet. The yield was estimated at approximately 1 gpm. Well B was drilled to a depth of 465 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 2 gpm. Well C (Well 6) was drilled to a depth of 465 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 25 gpm. No other information regarding this system was available at the time of this report.

2.2.3.3 The Water's Edge

The Water's Edge is a public community water system owned and operated by the WVWA. This system consists of four drilled wells. Well No. 3 is a 6-inch well and was drilled to a depth of 500 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 17.5 gpm. Well No. 4 is an 8-inch well and was drilled to a depth of 350 feet and cased and grouted to a depth of 58 feet. The yield was estimated at approximately 155 gpm. Well No. 7 is a 6-inch well and was drilled to a depth of 500 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 4.5 gpm. Well No. 12 is an 8-inch well and was drilled to a depth of 500 feet and cased and grouted to a depth of 68 feet. The yield was estimated at approximately 90 gpm. The water is treated with the following solutions: chlorine for continuous disinfection of the water, soda ash for pH adjustment, and potassium permanganate for the removal of iron and manganese. Water is filtered through three greensand filters to remove iron, manganese and radium from the drinking water. The water is stored in a 150,000 gallon elevated atmospheric type storage tank. The design capacity of the system is limited to 530 ERCs or 212,000 gpd.

2.2.3.4 Waterfront Sections II-IX

Waterfront Sections II-IX is a public community water system owned and operated by the WVWA. This system consists of eight drilled wells. Well No. 2 is a 6-inch well drilled to a depth of 305 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 19 gpm. Well No. 3 is a 6-inch well drilled to a depth of 200 feet and cased and grouted to a depth of 72 feet. The yield was estimated at approximately 29.6 gpm. Well No. 4 is an 8-inch well drilled to a depth of 325 feet and cased and grouted to a depth of 93 feet. The yield was estimated at approximately 42 gpm. Well No. 5 is a 6-inch well drilled to a depth of 375 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 5 gpm. Well No. 6 is a 6-inch well drilled to a depth of 375 feet and cased and grouted to a depth of 98 feet. The yield was estimated at approximately 13 gpm. Well No. 7 is a 6-inch well drilled to a depth of 400 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 7.5 gpm. No well construction information or well yield information was available for Well No. 15 and Well No. 16.

Treatment is provided by feeding the following solutions: chlorine for continuous disinfection of the water, soda ash for pH adjustment, and potassium permanganate for removal of iron and manganese in the drinking water. Three greensand filters are used to remove iron, manganese, and radium from the drinking water. The water is stored in a 130,000 gallon and a 26,000 gallon standpipe with a combined effective storage capacity of 149,000 gallons. The design capacity of the system is limited to 524 ERCs or 209,600 gpd.

2.2.3.5 Waterfront Sections I and XI

Waterfront Sections I and XI is a public community water system owned and operated by the WVWA. This system consists of four drilled wells. Well No. 1 is a 6-inch well drilled to a depth of 380 feet and cased and grouted to a depth of 117 feet. The yield was estimated at approximately 7.1 gpm. Well No. 2 is a 6-inch well drilled to a depth of 300 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 19.3 gpm. Well No. 3 is a 6-inch well drilled to a depth of 550 feet and cased and grouted to a depth of 95 feet. The yield was estimated at approximately 21.5 gpm. Well No. 4 is an 8-inch well drilled to a depth of 300 feet and cased and grouted to a depth of 78 feet. The yield was estimated at approximately 85 gpm. The water is treated by feeding an orthophosphate to sequester iron and manganese. The water is stored in an atmospheric type storage tank with an effective storage capacity of 50,100 gallons. The design capacity of the system is limited to 147 ERCs or 58,800 gpd.

2.2.3.6 Windmere Point

Windmere Point is a public community water system owned and operated by the WVWA. This system consists of three drilled 6-inch wells. Well No. 2 was drilled to a depth of 600 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 24 gpm. Well No. 3 was drilled to a depth of 425 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 40 gpm. Well No. 4 was drilled to a depth of approximately 650 feet and cased and grouted to a depth of 82 feet. The yield was estimated at approximately 9 gpm. The water is stored in an atmospheric type storage tank with an effective storage capacity of 12,700 gallons. The design capacity of the system is limited to 64 ERCs or 25,600 gpd.

2.2.3.7 LARC Field Recreation Park

LARC Field Recreation Park is owned and operated by Franklin County and consists of one well, two bladder tanks, and a distribution system. Well No. 2 was drilled to a depth of 400 feet and cased to a depth of 42 feet with 10-inch casing and cased to a depth of 69 feet with 6-inch casing. The well was completed in July 1998. A 24 hour pump test completed in July 1998 indicated a well yield of approximately 20 gpm at a drawdown depth of 36 feet. The design capacityof the system is limited to the existing drinking water fountain and six restrooms.

2.2.3.8 Waid Park

Waid Park is owned and operated by Franklin County and consists of one 6-inch well. No well construction or yield information was available. The design capacity is limited to the existing bath house and drinking water fountains.

2.2.3.9 Town of Ferrum

Town of Ferrum is a public community water system owned and operated by the FWSA. This community water system consists of three drilled wells. Well No. 1 is an 8-inch well and was drilled to a depth of 305 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 100 gpm. Well No. 4 is a 6.25-inch well and was drilled to a depth of 190 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 119 gpm. Well No. 5 is an 8-inch well and was drilled to a depth of 330 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 269 gpm. The water is stored in an atmospheric type storage tank with a storage capacity of 450,000 gallons. The design capacity of the system is limited to 967 connections or 3,904 persons.

2.2.3.10 Alton Park

Alton Park is a private community water system owned by the Aubon Water Company. This community water system consists of one drilled 6-inch well. The well was drilled to a depth of 110 feet and cased to a depth of 52 feet and grouted to a depth of 50 feet. No information on well yield was available. The water is stored in a 2,815 gallon pressure tank. The design capacity of the system is limited to 24 residential connections.

2.2.3.11 Arrington Trailer Court

Arrington Trailer Court is a private community water system owned by the Mr. J. E. Arrington. This community water system consists of one drilled well. Well No. 1 was reportedly drilled to a depth of 80 feet. No other well construction or yield information was available. The water is stored in two 80 gallon pressure tanks. The design capacity of this system is limited to the 18 existing mobile home connections.

2.2.3.12 Bernard’s Landing

Bernard’s Landing is a private community water system owned by Bernard’s Landing Water Company. This community water system consists of two drilled 8-inch wells. Well No. 2 was drilled to a depth of 400 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 130 gpm. Well No. 3 was drilled to a depth of 320 feet and cased and grouted to a depth of 65 feet. The yield was estimated at approximately 100 gpm. The water from these two wells goes to the treatment facility and flows through five pressure greensand filters. Chlorine is added to the water for disinfection as well as for oxidation of the iron and manganese in the water. Soda ash is added for pH adjustment and potassium permanganate is also added for oxidation of the iron and manganese. Finally, Aqua Mag is applied to the filtered water to control corrosion. The water is stored in a 34,000 gallon and a 13,000 gallon atmospheric type tanks as well as a 2,500 gallon hydropneumatic tank. The design capacity of this system is limited to 241 ERCs.

2.2.3.13 Boxwood Green

Boxwood Green is a private community water system owned by the Boxwood Green Property Owners Association. This community water system consists of three drilled 6-inch wells. Well No. 3 was drilled to a depth of 345 feet and cased and grouted to a depth of 62 feet. The yield was estimated at approximately 21 gpm. Well No. 4 was drilled to a depth of 405 feet and cased and grouted to a depth of 57 feet. Well No. 5 was drilled to a depth of 405 feet and cased and grouted to a depth of 62 feet. The yield was estimated at approximately 29 gpm. The water is filtered through two 42 inch diameter pressure manganese greensand filters. Potassium permanganate, hypochlorite solution and soda ash are added to treat the water. The water is stored in an atmospheric and a hydropneumatic tank with a combined effective storage capacity of 18,624 gallons. The design capacity of the system is limited to 93 ERCs.

2.2.3.14 Brown's Mobile Home Court

Brown's Mobile Home Court is a private community water system owned by Mr. James A. Brown. This system consists of one drilled well. No well construction or yield information was available. The water is pumped into a 320 gallon hydropneumatic storage tank with an effective storage capacity of 107 gallons. The design capacity of the system is limited to the 24 existing mobile home connections.

2.2.3.15 Cherokee Hills

Cherokee Hills is a private community water system owned by Shelton Waterworks. This system consists of one drilled 6-inch well. The well was drilled to a depth of 180 feet and cased and grouted to a depth of 75 feet. The yield was estimated at approximately 16.5 gpm. The water is stored in a 10,000 gallon atmospheric storage tank as well as a 2,000 gallon and an 80 gallon pressure tank. The design capacity of the system is limited to 28 ERCs.

2.2.3.16 Contentment Island

Contentment Island is a private community water system owned by Contentment Island L.L.C. This system consists of three drilled 6-inch wells. Well No.1 was drilled to a depth of 400 feet and cased and grouted to a depth of 69 feet. The yield was estimated at approximately 10 gpm. Well No. 2 was drilled to a depth of 400 feet and cased and grouted to a depth of 64 feet. The yield was estimated at approximately 47 gpm. Well No. 3 was drilled to a depth of 400 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 58 gpm. The water is stored in a 36,400 gallon standpipe. The design capacity of the system is limited to 144 ERCs or 57,600 gpd.

2.2.3.17 Deer Creek Estates

Deer Creek Estates is a private community water system owned by the Deer Creek Water Company, Inc. This system consists of two drilled wells. Well No. 1 was drilled to a depth of 240 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 20 gpm. Well No. 2 was drilled to a depth of 100 feet and cased and grouted to a depth of 63 feet. The yield is estimated at approximately 20 gpm. The water is treated with Aqua Mag and chlorine for disinfection. The water is stored in two 30,000 gallon atmospheric type tanks as well as one 2,130 gallon pressure tank with a total effective storage capacity of 55,000 gallon. The design capacity of the system is limited to 80 ERCs or 32,000 gpd.

2.2.3.18 Fork Mountain Adult Rest Home

Fork Mountain Adult Rest Home is a private community water system owned by Mr. Wayne Holcomb. This system consists of one drilled 6-inch well. The well was drilled to a depth of 280 feet and cased and grouted to a depth of 57 feet. The yield was estimated to be approximately 10 gpm. The water is stored in three hydropneumatic tanks with a combined effective storage capacity of 35 gallons. The design capacity of the system is limited to a 37 bed home for adults.

2.2.3.19 Franklin Acres

Franklin Acres is a private community water system owned by the Mayfore Water Company, Inc. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 205 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 45 gpm. Well No. 2 was drilled to a depth of 250 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 15 gpm. The water is stored in a 2,000 gallon pressure tank and plans have been approved for a 30,000 gallon steel standpipe. The design capacity of the system is limited to 120 ERCs.

2.2.3.20 Frederick Acres

Frederick Acres is a private community water system owned by Finney Construction. This system consists of one drilled 8-inch well. The well was drilled to a depth of 225 feet. No other well construction information was available. The yield was estimated at approximately 79 gpm. The water is stored in a 2,000 gallon hydropneumatic storage tank with an effective storage capacity of 666 gallons. The design capacity of the system is limited to 21 existing residential connections.

2.2.3.21 Hales Point Subdivision

Hales Point Subdivision is a private community water system owned by Petrus Environmental Services, Inc. This system consists of one drilled 6-inch well. The well was drilled to a depth of 260 feet and cased and grouted to a depth of 72 feet. The yield was estimated at approximately 22 gpm. The water is stored in a 0.0168 MG steel atmospheric type storage tank. The design capacity of the system is limited to 33 ERCs or 13,200 gpd.

2.2.3.22 Highland Lakes Subdivision

Highland Lakes Subdivision is a private community water system owned by Petrus Environmental Services, Inc. This system consists of two drilled 6-inch wells. Well No. 2 was drilled to a depth of 358 feet and cased and grouted to a depth of 125 feet. The yield was estimated at approximately 60 gpm. Well No. 3 was drilled to a depth of approximately 350 feet and cased and grouted to a depth of 51 feet. The yield was estimated at approximately 10 gpm. A polyphosphate chemical is added to the water to sequester iron and manganese. The water is stored in a 22,000 gallon atmospheric tank as well as a 9,240 gallon hydropneumatic tank with a combined effective storage capacity of 24,000 gallon. The design capacity of the system is limited to 119 ERCs or 47,600 gpd.

2.2.3.23 Idlewood Shores

Idlewood Shores is a private community water system owned by Terry Dooley. This system consists of one drilled well. The well was drilled to a depth of 300 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 35 gpm. The water is stored in a 35,000 gallon standpipe. The design capacity of the system is limited to 49 ERCs or 19,600 gpd.

2.2.3.24 Key Lakewood Subdivision

Key Lakewood Subdivision is a private community water system owned by V. T. Crawford. This system consists of three drilled wells. No well construction or yield information is available for the wells. The water is stored in three hydropneumatic tanks with a combined storage capacity of 9,000 gallons. The design capacity of the system is limited to 41 existing connections.

2.2.3.25 Lakeshore Terrace

Lakeshore Terrace is a private community water system owned by the Lakeshore Terrace Corporation. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 442 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 50 gpm. Well No. 2 was drilled to a depth of 505 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 50 gpm. The water is stored in two atmospheric type storage tanks with a combined storage of 32,400 gallons. The design capacity of the system is limited to 124 ERCs or 49,600 gpd.

2.2.3.26 Lakewood Forest Subdivision

Lakewood Forest Subdivision is a private community water system owned by Mr. Wayne Armstrong. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 400 feet and cased and grouted to a depth of 58 feet. The yield was estimated at approximately 8 gpm. Well No. 2 was drilled to a depth of 400 feet and cased and grouted to a depth of 58 feet. The yield was estimated at approximately 12 gpm. The water is stored in a 10,000 gallon standpipe. The design capacity of the system is limited to 68 connections.

2.2.3.27 Long Island Estates

Long Island Estates is a private community water system owned by Mr. David Petrus. This system consists of two drilled 6-inch wells. Well No. 2 was drilled to a depth of 252 and cased and grouted to a depth of 92 feet. The yield was estimated at approximately 12 gpm. Well No. 4 was drilled to a depth of 260 feet and cased and grouted to a depth of 90 feet. The yield was estimated at approximately 23.5 gpm. Chemical additions include soda ash for pH adjustment and sodium hypochlorite and potassium permanganate solutions for oxidation of iron and manganese. The water is also filtered through a 42-inch greensand filter to remove the iron and manganese. The water is stored in an atmospheric type storage tank with an effective storage capacity of 18,800 gallons as well as a hydropneumatic tank with an effective storage capacity of 333 gallons. The design capacity for the system is limited to 71 ERCs or 28,400 gpd.

2.2.3.28 Lynville On The Lake

Lynville On The Lake is a private community water system owned by the Lynville On The Lake Homeowners Association, Ltd. This system consists of five drilled 6-inch wells. Well No. 2 was drilled to a depth of 340 feet and cased and grouted to a depth of 111 feet. The yield was estimated at approximately 2 gpm. Well No. 3 was drilled to a depth of 340 feet and cased and grouted to a depth of 120 feet. The yield was estimated at approximately 2 gpm. Well No. 5 was drilled to a depth of 285 feet, cased to a depth of 70 feet and grouted to a depth of 50 feet from. The yield was estimated at approximately 24 gpm. Well No. 6 was drilled to a depth of 445 feet, cased to a depth of 90 feet and grouted to a depth of 50 feet. Well No. 7 was drilled to a depth of 500 feet, cased to a depth of 98 feet and grouted to a depth of 50 feet. A chemical solution is added to the water from wells No. 6 and No. 7 to sequester iron and manganese. The water is stored in steel standpipe with an effective storage capacity of 20,000 gallons. The design capacity of the system is limited to 91 ERCs or 36,400 gpd.

2.2.3.29 Park Place

Park Place is a private community water system owned by Mr. Jim McKelvey. The Park Place system is a combination of a newer system and an interconnection with the existing Winding Water water system. This combined system consists of eight drilled 6-inch wells. Well A (Park Place) was drilled to a depth of 405 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 18 gpm. Well B (Park Place) was drilled to a depth of 305 feet and cased and grouted to a depth of 63 feet. The yield was estimated at approximately 17 gpm. Well C (Park Place) was drilled to a depth of 365 feet and cased and grouted to a depth of 51 feet. The yield was estimated at approximately 11 gpm. Well E (Park Place) was drilled to a depth of 305 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 66 gpm. Well No. 12 (Winding Waters) was drilled to a depth of 305 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 6 gpm. Well No. 13 (Winding Waters) was drilled to a depth of 595 feet and cased and grouted to a depth of 62 feet. The yield was estimated at approximately 12 gpm. Well No. 14 (Winding Waters) was drilled to a depth of 350 feet and cased and grouted to a depth of 66 feet. The yield was estimated at approximately 34 gpm. Well No. 15 (Winding Waters) was drilled to a depth of 750 feet and cased and grouted to a depth of 64 feet. The yield was estimated at approximately 7 gpm.

The water is treated to remove iron and manganese with the addition of sodium hypochlorite, soda ash and potassium permanganate solutions and filtered through three 42-inch diameter pressure manganese greensand filters. The water is stored in a 100,000 gallon elevated storage tank. The design capacity of the system is limited to 301 ERCs or 121,000 gpd.

2.2.3.30 Ridgecrest Subdivision

Ridgecrest Subdivision is a private community water system owned by Petrus Environmental Services. This system consists of one drilled well. Well No. 2 was drilled to a depth of 250 feet and cased and grouted to a depth of 90 feet. The yield was estimated at approximately 29 gpm. A polyphosphate solution is added to the water to sequester iron and manganese. The water is stored in a 10,000 gallon atmospheric type tank as well as a 7,000 gallon hydropneumatic tank with a combined effective storage capacity of 12,300 gallons. The design capacity of the system is limited to 49 ERCs or 19,600 gpd.

2.2.3.31 Riverbay Subdivision

Riverbay Subdivision is a private community water system owned by Mr. James Buck. This system consists of one drilled 6-inch well. The well was drilled to a depth of 300 feet and cased and grouted to a depth of 65 feet. The water is stored in a 9,985 gallon atmospheric tank as well as a 1,000 gallon pressure tank with a combined effective storage capacity of 10,300 gallons. The design capacity for the system is limited to 38 ERCs or 15,200 gpd.

2.2.3.32 Starwood/Lakemount/Overlook Subdivision

Starwood/Lakemount/Overlook Subdivision is a private community water system owned by The Waterworks Company of Franklin County. This system consists of two drilled wells. Well No. 5 is an 8-inch well and was drilled to a depth of 340 feet and cased and grouted to a depth of 102 feet. The yield was estimated at approximately 31 gpm. Well No. 7 is a 6-inch well and was drilled to a depth of 320 feet and cased and grouted to a depth of 106 feet. The yield was estimated at approximately 29 gpm. The water is stored in a 15,600 gallon atmospheric type storage tank. The design capacity of the system is limited to 78 ERCs or 31,200 gpd.

2.2.3.33 Striper's Landing

Striper's Landing is a private community water system owned by the Striper's Landing Water Company. This system consists of four drilled 6-inch wells. Well No. 1 was drilled to a depth of 320 feet and cased and grouted to a depth of 68 feet. The yield was estimated at approximately 22 gpm. Well No. 6 was drilled to a depth of 300 feet and cased and grouted to a depth of 102 feet. The yield was estimated at approximately 4 gpm. Well No. 10 was drilled to a depth of 440 feet and cased and grouted to a depth of

58 feet. The yield was estimated at approximately 5 gpm. Well No. 11 was drilled to a depth of 320 feet and cased and grouted to a depth of 105 feet. The water is stored in an atmospheric type storage tank with an effective storage capacity of 44,000 gallons. The design capacity of the system is limited to 74 ERCs or 29,600 gpd.

2.2.3.34 Teel Brooke Estates

Teel Brooke Estates is a private community water system owned by the Teel Brooke Water Company. This system consists of three drilled 6-inch wells. Well No. 1 was drilled to a depth of 300 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 10 gpm. Well No. 15 was drilled to a depth of 400 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 8 gpm. Well No. 19 was drilled to a depth of 580 feet and cased and grouted to a depth of 58 feet. The yield was estimated at approximately 18 gpm. The water is stored in an atmospheric type tank and a pressure tank with a combined effective storage of 16,400 gallons. The design capacity of the system is limited to 72 ERCs or 28,800 gpd.

2.2.3.35 The Meadows (Glade Hill Apartments)

The Meadows is a private community water system owned by The Signet Group. This system consists of two drilled 6-inch wells. Well No. 4 was drilled to a depth of 360 feet and cased and grouted to a depth of 77 feet. The yield was estimated at approximately 17 gpm. Well No. 5 was drilled to a depth of 240 feet and cased and grouted to a depth of 100 feet. Aqua Mag is added to the water to sequester iron and manganese. The water is stored in a 10,000 gallon atmospheric tank as well as two pressure tanks. The combined effective storage capacity for the system is 10,550 gallons. The design capacity of the system is limited to 66 apartment units or 20,000 gpd.

2.2.3.36 Twin Coves Subdivision

Twin Coves Subdivision is a private community water system owned by Petrus Environmental Services, Inc. This system consists of three drilled 6-inch wells. Well No. 2 was drilled to a depth of 400 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 6 gpm. Well No. 3 was drilled to a depth of 320 feet and cased and grouted to a depth of 57 feet. The yield was estimated at approximately 8.8 gpm. Well No. 4 was drilled to a depth of 300 feet and cased and grouted to a depth of 66 feet. The yield was estimated at approximately 18 gpm. Orthophosphate is added to the water for corrosion control and a sodium hypochlorite solution is added for disinfection. The water treatment technique of blending is used to reduce the concentration of total radium to less than the Primary Maximum Contaminant Level (MCL) of 5 pCi/L and reduce the iron concentration to less than the Secondary MCL of 0.30 mg/l. The water is stored in a 10,000 gallon atmospheric type storage tank as well as a 1,000 gallon hydropneumatic tank with an effective storage capacity of 333 gallons. The design capacity of the system is limited to 20,800 gpd.

2.2.3.37 Walnut Run

Walnut Run is a private community water system owned by the Walnut Run Property Owners Association, Inc. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 340 feet and cased and grouted to a depth of 85 feet. The yield was estimated at approximately 25 gpm. Well No. 2 was drilled to a depth of 260 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 29 gpm. Soda ash is added to the water for pH adjustment and corrosion control. The water is stored in a 54,000 gallon standpipe with an effective storage capacity of 18,900 gallons. The design capacity of the system is limited to 94 ERCs or 37,600 gpd.

2.2.3.38 Waverly Subdivision

Waverly Subdivision is a private community water system owned by the Snyder Hunt Corporation. This system consists of two drilled wells. Well No. 1 was drilled to a depth of 220 feet and cased and grouted to a depth of 57 feet. The yield was estimated at approximately 42 gpm. Well No. 2 was drilled to a depth of 300 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 38 gpm. The water is treated for iron, manganese, radium, and pH adjustment, and disinfected with the chemical additions of soda ash, calcium hypochlorite solution and potassium permanganate. The water is stored in a 35,000 gallon atmospheric type storage tank as well as a 2,500 gallon pressure tank. The total effective storage for the system is 36,000 gallons. The design capacity of the system is limited to 180 ERCs or 72,000 gpd.

2.2.3.39 Weatherwood Subdivision

Weatherwood Subdivision is a private community water system owned by the Weatherwood Water System Association. This system consists of four drilled 6-inch wells. Well No. 1 was drilled to a depth of 340 feet and cased and grouted to a depth of 76 feet. The yield was estimated at approximately 2 gpm. Well No. 2 was drilled to a depth of 280 feet and cased and grouted to a depth of 75 feet. The yield was estimated at approximately 0.5 gpm. Well No. 3 was drilled to a depth of 260 feet and cased and grouted to a depth of 110 feet. The yield was estimated at approximately 0.5 gpm. Well No. 4 was drilled to a depth of 625 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 9.5 gpm. A sequestering agent is injected into the discharge from Well No. 4 to sequester manganese. The water is stored in an atmospheric type storage tank with an effective storage capacity of 10,400 gallons. The design capacity of the system is limited to 23 ERCs or 9,200 gpd.

2.2.3.40 Westlake Water Company

Westlake Water Company owns and operates two waterworks (formerly Arrowhead Village and Chestnut Creek) that have been interconnected. This combined system consists of eight drilled wells. Arrowhead Village Well No. 1 was drilled to a depth of 320 feet and cased and grouted to a depth of 57 feet. The yield was estimated at approximately 14 gpm. Arrowhead Village Well No. 2 was drilled to a depth of 300 feet and cased and grouted to a depth of 65 feet. The yield was estimated at approximately 5 gpm. Arrowhead Village Well A was drilled to a depth of 305 feet and cased and grouted to a depth of 65 feet. The yield was estimated at approximately 4 gpm. Arrowhead Village Well C was drilled to a depth of 305 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 1 gpm. Arrowhead Village Well E was drilled to a depth of 385 feet and cased and grouted to a depth of 54 feet. The yield was estimated at approximately 8 gpm. Arrowhead Village Well F was drilled to a depth of 385 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 12 gpm. Chestnut Creek Well No. 1 was drilled to a depth of 320 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 18 gpm. Chestnut Creek Well No. 7 was drilled to a depth of 400 feet and cased and grouted to a depth of 60 feet. The yield was estimated at approximately 26 gpm.

Water from the Arrowhead Village wells is treated with chemical addition to disinfect, adjust pH, and remove iron, manganese and radium. The water from the Chestnut Creek wells and the water received by the Chestnut Creek system from the Arrowhead system are blended to control radium and iron levels. Water from the Arrowhead Village system is stored in an atmospheric type storage tank with an effective storage capacity of 28,500 gallons and a pressure tank with an effective storage capacity of 833 gallons. Water from the Chestnut Creek system is stored in an atmospheric type storage tank with an effective storage capacity of 35,600 gallons and a pressure tank with an effective storage capacity of 833 gallons. The design capacity of the entire Westlake Water Company system is limited to 142 ERCs or 56,800 gpd.

2.2.3.41 Windy Gap Mountain Village

Windy Gap Mountain Village is a private community water system owned by Water Distributors, Inc. This system consists of three drilled 6-inch wells. Well No. 2 was drilled to a depth of 165 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 30 gpm. Well No. 3 was drilled to a depth of 355 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 22 gpm. Well No. 4 was drilled to a depth of 515 feet and cased and grouted to a depth of 63 feet. The yield was estimated at approximately 10 gpm. Iron and manganese are removed with the chemical addition of sodium hypochlorite, soda ash and potassium permanganate along with filtration through three 30-inch diameter pressure greensand filters. The water is stored in an atmospheric type storage tank with an effective storage capacity of 23,800 gallons. The design capacity of the system is limited to 88 ERCs or 35,200 gpd.

2.2.3.42 Others

Cedar Ridge Subdivision and Fox Chase Subdivision are community water systems using groundwater. No information was available about these water systems.

2.2.4 Roanoke County

Many of the community water systems in Roanoke County, both publicly and privately owned, rely on groundwater. The public community water systems in Roanoke County are owned by the WVWA and include the following: Delaney Court and Martin Creek. The following community water systems are privately owned: Carolina Village, Catawba Hospital, Garden City, Mountain View Mobile Home Village, Pine Hill, Pine Tree Village, Winterwood Apartments, and Yellow Mountain Village. Each is discussed below.

2.2.4.1 Delaney Court

Delaney Court is a public community water system owned by the WVWA. This community water system consists of one drilled 6-inch well. The well was drilled to a depth of 320 feet and cased and grouted to a depth of 103 feet. The yield was estimated at approximately 30 gpm. A chlorine solution is added to the raw water for disinfection before entering the storage tanks. The water is stored in a 4,200 gallon steel storage tank as well as a 1,670 gallon hydropneumatic tank. The system has a total effective storage capacity of 4,757 gallons. The design capacity of the system is limited to the 56 existing residential connections.

2.2.4.2 Martin Creek

Martin Creek is a public community water system owned by the WVWA. This community water system consists of 9 drilled wells. The Martin Creek water system includes the Carriage Hills and Forest Edge water systems which have been interconnected. The Martin Creek system consists of two drilled wells. Martin Creek Well No. 3 is an 8-inch well drilled to a depth of 300 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 6.5 gpm. Martin Creek Well No. 4 is an 8-inch well drilled to a depth of 225 feet and cased and grouted to a depth of 56 feet. The yield was estimated at approximately 6 gpm. The water from these wells flows into the discharge line from Martin Creek Well No. 5 ahead of the chlorinator and chlorine contact tank.

The Forest Edge system consists of three drilled 6-inch wells. Martin Creek Well No. 7 (Forest Edge Well No. 3) was drilled to a depth of 600 feet and cased and grouted to a depth of 55 feet. The yield was estimated at approximately 10 gpm. Martin Creek Well No. 5 (Forest Edge Well No. 5) was drilled to a depth of 350 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 15 gpm. Martin Creek Well No. 6 (Forest Edge Well No. 6) was drilled to a depth of 405 feet and cased and grouted to a depth of 55 feet. The yield was estimated at approximately 7.5 gpm. The water from Forest Edge and Martin Creek systems are chlorinated to disinfect the water and stored in a 149,000 gallon storage tank.

The Carriage Hills system consists of four drilled 6-inch wells. Martin Creek Well No. 10 (Carriage Hills Well No. 3) was drilled to a depth of 580 feet and cased and grouted to a depth of 84 feet. The yield was estimated at approximately 20 gpm. Martin Creek Well No. 8 (Carriage Hills Well No. 12) was drilled to a depth of 500 feet and cased and grouted to a depth of 52 feet. The yield was estimated at approximately 10.5 gpm. Martin Creek Well No. 9 (Carriage Hills Well No. 14) was drilled to a depth of 600 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 3.5 gpm. Martin Creek Well No. 2 (The Parker Well) was drilled to a depth of 285 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 18.5 gpm. A chlorine solution is added to the raw water in the well discharge line for disinfection. The water is stored in a 19,000 gallon storage tank. The Forest Edge and Carriage Hills systems are connected through an 8-inch diameter line.

The total source capacity of the systems is 78,000 gallons and the total combined storage for the system is 168,000 gallons. The design capacity of the system is limited to 78,000 gpd.

2.2.4.3 Carolina Village

Carolina Village is a private community water system owned by the Jer-Pam Properties. This system consists of one drilled well. The well was reportedly drilled to a depth of 212 feet. No other well construction information was available. The yield was estimated at approximately 40 gpm. The water is stored in a 5,993 gallon concrete storage tank as well as four 85 gallon hydropneumatic tanks. The combined effective storage capacity for the system is 6,106 gallons. The design capacity of the system is limited to the 36 existing connections.

2.2.4.4 Catawba Hospital

Catawba Hospital is a private community water system owned by the Commonwealth of Virginia. This system consists of one drilled 8-inch well and a spring. The capacity of the spring is unknown. Well No. 9 was drilled to a depth of 470 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 128 gpm.

The water from the spring and the well flow through a WTP. Chlorine, alum, soda ash and polymer are added to the raw water before entering the WTP. As the water enters the WTP, it flows into a flash mix basin. The flash mix basin has an effective volume of 644 gallons and a detention time of 13.4 minutes. The flocculators in the flash mix basin are vertical paddle type and are powered by 0.25 HP variable speed motors. The water then flows into two parallel sedimentation basins. These basins are rectangular steel chambers having a total effective capacity of 1,335 gallons and a detention time of approximately 14 minutes. After sedimentation, the water is filtered through two parallel mixed media filters with a total capacity of 96 gpm. The finished water enters a 100,000 gallon chlorine contact tank and is then sent to the distribution system.

The water is stored in two steel storage tanks, each with an effective storage capacity of 15,700 gallons as well as the 100,000 gallon chlorine contact tank. The total effective storage capacity of the system is 31,400 gallons. The design capacity of the system is limited to 102,400 gpd.

2.2.4.5 Garden City

Garden City is a private community water system owned by Mr. John W. Webb. This system consists of one drilled 6-inch well. Well No. 2 was drilled to a depth of 200 feet and cased and grouted to a depth of 80 feet. The yield was estimated at approximately 18 gpm. Chlorine and soda ash are added to the water for disinfection and corrosion control. The water is stored in a 14,400 gallon concrete reservoir and a 525 gallon hydropneumatic tank. The total effective storage for the system is 14,575 gallons. The design capacity of the system is limited to the 54 existing residential connections.

2.2.4.6 Mountain View Mobile Home Village

Mountain View Mobile Home Village is a private community water system owned by Mountain View Mobile Home Village, Inc. The system consists of two drilled wells. Well No. 1 was reportedly drilled to a depth of 80 feet. No other well construction information was available. The yield was estimated at approximately 20 gpm. Well No. 2 was reportedly drilled to a depth of 228 feet. No other well construction information was available. The yield was estimated at approximately 7 gpm. A chlorine solution is added to the water for disinfection. The water is stored in an 11,500 gallon concrete reservoir as well as five hydropneumatic tanks. The effective storage capacity of the system is 11,670 gallons. The design capacity of the system is limited to the existing 18 connections.

2.2.4.7 Pine Hill

Pine Hill is a private community water system owned by Michael and Glenna Dunn. The system consists of one drilled 6-inch well. The well was drilled to a depth of 267 feet and cased to a depth of 80 feet. No other well construction information was available. The yield was estimated at approximately 60 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 25,000 gallon storage tank as well a two 62 gallon pressure tanks. The total effective storage capacity for the system is 25,041 gallons. The design capacity of the system is limited to 19,600 gpd.

2.2.4.8 Pine Tree Village

Pine Tree Village is a public community water system owned by Ms. Juanita Carter. This system consists of one drilled well. The well was drilled to a depth of 75 feet. No other well construction or yield information was available. A chlorine solution is added to the water for disinfection. The water is stored in one 250 gallon and seven 119 gallon hydropneumatic tanks with a combined storage capacity of 361 gallons. The design capacity of the system is limited to the 40 existing mobile home connections.

2.2.4.9 Winterwood Apartments

Winterwood Apartments is a private community water system owned by Derey Properties, L.L.C. This system consists of two drilled 6-inch wells. Well No. 1 was drilled to a depth of 230 feet and cased and grouted to a depth of 107 feet. The yield was estimated at approximately 10 gpm. Well No. 2 was drilled to a depth of 800 feet and cased and grouted to a depth of 140 feet. The yield was estimated at approximately 24 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 6,000 gallon horizontal steel storage tank. The design capacity of the system is limited to 12,000 gpd.

2.2.4.10 Yellow Mountain Village

Yellow Mountain Village is a private community water system owned by Bowman Associates, L.L.C. This system consists of three drilled wells. Well No. 1 was drilled to a depth of 121 feet. No other well construction information was available. The yield was estimated at approximately 22 gpm. Well No. 2 was drilled to a depth of 260 feet. No other well construction information was available. The yield was estimated at approximately 13 gpm. Well No. 3 was drilled to a depth of 240 feet and cased and grouted to a depth of 140 feet. The yield was estimated at approximately 30 gpm. The water is stored in nine 86 gallon hydropneumatic tanks with a combined effective storage capacity of 258 gallons. The design capacity of the system is limited to the 102 existing connections.

2.2.4.11 City of Roanoke

There are no known community water systems using groundwater in the City of Roanoke.

2.2.5 City of Salem

One community water system in the City of Salem relies on groundwater. Springfield Waterworks is a private community water system owned and operated by Mr. Roy Brown. This system consists of one drilled 6-inch well. The well was drilled to a depth of 274 feet and cased to a depth of 90 feet. No other well construction or yield information was available. A chlorine solution is added to the water for disinfection. The water is stored in an 8,600 gallon concrete reservoir. The design capacity of the system is limited to the 27 existing residential connections.

2.2.6 Town of Boones Mill

The Town of Boones Mill owns and operates a public community water system consisting of one drilled 6-inch well and a spring. The well was drilled to a depth of 385 feet, cased to a depth of 58 feet and grouted to a depth of 56 feet. The yield was estimated at approximately 100 gpm. The spring has an estimated dry weather flow of 10 gpm. The spring water flows by gravity to a concrete basin with an effective storage capacity of 12,000 gallons. In addition, water from both the well and the spring are stored in an atmospheric type storage tank with an effective storage capacity of 235,000 gallons. A calcium hypochlorite solution is added to the water for disinfection. The design capacity of the system is limited to 206 ERCs or 82,400 gpd.

2.2.7 Town of Buchanan

The Town of Buchanan owns and operates a public community water system consisting of four drilled 8-inch wells. Well No. 1 was drilled to a depth of 376 feet and cased to a depth of 44 feet. No other well construction or yield information was available. Well No. 2 was drilled to a depth of 472 feet and cased and grouted to a depth of 297 feet. No yield information was available. Well No. 3 was drilled to a depth of 605 feet and cased and grouted to a depth of 200 feet. The yield was estimated at approximately 130 gpm. Well No. 4 was drilled to a depth of 520 feet and cased and grouted to a depth of 125 feet. The yield was estimated at approximately 240 gpm. A chlorine solution is added to the water from Well Nos. 1, 2 and 4 for disinfection. The water is stored in three atmospheric type storage tanks with a combined effective storage capacity of 540,000 gallons. The design capacity of the system is limited to 756,000 gpd.

2.2.8 Town of Fincastle

The Town of Fincastle owns and operates a public community water system consisting of two drilled 8-inch wells. Well No. 1 was drilled to a depth of 405 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 54 gpm. Well

No. 2 was drilled to a depth of 475 feet and cased and grouted to a depth of 208 feet. The yield was estimated at approximately 220 gpm. A chlorine solution is added to the water from Well No. 2 for disinfection. The water is stored in a 100,000 gallon ground storage tank and 6,200 gallon chlorine contact tank. The design capacity of the system is limited to 531 ERCs or 212,400 gpd.

2.2.9 Town of Troutville

The Town of Troutville owns and operates a public community water system consisting of five drilled wells. Well No. 1 is an 8-inch well drilled to a depth of 300 feet and cased and grouted to a depth of 110 feet. The yield was estimated at approximately 175 gpm. Well No. 2 is a 6.25-inch well drilled to a depth of 304 feet and cased and grouted to a depth of 104 feet. The yield was estimated at approximately 50 gpm. Well No. 3 is an 8-inch well drilled to a depth of 725 feet and cased and grouted to a depth of 103 feet. The yield was estimated at approximately 125 gpm. Well No. 4 is a 6-inch well drilled to a depth of 700 feet and cased and grouted to a depth of 51 feet. The yield was estimated at approximately 30 gpm. Well No. 5 is an 8-inch well drilled to a depth of 525 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 40 gpm. A chlorine solution is added to the water for disinfection. The water is stored in a 125,000 gallon elevated storage tank, a 249,000 gallon and a 500,000 gallon ground-level storage tanks, as well as four chlorine contact tanks with capacities of 1,800 gallons, 3,800 gallons, 5,080 gallons, and 5,000 gallons. The design capacity of the system is limited to 274,400 gpd.

2.2.10 Town of Rocky Mount

The Town of Rocky Mount does not own or operate a community water system using groundwater.

2.2.11 Town of Vinton

The Town of Vinton owns and operates a public community water system consisting of ten drilled wells. Well No. 1 is a 6-inch well drilled to a depth of 345 feet and cased and grouted to a depth of 55 feet. The yield was estimated at approximately 440 gpm. Well No. 3 is a 6-inch well drilled to a depth of 405 feet and cased and grouted to a depth of 66 feet. The yield was estimated at approximately 430 gpm. Well No. 4 is a 6-inch well drilled to a depth of 305 feet and cased and grouted to a depth of 53 feet. The yield was estimated at approximately 400 gpm. Well No. 5 is an 8-inch well drilled to a depth of 445 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 165 gpm. Well No. 6 is an 8-inch drilled to a depth of 485 feet and cased and grouted to a depth of 74 feet. The yield was estimated at approximately 130 gpm. Well No. 7 is an 8-inch well drilled to a depth of 360 feet and cased and grouted to a depth of 56 feet. The yield was estimated at approximately 1,000 gpm. Well No. 8 is an 8-inch well drilled to a depth of 705 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 50 gpm. Well No. 9 is an 8-inch well drilled to a depth of 412.5 feet and cased and grouted to a depth of 70 feet. The yield was estimated at approximately 400 gpm. Well No. 10 is a 6-inch well drilled to a depth of 625 feet and cased and grouted to a depth of 50 feet. The yield was estimated at approximately 260 gpm. Well No. 11 is a 10-inch well drilled to a depth of 280 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 250 gpm. Beginning in November 2008, the Town of Vinton began continuous disinfection of its entire water system by dosing at each of the ten source wells.

The water is stored in seven atmospheric type storage tanks. The Parkway Tank is 932,000 gallons, the Chestnut Mountain Tank is 2.0 MG, the Camney Lane Tank is 59,500 gallons, the Third Street Tank is 1.0 MG, the Twin Mountain Tank is 57,000 gallons, the Toddsbury Lower Tank is 107,000 gallons, and the Toddsbury Upper Tank is 77,000 gallons. The total storage capacity for the system is approximately 4.2 MG. The design capacity for the system is limited to 2.74 MGD due to a combination of limited well yields and pump capacities.

The Town of Vinton previously operated Falling Creek Estates, a public community water system consisting of four drilled wells; however, this community water system was connected to the Town of Vinton water system in 2008 and is now classified as inactive by VDH.

2.3 Community Water Systems Using Surface Water Reservoirs[3]

2.3.1 Bedford County

The BCPSA does not own or operate a community water system using a surface water reservoir. However, there is one private community water system, Eagle Eyrie Baptist Conference Center, which utilizes a surface water reservoir.

2.3.1.1 Eagle Eyrie Baptist Conference Center

The Eagle Eyrie Baptist Conference Center is a private community water system owned by the Virginia Baptist Mission Board of the Baptist General Association of Virginia and is operated by Mr. Paul Schnurer. The water system consists of a 5.0 MG surface water reservoir and chemical feed appurtenances. As water flows from the reservoir, soda ash is added in a mixing basin to increase the alkalinity of the raw water. No other information about the system or the reservoir was available.

2.3.2 Botetourt County

Botetourt County does not own or operate a community water system using a surface water reservoir.

2.3.3 Franklin County

Franklin County does not own or operate a community water system using a surface water reservoir.

2.3.4 Roanoke County/Roanoke City

The WVWA owns and operates three community water systems using a surface water reservoir: Carvins Cove, Falling Creek and Spring Hollow.

2.3.4.1 Carvins Cove WTF

Carvins Cove WTF is a public community water system owned and operated by the WVWA. The system consists of two drilled wells, Carvins Cove reservoir, Catawba Creek, and Tinker Creek along with Carvins Cove WTP. Well No. 1 was drilled to a

[3] 9 VAC 25-780-70 C.

depth of 700 feet and cased and grouted to a depth of 84 feet. The yield was estimated at approximately 229 gpm. Well No. 2 was drilled to a depth of 600 feet and cased and grouted to a depth of 63 feet. The yield was estimated at approximately 223 gpm.

The Carvins Cove reservoir has a drainage area of approximately 17.9 square miles and a capacity of 6.47 billion gallons (BG). The reservoir is fed by Catawba Creek in the James River Basin and Tinker Creek in the Roanoke River Basin through tunnels to the reservoir.

The WTF is divided into three sections: the 1944, 1954, and 1994 sections. The 1944 section treats approximately 25 percent of the water; the 1954 section treats approximately 35 percent of the water; and the 1994 treats approximately 40 percent of the water. The treatment process is the same for each section. Water is pumped from the reservoir through a 36-inch line to the treatment facility. As the water flows to the facility it runs across concrete aeration basins. Water feeding the 1944 and the 1954 sections flow into the same aeration basins and the water feeding the 1994 section flows into a separate aeration basin. The effluent water from the aeration basins is collected in a concrete channel and flows down the channel into three separate flash mix basin units. Chemicals added during the treatment process include ferric sulfate for pre-disinfection, chlorine dioxide for coagulant, fluoride and polymer. The total effective volume of all mixing basins for the three separate units is 669,000 gallons and has a detention time of approximately 34 minutes at the WTPs maximum capacity of 28 MGD.

The water flows from the flash mix basins into sedimentation basins. Water flowing through the 1944 section flows into two concrete sedimentation basins with a combined effective volume of approximately 783,000 gallons. Water flowing through the 1954 section flows into two concrete sedimentation basins with a combined effective volume of approximately 1.30 MG. Water flowing through the 1994 section flows into four concrete sedimentation basins with a combined effective volume of approximately 1.50 MG. The detention time at the WTPs max capacity of 28 MGD is approximately 3.1 hours.

After sedimentation, the water is filtered. Filtration is accomplished by ten dual media high rate gravity filters. These filters consist of a gravel support layer, torpedo sand, filter sand, and anthracite. These filters have a filtration rate of up to 4.0 gpm/ft^2 and have a surface area of approximately 519.32 square feet each. Chlorine is added to the finished water as a post-treatment disinfectant. The chlorine is injected into the 42-inch and the 32-inch water lines leaving the WTP and into the two clearwells. The 42-inch line runs to the 4.0 MG concrete clearwell and the 32-inch line runs to the 2.0 MG concrete clearwell. From these two clearwells, water flows into the distribution system.

The distribution system consists of fourteen pumping and booster stations as well as eighteen smaller storage tanks. The total system storage is approximately 19.25 MG. The design capacity of the system is limited by the safe yield of Carvins Cove reservoir to 18.4 MGD.

2.3.4.2 Falling Creek WTF

Falling Creek WTF is a public community water system owned and operated by the WVWA. This community water system consists of Falling Creek and Beaver Dam Reservoirs along with Falling Creek WTP. The reservoirs have a combined safe yield of 1.45 MGD. Falling Creek Reservoir has a drainage area of approximately 1.4 square miles and a total storage volume of 85 MG. Beaver Dam Reservoir has a drainage area of approximately 1.7 square miles and a total storage volume of 435 MG.

Water flows by gravity from the reservoirs to the WTP through 16-inch and 12-inch raw water lines. Provisions have been made for the addition of chlorine, alum, PAC "ultra floc" (for cold water temperature operations), sodium hydroxide, potassium permanganate, polymer, and fluoride to the raw water prior to entering the WTP. Flash mixing occurs in a 21-inch by 8-inch diameter inline static mixer. Flocculation occurs in two parallel rectangular steel basins. Each flocculating basin has an effective volume of 13,301 gallons and a detention time of approximately 19.2 minutes at the design flow of 1,389 gpm.

After leaving the flocculating basins, the water flows into two parallel rectangular steel sedimentation basins. The basins have a combined effective volume of 11,084 gallons and a detention time of approximately 7.98 minutes at the design flow. After sedimentation, the water is filtered through two parallel mixed media filters. The filters have a total capacity of 2.0 MGD. The filters are composed of anthracite, intermediate sand, high density sand, and gravel. Filtered water is transferred from a 38,500 gallon filtered water wetwell to a 50,000 gallon clearwell and a 229,500 gallon clearwell by three 5-HP centrifugal pumps. Water flows from the clearwells to the Parkway storage tank and into the distribution system.

The design capacity for the system is limited by the raw water source to 1.45 MGD.

2.3.4.3 Spring Hollow WTF

Spring Hollow WTF is a public community water system owned and operated by the WVWA. The system consists of Spring Hollow Reservoir, the Roanoke River and the Spring Hollow WTP. Spring Hollow Reservoir is a pump storage reservoir and has a safe yield of 23.0 MGD. The reservoir has a surface area of 158 acres and a drainage area of 540 acres. Water is pumped from the Roanoke River, through two 42-inch diameter pipe lines, to the west side of the 3.2 BG reservoir. The pump station is capable of pumping 80 MGD. The reservoir water retention time is 24 hours at a minimum.

A linear bubble plume diffuser is installed in Spring Hollow Reservoir to improve raw water quality by oxygenating the reservoir's hypolimnion. This system is operated during late summer stratification to maintain elevated levels of dissolved oxygen (DO). Elevated DO levels help to control compounds that cause taste and odor issues by minimizing the presence of iron and manganese and controlling eutrophication by minimizing internal loading of phosphorous.

Water from the reservoir flows by gravity to the WTP through 3000 feet of 36-inch diameter pipe. Two pumps are in place along this line to supply water to the WTP when reservoir levels are too low to be fed by gravity. Chlorine dioxide, hydroxylated ferric-sulfate and calcium hypochlorite are added to the raw water for disinfection and coagulation. The water then flows through a flash mixing unit. The water is mixed using trapezoidal tabs mounted at an acute angle relative to the downstream surface housing.

The mixer has a retention time of approximately 4.9 seconds and 2.45 seconds at design flows of 15 MGD and 30 MGD, respectively.

Water flows from the static mixer to the treatment units. Treatment is accomplished by an upflow adsorption clarifier process. Three clarifier modules are provided. Each module is designed for a flow of 6.0 MGD. Approximately 5,000 cubic feet of high density polyethylene media is present in each of the clarifier modules. The water flows from the clarifiers to the filtration units. Filtration is accomplished by six media filters (two for each clarifier module). The filter media consists of anthracite coal, silica sand and high density sand. Each filter has a surface area of 434.84 square feet and a filtration rate of 4.8 gpm/ft^2.

Water flows from the filter units to a Granular Activated Carbon treatment unit (GAC unit), further clarifying the water. The water then flows toward a 2.0 MG clearwell through a 42-inch water line. The water is chlorinated and fluorinated with the addition of chlorine gas and hydrofluosilicic acid while flowing through the 42-inch water line. The water is stored in the 2.0 MG clearwell until it is pumped into the distribution system by four vertical open lineshaft turbine pumps. Each pump is capable of pumping 4,200 gpm. The design capacity of Spring Hollow WTF is limited to 18.0 MGD based on treatment capacity of the adsorption clarifier modules.

2.3.5 City of Salem

The City of Salem does not own or operate a community water system using a surface water reservoir.

2.3.6 Town of Boones Mill

The Town of Boones Mill does not own or operate a community water system using a surface water reservoir.

2.3.7 Town of Buchanan

The Town of Buchanan does not own or operate a community water system using a surface water reservoir.

2.3.8 Town of Fincastle

The Town of Fincastle does not own or operate a community water system using a surface water reservoir.

2.3.9 Town of Troutville

The Town of Troutville does not own or operate a community water system using a surface water reservoir.

2.3.10 Town of Rocky Mount

The Town of Rocky Mount does not own or operate a community water system using a surface water reservoir.

2.3.11 Town of Vinton

The Town of Vinton does not own or operate a community water system using a surface water reservoir.

2.4 Community Systems Using Stream Intakes[4]

2.4.1 Bedford County

The BCPSA owns and operates one public community water system (High Point WTP) using a stream intake (the Roanoke River arm of Smith Mountain Lake).

Raw water is pumped from the Roanoke River arm of Smith Mountain Lake and flows by gravity to the pumping station, which is equipped with two 15-HP submersible turbine pumps. The raw water flows through a screen upon entering the WTP followed by a series of strainers consisting of four units in parallel with either 40-mesh or 100-mesh screens. Following screening, the water is delivered to the raw water storage tank.

Water from the raw water storage tank is then fed through membrane filter units using a feed pump integral to the membrane filter system. Following filtration, sodium hypochlorite is added and a corrosion inhibitor can be added if necessary before entering the chlorine contact storage tank. High service pumps then deliver the water from the

[4] 9 VAC 25-780-70 D.

chlorine contact storage tank into the distribution system. The two 75-HP centrifugal high service pumps are rated at 845 gpm. Two higher service pumps are provided at the WTP for future expansion. The distribution system consists of a 1.0 MG elevated storage tank.

The membrane filter units are the limiting factor in the production of potable water at this facility. The design capacity for the High Point WTP is 171,000 gpd.

2.4.2 Botetourt County

Botetourt County does not own or operate a community water system using a stream intake.

2.4.3 Franklin County

Franklin County does not own or operate a community water system using a stream intake.

2.4.4 Roanoke County/Roanoke City

The WVWA owns and operates one public community water system using a spring: Crystal Spring WTF.

The system consists of Crystal Spring and a membrane filtration treatment facility. The spring has a safe yield of 3.5 MGD but flows of 4.0 MGD and above have been recorded. Water flows from the concrete spring collection box to the raw water pumping station. The pumping station is equipped with two submersible raw water pumps rated at 3,500 gpm each. The water passes through two 500-micron automatic backwashing strainers to remove sediment.

Water from the spring is filtered by five US Filter/Memcor Model 201M10C filtration units. Each filtration unit consists of 102 individual modules. Each module consists of hollow fiber polypropylene membranes. The design filtration rate of the five-unit system is 4.84 MGD with one unit out of service. Chlorine gas is added to the filtered water for disinfection and fluoride is added to the water by a fluoride saturator. Filtered water flows from the filters into the southern end of the 3.0 MG concrete reservoir. Water flows out of the northern end of the reservoir to the Crystal Spring pumping/booster station. This pumping station serves the south, central and southwest portions of the City of Roanoke. The water is pumped to the Mill Mountain storage tank, with a capacity of 84,000 gallons.

The design capacity for Crystal Spring WTF is limited to the estimated safe yield of 3.5 MGD.

2.4.5 City of Salem

The City of Salem owns and operates one public community water system using a stream intake: City of Salem WTP.

The system consists of an intake on the Roanoke River, three raw water wells and the WTP. The City of Salem has a withdrawal permit to remove 8.0 MGD from the Roanoke River in addition to three raw water wells that produce a combined 2.0 MGD. Well No. 1 is a 15-inch well that was drilled to a depth of 480 feet and cased and grouted to a depth of 103 feet. The yield was estimated at approximately 1,360 gpm. Well No. 2 is a 10-inch well that was drilled to a depth of 490 feet and cased and grouted to a depth of 100 feet. The yield was estimated at approximately 1,091 gpm. Well No. 3 is an 8-inch well and was drilled to a depth of 800 feet and cased and grouted to a depth of 116 feet. The yield was estimated at approximately 240 gpm. The water from all of the wells is combined in a 16-inch water line that connects to the 30-inch river water main before it enters into the operation building.

Raw water from the river intake structures enters the pumping station wet well. Three 50 HP river water pumps are used and each pump is capable of delivering 2,800 gpm. The water is directed toward a pretreatment rapid mix chamber. This chamber provides a detention time of approximately 17 seconds. The water then flows to a flocculation basin that provides an addition detention time of approximately 30 minutes at the design flow of 8.0 MGD. The water flows from the flocculation basin into two detention basins. The detention basins allow an additional 1.5 hours of detention time but when they are operating in parallel, they allow up to 3.0 hours of detention time.

The water then flows into two separate rapid mix chambers that provide a detention time of approximately 19 seconds. From there, the water flows into four flocculation basins which can be operated in series or parallel. Each flocculation basin provides a detention time of approximately 33 minutes. The water flows from the flocculation basins to four sedimentation basins that provide an additional detention time of 4.5 hours. Chemical additions during this pretreatment process include potassium permanganate added ahead of the pretreatment detention basins, carbon added between the pretreatment detention basins and the rapid mix chambers, liquid coagulant added to the pretreatment rapid mix chamber and polymer added to the rapid mix chamber effluent line.

The water then flows toward the four filtration cells. Each filter has a surface area of 435 square feet and a 4.0 gpm per square foot filtration rate at the design flow of 10 MGD. Filter media consists of anthracite coal, filter sand, torpedo sand and a layer of support gravel. Filtered water is collected in a common plenum and discharged into a collection flume. The water is directed from the collection flume and the wetwell toward the clearwells. Chemical additions to the finished water include fluoride in the form of hydrofluosilicic acid and chlorine in the form of chlorine gas.

Filtered water is stored in two concrete clearwells, each with an effective volume of 961,000 gallons. Total storage for the treatment plant and the distribution system storage tanks is approximately 6.25 MG. The design capacity for this facility is limited to 10.0 MGD based on filtration capacity.

2.4.6 Town of Boones Mill

The Town of Boones Mill does not own or operate a community water system using a stream intake.

2.4.7 Town of Buchanan

The Town of Buchanan does not own or operate a community water system using a stream intake.

2.4.8 Town of Fincastle

The Town of Fincastle does not own or operate a community water system using a stream intake.

2.4.9 Town of Troutville

The Town of Troutville does not own or operate a community water system using a stream intake.

2.4.10 Town of Rocky Mount

The Town of Rocky Mount owns and operates one public community water system using a stream intake: Town of Rocky Mount WTP.

The system consists of an intake on the Blackwater River and the WTP. The Blackwater River has a drainage area of approximately 86 square miles above the raw water intakes. Raw water from the river flows by gravity to a wet well at the raw water pump station. Two raw water pumps, each rated at 1,400 gpm, deliver water to the WTP through a 14-inch diameter water line. As the water flows into the WTP, it enters an induced draft aerator. After leaving the aerator, the water enters a flash mix unit with a 40 second detention time. Soda ash, lime, alum fluoride, chlorine, activated carbon, potassium permanganate and polymer are added to the water. The water then flows into three flocculator basins with vertical shaft flocculators. These basins allow for a 40 minute detention time. After leaving the flocculators, the water flows into two settling basins that allow a 6 hour detention time. The water then goes through two rapid rate sand filters. When leaving the filters, soda ash, lime, fluoride and chlorine are added to the water again for disinfection and pH adjustment. The water then flow into a 250,000 gallon clearwell. From there it is pumped out into the distribution system.

Seven steel storage tanks provide storage in the distribution system. The combined storage capacity for the distribution system is 2.4 MG. Based on the WTP capacity, the design capacity for the system is limited to 5,000 ERCs or 2.0 MGD.

2.4.11 Town of Vinton

The Town of Vinton does not own or operate a community water system using a stream intake.

2.5 Amount of Ground or Surface Water Purchased from Water Supply Systems Outside the Geographic Boundaries of the Locality[5]

2.5.1 Bedford County

2.5.1.1 Forest Central Water System

The Forest Central Water System is a public community water system operated by the BCPSA and served by water purchased from the City of Lynchburg. The BCPSA currently has a water purchase contract with the City of Lynchburg. This contract will be in effect for 15 years from July 1, 2007 through June 30, 2022. At the end of year 13, June 30, 2020, each party must notify the other of its intention to terminate or renew the contract at the end of year 15. If the intent is to renew the contract, the contract will automatically be renewed in ten year increments unless the parties provide written notice of their intention to terminate the contract two years prior to the end of the ten year renewal period.

The BCPSA may not sell water to customers within the City of Lynchburg without permission from the City of Lynchburg and vice versa. In addition, the BCPSA may not sell water purchased from the City of Lynchburg to residential customers at an amount that is less than the costs of purchasing water from the City of Lynchburg. The City of Lynchburg reserves the right to restrict BCPSA water usage during drought conditions and other emergencies. Restrictions placed on water sold to the BCPSA will be equivalent to those restrictions placed upon City of Lynchburg customers. Finally, the contract requires the BCPSA to participate in a committee comprising the Utility Directors or their representatives with the City of Lynchburg, Amherst County Service Authority (ACSA), and Campbell County Utilities and Service Authority (CCUSA). The purpose of the committee is to evaluate the feasibility, benefits, and drawbacks of forming a regional water and wastewater authority.

[5] 9 VAC 25-780-70 G.

While the contract between the BCPSA and the City of Lynchburg does not specify a specific or maximum amount that the BCPSA may purchase from the City of Lynchburg, the BCPSA currently purchases approximately 1.2 MGD from the City of Lynchburg for resale to the Forest Central Water System. The water is stored in a 1.2 MG atmospheric-type storage tank.

2.5.1.2 Stewartsville Consecutive

Stewartsville Consecutive is owned and operated by the BCPSA and served by water purchased from the WVWA. This water supply system consists of a 550,000 gallon atmospheric water storage tank and a hypochlorination system to rechlorinate the finished water. The design capacity for the system is limited to 1.0 MGD.

2.5.2 Botetourt County

2.5.2.1 Cloverdale

Cloverdale is a public community water system operated by Botetourt County and is served by water purchased from the Town of Troutville. The Cloverdale system consists of a 500,000 gallon storage tank (Hardee's Tank) and a metered connection with the Town of Troutville. Botetourt County is allotted up to 33,333 gpd through this metered connection.

2.5.2.2 East Park Commerce Center

The East Park Commerce Center also known as the Botetourt Industrial Park is located in the southwestern portion of the County. The East Park Commerce Center is served by a 12-inch water main from the WVWA. Although the East Park Commerce Center is located in Botetourt County, the customers are connected and billed directly from the WVWA system.

2.5.3 Franklin County

2.5.3.1 Franklin County Public Water System

The Franklin County Public Water System is a public community water system owned and operated by WVWA. Franklin County became a member of the WVWA on

November 5, 2009. This community water system includes Phase I, Forest Hills, Commerce Center, and three County Parks. Phase I is served by water purchased from the BCPSA through a metered connection with the High Point WTF. Franklin County is allotted up to 400,000 gpd. The Forest Hills system is served by water purchased from the Town of Rocky Mount through a metered connection. There is no limitation on the maximum daily withdrawal.

The Commerce Center is a public community water system using groundwater and is discussed in section 2.2.3.1. The three County Parks are served by separate groundwater wells and are included in section 2.6.3.

2.5.4 Roanoke County/ Roanoke City

2.5.4.1 Andrew Lewis Place

Andrew Lewis Place is a public community water system owned and operated by the WVWA. The water for this system is purchased from the City of Salem through a metered line. There is no storage facility for this system. The design capacity for this system is based on the City of Salem's system capacity of 10 MGD.

2.5.5 City of Salem

The City of Salem does not purchase water from water supply systems outside the geographic boundaries of the City.

2.5.6 Town of Boones Mill

The Town of Boones Mill does not purchase water from water supply systems outside the geographic boundaries of the Town.

2.5.7 Town of Buchanan

The Town of Buchanan does not purchase water from water supply systems outside the geographic boundaries of the Town.

2.5.8 Town of Fincastle

The Town of Fincastle does not purchase water from water supply systems outside the geographic boundaries of the Town.

2.5.9 Town of Troutville

The Town of Troutville does not purchase water from water supply systems outside the geographic boundaries of the Town.

2.5.10 Town of Rocky Mount

The Town of Rocky Mount does not purchase water from water supply systems outside the geographic boundaries of the Town.

2.5.11 Town of Vinton

The Town of Vinton purchases water from the WVWA primarily for one large industrial customer located in the Town and a small number of residential customers located in eastern Roanoke County.

2.6 Non-Agricultural, Self-Supplied Users of More than 300,000 Gallons per Month of Surface Water[6] and Ground Water[7]

Information on self-supplied, non-agricultural users in the region was generally very limited. Available information was provided by the Virginia Department of Environmental Quality (VDEQ) through their Water Use Database. In addition, information was collected from the Virginia Health Department (VDH) on non-transient, non-community and transient, non-community water users and these users are considered self-supplied users. A map showing self-supplied users in the region is presented as Figure 2.6.

[6] 9 VAC 25-780-70 E.
[7] 9 VAC 25-780-70 F.

Figure 2.6: Map Showing Self-Supplied Users in the Region.

2.6.1 Bedford County

There are 32 known self-supplied, non-agricultural users using greater than 300,000 gallons per month of water in Bedford County. Information on the self-supplied non-agricultural users of greater than 300,000 gallons per month of water in Bedford County is presented in Table 2.6.1.

Table 2.6.1: Known Non-Agricultural, Self-Supplied Users Greater Than 300,000 Gallons per month in Bedford County

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Boxley Materials Co.	Drilled Well and Surface Water	Unknown	Unknown	Unknown	Unknown
Georgia Pacific Corporation	Four Drilled Wells	27,600 gpd	Well No. 1 - 9.0 gpm Well No. 2 - 4.0 gpm Well No. 3 - 2.0 gpm Well No. 4 - 21 gpm	Well No. 1 - 9.0 gpm Well No. 2 - 3.5 gpm Well No. 3 - 2.5 gpm Well No. 4 - 20 gpm	32,000 Gallons
Gunnoe Sausage Company	Drilled Well	Unknown	Unknown	Unknown	Unknown
Ivy Hills Golf Course	Surface Water	Unknown	Unknown	Unknown	Unknown
London Down Golf Course	Surface Water	Unknown	Unknown	Unknown	Unknown
Mariners Landing Golf Course	Surface Water	Unknown	Unknown	Unknown	Unknown
Rainforest Nursery	Surface Water	Unknown	Unknown	Unknown	Unknown
Staunton River High School	Two Drilled Wells	10,000 gpd	Well No. 2 - Unknown Well No. 3 - 14 gpm	Well No. 2 - Unknown Well No. 3 - 18 gpm	5,014 Gallons
Smith Mountain Lake State Park (Picnic Area)	Drilled Well	21,670 gpd	Existing Well - 12 gpm	Existing Well - 9 gpm	21,670 Gallons
Smith Mountain Lake State Park (Boat Launch Area)	Drilled Well	15,840 gpd	21 gpm	11 gpm	3,057 Gallons
Smith Mountain Lake State Park (Primitive Campground)	Drilled Well	9,216 gpd	Well No. 7 - 14 gpm	Well No. 7 - 6.4 gpm	50 Gallons
Smith Mountain Lake State Park (Visitor's Center)	Drilled Well	12,960 gpd	14.5 gpm	9 gpm	2,057 Gallons
Body Camp Elementary School	Two Drilled Wells	300 persons	Well No. 3 - 11.5 gpm Well No. 4 - 19.0 gpm	Well No. 3 -Unknown Well No. 4 - 19 gpm	10,000 Gallons
Big Island Elementary School	Drilled Well	Existing students and staff	Unknown	Unknown	Unknown

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Huddleston Elementary School	Drilled Well	273 persons at school, 1 church	Unknown	12 gpm	400 Gallons
Moneta Elementary School	Drilled Well	330 persons	Unknown	20 gpm	685 Gallons
Otter River Elementary School	Drilled Well	350 persons	Unknown	16.5 gpm	Unknown
Thaxton Elementary School	Drilled Well	275 persons	Unknown	10.0 gpm	400 Gallons
Bedford Moose Lodge	Drilled Well	Unknown	Unknown	Unknown	Unknown
Bedford Restaurant	Drilled Well	52 restaurant seats	Unknown	Unknown	Negligible
Big Island Community	Drilled Well	Unknown	Unknown	Unknown	Unknown
Camp Loman	Three Drilled Wells	320 Dormitory beds, 1 support building	Unknown	Unknown	5,000 Gallons
Camp VA Jaycee	Drilled Well	188 dormitory beds, camp office/cafeteria, residence, other support buildings	Unknown	Unknown	80 Gallons
Lakehaven Marina	Drilled Well	Unknown	Unknown	Unknown	Unknown
Mama's Homecooking	Drilled Well	Unknown	Unknown	Unknown	Unknown
Millstone Tea Room	Drilled Well	Unknown	Unknown	Unknown	Unknown
Mitchell's Point Marina	Drilled Well	4 seat snack bar, 25 camper connection, marina	Unknown	Unknown	28 Gallons
Smith Mountain Lake Moose Lodge	Drilled Well	60 restaurant seats	Unknown	Unknown	Negligible
Tuck Away Campground	Drilled Well	23 camp sites and bathhouse	Unknown	Unknown	Negligible
Waterfront Park	Drilled Well	100 camper connections	Unknown	Unknown	Negligible
White House Corner Store	Drilled Well	25 restaurant seats	Unknown	Unknown	Negligible
White House Restaurant	Drilled Well	130 restaurant seats	Unknown	Unknown	Negligible

2.6.2 Botetourt County

There are eight known self-supplied, non-agricultural users using groundwater in Botetourt County. Information on known self-supplied, non-agricultural users using groundwater in Botetourt County is presented in Table 2.6.2.

Table 2.6.2: Known Non-Agricultural, Self-Supplied Users Using Groundwater in Botetourt County

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Carris Plastics, Inc.	Drilled Well	125 employees	Unknown	10 gpm	667 Gallons
Colonial Elementary School	Drilled Well	395 students and staff	20 gpm	Unknown	2,869 Gallons
Eagle Rock Elementary School	Drilled Well	275 students and staff	Unknown	Unknown	5,159 Gallons
Gala Industries, Inc.	Drilled Well	18,952 gpd	25.5 gpm	Unknown	9,476 Gallons
Mill Creek Child Care	Drilled Well	115 children and staff	20 gpm	Unknown	27 Gallons
Peaks of Otter	Three Drilled Wells	65,600 gpd	Well No. 1 - 30 gpm Well No. 2 - 60 gpm Well No. 3 - 40 gpm	Well No. 1 - 30 gpm Well No. 2 - 22 gpm Well No. 3 - 30 gpm	0.303 MG
Roanoke Cement Company	Drilled Well	230 employees	Unknown	Unknown	25,900 Gallons
Middle Creek Campground	Two Drilled Wells	93 campsites or 4,650 gpd	Unknown	Unknown	Negligible

According to the VDEQ Water Use Database, there are three non-agricultural, self-supplied users using surface water in Botetourt Count: General Shale Brick, which utilizes Glade Creek; Roanoke Cement, which utilizes Catawba Creek; and Columbia Gas Transmission Corporation, which utilizes Mill Creek.

2.6.3 Franklin County

There are 48 known non-agricultural, self-supplied users using groundwater in Franklin County. Information on the known non-agricultural, self-supplied users using groundwater in Franklin County is presented in Table 2.6.3.

Table 2.6.3: Known Non-Agricultural, Self-Supplied Users Using Groundwater in Franklin County.

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Boones Mill Elementary School	Two Drilled Wells	7,200 gpd	Well No. 2 - unknown Well No. 3 - 11 gpm	Well No. 2 - 7gpm Well No. 3 - 13.5 gpm	12,550 Gallons
Bridgewater Plaza	Drilled Well	13 connections	22 gpm	22 gpm	90 Gallons
Burnt Chimney Elementary School	Drilled Well	21,180 gpd	27.5 gpm	28 gpm	7,987 Gallons
Callaway Elementary School	Drilled Well	232 persons	Unknown	Unknown	833 Gallons
Doyle Enterprises, Inc	Drilled Well	50 employees	17 gpm	Unknown	950 Gallons
Dudley Elementary School	Drilled Well	361 persons	25 gpm	20 gpm	1,400 Gallons
Duncan Ford	Drilled Well	Unknown	Unknown	Unknown	Unknown
Glade Hill Elementary School	Drilled Well	5,426 gpd	12.5 gpm	9.5 gpm	866 Gallons
Henry Elementary School	Drilled Well	383 Students, faculty and staff	13 gpm	13 gpm	1,133 Gallons
Lake Center - Springwood Plaza	Drilled Well	24,000 gpd	32 gpm	30 gpm	30,163 Gallons
Plateau Plaza	Drilled Well	Unknown	Unknown	Unknown	Unknown
Shredded Products	Drilled Well	6,400 gpd	22 gpm	18 gpm	18 Gallons
Smith Mountain Childcare and Learning Center	Drilled Well	2,422 gpd	5 gpm	5gpm	22 Gallons
Snow Creek Elementary School	Drilled Well	7,200 gpd	9 gpm	10 gpm	1,333 Gallons
Sontag Elementary School	Drilled Well	6,226 gpd	14 gpm	9.5 gpm	1,666 Gallons
Sunshine Valley School	Drilled Well	800 gpd	1 gpm	4 gpm	492 Gallons
Bay Roc Marina	Drilled Well	75 boat slips and 20 seat restaurant	Unknown	Unknown	102 Gallons
Blue Ridge Campground and Marina	Drilled Well	104 campsites and 77 boat slips	Unknown	Unknown	2,077 Gallons
Booker T. Washington National Monumant Visitors Center	Drilled Well	26 gpm	Unknown	26 gpm	167 Gallons
Carl's Place	Drilled Well	40 seat restaurant, 1 retail business building	Unknown	Unknown	Negligible
Crazyhorse Campground and Marina	Drilled Well	110 campsites, 119 boat slips, 30 restaurant seats	Unknown	Unknown	225 Gallons
Dudley Mart & Restaurant	Drilled Well	67 restaurant seats	Unknown	Unknown	27 Gallons
El Torito	Drilled Well	3,420 gpd	4.75 gpm	9 gpm	40 Gallons

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
EZN Market # 204	Drilled Well	16 seat restaurant/ snack bar, 1 convenience store, 1 maintenance shop	Unknown	Unknown	27 Gallons
Franklin Ford	Drilled Well	7,270 gpd	18.5 gpm	15 gpm	76 Gallons
Franklin Motel	Drilled Well	22 motel rooms	Unknown	Unknown	1,167 Gallons
Franklin Restaurant	Drilled Well	98 restaurant seats	Unknown	Unknown	Negligible
Glade Hill Minute Market	Drilled Well	20,880 gpd	20 gpm	14.5 gpm	15,040 Gallons
Hilltop Diner	Drilled Well	24 restaurant seats, 4 mobile home connections	Unknown	Unknown	39.7 Gallons
La Trattoria	Two Drilled Wells	64 seat restaurant and business	Unknown	Unknown	113 Gallons
Penhook Minute Market	Drilled Well	32 seat restaurant, 1 convenience store	Unknown	Unknown	39.7 Gallons
Philpott Lake - Deer Island	Drilled Well	9,600 gpd	10 gpm	Hand Pump	None
Philpott Lake - Deer Island	Drilled Well	28,800 gpd	30 gpm	Hand Pump	None
Philpott Lake - Horseshoe Point	Drilled Well	11,520 gpd	12 gpm	Unknown	Unknown
Philpott Lake - Horseshoe Point	Drilled Well	4,320 gpd	4.5 gpm	Hand Pump	None
Philpott Lake - Jamison Mill	Drilled Well	6,720 gpd	7 gpm	Hand Pump	None
Philpott Lake - Jamison Mill	Drilled Well	7,680 gpd	8 to 10 gpm	Unknown	250 Gallons
Philpott Lake - Salthouse Branch	Drilled Well	14,400 gpd	15 gpm	Unknown	283.3 Gallons
Philpott Lake - Salthouse Branch	Drilled Well	14,400 gpd	15 gpm	15 gpm	183.3 Gallons
Philpott Lake - Salthouse Branch	Drilled Well	43,200 gpd	45 gpm	Unknown	566.7 Gallons
Philpott Lake - Tailrace Area Comfort Station	Drilled Well	40,320 gpd	51 gpm	28 gpm	133 Gallons
Redwood Express Mart	Drilled Well	32 seat restaurant/ convenience Store	8 gpm	Unknown	15 Gallons
Smart View Picnic Area	Drilled Well	Unknown	Unknown	Unknown	Unknown
Smith Mountain Lake 4-H Education Center	Drilled Well	19,440 gpd	15 gpm	13.5 gpm	40,000 Gallons
The Blackwater Café	Drilled Well	110 restaurant seats	Unknown	Unknown	57.3 Gallons
Westlake Waterfront Inn	Drilled Well	Unknown	Unknown	Unknown	Unknown

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Whistle Stop	Drilled Well	3,520 gpd	16 gpm	14 gpm	40 Gallons
Willow Creek Country Club	Drilled Well	24 restaurant seats/ snack bar seats	Unknown	8 to 12 gpm	Negligible

In addition, according the VDEQ Water Use Database, there are two non-agricultural, self-supplied users using surface water in Franklin County: Waterfront Golf Course and West Lake Golf and Country Club.

2.6.4 Roanoke County

There are 24 known non-agricultural, self-supplied users utilizing groundwater in Roanoke County. There are no known non-agricultural, self-supplied users utilizing surface water in Roanoke County. Information on self-supplied, non-agricultural users using groundwater in Roanoke County is presented in Table 2.6.4.

Table 2.6.4: Known Non-Agricultural, Self-Supplied Users Using Groundwater in Roanoke County.

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Back Creek Elementary School	Drilled Well	300 students and staff	15 gpm	Unknown	1,010 Gallons
Bent Mountain Elementary School	Drilled Well	175 students, staff and a church	15 gpm	Unknown	Unknown
Cave Spring Junior High School	Drilled Well	1,175 students and staff	30 gpm	Unknown	12,666 Gallons
Glenvar Elementary School and High School	Drilled Well	2,000 students and staff	50 gpm	Unknown	20,900 Gallons
Green Valley Elementary School	Drilled Well	500 students and staff	30 gpm	Unknown	13,000 Gallons
Mason's Cove Elementary School	Drilled Well	385 students and staff	25 gpm	Unknown	9,333 Gallons
Mount Pleasant Elementary School	Drilled Well	540 students and staff	95 gpm	16.5 gpm	1,333 Gallons
Northside High School	Drilled Well	887 students and staff	30 gpm	Unknown	13,167 Gallons
Northside Middle School	Drilled Well	820 students and staff	45 gpm	Unknown	15,200 Gallons
Planet Kids	Drilled Well	200 children and staff	Unknown	Unknown	Negligible
Rish Equipment Company	Drilled Well	79,200 gpd	55 gpm	61 gpm	500 Gallons

Water System	Source	Design Capacity	Well Yield (Approximate)	Well Pump Capacity	Effective Storage Capacity
Back Creek Grill	Drilled Well	Unknown	Unknown	Unknown	Unknown
Camp Roanoke	Drilled Well	344 campers and staff	10 gpm	Unknown	10,079 Gallons
Dark Hollow - Lower	Drilled Well	40 persons per day	Unknown	Unknown	Negligible
Dark Hollow - Upper	Drilled Well	60 persons per day	Unknown	Unknown	Negligible
Explore Park	Drilled Well	15,200 gpd	27.5 gpm	19 gpm	0.107 MG
Green Hill Park	Drilled Well	3,332 gpd	79 gpm	50 gpm	1,663 Gallons
Hollow Creek Swim Club	Drilled Well	200 visitors per day	Unknown	Unknown	Negligible
Homeplace	Drilled Well	500 persons per day	Unknown	Unknown	Negligible
Moose Lodge No. 284	Two Drilled Wells	100 persons per day	Unknown	Unknown	8,120 Gallons
Rising Star Sports and Adventure Camp	Drilled Well	300 visitors per day	27 gpm	Unknown	Negligible
Skate Center of Roanoke Valley	Drilled Well	150 persons per day	Unknown	Unknown	Negligible
Skyline Motel	Drilled Well	2,470 gpd	Unknown	Unknown	Negligible
Spring Run Swim Club	Drilled Well	100 visitors per day	Unknown	Unknown	Negligible

2.6.5 City of Roanoke

According the VDEQ Water Use Database, there are eight known non-agricultural, self-supplied users using greater than 300,000 gallons per month of surface or groundwater within the City of Roanoke. The following are non-agricultural, self-supplied users using greater than 300,000 gallons per month of surface water: Hanging Rock Golf Course, Norfolk Southern, and Koppers Industries Inc. – Glenvar Plant. Koppers Industries Inc. – Glenvar Plant also utilizes groundwater as a water source. The following are non-agricultural, self-supplied users using greater than 300,000 gallons per month of groundwater: Associated Asphalt Roanoke, Blue Hills Golf Corporation, CEI Roanoke, Inc. – Elizabeth Arden, and KSL Fairways, Inc.

2.6.6 City of Salem

According to the VDEQ Water Use Database, there are two known non-agricultural, self-supplied users within the City of Salem: Hidden Valley Country Club and Novozymes Biological Inc., both of which utilize groundwater wells as a water source.

2.6.7 Town of Boones Mill

There are no known non-agricultural, self supplied users within the Town of Boones Mill service area.

2.6.8 Town of Buchanan

There are no known non-agricultural, self supplied users within the Town of Buchanan service area.

2.6.9 Town of Fincastle

There are no known non-agricultural, self supplied users within the Town of Fincastle service area.

2.6.10 Town of Troutville

There are no known non-agricultural, self supplied users within the Town of Troutville service area.

2.6.11 Town of Rocky Mount

There are no known non-agricultural, self supplied users within the Town of Rocky Mount service area.

2.6.12 Town of Vinton

There are no known non-agricultural, self supplied users within the Town of Vinton service area.

2.7 Amount of Water Available to be Purchased from Outside each Jurisdiction from any Source with the Capacity to Withdraw more than 300,000 Gallons per Month of Surface and Ground Water[8]

2.7.1 Bedford County

The BCPSA currently purchases water from the WVWA in Roanoke County to provide water to the Stewartsville area located in the western portion of the county. It may be feasible for the BCPSA to purchase additional water from the WVWA in the future.

In addition, the BCPSA currently purchases water from the City of Lynchburg in order to provide water to the Forest and New London area located in eastern portion of the county. The current contract between the BCPSA and City of Lynchburg does not specify a maximum amount of water that may be purchased by the BCPSA from the City of Lynchburg. Therefore, it may be feasible for the BCPSA to purchase additional water from the City of Lynchburg in the future.

2.7.2 Botetourt County

The WVWA may be a feasible source of water available to Botetourt County in the future.

2.7.3 Franklin County

Franklin County currently purchases water from the BCPSA in Bedford County through a metered connection with the High Point Water Treatment Plant to provide water to the Phase I water system. It may be feasible for Franklin County to purchase additional water from the BCPSA in the future.

In addition, Franklin County currently purchases water from the Town of Rocky Mount through a metered connection to serve the Forest Hills water system. The current contract between Franklin County and the Town of Rocky Mount does not specify a specific maximum amount of water to be purchased by Franklin County from the Town of Rocky Mount. Therefore, it may be feasible for Franklin County to purchase additional water from the Town of Rocky Mount in the future.

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[8] 9 VAC 25-780-70 H.

Finally, the WVWA may be feasible for Franklin County to purchase water from in the future.

2.7.4 Roanoke County

The WVWA owns and operates the community water systems in Roanoke County. The WVWA currently sells water to the BCPSA and the City of Salem; however, the BCPSA and the City of Salem may also be feasible sources of water available to the WVWA and Roanoke County.

In addition, Franklin County and the Town of Vinton may be feasible sources of water available to the WVWA and Roanoke County.

2.7.5 City of Salem

The City of Salem currently purchases water from the WVWA and the WVWA will continue to be a feasible source of water available to the City of Salem to purchase water from.

2.7.6 City of Roanoke

The WVWA owns and operates the community water systems in the City of Roanoke. The WVWA currently sells water to the BCPSA and the City of Salem; however, the BCPSA and the City of Salem may also be feasible sources of water available to the WVWA and the City of Roanoke.

In addition, Franklin County and the Town of Vinton may be feasible sources of water available to the WVWA and the City of Roanoke in the future.

2.7.7 Town of Boones Mill

The WVWA and the Town of Rocky Mount may be a feasible sources of water available to the Town of Boones Mill.

2.7.8 Town of Buchanan

There are currently no known significant or feasible sources of water available to be purchased from outside the Town of Buchanan limits.

2.7.9 Town of Fincastle

There are currently no known significant or feasible sources of water available to be purchased from outside the Town of Fincastle limits.

2.7.10 Town of Rocky Mount

There are currently no known significant or feasible sources of water available to be purchased from outside the Town of Rocky Mount limits.

2.7.11 Town of Troutville

The WVWA may be a feasible source of water available to the Town of Troutville.

2.7.12 Town of Vinton

The WVWA may be a feasible source of water available to the Town of Vinton.

2.8 Agricultural Users, Who Utilize More than 300,000 Gallons per Month, Estimate of Total Agricultural Usage by Source, Irrigation vs. Non-Irrigation and Source[9]

The Virginia Cooperative Extension (VCE) agents for each county within the region were initially contacted in order to collect available information on agricultural users utilizing more than 300,000 gallons of groundwater or surface water. The VCE agents were not cooperative and would not provide available information. In addition, water usage records from the VDEQ Water Use Database were reviewed; however, no data concerning individual agricultural users for livestock or crops was available. Therefore, agricultural information was collected from the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). General agricultural information for each county, including number of farms, total farm land acreage, and average size of farm, was collected from the 2002 Census of Agriculture and is discussed below. In addition, information on livestock (e.g., number of head of cattle) and crops (e.g., type of crop planted, total acres harvested) for the region was available for 2002. Please note that the USDA 2002 Census of Agriculture and NASS does not provide information for cities and towns. These sources do not provide specific information on

[9] 9 VAC 25-780-70 I.

agricultural water use within the region; however, the sources do provide information for estimating agricultural water use in the region. In the event specific data regarding agricultural water use in the region becomes available, the Plan should be updated.

2.8.1 Bedford County

According to the 2002 Census of Agriculture, there are approximately 1,289 farms in Bedford County, which use approximately 199,244 acres of land. The average size of the farms in Bedford County is approximately 155 acres.

Table 2.8.1A: Type and amount of livestock in Bedford County.

Type of Livestock	# in 2002	Number of Farms
Beef Cattle & Calves	23,500	857
Milk Cows	1,838	26
Hogs & Pigs	1,461	14
Sheep & Lambs	343	21
Poultry Layers	1,217	57
Poultry Broilers	1,750	5
Horses	2,104	0
Goats	919	0

Table 2.8.1B: Type and amount of crops planted and harvested in Bedford County.

Type of Crop	Acres in 2002	Number of Farms
Corn for Grain	746	15
Corn for Silage	2,574	49
Forage	48,146	913
Wheat for Grain	441	11
Oats for Grain	103	9
Barley for Grain	386	11
Cotton	0	0
Soybean	0	0
Tobacco	32	6
Vegetables	15	15
Potatoes	3	3
Unknown	676	57

In addition, Duis Nursery and Hawkins Brother Farm were identified in the VDEQ Water Use Database as self-supplied agricultural users of greater than 300,000 gallons per month. Duis Nursery is served by groundwater wells; however, no other information was available. No information for Hawkins Brother Farm was available.

2.8.2 Botetourt County

According to the 2002 Census of Agriculture, there are approximately 610 farms in Botetourt County, which use approximately 97,091 acres of land. The average size of the farms in Botetourt County is approximately 159 acres.

Table 2.8.2A: Type and amount of livestock in Botetourt County.

Type of Livestock	# in 2002	Number of Farms
Beef Cattle & Calves	10,068	353
Milk Cows	1,295	29
Hogs & Pigs	333	9
Sheep & Lambs	690	14
Poultry Layers	887	21
Poultry Broilers	Unknown	Unknown
Horses	1,064	Unknown
Goats	Unknown	Unknown
Bee Colonies	Unknown	Unknown

Table 2.8.2B: Type and amount of crops in Botetourt County.

Type of Crop	Acres in 2002	Number of Farms
Corn for Grain	1,349	19
Corn for Silage	1,557	30
Forage	20,301	421
Wheat for Grain	81	4
Oats for Grain	Unknown	Unknown
Barley for Grain	Unknown	2
Cotton	Unknown	Unknown
Soybean	3	Unknown
Tobacco	Unknown	Unknown
Vegetables	Unknown	Unknown
Potatoes	Unknown	Unknown
Unknown	253	24

2.8.3 Franklin County

According to the 2002 Census of Agriculture, there are approximately 1,012 farms in Franklin County, which use approximately 172,539 acres of land. The average size of the farms in Franklin County is approximately 170 acres.

Table 2.8.3A: Type and amount of livestock in Franklin County.

Type of Livestock	# in 2002	Number of Farms
Beef Cattle & Calves	14,844	615
Milk Cows	8,879	82
Hogs & Pigs	437	16
Sheep & Lambs	Unknown	5
Poultry Layers	988	32
Poultry Broilers	108	5
Horses	881	Unknown
Goats	Unknown	Unknown
Bee Colonies	350	Unknown

Table 2.8.3B: Type and amount of crops in Franklin County.

Type of Crop	Acres in 2002	Number of Farms
Corn for Grain	2,674	52
Corn for Silage	10,183	105
Forage	35,033	714
Wheat for Grain	641	35
Oats for Grain	76	4
Barley for Grain	105	6
Cotton	Unknown	Unknown
Soybean	564	10
Tobacco	799	74
Vegetables	36	19
Potatoes	Unknown	3
Unknown	1,126	88

2.8.4 Roanoke County

According to the 2002 Census of Agriculture, there are approximately 342 farms in Roanoke County, which use approximately 30,914 acres of land. The average size of the farms in Roanoke County is approximately 90 acres.

Table 2.8.4A: Type and amount of livestock in Roanoke County.

Type of Livestock	# in 2002	Number of Farms
Beef Cattle & Calves	2,276	155
Milk Cows	99	5
Hogs & Pigs	3	6
Sheep & Lambs	111	5
Poultry Layers	251	8
Poultry Broilers	Unknown	Unknown
Horses	677	Unknown
Goats	65	Unknown
Bee Colonies	Unknown	Unknown

Table 2.8.4B: Type and amount of crops in Roanoke County.

Type of Crop	Acres in 2002	Number of Farms
Corn for Grain	Unknown	1
Corn for Silage	239	7
Forage	5,054	197
Wheat for Grain	Unknown	1
Oats for Grain	Unknown	Unknown
Barley for Grain	Unknown	Unknown
Cotton	Unknown	Unknown
Soybean	Unknown	Unknown
Tobacco	9	3
Vegetables	128	21
Potatoes	56	6
Unknown	92	18

2.8.5 City of Salem

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the City of Salem; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the City of Salem.

2.8.6 City of Roanoke

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the City of Roanoke; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the City of Roanoke.

2.8.7 Town of Boones Mill

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Boones Mill; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Boones Mill.

2.8.8 Town of Buchanan

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Buchanan; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Buchanan.

2.8.9 Town of Fincastle

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Fincastle; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Fincastle.

2.8.10 Town of Rocky Mount

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Rocky Mount; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Rocky Mount.

2.8.11 Town of Troutville

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Troutville; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Troutville.

2.8.12 Town of Vinton

Agricultural information from the USDA 2002 Census of Agriculture and NASS was not available for the Town of Vinton; however, there are no known self-supplied, agricultural users utilizing more than 300,000 gallons per month of groundwater or surface water in the Town of Vinton.

2.9 Residences and Businesses that are Self-Supplied and Individual Wells Withdrawing less than 300,000 Gallons per Month[10]

To estimate the residences and businesses that are self-supplied and served by individual groundwater wells withdrawing less than 300,000 gallons per month, the population served by both public and private community water systems was determined. Population served by public community water systems was provided by each jurisdiction and is based on 2006 data. Population served by private community water systems was provided by VDH. The total population for each jurisdiction was provided by the 2000 US Census Bureau.

A summary of the population served by individual wells by jurisdiction is included in Table 2.9. The population served by individual wells was estimated by subtracting the population served by public and private community water systems from the total

[10] 9 VAC 25-780-70 J.

population. It is important to note that the total county populations do not include the towns within the respective county. In addition, the City of Salem and many of the towns serve areas in their respective county that are outside the city/town limits. The population served by the respective public community water system outside the city/town limits and in the respective county is included in the 'Population Served by Public CWS' for the respective county. For example, the total population for the Town of Vinton in 2000 was approximately 7,782 people. The Town of Vinton public community water system serves approximately 13,000 people. The additional 5,218 people served by the Town of Vinton public community water system are located in the eastern portion of Roanoke County and were included in the 'Population Served by Public CWS' for Roanoke County in Table 2.9.

Table 2.9: Estimated Population Served by Individual Residential Wells by Jurisdiction.

Jurisdiction	Total Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells
Bedford County	60,371	17,993	3,742	38,636
Botetourt County*	28,472	4,780	9,049	14,643
Franklin County*	42,935	4,832	4,961	33,349
Roanoke County*	77,996	62,332	1,113	14,551
City of Roanoke	94,911	94,911	0	0
City of Salem**	24,747	24,682	65	0
Town of Boones Mill**	285	285	0	0
Town of Buchanan	1,233	1,230	0	3
Town of Fincastle**	359	359	0	0
Town of Rocky Mount**	4,066	4,066	0	0
Town of Troutville**	432	432	0	0
Town of Vinton**	7,782	7,782	0	0
Total	343,589	223,684	18,865	101,179
* Total county population does not include the towns within the respective county.				
**City/Towns serve areas in respective county outside the city/town limits. The population served by the respective public CWS is included in the 'Population Served by Public CWS' for the respective county.				

2.10 Summary of Findings and Recommendations from Source Water Assessment Plans and Wellhead Protection Plans[11]

2.10.1 Bedford County

As part of the zoning ordinance for Bedford County, the County has included a Wellhead Protection Overlay District. The Wellhead Protection Overlay District is included as Section 30-76 in Article III – District Regulations. The purpose of Wellhead Protection (WHP) is to prevent contamination of public wells, public wellfields, and other groundwater resources that are used as sources of public drinking water. This district is designed to promote the health, safety, and general welfare of the community by protecting the groundwater supply within the county. The wellhead protection overlay district includes specifications on use of agricultural and household chemicals, uses permitted in the WHP overlay district, and uses prohibited within the WHP overlay district. A copy of the Wellhead Protection Overlay District is included in Appendix C.

2.10.2 Botetourt County

There are no SWAPs or Wellhead Protection Plans for the Botetourt County public community water systems (Cloverdale, Glen Wilton, Greenfield, and Griffith Park) at this time.

There are no SWAPs or Wellhead Protection Plans for the following private community water systems in Botetourt County: Apple Tree, Ashley Plantation, Bethel Ridge, British Woods, Brookfield, Dal-Nita Hills, Daleville, Keswick Farms, Mount Joy Mobile Village, Mountain Crest, Oakwood/Oakcrest Forest/Parkview, Santillane, Stratford Place, White Oaks Estates, and Williamsburg Court.

The following private community water systems in Botetourt County have a SWAP completed by VDH in 2002: Blue Ridge Community, Blue Ridge Heights, Botetourt Forest, Cave Creek Assisted Living Facility, Cedar Ridge, Dalecourt, Eagle Rock, Forest Lake, Heatherstone Subdivision, Hollins Mobile Home Park, Rainbow Forest, Sommersby, Tinkerview Gardens, and Willowbrook Mobile Home Park.

[11] 9 VAC 25-780-70 K.

The Virginia Department of Health (VDH) completed a SWAP for the Blue Ridge Community water system in Botetourt County. The SWAP noted that the wells are highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area. The plan recommended the use of best management practices in these areas. A copy of the SWAP for the Blue Ridge Community water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Blue Ridge Heights water system in Botetourt County. The SWAP noted that the three groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential conduits to groundwater in Zone 1 or Zone 2 of the assessment area. A copy of the SWAP for the Blue Ridge Heights water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Botetourt Forest water system in Botetourt County. The SWAP noted that the well is highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential conduits to groundwater in Zone 1 or Zone 2 of the assessment area. The plan recommended the use of best management practices in these areas and documented potential sources of contamination. A copy of the SWAP for the Botetourt Forest water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Cave Creek Adult Home water system in Botetourt County. The SWAP noted that the well is highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area. A copy of the SWAP for the Cave Creek Adult Home water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Cedar Ridge water system in Botetourt County. The SWAP noted that the two groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential conduits to groundwater in Zone 1 or Zone 2 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Cedar Ridge water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Dale Court water system in Botetourt County. The SWAP noted that the well is highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Dale Court water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Eagle Rock water system in Botetourt County. The SWAP noted that the two groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential conduits to groundwater in Zone 1 or Zone 2 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Eagle Rock water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Forest Lake water system in Botetourt County. The SWAP noted that the two springs are highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area and/or potential sources of contamination in Zone 1 or Zone 2 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Forest Lake water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Heatherstone water system in Botetourt County. The SWAP noted that the two groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential sources of contamination in Zone 1 or Zone 2 of the assessment area. The plan recommended the use of best management practices in these areas and documented potential sources of contamination. A copy of the SWAP for the Heatherstone water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Hollins Mobile Home Park water system in Botetourt County. The SWAP noted that the well is highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area and potential sources of contamination in Zone 1 or Zone 2 of the assessment area. The plan documented potential land use activities of concern, potential conduits to groundwater, and potential sources of contamination. A copy of the SWAP for the Hollins Mobile Home Park water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Rainbow Forest water system in Botetourt County. The SWAP noted that the four groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Rainbow Forest water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Sommersby water system in Botetourt County. The SWAP noted that the two groundwater wells are highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area and potential sources of contamination in Zone 1 or Zone 2 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Sommersby water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Tinkerview Gardens water system in Botetourt County. The SWAP noted that Well 2 is highly susceptible to contamination, based on surrounding land use activities of concern in Zone 1 of the assessment area, and Well 3 is moderately susceptible to contamination. The plan documented land use activities of concern and potential sources of contamination for

Well 2 and noted that no land use activities of concern, potential sources of contamination, or potential conduits to groundwater are known to exist in the assessment area for Well 3. A copy of the SWAP for the Tinkerview Gardens water system is included in Appendix C.

The Virginia Department of Health (VDH) completed a SWAP for the Willowbrook Mobile Home Park water system in Botetourt County. The SWAP noted that the well is highly susceptible to contamination, based on surrounding land use activities of concern and potential conduits to groundwater in Zone 1 of the assessment area and potential sources of contamination in Zone 1 or Zone 2 of the assessment area. The plan documented land use activities of concern, potential sources of contamination, and potential conduits to groundwater. A copy of the SWAP for the Willowbrook Mobile Home Park water system is included in Appendix C.

2.10.3 Franklin County

Information on SWAPs or Wellhead Protection Plans for Franklin County is not available at this time.

2.10.4 Roanoke County

Information on SWAPs or Wellhead Protection Plans for Roanoke County is not available at this time.

2.10.5 City of Roanoke

Draper Aden Associates completed a SWAP for Crystal Spring located in the City of Roanoke in February 2001. The SWAP noted that Crystal Spring is considered highly susceptible to contamination, based on one land use activity of concern was identified in Zone 1 of the assessment area (Carilion Roanoke Memorial Hospital) and various potential sources of contamination were identified in Zone 2 of the assessment area. In addition, Crystal Spring has been classified by VDH as directly under the influence of surface water; therefore, the source is considered sensitive. The designation does not mean that the source water has been impacted or that it will be impacted in the future. It does mean that if there is a release of pollutants in the source water assessment area, the source water could be impacted. A copy of the SWAP for Crystal Spring is included in Appendix C.

Draper Aden Associates completed a SWAP for Carvins Cove located in the City of Roanoke in February 2001. The source water assessment area includes the Carvins Cove drainage area, as well as portions of the Catawba Creek and Tinker Creek drainage areas which are used to supplement the City's water supply. The assessment area was defined with Zone 1 the watershed boundary, within a 5-mile radius of the water intake, and Zone 2 as the remainder of the watershed outside the 5-mile radius. The following land use activities of concern and potential sources of contamination (PSC) were identified in Zones 1 and 2:

- agricultural sites with established Best Management Practices in Zones 1 and 2;
- a Norfolk Southern rail spur in Zones 1 and 2;
- a 30,000-gallon above-ground storage tank at Catawba Hospital in Zone 2; and
- a sanitary wastewater treatment plant discharge at Catawba Hospital in Zone 2.

Based on the nature of surface water resources and the presence of these land use activities of concern and potential sources of contamination, the Carvins Cove Reservoir is considered highly susceptible to contamination. The designation does not mean that the source water has been impacted or that it will be impacted in the future. It does mean that if there is a release of pollutants in the source water assessment area, the source water could be impacted.

Draper Aden Associates completed a SWAP for Falling Creek Reservoir located in the City of Roanoke in February 2001. The source water assessment area includes the Falling Creek drainage area, as well as the Beaver Dam Reservoir drainage area as water from Beaver Dam flow into Falling Creek. The assessment area was defined with Zone 1 the watershed boundary, within a 5-mile radius of the water intake, and Zone 2 as the remainder of the watershed outside the 5-mile radius. For Falling Creek the entire watershed is within the 5-mile radius, so Zone 1 comprises the assessment area. No land use activities of concern or potential sources of contamination were identified in Zone 1. Based on the nature of surface water resources and the absence of land use activities of concern and potential sources of contamination, the Falling Creek Reservoir is considered moderately susceptible to contamination. Because the source water is a surface water body it is inherently susceptible to a release of contaminants; however, no potential sources of contamination currently exist within the assessment area.

2.10.6 City of Salem

Information on SWAPs or Wellhead Protection Plans for the City of Salem is not available at this time.

2.10.7 Town of Boones Mill

Information on SWAPs or Wellhead Protection Plans for the Town of Boones Mill is not available at this time.

2.10.8 Town of Buchanan

Information on SWAPs or Wellhead Protection Plans for the Town of Buchanan is not available at this time.

2.10.9 Town of Fincastle

Information on SWAPs or Wellhead Protection Plans for the Town of Fincastle is not available at this time.

2.10.10 Town of Rocky Mount

A SWAP was prepared for the Town of Rocky Mount by the Virginia Rural Water Association in December 2005. A copy of the SWAP for the Town of Rocky Mount is included in Appendix C.

2.10.11 Town of Troutville

Information on SWAPs or Wellhead Protection Plans for the Town of Troutville is not available at this time.

2.10.12 Town of Vinton

Information on SWAPs or Wellhead Protection Plans for the Town of Vinton is not available at this time.

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3.0 EXISTING WATER USE INFORMATION

3.1 Community Water Systems

3.1.1 Population[1]

Based on the 2000 Census, the total population of the region was estimated at 343,589. Table 3.1.1 presents the 2000 Census population information for each locality within the region. Please note that the population information for each county does not include the cities and towns within the respective county. A map showing the population density for the region is included as Figure 3.1.1A. In addition, a map showing the household density for the region is included as Figure 3.1.1B.

Table 3.1.1: Summary of Total Population in Region Based on 2000 Census

Jurisdiction	Total Population
Bedford County	60,371
Botetourt County	28,472
Franklin County	42,935
Roanoke County	77,996
City of Roanoke	94,911
City of Salem	24,747
Town of Boones Mill	285
Town of Buchanan	1,233
Town of Fincastle	359
Town of Rocky Mount	4,066
Town of Troutville	432
Town of Vinton	7,782
Total	343,589

[1] 9 VAC 25-780-80 B.1.

Figure 3.1.1A: Map Showing the Population Density for the Region.

Figure 3.1.1B: Map Showing the Household Density for the Region.

3.2 Bedford County

3.2.1 Public Community Water Systems

The BCPSA owns and operates the public community water systems in Bedford County. The BCPSA consists of twelve community water systems using groundwater and three community water systems using surface water. The BCPSA serves approximately 17,993 people with approximately 7,768 known connections. Table 3.2.1A summarizes the available population and connection information for the public community water systems owned and operated by the BCPSA.

Table 3.2.1A: Summary of Public Community Water Systems in Bedford County

Water System Name	Owner	Source	Population Served	Number of Connections
Forest and New London Area	BCPSA	Purchase	15,666	6,581
Forty Acres Subdivision	BCPSA	Groundwater	90	36
Gross Point Subdivision	BCPSA	Groundwater	255	100
High Point	BCPSA	Surface	618	483
Hillcrest Subdivision	BCPSA	Groundwater	182	52
Lake Estates	BCPSA	Groundwater	235	96
Meadow Run MHP	BCPSA	Groundwater	34	Not Available
Mountain View Shores	BCPSA	Groundwater	460	186
Stallion Run/Quesenberry	BCPSA	Groundwater	35	35
Stewartsville Consecutive	BCPSA	Purchase	294	85
Valley Mills Crossing	BCPSA	Groundwater	54	27
WoodHaven Nursing Home	BCPSA	Groundwater	70	1
Total			17,993	7,682

Table 3.2.1B summarizes water withdrawal information for the public community water systems operated by the BCPSA. The total average daily withdrawal for the BCPSA systems is approximately 1.65 MGD with a maximum daily withdrawal of approximately 1.98 MGD, assuming a peak factor of 1.2.

Table 3.2.1B: Summary of Water Withdrawal Amounts for Public CWS in Bedford County

Water System Name	Owner	Source	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
Forest and New London Area	BCPSA	Purchase	Not Available	Not Available
Forty Acres Subdivision	BCPSA	Groundwater	0.005	0.006
Gross Point Subdivision	BCPSA	Groundwater	0.014	0.017
High Point	BCPSA	Purchase	0.307	0.369
Hillcrest Subdivision	BCPSA	Groundwater	0.009	0.010
Lake Estates	BCPSA	Groundwater	0.012	0.015
Meadow Run MHP	BCPSA	Groundwater	Not Available	Not Available
Mountain View Shores	BCPSA	Groundwater	0.032	0.039
Stallion Run/Quesenberry	BCPSA	Groundwater	Not Available	Not Available
Stewartsville Area	BCPSA	Purchase	Not Available	Not Available
Valley Mills Crossing	BCPSA	Groundwater	0.0012	0.0014
WoodHaven Nursing Home	BCPSA	Groundwater	Not Available	Not Available

Available water use information for the BCPSA community water systems is provided in Table 3.2.1C. The total average monthly usage for the BCPSA is approximately 50.13 MG with an annual average water usage information of approximately 601.56 MG.

Table 3.2.1C: Summary of Water Use Information for Public CWS in Bedford County

Water System Name	Owner	Source	Average Monthly (MG)	Annual Average (MG)
Forest and New London Area	BCPSA	Purchase	Not Available	Not Available
Forty Acres Subdivision	BCPSA	Groundwater	0.141	1.7
Gross Point Subdivision	BCPSA	Groundwater	0.283	3.39
High Point	BCPSA	Purchase	4.31	51.73
Hillcrest Subdivision	BCPSA	Groundwater	0.276	3.32
Lake Estates	BCPSA	Groundwater	1.27	15.3
Meadow Run MHP	BCPSA	Groundwater	Not Available	Not Available
Mountain View Shores	BCPSA	Groundwater	0.51	6.12
Stallion Run/Quesenberry	BCPSA	Groundwater	Not Available	Not Available
Stewartsville Area	BCPSA	Purchase	0.20	2.41
Valley Mills Crossing	BCPSA	Groundwater	0.037	0.44
WoodHaven Nursing Home	BCPSA	Groundwater	Not Available	Not Available

The estimated water demand for the BCPSA disaggregated into categories of use is provided in Table 3.2.1D.

Table 3.2.1D: Estimated Monthly Water Demand Disaggregated into Categories of Use for the BCPSA

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-water (MG)	Sales (MG)	Other (MG)	Total (MG)
BCPSA	36.98	1.95	0.91	0.00	1.50	4.86	1.50	2.43	50.13

* Water use information was provided by the BCPSA and/or DEQ and is based on data reported during calendar year 2006.

3.2.1.1 Private Community Water Systems

There are 17 known private community water systems in Bedford County. All of the private community water systems in Bedford County rely on groundwater except the Eagle Eyrie Baptist Conference Center, which relies on a surface water reservoir. Table 3.2.1.1 summarizes population and connection information available for the private community water systems in Bedford County. The estimated annual average water use for private community water systems is also provided in Table 3.2.1.1.

The estimated annual water use for the private community water systems in Bedford County is approximately 188.94 MG. The annual average water use for Eagle Eyrie Baptist Conference Center was estimated based on the average daily design capacity for the system. The annual average water use for Big Island, Cedar Hills MHP, Harbor Ridge Subdivision, Hardy Road MHP Section I, Hardy Road MHP Section II, Virginia Ridge Subdivision, and Paradise Point Estates was estimated assuming 75 gpd per person. The annual average water use for Ramsey's MHP, Harbor Heights Subdivision, and Montvale Water Company, Inc. was estimated assuming 2.52 persons per connection at 75 gpd per person. Finally, the annual average water use for Mariners Landing Subdivision, Timber Ridge Subdivision, Twin Oaks MHP, and Waterways Subdivision was provided by VDEQ Water Use Database.

Table 3.2.1.1: Summary of Private Community Water Systems in Bedford County

Water System Name	Owner	Source	Population Served	Number of Connections	Annual Average (MG)
Big Island: Main	Not Available	Groundwater	324	1	8.88
Cedar Hills MHP	James Perkins	Groundwater	60	33	1.64
Cherry Hill Estates	Cherry Hill Water Co.	Groundwater	Unknown	49	3.38
Eagle Eyrie Baptist Conference Center	Virginia Baptist General Board Dept. of Assemblies	Surface	1,000	45	58.44
Ramsey's MHP	Mr. & Mrs. Ramsey	Groundwater	100	50	3.45
Harbour Heights Subdivision	Smith Mountain Lake Development Corporation	Groundwater	115	40	2.76
Harbor Ridge Subdivision	James L. Trinkle	Groundwater	40	26	1.10
Hardy Road MHP, Section I	D.J. Cooper	Groundwater	60	42	1.64
Hardy Road MHP, Section II	D.J. Cooper	Groundwater	260	88	7.12
Mariners Landing Subdivision	J.W. Development	Groundwater	430	49	42.95
Montvale	Montvale Water Company Inc.	Groundwater	725	268	18.50
Paradise Point Estates	Paradise Point Estates	Groundwater	60	25	1.64
Timber Ridge Subdivision	Aqua Va - Div of Aqua America	Groundwater	108	27	7.60
Turner Stone Park (Formerly Peaksview MHP)	James E. Owen	Groundwater	175	63	4.79
Twin Oaks MHP	Not Available	Groundwater	50	15	5.84
Virginia Ridge Subdivision	Virginia Ridge Water Co.	Groundwater	200	53	5.48
Water Subdivision	Waterways Subdivision	Groundwater	150	73	13.73
Total			3,857	947	188.94

3.2.2 Botetourt County

3.2.2.1 Public Community Water Systems

Botetourt County owns and operates nine public community water systems within the County that utilize groundwater or purchase water from the Town of Troutville. Botetourt County serves approximately 4,119 people with approximately 1,095 known connections. Table 3.2.2.1A summarizes available data for population served and number of connections for each public community water system in Botetourt County.

Table 3.2.2.1A: Summary of Public Community Water Systems in Botetourt County.

Water System Name	Owner	Source	Population Served	Number of Connections
Cloverdale/Vista Park	Botetourt County	Groundwater/ Town of Troutville	448	137
Glen Wilton	Botetourt County	Groundwater	150	75
Greenfield	Botetourt County	Groundwater	1,477	442
Griffith Park	Botetourt County	Groundwater	100	25
Cedar Ridge	Botetourt County	Groundwater	228	73
Forest Lake	Botetourt County	Groundwater	332	137
Tinkerview Gardens	Botetourt County	Groundwater	804	206
Wetherwood	Botetourt County	Groundwater	Unknown	Unknown
Williamsburg Court	Botetourt County	Groundwater	580	Unknown

Table 3.2.2.1B summarizes water withdrawal information for the public community water systems in Botetourt County. The total average daily withdrawal for the public community systems in Botetourt County is approximately 0.42 MGD with a maximum daily withdrawal of approximately 0.50 MGD, assuming a peak factor of 1.2.

Table 3.2.2.1B: Summary of Water Withdrawal Amounts for the Public Community Water Systems in Botetourt County.

Water System Name	Owner	Source	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
Cloverdale/Vista Park	Botetourt County	Groundwater/ Town of Troutville	0.06	0.07
Glen Wilton	Botetourt County	Groundwater	0.01	0.01
Greenfield	Botetourt County	Groundwater	0.12	0.15
Griffith Park	Botetourt County	Groundwater	0.01	0.01
Cedar Ridge	Botetourt County	Groundwater	0.02	0.03

Water System Name	Owner	Source	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
Forest Lake	Botetourt County	Groundwater	0.09	0.11
Tinkerview Gardens	Botetourt County	Groundwater	0.04	0.04
Wetherwood	Botetourt County	Groundwater	0.03	0.03
Williamsburg Court	Botetourt County	Groundwater	0.04	0.05

Available water use information for the public community water systems in Botetourt County is provided in Table 3.2.2.1C. The total average monthly usage for Botetourt County is approximately 12.96 MG with an annual average water usage of approximately 155.48 MG.

Table 3.2.2.1C: Summary of Water Use Information for Public Community Water Systems in Botetourt County.

Water System Name	Owner	Source	Average Monthly (MG)	Annual Average (MG)
Cloverdale/Vista Park	Botetourt County	Groundwater/ Town of Troutville	1.90	22.79
Glen Wilton	Botetourt County	Groundwater	0.33	3.99
Greenfield	Botetourt County	Groundwater	3.75	45.04
Griffith Park	Botetourt County	Groundwater	0.23	2.74
Cedar Ridge	Botetourt County	Groundwater	0.68	8.19
Forest Lake	Botetourt County	Groundwater	2.84	34.10
Tinkerview Gardens	Botetourt County	Groundwater	1.10	13.20
Wetherwood	Botetourt County	Groundwater	0.80	9.54
Williamsburg Court	Botetourt County	Groundwater	1.32	15.89

The estimated water demand for Botetourt County disaggregated into categories of use is provided in Table 3.2.2.1D.

Table 3.2.2.1D: Estimated Monthly Water Demand Disaggregated into Categories of Use for Botetourt County.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-water (MG)	Sales (MG)	Other (MG)	Total (MG)
Botetourt County	8.55	0.65	0.00	0.00	0.52	3.24	0.00	0.00	12.96

* Water use information was provided by DEQ and is based on data reported during calendar year 2006.

3.2.2.2 Private Community Water Systems

There are 29 known private community water systems in Botetourt County. All of the private community water systems in Botetourt County rely on groundwater. Table 3.2.2.2 summarizes population and connection information available for the private community water systems in Botetourt County. The estimated annual average water use for private community water systems in Botetourt County is also provided in Table 3.2.2.2.

The estimated annual water use for the private community water systems in Botetourt County is approximately 254.69 MG. The annual average water use for Blue Ridge Heights, Oakwood/Parkview, Rainbow Forest, Stratford Place, and White Oaks Estates was provided by VDEQ Water Use Database and is based on data from 2006. The annual average water use for the remaining private community water systems was estimated assuming 75 gpd per person.

Table 3.2.2.2: Summary of Private Community Water Systems in Botetourt County.

Name	Population Served	Number of Connections	Annual Average (MG)
Apple Tree	2245	931	61.50
Blue Ridge Heights	315	133	8.39
Brookfield	415	115	11.37
Botetourt Forest	206	46	5.64
Daleville	30	15	0.82
Heatherstone Subdivision	270	75	7.40
British Woods	155	52	4.25
Ashley Plantation	857	245	23.48
Dalecourt	30	15	0.82

Name	Population Served	Number of Connections	Annual Average (MG)
Eagle Rock	287	96	7.86
Hollins MHP	175	80	4.79
Dal-Nita Hills	100	35	2.74
Keswick Farms	60	22	1.64
Mountain Crest	108	28	2.96
Santillane	147	49	4.03
Cave Creek Assisted Living Facility	77	2	2.11
Blue Ridge Community	25	25	0.68
Bethel Ridge	55	1	1.51
Heatherstone	270	75	7.40
Hollins MHP	175	73	4.79
Keswick Farms	60	60	1.64
Mount Joy Mobile Village	66	26	1.81
Mountain Crest	108	28	2.96
Oakwood/Parkview	605	247	10.56
Rainbow Forest	1,535	641	46.44
Sommersby	164	66	4.49
Statford Place	333	134	8.37
White Oak Estates	300	140	13.04
Willowbrook MHP	44	29	1.21
Total	9,217	3,484	254.69

3.2.3 Franklin County

3.2.3.1 Public Community Water Systems

There are 12 public community water systems in Franklin County utilizing groundwater or water purchased from the BCPSA and the Town of Rocky Mount. Franklin County serves approximately 4,832 people with approximately 2,460 known connections. The following public water systems were purchased by the WVWA in 2009: Boardwalk, Water's Edge, Water Front Sections II-IX, Water Front Sections I & XI, and Windmere Point. Table 3.2.3.1A summarizes available data for population served and number of connections for each public community water system in Franklin County.

Table 3.2.3.1A: Summary of Public Community Water Systems in Franklin County.

Water System Name	Owner	Source	Population Served	Number of Connections
Franklin County Public Water System - Phase 1	WVWA	BCPSA	500	140

Forest Hills	WVWA	Rocky Mount	Unknown	35
The Boardwalk	WVWA	Groundwater	160	49
Water's Edge	WVWA	Groundwater	400	530
Water Front - Sections II-IX	WVWA	Groundwater	650	524
Water Front - Sections I & XI	WVWA	Groundwater	150	147
Windmere Point	WVWA	Groundwater	97	47
Commerce Center Industrial Park	WVWA	Groundwater	50	2
Waid Park	Franklin County	Groundwater	100	1
LARC Field Recreational Park	Franklin County	Groundwater	800	5
Franklin County Recreation Park	Franklin County	Groundwater	75	4
Ferrum W&SA	Town of Ferrum	Groundwater	1850	976

Table 3.2.3.1B summarizes water withdrawal information for the public community water systems in Franklin County. The total average daily withdrawal for the public community systems in Franklin County is approximately 0.637 MGD with a maximum daily withdrawal of approximately 0.764 MGD, assuming a peak factor of 1.2.

Table 3.2.3.1B: Summary of Water Withdrawal Amounts for Public Community Water Systems in Franklin County.

Water System Name	Owner	Source	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (MGD)
Franklin County Public Water System - Phase 1	WVWA	BCPSA	0.400	0.480
Forest Hills	Franklin County	Rocky Mount	0.005	0.007
The Boardwalk	WVWA	Groundwater	0.011	0.012
Water's Edge	WVWA	Groundwater	0.036	0.043
Water Front - Sections II-IX	WVWA	Groundwater	0.033	0.040
Water Front - Sections I & XI	WVWA	Groundwater	0.012	0.014
Windmere Point	WVWA	Groundwater	0.007	0.008
Commerce Center Industrial Park	Franklin County	Groundwater	0.045	0.054
Waid Park	Franklin County	Groundwater	0.001	0.001
LARC Field Recreational Park	Franklin County	Groundwater	0.001	0.001
Recreation Park	Franklin County	Groundwater	0.001	0.001
Ferrum W&SA	Town of Ferrum	Groundwater	0.085	0.102

Water use information available for the public community water systems in Franklin County is provided in Table 3.2.3.1C. The total average monthly usage for Franklin

County is approximately 19.36 MG with an annual average water usage information of approximately 232.40 MG.

Table 3.2.3.1C: Summary of Water Use Information for Public Community Water Systems in Franklin County.

Water System Name	Owner	Source	Average Monthly (MG)	Annual Average (MG)
Franklin County Public Water System - Phase 1	WVWA	BCPSA	12.17	146.00
Forest Hills	Franklin County	Rocky Mount	0.17	2.00
The Boardwalk	WVWA	Groundwater	0.34	4.12
Water's Edge	WVWA	Groundwater	1.11	13.28
Water Front - Sections II-IX	WVWA	Groundwater	1.01	12.16
Water Front - Sections I & XI	WVWA	Groundwater	0.36	4.27
Windmere Point	WVWA	Groundwater	0.22	2.66
Commerce Center Industrial Park	Franklin County	Groundwater	1.33	16.00
Waid Park	Franklin County	Groundwater	0.02	0.28
LARC Field Recreational Park	Franklin County	Groundwater	0.02	0.29
Recreation Park	Franklin County	Groundwater	0.03	0.35
Ferrum W&SA	Town of Ferrum	Groundwater	2.58	30.99

The estimated water demand for Franklin County disaggregated into categories of use is provided in Table 3.2.3.1D.

Table 3.2.3.1D: Estimated Monthly Water Demand Disaggregated into Categories of Use for Franklin County

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-water (MG)	Sales (MG)	Other (MG)	Total (MG)
Franklin County	0.54	1.29	0.00	0.00	1.01	0.00	0.00	0.00	2.84

* Water use information was provided by Franklin County and is based on data reported during 2006 and 2007.

3.2.3.2 Private Community Water Systems

There are 34 known private community water systems in Franklin County. All of the private community water systems in Franklin County rely on groundwater. Table 3.1.4.2 summarizes population and connection information available for the private community water systems in Franklin County. The estimated annual average water use for private community water systems in Franklin County is also provided in Table 3.2.3.2.

The estimated annual water use for the private community water systems in Franklin County is approximately 118.60 MG. The annual average water use for the following private community water systems was provided by the VDEQ Water Use Database and is based on data from 2006: Bernards Landing, Ferrum Water and Sewer, Franklin Acres, Windy Gap Mountain Village, Water Front Waterworks – Riverbay, and Water Front Waterworks - Westlake. The annual average water use for the remaining private community water systems was estimated assuming 75 gpd per person.

Table 3.2.3.2: Summary of Private Community Water Systems in Franklin County.

Name	Population Served	Number of Connections	Annual Average (MG)
Bernards Landing	500	241	12.72
Franklin Acres	175	120	4.80
Windy Gap Mtn Village	150	88	2.58
Water Front Waterworks - Riverbay	28	38	0.99
Water Front Waterworks - Westlake	584	180	1.00
Alton Park	99	24	2.71
Arrington Trailer Court	35	18	0.96
Boxwood Green	180	77	4.93
Browns Mobile Home Village	75	24	2.05
Cedar Ridge Subdivision	25	28	0.68
Cherokee Hills	60	28	1.64
Contentment Island	80	144	2.19
Deer Creek Estates	187	80	5.12
Fork Mountain Adult Rest Home	58	1	1.59
Fox Chase Subdivision	100	17	2.74
Frederick Acres	67	21	1.84
Hales Point Waterworks	36	17	0.99
Highland Lake Subdivision	376	119	10.30
Idlewood Shores	100	43	2.74
Key Lakewood	75	41	2.05
Lakemount/Starwood/Overlook Subdivision	195	78	5.34
Lakeshore Terrace Corporation	123	124	3.37
Lakewood Forest	160	68	4.38
Long Island Estates	100	71	2.74
Lynville on the Lake	65	91	1.78
Park Place/Winding Waters	450	301	12.33
Ridgecrest Subdivision	52	25	1.42

Name	Population Served	Number of Connections	Annual Average (MG)
Stripers Landing	125	74	3.42
Teel Brooke Estates	187	68	5.12
The Meadows	89	46	2.44
Twin Coves Subdivision	88	25	2.41
Walnut Run	130	72	3.56
Waverly	155	80	4.25
Weatherwood Subdivision	52	26	1.42
Total	4,961	2,498	118.60

3.2.4 Roanoke County

3.2.4.1 Public Community Water Systems

The WVWA owns and operates seven public community water systems: Carvins Cove Reservoir, Falling Creek/Beaver Dam Reservoir, Spring Hollow Reservoir, Crystal Spring, Andrew Lewis Place, which purchases water from the City of Salem, Delaney Court, and Martin Creek. The WVWA also utilizes groundwater wells. The WVWA serves approximately 151,107 people in Roanoke County and the City of Roanoke with approximately 56,048 known connections.

The total average daily withdrawal for the WVWA is approximately 23.34 MGD with a maximum daily withdrawal of approximately 28.01 MGD, assuming a peak factor of 1.2.

The total average monthly usage for WVWA is approximately 710.47 MG with an annual average water use of approximately 8,525.64 MG. The estimated water demand for the WVWA disaggregated into categories of use is provided in Table 3.2.4.1.

Table 3.2.4.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the WVWA.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-water (MG)	Sales (MG)	Other (MG)	Total (MG)
WVWA	231.74	177.64	34.30	0.00	25.45	241.34	0.00	0.00	710.47

* Water use information was provided by the WVWA and is based on data reported during calendar year 2008.

3.2.4.2 Private Community Water Systems

There are eight known private community water systems in Roanoke County. All of the private community water systems in Roanoke County rely on groundwater. Table 3.2.4.2 summarizes the available population and connection information for the private community water systems in Roanoke County. The estimated annual average water use for private community water systems in Roanoke County is also provided in Table 3.2.4.2.

The estimated annual water use for the private community water systems in Roanoke County is approximately 35.88 MG. The annual average water use for Catawba Hospital was provided in the VDEQ Water Use Database and is based on data from 2006. The annual average water use for the remaining private community water systems was estimated assuming 75 gpd per person.

Table 3.2.4.2: Summary of Private Community Water Systems in Roanoke County.

Name	Population Served	Number of Connections	Annual Average (MG)
Carolina Village	72	36	1.97
Catawba Hospital	420	15	16.90
Garden City	165	56	4.52
Mountain View Mobile Home Village	50	18	1.37
Pine Hill	71	20	1.94
Pine Tree Village	78	40	2.14
Winterwood Apartments	47	18	1.29
Yellow Mountain Village	210	102	5.75
Total	1,113	305	35.88

3.2.5 City of Roanoke

3.2.5.1 Public Community Water Systems

The WVWA owns and operates the public community water systems in the City of Roanoke and Roanoke County. Please refer to Section 3.1.5 for water use information on the WVWA.

3.2.5.2 Private Community Water Systems

There are no known private community water systems in the City of Roanoke.

3.2.6 City of Salem

3.2.6.1 Public Community Water Systems

The City of Salem owns and operates the public community water system in the City of Salem. The City of Salem community water system serves approximately 25,600 people with approximately 9,157 connections. The average daily withdrawal for the water system is approximately 5.60 MGD with a maximum daily withdrawal of 6.72 MG, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 170.32 MG with an annual average of approximately 2,043.84 MG. The estimated water demand for the City of Salem disaggregated into categories of use is provided in Table 3.2.6.1.

Table 3.2.6.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the City of Salem.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-water (MG)	Sales (MG)	Other (MG)	Total (MG)
City of Salem	36.45	50.43	0.00	0.00	6.37	31.84	42.58	2.65	170.32

* Water use information was provided by the City of Salem and is based on data reported during calendar year 2008.

3.2.6.2 Private Community Water Systems

There is one known private community water system in the City of Salem: Springfield Waterworks. Springfield Waterworks serves approximately 64 residential customers and has approximately 27 connections. The average daily withdrawal is approximately 0.005 MGD with a maximum daily withdrawal of approximately 0.006, assuming a peaking factor of 1.2. The average monthly withdrawal is approximately 0.143 MG and the average annual withdrawal is approximately 1.72 MG. Water use information for Springfield Waterworks is estimated based on the assumption of 2.41 people per connection and 75 gpd per person.

3.2.7 Town of Boones Mill

3.2.7.1 Public Community Water Systems

The Town of Boones Mill owns and operates the public community water system in the Town of Boones Mill, which serves approximately 350 people with approximately 268 connections. The average daily withdrawal for the water system is approximately 0.07 MGD and a maximum daily withdrawal of approximately 0.08 MGD, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 2.16 MG with an annual average of approximately 25.92 MG. The estimated water demand for the Town of Boones Mill disaggregated into categories of use is provided in Table 3.2.7.1.

Table 3.2.7.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Boones Mill.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Boones Mill	1.42	0.11	0.00	0.00	0.09	0.54	0.00	0.00	2.16

3.2.7.2 Private Community Water Systems

There are no known private community water systems in the Town of Boones Mill.

3.2.8 Town of Buchanan

3.2.8.1 Public Community Water Systems

The Town of Buchanan owns and operates the public community water system in the Town of Buchanan, which serves approximately 1,230 people with approximately 545 connections. The average daily withdrawal for the water system is approximately 0.26 MGD and a maximum daily withdrawal of 0.31, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 7.83 MG with an annual average of approximately 93.96 MG. The estimated water demand for the Town of Buchanan disaggregated into categories of use is provided in Table 3.2.8.1.

Table 3.2.8.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Buchanan.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Buchanan	5.17	0.39	0.00	0.00	0.31	1.96	0.00	0.00	7.83

3.2.8.2 Private Community Water Systems

There are no known private community water systems in the Town of Buchanan.

3.2.9 Town of Fincastle

3.2.9.1 Public Community Water Systems

The Town of Fincastle owns and operates the public community water system in the Town of Fincastle, serves approximately 952 people with approximately 252 connections. The average daily withdrawal for the water system is approximately 0.08 MGD and a maximum daily withdrawal of approximately 0.096 MGD, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 2.53 MG with an annual average of approximately 30.36 MG. The estimated water demand for the Town of Fincastle disaggregated into categories of use is provided in Table 3.2.9.1.

Table 3.2.9.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Fincastle.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Fincastle	1.67	0.13	0.00	0.00	0.10	0.63	0.00	0.00	2.53

3.2.9.2 Private Community Water Systems

There are no known private community water systems in the Town of Fincastle.

3.2.10 Town of Rocky Mount

3.2.10.1 Public Community Water Systems

The Town of Rocky Mount owns and operates the public community water system in the Town of Rocky Mount, which serves approximately 5,689 people with approximately 2,700 connections. The average daily withdrawal for the water system is approximately 1.01 MGD and a maximum daily withdrawal of approximately 1.20 MGD, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 30.81 MG with an annual average of approximately 369.72 MG. The estimated water demand for the Town of Rocky Mount disaggregated into categories of use is provided in Table 3.2.10.1.

Table 3.2.10.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Rocky Mount.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Rocky Mount	20.34	1.54	0.00	0.00	1.23	7.70	0.00	0.00	30.81

3.2.10.2 Private Community Water Systems

There are no known private community water systems in the Town of Rocky Mount.

3.2.11 Town of Troutville

3.2.11.1 Public Community Water Systems

The Town of Troutville owns and operates the public community water system in the Town of Troutville, which serves approximately 500 people with approximately 322 connections. The average daily withdrawal for the water system is approximately 0.21 MGD and a maximum daily withdrawal of approximately 0.25 MGD, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 6.33 MG with an annual average of approximately 75.96 MG. The estimated water demand for the Town of Troutville disaggregated into categories of use is provided in Table 3.2.11.1.

Table 3.2.11.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Troutville.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Troutville	0.90	1.92	0.00	0.00	0.32	3.16	0.00	0.03	6.33

3.2.11.2 Private Community Water Systems

There are no known private community water systems in the Town of Troutville.

3.2.12 Town of Vinton

3.2.12.1 Public Community Water Systems

The Town of Vinton owns and operates the public community water system in the Town of Vinton, which serves approximately 13,000 people with approximately 4,916 connections. The average daily withdrawal for the water system is approximately 1.26 MGD and a maximum daily withdrawal of approximately 1.51 MGD, assuming a peaking factor of 1.2. The average monthly water use for the system is approximately 38.30 MG with an annual average of approximately 459.60 MG. The estimated water demand for the Town of Vinton disaggregated into categories of use is provided in Table 3.2.12.1.

Table 3.2.12.1: Estimated Monthly Water Demand Disaggregated into Categories of Use for the Town of Vinton.

Water System Name	Residential (MG)	CIL (MG)	Heavy Industrial (MG)	Military (MG)	Production Process Water (MG)	Unaccounted-for-Water (MG)	Sales (MG)	Other (MG)	Total (MG)
Town of Vinton	23.37	5.79	3.48	0.00	0.29	5.37	0.00	0.00	38.30

3.2.12.2 Private Community Water Systems

There are no known private community water systems in the Town of Vinton.

3.3 Estimate of Water Used by Self-Supplied, Non-Agricultural Users of More than 300,000 Gallons per Month of Surface and Ground Water Inside the Service Areas of the Community Water Systems[2]

Available water use information for self-supplied, non-agricultural users inside the service area of community water systems in the region was generally limited. Available information is discussed in the following sections and presented in the tables below.

Information for self-supplied, non-agricultural users in the region was provided by VDH and VDEQ. Information for many of the self-supplied, non-agricultural users greater than 300,000 gallons of water per month was available through VDEQ's water use database. For those self-supplied, non-agricultural users not included in VDEQ's Water Use Database, water use information was estimated based on one of the following assumptions: groundwater well average daily withdrawal, VDH permit capacity, SCAT regulations, or the number of people served at 75 gpd.

3.3.1 Bedford County

There is one known self-supplied, non-agricultural users inside the BCPSA service area (Table 3.3.1).

Table 3.3.1: Estimated Water Use for Self-Supplied, Nonagricultural Users inside BCPSA service area

Name	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
London Downs Golf Course	0.05845	21.35
Total	0.05845	21.35

3.3.2 Botetourt County

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Botetourt County service area.

[2] 9 VAC 25-780-80 C.

3.3.3 Franklin County

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Franklin County service area.

3.3.4 Roanoke County

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the WVWA service area in Roanoke County.

3.3.5 City of Roanoke

According to the VDEQ Water Use Database, there are nine known non-agricultural, self-supplied users within the WVWA service area in the City of Roanoke (Table 3.2.5). Eight of the nine known non-agricultural, self-supplied users within the WVWA service area in the City of Roanoke use greater than 300,000 gallons per month of water (Table 3.3.5)

Table 3.3.5: Estimated Water Use for Non-Agricultural, Self-Supplied Users Using Greater Than 300,000 Gallons Per Month of Water Within the WVWA Service Area in the City of Roanoke.

Name	Source	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Associated Asphalt Roanoke	Groundwater	0.004	1.34
Blue Hills Golf Corporation	Groundwater	0.043	15.75
Roanoke Electric Steel	Groundwater	0.234	85.63
Norfolk Southern	Roanoke River	0.601	219.60
Hanging Rock Golf Course	Irrigation Pond	0.045	16.50
Koppers Industries Inc. - Glenvar Plant	Groundwater/ Roanoke River	0.017	6.12
KSL Fairways Inc.	Groundwater	0.026	9.48
Skate Center of Roanoke Valley	Groundwater	0.011	4.11
CEI Roanoke, Inc. - Elizabeth Arden	Groundwater	0.001	0.47

3.3.6 City of Salem

There are two known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the City of Salem service area: Hidden Valley Country Club and Novozymes Biological Inc. Hidden Valley Country Club and Novozymes Biological

Inc. utilize groundwater wells as a water source. According to the VDEQ Water Use Database, the estimated annual average water use for the Hidden Valley Country Club is approximately 17.00 MG and the estimated annual average water use for Novozymes Biological, Inc. is approximately 3.71 MG.

3.3.7 Town of Boones Mill

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Boones Mill service area.

3.3.8 Town of Buchanan

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Buchanan service area.

3.3.9 Town of Fincastle

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Fincastle service area.

3.3.10 Town of Rocky Mount

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Rocky Mount service area.

3.3.11 Town of Troutville

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Troutville service area.

3.3.12 Town of Vinton

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water inside the Town of Vinton service area.

3.4 Estimate of Water Used by Self-Supplied Non-agricultural Users of More than 300,000 Gallons per Month of Surface and Ground Water Outside the Service Areas of the Community Water Systems[3]

[3] 9 VAC 25-780-80 C.

Available water use information for self-supplied, non-agricultural users outside the service area of community water systems in the region was generally limited. Available information is discussed in the following sections and presented in the tables below.

Information for self-supplied, non-agricultural users in the region was provided by VDH and VDEQ. Information for many of the self-supplied, non-agricultural users greater than 300,000 gallons of water per month was available through VDEQ's water use database. For those self-supplied, non-agricultural users not included in VDEQ's Water Use Database, water use information was estimated based on one of the following assumptions: groundwater well average daily withdrawal, VDH permit capacity, SCAT regulations, or the number of people served at 75 gpd.

3.4.1 Bedford County

There are 32 known self-supplied, non-agricultural users outside the BCPSA service area, with 17 using greater than 300,000 gallons per month of water (Table 3.4.1).

Table 3.4.1: Estimated Water Use for Non-Agricultural, Self-Supplied Users Outside the BCPSA Service Area.

Name	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Staunton River High School	0.009993	3.65
Georgia Pacific	0.027600	10.00
Smith Mountain Lake State Park	0.015900	5.80
Smith Mountain Lake State Park	0.00931	3.40
Smith Mountain Lake State Park	0.02160	7.90
Smith Mountain Lake State Park	0.01290	4.70
Boxley Materials Co.	0.03255	11.89
Georgia Pacific	9.14716	3,341.00
Ivy Hill Golf Course	0.08961	32.73
Big Island Elementary School	0.01650	6.03
Body Camp Elementary School	0.00214	0.78
Bedford Moose Lodge	0.01133	4.14
Camp Lowman	0.00520	1.90
Gunnoe Sausage Co.	0.00375	1.37
White House Restaurant	0.00650	2.37
Lake Haven Marina	0.00600	2.19
Mama's Home Cooking	0.01500	5.48
Millstone Tea Room	0.00375	1.37

Name	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Huddleston Elementary School	0.00195	0.71
Moneta Elementary School	0.00236	0.86
Otter River Elementary School	0.00250	0.91
Thaxton Elementary School	0.00197	0.72
Bedford Restaurant	0.00260	0.95
Big Island Community	0.00188	0.68
Camp Va Jaycee TES	0.00306	1.12
Waterfront Park	0.00124	0.45
White House Corner Store	0.00125	0.46
Mitchells Point Marina	0.00125	0.46
Smith Mountain Lake Moose Lodge	0.00300	1.10
Tuck Away Campground	0.00029	0.11
Mariners Landing Golf Course	Unavailable	Unavailable
Rainforest Nursery	Unavailable	Unavailable

3.4.2 Botetourt County

There are 10 known non-agricultural, self-supplied users outside the Botetourt County service area, with six using greater than 300,000 gallons per month of water (Table 3.4.2).

Table 3.4.2: Estimated Water Use for Non-Agricultural, Self-Supplied Users Using Greater Than 300,000 Gallons Per Month of Water Outside the Botetourt County Service Area.

Name	Source	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
General Shale Brick	Glade Spring	0.002	0.71
Roanoke Cement	Groundwater/ Catawba Creek	0.005	1.73
Colonial Elementary School	Groundwater	0.005	1.42
Eagle Rock Elementary School	Groundwater	0.002	0.47
Gala Industries	Groundwater	0.006	2.28
Carris Plastics	Groundwater	0.014	5.11
Middle Creek Campground	Groundwater	0.013	1.19
Mill Creek Child Care	Groundwater	0.001	0.33
Peaks of Otter	Groundwater	0.006	2.30
Columbia Gas Transmission Corp	Mill Creek	0.015	5.55

3.4.3 Franklin County

There are 41 known non-agricultural, self-supplied users outside the Franklin County service area, with seven using greater than 300,000 gallons per month of water (Table 3.4.3).

Table 3.4.3: Estimated Water Use for Non-Agricultural, Self-Supplied Users Using Greater Than 300,000 Gallons Per Month of Water Outside the Franklin County Service Area.

Name	Source	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Bay Roc Marina	Groundwater	0.001	0.33
Blue Ridge Campground and Marina	Groundwater	0.010	0.89
Booker T. Washington Monument Visitor's	Groundwater	0.0003	0.09
Boones Mill Elementary School	Groundwater	0.005	1.37
Bridgewater Plaza	Groundwater	0.002	0.66
Burnt Chimney Elementary School	Groundwater	0.021	7.74
Callaway Elementary School	Groundwater	0.003	0.74
Carl's Place	Groundwater	0.001	0.25
Crazyhorse Campground Marina	Groundwater	0.012	1.05
Doyle Enterprises, Inc.	Groundwater		
Dudley Elementary School	Groundwater	0.004	1.13
Dudley Mart & Restaurant	Groundwater	0.001	0.33
Duncan Ford	Groundwater		
El Torito	Groundwater	0.001	0.25
EZN Market #204	Groundwater	0.001	0.25
Franklin Ford	Groundwater	0.007	2.66
Franklin Motel	Groundwater	0.006	2.33
Franklin Restaurant	Groundwater	0.001	0.32
Glade Hill Elementary School	Groundwater	0.005	1.98
Glade Hill Minute Market	Groundwater	0.021	7.63
Henry Hill Elementary School	Groundwater	0.003	0.67
Hilltop Diner	Groundwater	0.0005	0.16
La Trattoria	Groundwater	0.002	0.82
Lake Center - Springwood Plaza	Groundwater	0.024	8.77
Penhook Minute Market	Groundwater	0.002	0.66
Phillpott Lake	Groundwater	0.060	22.00
Plateau Plaza	Groundwater	0.004	1.41

Name	Source	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Redwood Express Mart	Groundwater	0.001	0.33
Shredded Products	Groundwater	0.001	0.37
Smart View Picnic Area	Groundwater	0.00013	0.05
Smith Mountain Childcare	Groundwater	0.001	0.16
Smith Mountain Lake 4H Education Center	Groundwater	0.005	1.17
Snow Creek Elementary School	Groundwater	0.002	0.62
Sontag Elementary School	Groundwater	0.004	1.07
Sunshine Valley School	Groundwater	0.001	0.26
The Blackwater Café	Groundwater	0.001	0.36
Whistle Stop	Groundwater	0.001	0.33
Willow Creek County Club	Groundwater	0.0002	0.08
Waterfront Golf Course	Groundwater	0.06845	25
West Lake Golf and County Club	Groundwater	0.07118	26
Westlake Waterfront Inn	Groundwater	0.0014	0.49

3.4.4 Roanoke County

According to the VDEQ Water Use Database, there are 19 known non-agricultural, self-supplied users outside the WVWA service area in Roanoke County, with five using greater than 300,000 gallons per month of water (Table 3.4.4).

Table 3.4.4: Estimated Water Use for Non-Agricultural, Self-Supplied Users Using Greater Than 300,000 Gallons Per Month of Water Outside the WVWA Service Area in Roanoke County.

Name	Source	Average Daily Withdrawal (MGD)	Estimated Annual Average Use (MG)
Back Creek Elementary School	Groundwater	0.004	1.10
Back Creek Grill	Groundwater	0.0005	0.16
Bent Mountain Elementary School	Groundwater	0.001	0.23
Camp Roanoke	Groundwater	0.002	0.15
Cave Spring Junior High School	Groundwater	0.008	2.17
Explore Park	Groundwater	0.002	0.68
Girl Scout Program Center	Groundwater	0.020	1.76
Glenvar Elementary and High School	Groundwater	0.014	3.64
Green Hill Park	Groundwater	0.0001	0.05
Hollow Creek Swim Club	Groundwater	0.002	0.73
Homeplace	Groundwater	0.005	1.64
Mason's Cove Elementary School	Groundwater	0.003	0.76
Moose Lodge 284	Groundwater	0.001	0.33
Mount Pleasant Elementary School	Groundwater	0.004	0.99
Northside Middle School	Groundwater	0.008	2.20
Rish Equipment Company	Groundwater	0.001	0.26
Rising Star Sports and Adventure Camp	Groundwater	0.002	0.90
Skyline Motel	Groundwater	0.003	0.95
Spring Run Swim Club	Groundwater	0.001	0.26

3.4.5 City of Roanoke

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the WVWA service area in the City of Roanoke.

3.4.6 City of Salem

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the City of Salem service area.

3.4.7 Town of Boones Mill

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Boones Mill service area.

3.4.8 Town of Buchanan

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Buchanan service area.

3.4.9 Town of Fincastle

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Fincastle service area.

3.4.10 Town of Rocky Mount

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Rocky Mount service area.

3.4.11 Town of Troutville

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Troutville service area.

3.4.12 Town of Vinton

There are no known self-supplied, non-agricultural users of greater than 300,000 gallons per month of water outside the Town of Vinton service area.

3.5 Estimate of Water used by Self-Supplied Agricultural Users of More than 300,000 Gallons per Month of Surface and Ground Water Outside the Service Areas of the Community Water Systems[4]

Agricultural water usage information for users of more than 300,000 gallons per month of water outside the service areas of community water systems was limited or unavailable. General agricultural information as well as available information on livestock (e.g., number of head of cattle) and crops (e.g., type of crop planted) for the region was

[4] 9 VAC 25-780-80 D.

collected from the USDA NASS. This information was used to make a general estimate of water used by self-supplied agricultural users in the region. Please note that the USDA 2002 Census of Agriculture and NASS does not provide information for cities and towns. While this information does not provide information on specific agricultural users within the region, it provides a good starting point for estimating agricultural use in the region.

3.5.1 Bedford County

The estimated volume of water used by self-supplied, agricultural users in Bedford County is approximately 505.54 MG per year. The volume of water used by livestock was estimated at approximately 138.71 MG per year and the volume of water used for crop irrigation was estimated at approximately 366.83 MG per year. In addition, information for Duis Nursery was available through VDEQ's Water Use Database. The estimated water use by Duis Nursery is approximately 43.91 MG per year. No information for the Hawkins Brothers Farm was available. The volume of water estimated to be used for livestock in Bedford County is shown in Table 3.5.1A.

Table 3.5.1A: Bedford County Estimated Water Use for Livestock

Type of Livestock	# in 2002	Number of Farms	Gallons of Water Needed per Day per Animal	Estimated Monthly Usage (gal)	Estimated Annual Usage (gal)
Beef Cattle & Calves	23,500	857	12.00	8,584,080	103,008,960
Milk Cows	1,838	26	35.00	1,958,205	23,498,462
Hogs & Pigs	1,461	14	5.00	222,364	2,668,370
Sheep & Lambs	343	21	2.00	20,882	250,582
Poultry Layers	1,217	57	0.06	2,223	26,673
Poultry Broilers	1,750	5	0.06	3,196	38,354
Horses	2,104	0	12.00	768,549	9,222,589
Goats	919	0	0.00	0	0
				Total:	138,713,991

The volume of water estimated to be used for crops in Bedford County is shown in Table 3.5.1B.

Table 3.5.1B: Bedford County Estimated Water Use for Crop Irrigation

Type of Crop	Acres in 2002	Acres Irrigated	Number of Farms	Approximate Irrigation (in/acre)	Total Annual Irrigation (gal)
Corn for Grain	746	0	15	0	0
Corn for Silage	2,574	0	49	0	0
Forage	48,146	0	913	0	0
Wheat for Grain	441	0	11	0	0
Oats for Grain	103	0	9	0	0
Barley for Grain	386	0	11	0	0
Cotton	0	0	0	0	0
Soybean	0	0	0	0	0
Tobacco	32	16	6	25	10,860,960
Vegetables	15	15	15	15	6,109,290
Potatoes	3	3	3	15	1,221,858
Unknown	676	642	57	20	348,636,816
				Total:	366,828,924

3.5.2 Botetourt County

The estimated volume of water used by self-supplied, agricultural users in Botetourt County is approximately 203.87 MG per year. The volume of water used by livestock was estimated at approximately 66.48 MG per year and the volume of water used for crop irrigation was estimated at approximately 137.39 MG per year. The volume of water estimated to be used for livestock in Botetourt County is shown in Table 3.5.2A.

Table 3.5.2A: Botetourt County Estimated Water Use for Livestock

Type of Livestock	# in 2002	Number of Farms	Gallons of Water Needed per Day per Animal	Estimated Monthly Usage (gal)	Estimated Annual Usage (gal)
Beef Cattle & Calves	10,068	353	12.00	3,677,639	44,131,668
Milk Cows	1,295	29	35.00	1,379,693	16,556,316
Hogs & Pigs	333	9	5.00	50,683	608,191
Sheep & Lambs	690	14	2.00	42,007	504,086
Poultry Layers	887	21	0.06	1,620	19,440
Poultry Broilers	0	0	0.06	0	0
Horses	1,064		12.00	388,658	4,663,895
Goats			0.00	0	0
				Total:	66,483,597

The volume of water estimated to be used for crop irrigation in Botetourt County is shown in Table 3.5.2B.

Table 3.5.2B: Botetourt County Estimated Water Use for Crop Irrigation

Type of Crop	Acres in 2002	Acres Irrigated	Number of Farms	Approximate Irrigation (in/acre)	Total Annual Irrigation (gal)
Corn for Grain	1,349	0	19	0	0
Corn for Silage	1,557	0	30	0	0
Forage	20,301	0	421	0	0
Wheat for Grain	81	0	4	0	0
Oats for Grain	Unknown	0	Unknown	0	0
Barley for Grain	Unknown	0	2	0	0
Cotton	Unknown	0	Unknown	0	0
Soybean	3	0	Unknown	0	0
Tobacco	Unknown	0	Unknown	25	0
Vegetables	Unknown	0	Unknown	15	0
Potatoes	Unknown	0	Unknown	15	0
Unknown	253	253	24	20	137,391,144
				Total:	137,391,144

3.5.3 Franklin County

The estimated volume of water used by self-supplied, agricultural users in Franklin County is approximately 844.09 MG per year. The volume of water used by livestock was estimated at approximately 183.27 MG per year and the volume of water used for crop irrigation was estimated at approximately 660.82 MG per year. The volume of water estimated to be used for livestock in Franklin County is shown in Table 3.5.3A.

Table 3.5.3A: Franklin County Estimated Water Use for Livestock

Type of Livestock	# in 2002	Number of Farms	Gallons of Water Needed per Day per Animal	Estimated Monthly Usage (gal)	Estimated Annual Usage (gal)
Beef Cattle & Calves	14,844	615	12.00	5,422,216	65,066,596
Milk Cows	8,879	82	35.00	9,459,687	113,516,239
Hogs & Pigs	437	16	5.00	66,511	798,137
Sheep & Lambs	0	5	2.00	0	0
Poultry Layers	988	32	0.06	1,804	21,654
Poultry Broilers	108	5	0.06	197	2,367
Horses	881	0	12.00	321,812	3,861,740
Goats	0	0	0.00	0	0
	350				
				Total:	183,266,733

The volume of water estimated to be used for crop irrigation in Franklin County is shown in Table 3.5.3B.

Table 3.5.3B: Franklin County Estimated Water Use for Crop Irrigation

Type of Crop	Acres in 2002	Acres Irrigated	Number of Farms	Approximate Irrigation (in/acre)	Total Annual Irrigation (gal)
Corn for Grain	2,674	0	52	0	0
Corn for Silage	10,183	0	105	0	0
Forage	35,033	0	714	0	0
Wheat for Grain	641	0	35	0	0
Oats for Grain	76	0	4	0	0
Barley for Grain	105	0	6	0	0
Cotton	0	0	0	0	0
Soybean	564	0	10	0	0
Tobacco	799	400	74	25	271,184,595
Vegetables	36	36	19	15	14,662,296
Potatoes	0	0	3	15	0
Unknown	1,126	691	88	20	374,974,644
				Total:	660,821,535

3.5.4 Roanoke County

The estimated volume of water used by self-supplied, agricultural users in Roanoke is approximately 52.79 MG per year. The volume of water used by livestock was estimated at approximately 14.30 MG per year and the volume of water used for crop irrigation was estimated at approximately 38.49 MG per year. The volume of water estimated to be used for livestock in Roanoke County is shown in Table 3.5.4A.

Table 3.5.4A: Roanoke County Estimated Water Use for Livestock

Type of Livestock	# in 2002	Number of Farms	Gallons of Water Needed per Day per Animal	Estimated Monthly Usage (gal)	Estimated Annual Usage (gal)
Beef Cattle & Calves	2,276	155	12.00	831,377	9,976,527
Milk Cows	99	5	35.00	105,475	1,265,695
Hogs & Pigs	3	6	5.00	457	5,479
Sheep & Lambs	111	5	2.00	6,758	81,092
Poultry Layers	251	8	0.06	458	5,501
Poultry Broilers	Unknown	Unknown	0.06	0	0
Horses	677	Unknown	12.00	247,295	2,967,535
Goats	65	Unknown	0.00	0	0
				Total:	14,301,830

The volume of water estimated to be used for crop irrigation in Roanoke County is shown in Table 3.5.4B.

Table 3.5.4B: Roanoke County Estimated Water Use for Crop Irrigation

Type of Crop	Acres in 2002	Acres Irrigated	Number of Farms	Approximate Irrigation (in/acre)	Total Annual Irrigation (gal)
Corn for Grain	0	0	1	0	0
Corn for Silage	239	0	7	0	0
Forage	5,054	0	197	0	0
Wheat for Grain	0	0	1	0	0
Oats for Grain	0	0	0	0	0
Barley for Grain	0	0	0	0	0
Cotton	0	0	0	0	0

Type of Crop	Acres in 2002	Acres Irrigated	Number of Farms	Approximate Irrigation (in/acre)	Total Annual Irrigation (gal)
Soybean	0	0	0	0	0
Tobacco	9	5	3	25	3,054,645
Vegetables	128	67	21	15	27,288,162
Potatoes	56	20	6	15	8,145,720
Unknown	92	0	18	20	0
				Total:	38,488,527

3.5.5 City of Roanoke

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the City of Roanoke water system service area.

3.5.6 City of Salem

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the City of Salem water system service area.

3.5.7 Town of Boones Mill

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Boones Mill water system service area.

3.5.8 Town of Buchanan

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Buchanan water system service area.

3.5.9 Town of Fincastle

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Fincastle water system service area.

3.5.10 Town of Rocky Mount

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Rocky Mount water system service area.

3.5.11 Town of Troutville

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Troutville water system service area.

3.5.12 Town of Vinton

There are no known self-supplied, agricultural users of more than 300,000 gallons per month of water outside the Town of Vinton water system service area.

3.6 Estimate of Water used by Self-Supplied Users of Less than 300,000 Gallons per Month of Ground Water and an Estimate of the Total Average Annual Use Outside the Service Areas of the Community Water Systems[5]

To estimate the number of residences and businesses that are self-supplied and served by individual groundwater wells withdrawing less than 300,000 gallons per month, the population served by both public and private community water systems was determined. Population served by public community water systems was provided by each jurisdiction. Population served by private community water systems was provided by VDH. The total population for each county and city was provided by the 2000 US Census Bureau. The total population for each town was provided by the 2000 US Census Bureau and subtracted from the county population.

The population served by individual wells was estimated by subtracting the population served by public and private community water systems from the total population. It is important to note that the total county populations do not include the towns within the respective county. In addition, the City of Salem and many of the towns serve areas in their respective county that are outside the city/town limits. The population served by the respective public community water system outside the city/town limits and in the respective county is included in the 'Population Served by Public CWS' for the respective county. For example, the total population for the Town of Vinton in 2000 was approximately 7,782 people. The Town of Vinton public community water system serves approximately 13,000 people. The additional 5,218 people served by the Town of Vinton

[5] 9 VAC 25-780-80 E.

public community water system are located in the eastern portion of Roanoke County and were included in the 'Population Served by Public CWS' for Roanoke County.

Water use for self-supplied, individual well users in each jurisdiction was estimated based on the assumption of 75 gallons per day per person.

3.6.1 Bedford County

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in Bedford County is presented in Table 3.6.1.

Table 3.6.1: Estimated Water Use for Individual Well Users in Bedford County.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
60,371	17,993	3742	38,636	1058.38

3.6.2 Botetourt County

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in Botetourt County is presented in Table 3.6.2.

Table 3.6.2: Estimated Water Use for Individual Well Users in Botetourt County.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
28,472	4,780	9,049	14,643	401.13

3.6.3 Franklin County

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in Franklin County is presented in Table 3.6.3.

Table 3.6.3: Estimated Water Use for Individual Well Users in Franklin County.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
42,935	4,832	4,754	33,349	913.60

3.6.4 Roanoke County

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in Roanoke County is presented in Table 3.6.4.

Table 3.6.4: Estimated Water Use for Individual Well Users in Roanoke County.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
77,996	62,332	1,113	14,551	398.61

3.6.5 City of Roanoke

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the City of Roanoke is presented in Table 3.6.5.

Table 3.6.5: Estimated Water Use for Individual Well Users in the City of Roanoke.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
94,911	94,911	0	0	0.00

3.6.6 City of Salem

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the City of Salem is presented in Table 3.6.6.

Table 3.6.6: Estimated Water Use for Individual Well Users in the City of Salem.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
24,747	24,682	65	0	0.00

3.6.7 Town of Boones Mill

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Boones Mill is presented in Table 3.6.7.

Table 3.6.7: Estimated Water Use for Individual Well Users in the Town of Boones Mill.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
285	285	0	0	0.00

3.6.8 Town of Buchanan

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Buchanan is presented in Table 3.6.8.

Table 3.6.8: Estimated Water Use for Individual Well Users in the Town of Buchanan.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
1,233	1,230	0	3	0.08

3.6.9 Town of Fincastle

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Fincastle is presented in Table 3.6.9.

Table 3.6.9: Estimated Water Use for Individual Well Users in the Town of Fincastle.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
359	359	0	0	0.00

3.6.10 Town of Rocky Mount

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Rocky Mount is presented in Table 3.6.10.

Table 3.6.10: Estimated Water Use for Individual Well Users in the Town of Rocky Mount.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
4066	4066	0	0	0.00

3.6.11 Town of Troutville

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Troutville is presented in Table 3.6.11.

Table 3.6.11: Estimated Water Use for Individual Well Users in the Town of Troutville.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
432	432	0	0	0.00

3.6.12 Town of Vinton

Estimated water used by self-supplied, residential users on individual wells using less than 300,000 gallons per month of groundwater in the Town of Vinton is presented in Table 3.6.12.

Table 3.6.12: Estimated Water Use for Individual Well Users in the Town of Vinton.

2000 Census Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells	Estimated Annual Average Water Use (MG)
7,782	7,782	0	0	0.00

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4.0 EXISTING RESOURCE INFORMATION

4.1 Geologic, Hydrologic and Meteorological Conditions[1]

The following geologic, hydrologic, and meteorological information is compiled from a variety of United States Geological Survey (USGS), Virginia Division of Mineral Resources (VDMR) publications, and the National Oceanic and Atmospheric Administration (NOAA). Watershed information was retrieved through the United States Environmental Protection Agency (USEPA) Surf Your Watershed, Virginia Department of Conservation and Recreation (VDCR) Soil and Water Conservation (SWC), United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), and USGS Water Resources of the United States.

4.1.1 Physiographic Provinces

The Roanoke Valley-Alleghany Region spans multiple Physiographic Provinces in Virginia including the Piedmont, Blue Ridge, and Valley and Ridge. Geologic maps for each County (including towns and cities) are presented as Figures 4.1.3, 4.1.4, 4.1.5, 4.1.6. The underlying geology affects the availability and quality of water resources.

Botetourt and Roanoke counties are located in the Valley and Ridge with minor portions of each county located in the Blue Ridge. Bedford County is primarily located in the Piedmont; however, limited portions of the western side of the county are located in the Blue Ridge. Similarly, Franklin County is located in the Piedmont, with minor portions of the northwestern side of the county located in the Blue Ridge. The western edge of Franklin County is located along the boundary separating the Piedmont and southern Blue Ridge.

Blue Ridge and Piedmont Physiographic Provinces

Both the Blue Ridge and Piedmont provinces are primarily underlain by crystalline (igneous and metamorphic) rocks. Regolith, which consists of saprolite, colluvium, alluvium, and soil, overlies the crystalline rock throughout the region. Because of the varied nature of the regolith in thickness, composition, and grain size, its hydraulic properties also vary greatly. However, the regolith is more permeable than the underlying bedrock in which the only effective porosity is through fractures.

[1] 9 VAC 25-780-90 A.

Recharge of aquifers is highly variable in the Blue Ridge and Piedmont provinces since it is primarily determined by local precipitation and runoff, which are influenced by both topography and surface infiltration. The western part of the Piedmont Province (spanning from North Carolina to central Virginia) is in the rain shadow of the Blue Ridge Mountains; this area receives less precipitation than other areas of Virginia. Well yields for all types of crystalline rocks are generally small; however, coarse-textured crystalline rocks, such as gneiss and schist generally yield more water than fine-grained metavolcanic rocks. Regardless, water is primarily transported through fracture zones in these types of rocks. The majority of water is stored in the regolith (thick or thin), from which water moves downward and is stored in bedrock fractures (which generally decrease with depth). The thicker the regolith, the greater the volume of water in storage, and the more likely the well can sustain its yield. Conversely, a well drilled in an area of thin regolith overlying crystalline rock is more likely to go dry during the summer months. Fracture traces or lineaments can often be identified using aerial photography to aid in siting higher yield wells.

The Piedmont Physiographic Province contains a diverse geology; therefore, there are wide variations in groundwater quality and well yields. In areas with hard crystalline rocks, groundwater occurs in faults and fractures within 300 ft of the surface; well yields in such areas are typically 3 to 20 gallons per minute (gpm). The quality of groundwater in areas of crystalline bedrock is generally good, although the groundwater locally may be acidic and have high iron, manganese, or sulfate content. The pollution potential with such hydrogeology is moderate to low.

The Blue Ridge Physiographic Province is a relatively narrow, mountainous region underlain by granite, gneiss and marble. The province is characterized by rapid surface runoff and low aquifer recharge. Groundwater use in the Blue Ridge is generally limited to domestic wells which produce less than 20 gpm. The groundwater is typically of good quality although it may be locally high in iron, manganese, or sulfate content. The groundwater pollution potential in this area is low.

The crystalline and undifferentiated sedimentary rocks of the Piedmont and Blue Ridge aquifers generally have low dissolved solids contents, water is considered soft. The median hydrogen ion concentration, measured in pH units, is 6.7; therefore, the aquifers tend to be slightly acidic.

Valley and Ridge Physiographic Province

The Valley and Ridge is composed of limestone, dolomite, shale and sandstone. In areas underlain by limestone the groundwater is generally hard and calcium-rich; groundwater in areas underlain by shale is normally sulfurous and iron-bearing; groundwater in areas underlain by sandstone is generally of good quality. Sources of groundwater in the Valley and Ridge are fractured sandstone and cavernous limestone with recharge through precipitation and surface streams. Limestone aquifers may yield up to 3000 gpm, whereas yields from sandstone and shale aquifers are normally 5 to 100 gpm, only sufficient for rural or domestic use. The limestone areas are subject to the development of karst topography including the development of sinkholes, subsidence and cave openings. Surface streams in these areas often flow into underground caverns; therefore the potential for pollution of groundwater resources is very high. These streams recharge the aquifers and thereby provide direct conduits for pollutants to the subsurface.

4.1.2 Regional Watersheds

The region is primarily located within the Roanoke River watershed, with the northern portions of Bedford and Botetourt counties in the James River watershed. Smaller watersheds and notable rivers and streams are discussed in the following sections. Watershed information was retrieved through the USEPA Surf Your Watershed, VDCR SWC, USDA NRCS, and USGS Water Resources of the United States. Watersheds are defined by Hydrologic Unit Codes (HUC). Major watersheds are identified by 8-digit HUCs. Each 2-digit piece of the HUC identifies the watersheds, region, sub-region, basin, and sub-basin. The major watersheds are divided into smaller watersheds with 10-digit HUCs (also known as level 5). Level 5 watersheds are the basis for natural resource planning. Sub-watersheds (level 6 or 12-digit HUCs) help identify water sources such as rivers and streams that contribute within a watershed. Level 5 or 10-digit HUC watersheds are presented for the region in Figure 4.1.2.

Figure 4.1.2: Watershed Map

Meteorological Data

Meteorological information was reviewed through the NOAA Satellite and Information Service, National Environmental Satellite, Data, and Information Service (NESDIS). The publication *Climatography of the United States No. 81, Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000* for the State of Virginia is referenced where appropriate in the following sections. Normals are a 30-year arithmetic mean, computed once per decade.

4.1.3 Bedford County

Geology

Bedford County is located primarily in the Piedmont Physiographic Province; the western portion of the County is located in the Blue Ridge Physiographic Province. Rock types found throughout Bedford County include stratified Cambrian age rocks of the Blue Ridge Anticlinorium (crystalline), Middle Proterozoic (Grenville age) Plutonic Rocks and Middle Proterozoic (early to pre-Grenville age) Gneisses of the Blue Ridge Basement Complex, and a small portion of Cambrian age sedimentary rocks (shale, sandstone, siltstone, limestone, and dolostone) on the far western portion of the County. A geologic map of the county is presented as Figure 4.1.3.

Hydrology

The majority of Bedford County is located in the Roanoke River Basin including the City of Bedford. A small portion, located in the northeastern section of the County, is located within the James River Basin. The county is located in two major watersheds: the Upper Roanoke (HUC 03010101) and the Middle James-Buffalo (HUC 02080203). Level 5 watersheds include all or portions of the Upper Big Otter River, Upper Goose Creek, Roanoke River-Smith Mountain Lake, Lower Goose Creek, Lower Big Otter River, James River-Reed Creek, James River-Harris Creek, and Roanoke River-Leesville Lake. The City of Bedford is located within the Upper Big Otter River Watershed.

Meteorological Conditions

Three NOAA monitoring stations are located in Bedford County at the Bedford, Holcomb Rock, and Huddleston Stations. Temperature normals were not available for the Holcomb Rock or Huddleston Stations. The mean annual temperature at the Bedford station is documented at 55.6 degrees Fahrenheit (°F) with an annual average high of 66.6°F and average annual low of 44.5°F. Highest temperatures are generally documented in July and the lowest temperatures in January. Annual precipitation ranges from 42.89” to 44.80” between the three stations with the highest precipitation normals documented in May, July, and September and the lowest precipitation normals documented in February and December.

Figure 4.1.3: Bedford County Geologic Map

4.1.4 Botetourt County including the Towns of Buchanan, Fincastle, and Troutville

Geology

Botetourt County is located primarily in the Valley and Ridge Physiographic Province; the southeastern portion of the County is located in the Blue Ridge Physiographic Province. Rock types found throughout Botetourt County include stratified Cambrian, Ordivician, Silurian, and Devonian age sedimentary rocks (shale, sandstone, siltstone, limestone, and dolostone) of the Valley and Ridge and Middle Proterozoic (early or pre-Grenville age) gneisses of the Blue Ridge Basement Complex in the southeastern portion of the County. A geologic map of the county is presented as Figure 4.1.4.

Hydrology

The majority of Botetourt County is located in the James River Basin. A small portion located in the southwestern section of the County is located within the Roanoke River Basin. The county is located in one major watershed: the Upper James (HUC 02080201). Level 5 watersheds include all or portions of the Lower Cowpasture River, James River-Mill Creek, Lower Maury River, Lower Craig Creek, Catawba Creek, James River-Looney Creek, James River-Cedar Creek, and the Roanoke River-Tinker Creek.

Meteorological Conditions

One NOAA monitoring station is located in Botetourt County at the Buchanan Station. The mean annual temperature at the Buchanan station is documented at 56.2°F with an annual average high of 69.1°F and average annual low of 43.2°F. Highest temperatures are generally documented in July and the lowest temperatures in January. Annual precipitation is 42.49” with the highest precipitation normals documented in May and the lowest precipitation normals documented in February.

Figure 4.1.4: Botetourt County Geologic Map

4.1.5 Franklin County including the Towns of Boones Mill and Rocky Mount

Geology

Franklin County is located primarily in the Piedmont Physiographic Province; the northern portion of the County is located in the Blue Ridge Physiographic Province. Rock types found throughout Franklin County include stratified Cambrian age rocks of the Blue Ridge Anticlinorium (crystalline), and Middle Proterozoic (early to pre-Grenville age) gneisses. A geologic map of the county is presented as Figure 4.1.5.

Hydrology

The majority of Franklin County is located in the Roanoke River Basin. The county is located in two major watersheds: the Upper Roanoke (HUC 03010101) and the Upper Dan (HUC 03010103). Level 5 watersheds include all or portions of the Roanoke River-Smith Mountain Lake, Lower Blackwater River, Upper Pigg River, Snow Creek, Middle Smith River, Upper Smith River, and the Upper Blackwater River.

Meteorological Conditions

One NOAA monitoring station is located in Franklin County at the Rocky Mount Station. The mean annual temperature at the Rocky Mount station is documented at 55.5°F with an annual average high of 66.7°F and average annual low of 44.7°F. Highest temperatures are generally documented in July and the lowest temperatures in January. Annual precipitation is 46.62” with the highest precipitation normals documented in July and the lowest precipitation normals documented in December.

Figure 4.1.5: Franklin County Geologic Map

4.1.6 Roanoke County including the Cities of Roanoke and Salem and the Town of Vinton

Geology

Roanoke County is located primarily in the Valley and Ridge Physiographic Province; the southeastern portion of the County is located in the Blue Ridge Physiographic Province. Rock types found throughout Roanoke County include stratified Cambrian, Silurian, and Devonian age sedimentary rocks (shale, sandstone, siltstone, limestone, and dolostone) of the Valley and Ridge and Middle Proterozoic (early or pre-Grenville age) Gneisses of the Blue Ridge Basement Complex in the south and southeastern portions of the County. A geologic map of the county is presented as Figure 4.1.6.

Hydrology

Roanoke County including the City of Roanoke and the City of Salem is located in the Roanoke River Basin. The county is located in one major watershed: the Upper Roanoke (HUC 03010101). Level 5 watersheds include all or portions of the Roanoke River-Tinker Creek, Upper Craig Creek, North Fork Roanoke River, and the South Fork Roanoke River. The City of Roanoke is located within the Roanoke River-Tinker Creek Watershed. The City of Salem is located primarily within the Roanoke River-Mason Creek Watershed.

Meteorological Conditions

One NOAA monitoring station is located in Roanoke County at the Roanoke Woodrum AP Station. The mean annual temperature at the Roanoke Woodrum AP station is documented at 56.3°F with an annual average high of 67.2°F and average annual low of 45.42°F. Highest temperatures are generally documented in July and the lowest temperatures in January. Annual precipitation is 42.49" with the highest precipitation normals documented in May and the lowest precipitation normals documented in February.

Figure 4.1.6: Roanoke County Geologic Map

4.2 Existing Environmental Conditions that Pertain to or May Affect In-Stream Flow, In-Stream Uses, and Sources that Provide the Current Supply[2]

Environmental conditions that may affect use of surface water sources include threatened and endangered species, habitats of concern, significant fisheries, recreational river segments, historical and archaeological sites, unusual geologic site or special soil types, wetlands, riparian buffers and conservation easements, land use patterns, impaired streams, point source discharges, and other threats to water quantity and quality.

4.2.1 State or Federal Listed Threatened or Endangered Species or Habitats of Concern

Information on state or federal listed threatened and endangered species or habitats of concern for the region was collected from the Virginia Fish and Wildlife Information Service (VAFWIS) whose database can be accessed by county. Species are listed as federal endangered (FE), federal threatened (FT), federal candidate (FC), federal species of concern (FS), state endangered (SE), state threatened (ST), and state special concern (SS). Federal species of concern and state special concern are not legal status and the list is maintained by the U.S. Fish and Wildlife Service (USFWS) Virginia Field Office. Table 4.2.1A summarizes state and/or federal listed threatened or endangered species in Bedford, Botetourt, Franklin, and Roanoke counties and the City of Roanoke, and the City of Salem and associated Towns.

Table 4.2.1A: State and Federal Threatened and Endangered Species

Species Code	Common Name	Scientific Name	Status
Bedford County			
010214	Logperch, Roanoke	*Percina rex*	FE/SE
040379	Sparrow, Henslow's	*Ammodramus henslowii*	ST
060173	Pigtoe, Atlantic	*Fusconaia masoni*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
100248	Fritillary, regal	*Speyeria idalia idalia*	FS
010174	Bass, Roanoke	*Ambloplites cavifrons*	SS
020039	Salamander, Peaks of Otter	*Plethodon hubrichti*	FS/SS
100154	Butterfly, Persius duskywing	*Erynnis persius persius*	FS
100256	Crescent, tawny	*Phyciodes batesii batesii*	FS
010110	Jumprock, bigeye	*Scartomyzon ariommus*	FS
100001	Fritillary, Diana	*Speyeria Diana*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
040093	Eagle, bald	*Haliaeetus leucocephalus*	FS/ST
010077	Shiner, bridle	*Notropis bifrenatus*	SS

[2] 9 VAC 25-780-90 B.

Species Code	Common Name	Scientific Name	Status
040372	Crossbill, red	*Loxia curvirostra*	SS
040306	Warbler, golden-winged	*Vermivora chrysoptera*	SS
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040040	Ibis, glossy	*Plegadis falcinellus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS
040189	Tern, Caspian	*Sterna caspia*	SS
040278	Thrush, hermit	*Catharus guttatus*	SS
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	SS
Botetourt County and Towns of Buchanan, Fincastle, and Troutville			
060017	Spinymussel, James	*Pleurobema collina*	FE/SE
010127	Madtom, orangefin	*Noturus gilberti*	FS/ST
060173	Pigtoe, Atlantic	*Fusconaia masoni*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
100248	Fritillary, regal	*Speyeria idalia idalia*	FS
010346	Shiner, roughhead	*Notropis semperasper*	FS/SS
020039	Salamander, Peaks of Otter	*Plethodon hubrichti*	FS/SS
100001	Fritillary, Diana	*Speyeria Diana*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
040093	Eagle, bald	*Haliaeetus leucocephalus*	FS/ST
040372	Crossbill, red	*Loxia curvirostra*	SS
040306	Warbler, golden-winged	*Vermivora chrysoptera*	SS
040213	Owl, northern saw-whet	*Aegolius acadicus*	SS
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040241	Flycatcher, alder	*Empidonax alnorum*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS

Species Code	Common Name	Scientific Name	Status
040278	Thrush, hermit	*Catharus guttatus*	SS
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	**SS**
Franklin County and Towns of Boones Mill and Rocky Mount			
010214	Logperch, Roanoke	*Percina rex*	FE/SE
010127	Madtom, orangefin	*Noturus gilberti*	FS/ST
060173	Pigtoe, Atlantic	*Fusconaia masoni*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
010174	Bass, Roanoke	*Ambloplites cavifrons*	SS
010110	Jumprock, bigeye	*Scartomyzon ariommus*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
040093	Eagle, bald	*Haliaeetus leucocephalus*	FS/ST
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS
040189	Tern, Caspian	*Sterna caspia*	SS
040278	Thrush, hermit	*Catharus guttatus*	SS
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	SS
Roanoke County and Town of Vinton			
010214	Logperch, Roanoke	*Percina rex*	FE/SE
100155	Skipper, Appalachian grizzled	*Pyrgus Wyandot*	FSST
010127	Madtom, orangefin	*Noturus gilberti*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
010174	Bass, Roanoke	*Ambloplites cavifrons*	SS
100248	Fritillary, regal	*Speyeria idalia idalia*	FS
100154	Butterfly, Persius duskywing	*Erynnis persius persius*	FS
010110	Jumprock, bigeye	*Scartomyzon ariommus*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
010115	Sucker, rustyside	*Thoburnia hamiltoni*	SS
100001	Fritillary, Diana	*Speyeria Diana*	FS
040372	Crossbill, red	*Loxia curvirostra*	SS
040306	Warbler, golden-winged	*Vermivora chrysoptera*	SS

Species Code	Common Name	Scientific Name	Status
040304	Warbler, Swanson's	*Limnothlypis swainsonii*	SS
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040241	Flycatcher, alder	*Empidonax alnorum*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS
040278	Thrush, hermit	*Catharus guttatus*	SS
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	SS
City of Roanoke			
010214	Logperch, Roanoke	*Percina rex*	FE/SE
100155	Skipper, Appalachian grizzled	*Pyrgus Wyandot*	FSST
010127	Madtom, orangefin	*Noturus gilberti*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
010174	Bass, Roanoke	*Ambloplites cavifrons*	SS
100248	Fritillary, regal	*Speyeria idalia idalia*	FS
100154	Butterfly, Persius duskywing	*Erynnis persius persius*	FS
010110	Jumprock, bigeye	*Scartomyzon ariommus*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
040093	Eagle, bald	*Haliaeetus leucocephalus*	FS/ST
100001	Fritillary, Diana	*Speyeria Diana*	FS
010115	Sucker, rustyside	*Thoburnia hamiltoni*	SS
040306	Warbler, golden-winged	*Vermivora chrysoptera*	SS
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040241	Flycatcher, alder	*Empidonax alnorum*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS
040278	Thrush, hermit	*Catharus guttatus*	SS

Species Code	Common Name	Scientific Name	Status
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	SS
City of Salem			
010214	Logperch, Roanoke	*Percina rex*	FE/SE
100155	Skipper, Appalachian grizzled	*Pyrgus Wyandot*	FSST
010127	Madtom, orangefin	*Noturus gilberti*	FS/ST
040292	Shrike, migrant loggerhead	*Lanius ludovicianus migrans*	ST
010174	Bass, Roanoke	*Ambloplites cavifrons*	SS
100248	Fritillary, regal	*Speyeria idalia idalia*	FS
100154	Butterfly, Persius duskywing	*Erynnis persius persius*	FS
010110	Jumprock, bigeye	*Scartomyzon ariommus*	FS
040096	Falcon, peregrine	*Falco peregrines*	ST
040129	Sandpiper, upland	*Bartramia longicauda*	ST
040293	Shrike, loggerhead	*Lanius ludovicianus*	ST
010115	Sucker, rustyside	*Thoburnia hamiltoni*	SS
100001	Fritillary, Diana	*Speyeria Diana*	FS
040093	Eagle, bald	*Haliaeetus leucocephalus*	FS/ST
040306	Warbler, golden-winged	*Vermivora chrysoptera*	SS
040266	Wren, winter	*Troglodytes troglodytes*	SS
040094	Harrier, northern	*Circus cyaneus*	SS
040036	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*	SS
040204	Owl, barn	*Tyto alba pratincola*	SS
040264	Creeper, brown	*Certhia americana*	SS
040364	Dickcissel	*Spiza americana*	SS
040032	Egret, great	*Ardea alba egretta*	SS
040366	Finch, purple	*Carpodacus purpureus*	SS
040241	Flycatcher, alder	*Empidonax alnorum*	SS
040285	Kinglet, golden-crowned	*Regulus satrapa*	SS
040112	Moorhen, common	*Callinula chloropus cachinnans*	SS
040262	Nuthatch, red-breasted	*Sitta cnadensis*	SS
040278	Thrush, hermit	*Catharus guttatus*	SS
040314	Warbler, magnolia	*Dendroica magnolia*	SS
050045	Otter, northern river	*Lontra Canadensis lataxina*	SS

Source: http://vafwis.org/fwis/?Menu=Home.Species+Information April 16, 2009.

Information on state listed threatened and endangered plant species was collected from the VDCR, Division of Natural Heritage (DNH) and the USDA NRCS. The following table summarizes federal and state listed threatened or endangered plant species for the region.

Table 4.2.1B: State and Federal Threatened and Endangered Plant Species

County/City	Common Name	Scientific Name	Status
Bedford	Small whorled pogonia	*Isotria medeoloides*	SE/FT
Botetourt	Smooth coneflower	*Echinacea laevigata*	FE/ST
Franklin			
Roanoke			

Source: http://plants.usda.gov/threat.html April 21, 2009.
Source: http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml April 21, 2009.

4.2.2 Anadromous Trout and other Significant Fisheries

No anadromous fish species are present in the region. Trout and other significant fish species identified and recorded by the Virginia Department of Game and Inland Fisheries (VDGIF) are found in waterways throughout the region. Fish species are given Game, Sport, and Pest/Nuisance designations where appropriate. Additional designations are given under the Virginia Wildlife Action Plan (VWAP), which determines noted levels of conservation need from moderate (level IV) to critical (level I) beyond the threatened and endangered listings.

In Bedford County, 74 fish species are recorded, 29 of which are sport fish and one of which is a pest/nuisance fish. Botetourt County has 59 fish species of which 20 are considered sport and one is considered a pest/nuisance. Franklin County has 42 fish species recorded with 27 of them identified as sport fish and one pest/nuisance. Roanoke County has 60 recorded fish species with 17 of those being sport fish and one pest/nuisance. Designated Game, Sport, and Pest/Nuisance fish species for the region are presented in Table 4.2.2.

Table 4.2.2: Game, Sport, and Pest/Nuisance Fish Species

Species Code	Common Name	Scientific Name	Status/WAP
Bedford County			
010174	Bass, Roanoke	*Ambloplites cavifrons*	Sport Fish/II
010038	Alewife	*Alosa pseudoharengus*	Sport Fish/IV
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010168	Bass, striped	*Morone saxatilis*	Sport Fish
010167	Bass, white	*Morone chrysops*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish
010123	Bullhead, brown	*Ameiurus nebulosus*	Sport Fish
010124	Bullhead, flat	*Ameiurus platycephalus*	Sport Fish

Species Code	Common Name	Scientific Name	Status/WAP
010062	Carp, common	*Cyprinus carpio*	Sport Fish
010125	Catfish, channel	*Ictalurus punctatus*	Sport Fish
010130	Catfish, flathead	*Pylodictis olivaris*	Sport Fish
010120	Catfish, white	*Ameiurus catus*	Sport Fish
010190	Crappie, black	*Pomoxis nigromaculatus*	Sport Fish
010189	Crappie, white	*Pomoxis annularis*	Sport Fish
010365	Muskellunge	*Esox masquinongy*	Sport Fish
010166	Perch, white	*Morone americana*	Sport Fish
010206	Perch, yellow	*Perca flavescens*	Sport Fish
010056	Pickerel, chain	*Esox niger*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish
010116	Redhorse, shorthead	*Moxostoma macrolepidotum*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish
010052	Trout, brook	*Salvlinus fontinalis*	Sport Fish
010051	Trout, brown	*Salmo trutta*	Sport Fish
010050	Trout, rainbow	*Oncorhynchus mykiss*	Sport Fish
010216	Walleye	*Stizostedion vitreum vitreum*	Sport Fish
010177	Warmouth	*Lepomis gulosus*	Sport Fish
Botetourt County and Towns of Buchanan, Fincastle, and Troutville			
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish
010123	Bullhead, brown	*Ameiurus nebulosus*	Sport Fish
010124	Bullhead, flat	*Ameiurus platycephalus*	Sport Fish
010062	Carp, common	*Cyprinus carpio*	Sport Fish
010125	Catfish, channel	*Ictalurus punctatus*	Sport Fish
010130	Catfish, flathead	*Pylodictis olivaris*	Sport Fish
010120	Catfish, white	*Ameiurus catus*	Sport Fish
010190	Crappie, black	*Pomoxis nigromaculatus*	Sport Fish
010056	Pickerel, chain	*Esox niger*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish
010116	Redhorse, shorthead	*Moxostoma macrolepidotum*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish
010052	Trout, brook	*Salvlinus fontinalis*	Sport Fish
010051	Trout, brown	*Salmo trutta*	Sport Fish
010050	Trout, rainbow	*Oncorhynchus mykiss*	Sport Fish
010177	Warmouth	*Lepomis gulosus*	Sport Fish
Franklin County and Towns of Boones Mill and Rocky Mount			
010174	Bass, Roanoke	*Ambloplites cavifrons*	Sport Fish/II
010038	Alewife	*Alosa pseudoharengus*	Sport Fish/IV
010040	Shad, American	*Alosa sapidissima*	Sport Fish/IV
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010168	Bass, striped	*Morone saxatilis*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish

Species Code	Common Name	Scientific Name	Status/WAP
010123	Bullhead, brown	*Ameiurus nebulosus*	Sport Fish
010124	Bullhead, flat	*Ameiurus platycephalus*	Sport Fish
010062	Carp, common	*Cyprinus carpio*	Sport Fish Pest/Nuisance
010125	Catfish, channel	*Ictalurus punctatus*	Sport Fish
010120	Catfish, white	*Ameiurus catus*	Sport Fish
010190	Crappie, black	*Pomoxis nigromaculatus*	Sport Fish
010189	Crappie, white	*Pomoxis annularis*	Sport Fish
010365	Muskellunge	*Esox masquinongy*	Sport Fish
010206	Perch, yellow	*Perca flavescens*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish
010116	Redhorse, shorthead	*Moxostoma macrolepidotum*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010181	Sunfish, green	*Lepomis cyanellus*	Sport Fish
010185	Sunfish, redear	*Lepomis microlophus*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish
010052	Trout, brook	*Salvlinus fontinalis*	Sport Fish
010051	Trout, brown	*Salmo trutta*	Sport Fish
010050	Trout, rainbow	*Oncorhynchus mykiss*	Sport Fish
010216	Walleye	*Stizostedion vitreum vitreum*	Sport Fish
Roanoke County and Town of Vinton			
010174	Bass, Roanoke	*Ambloplites cavifrons*	Sport Fish/II
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish
010123	Bullhead, brown	*Ameiurus nebulosus*	Sport Fish
010062	Carp, common	*Cyprinus carpio*	Sport Fish
010125	Catfish, channel	*Ictalurus punctatus*	Sport Fish
010056	Pickerel, chain	*Esox niger*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish
010116	Redhorse, shorthead	*Moxostoma macrolepidotum*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010181	Sunfish, green	*Lepomis cyanellus*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish
010052	Trout, brook	*Salvlinus fontinalis*	Sport Fish
010051	Trout, brown	*Salmo trutta*	Sport Fish
010050	Trout, rainbow	*Oncorhynchus mykiss*	Sport Fish
City of Roanoke			
010174	Bass, Roanoke	*Ambloplites cavifrons*	Sport Fish/II
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish
010062	Carp, common	*Cyprinus carpio*	Sport Fish
010190	Crappie, black	*Pomoxis nigromaculatus*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish

Species Code	Common Name	Scientific Name	Status/WAP
City of Salem			
010174	Bass, Roanoke	*Ambloplites cavifrons*	Sport Fish/II
010188	Bass, largemouth	*Micropterus salmoides*	Sport Fish
010175	Bass, rock	*Ambloplites rupestris*	Sport Fish
010186	Bass, smallmouth	*Micropterus dolomieu*	Sport Fish
010183	Bluegill	*Lepomis macrochirus*	Sport Fish
010123	Bullhead, brown	*Ameiurus nebulosus*	Sport Fish
010056	Pickerel, chain	*Esox niger*	Sport Fish
010105	Sucker, white	*Catostomus commersoni*	Sport Fish
010180	Sunfish, redbreast	*Lepomis auritus*	Sport Fish
010182	Pumpkinseed	*Lepomis gibbosus*	Sport Fish

Source: http://vafwis.org/fwis/?Menu=Home.Species+Information April 21, 2009.

4.2.3 River Segments that have Recreational Significance including Scenic River Status

Information on river segments with recreation significance, including state scenic river status, was collected from VDCR. VDCR has established the Virginia Scenic River System. The intent of this program is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. A focus of the program is to enhance the conservation and wise use of scenic rivers and their attendant corridors. Table 4.2.3A presents river segments in the region which are designated or potential scenic streams based on a review of the Scenic Rivers Map of Virginia. However, according to a representative from VDCR, the segment of the Roanoke River from Shawsville to Smith Mountain Lake is no longer considered scenic though the on-line data has not been updated, the GIS layer (as is presented on Figure 4.2.3) is accurate. A river component identified as desirable is one that has been evaluated and found worthy of the scenic designation, but has not been legislatively designated. A river component identified as potential is one that has been identified as being worthy of future study. A map showing scenic rivers in the region is included as Figure 4.2.3.

Figure 4.2.3: Designated Scenic Rivers Map

Table 4.2.3A: Virginia's Scenic Rivers

River	Designated Reach	City/County	Status
Blackwater River	Rte. 220 to Smith Mountain Lake	Franklin	Potential
Pigg River	Entire River in Franklin and Pittsylvania Counties	Franklin	Potential
Roanoke River*	Shawsville to Smith Mtn. Lake	Bedford	Scenic
James River	2 miles west Rte. 43 crossing Rte. 630 bridge at Springwood	Botetourt	Scenic
James River	Springwood to Glasgow	Botetourt	Desirable

Source:http://www.dcr.virginia.gov/recreational_planning/documents/srlist.pdf April 21, 2009.
http://www.dcr.virginia.gov/recreational_planning/documents/srmap.pdf April 21, 2009.
*As noted in the preceding paragraph, according to a representative from DCR, the segment of the Roanoke River from Shawsville to Smith Mountain Lake is no longer considered scenic though on-line data has not been updated. The information is presented in this table as it was documented on the source page.

Additionally, the National Park Service maintains a Nationwide Rivers Inventory as part of the Rivers, Trains, and Conservation Assistance program. The list of Virginia river segments with noted significance is presented in Table 4.2.3B.

Table 4.2.3B: Rivers, Trails & Conservation Program River Segments

River	Locality	Year Listed/updated	Significance
Big Otter River	Bedford County	1982	Geologic Botanic
Big Otter River	Bedford County	1982	Hydrologic
Craig Creek	Botetourt County	1982	Historic Recreation Cultural Geologic
James River (2 segments)	Botetourt County	1982	Hydrologic Historic

Source: http://www.nps.gov/ncrc/programs/rtca/nri/states/va.html last modified February 7, 2009, accessed April 21, 2009.

4.2.4 Site of Historic or Archeological Significance

The National Register of Historic Places (NRHP) is the Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act (NHPA) of 1966, the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate and protect historic and archaeological resources. Properties listed in the NRHP include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture.

The Virginia Department of Historic Resources (VDHR) protects Virginia's significant historic, architectural, archaeological, and cultural resources. Under federal law, a historic property is any district, site, building, structure, or object that meets the criteria for listing on the NRHP. The National Register is a list established by the NHPA of 1966, as amended, to recognize properties for their significance in history, architecture, archaeology, engineering, or culture. Under state law, a historic property is any district, site, building, structure, or object designated by the Virginia Board of Historic Resources for listing on the Virginia Landmarks Register (VLR). The criteria are the same as those used for the National Register.

The VLR, established in 1966, is managed by the VDHR. It is the State's official list of properties important to Virginia's history. The same criteria used by the VDHR are used to evaluate resources for inclusion in the VLR. Table 4.2.4 summarizes historic sites in the Region.

Table 4.2.4: Summary of Historic Sites

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
Bedford County					
Poplar Forest	Lynchburg	Forest	5/13/69	11/12/69 NHL 11/11/71	009-0027
Three Otters	Bedford	Bedford	7/7/70	9/15/70	009-0031
Fancy Farm	Bedford	Peaks of Otter	7/6/71	1/7/72	009-0007
New London Academy	Forest	Forest	12/21/71	4/13/72	009-0047
Elk Hill	Forest	Boonsboro	11/21/72	4/2/73	009-0006
Woodbourne	Forest	Forest	4/17/73	7/2/73	009-0033
Old Rectory (Saint Stephen's)	Perrowville	Boonsboro	9/16/73	7/24/73	009-0056
Hope Dawn	Lynchburg	Lynchburg/Tobacco Row Mtn.	9/17/74	10/9/74	009-0043
Saint Stephen's Episcopal Church	Forest	Boonsboro	8/13/85	11/07/85	009-0029
Bellvue	Goode	Forest	8/15/89	12/19/90	009-0003
Locust Level	Montvale	Montvale	8/21/90	12/21/90	009-0018
Mount Airy	Leesville	Leesville	10/16/90	12/19/90	009-0221
Cifax Rural Historic District	Cifax	Sedalia	8/21/91	2/20/92	009-0254
Rothsay	Forest	Forest	2/28/92	10/30/92	009-0065
Bowling Eldridge House	Moved from Halifax County	Lynchburg	6/19/93	8/12/93	009-5283
Brook Hill Farm	Forest	Goode/Forest	9/18/96	6/6/97	009-0318
Big Otter Mill	Bedford	Peaks of Otter	9/14/98	10/30/98	009-0152
New Prospect Church	Bedford	Montvale	6/16/99	3/31/00	009-5211
Otterburn	Bedford	Goode	12/6/00	2/16/01	009-0024

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
Twin Oaks Farm	-	Montvale	3/14/01	7/5/01	009-5273
Thomas Methodist Episcopal Chapel	Thaxton	Montvale	6/16/04	8/11/04	009-0178
Bellevue Rural Historic District	Forest	Forest/Goode	10/14/05	11/30/05	009-5296
Pleasant View	Forest	Forest	9/6/06	11/15/06	009-0207
Olive Branch Missionary Baptist Church	Moneta	Goodview	3/7/07	5/4/07	009-0135
Botetourt County and Towns of Buchanan, Fincastle, and Troutville					
Fincastle Historic District	Fincastle	Daleville, Oriskany, Salisbury, Villamont	6/13/69	11/12/69	218-0051
Callie Furnace	Glen Wilton	Clifton Forge	7/17/73	1/21/74	011-0065
Santillane	Fincastle	Daleville	1/15/74	7/24/74	011-0032
Phoenix Bridge	Eagle Rock	Eagle Rock	2/18/75	6/10/75	001-0095
Wilson Warehouse	Buchanan	Buchanan	7/19/77	1/26/78	180-0006
Looney Mill Creek Site	Buchanan	Buchanan	4/19/77	8/3/78	011-0184
Prospect Hill	Fincastle	Villamont	9/18/79	12/28/79	011-0185
Nininger's Mill	Daleville	Daleville	5/20/80	7/30/80	011-0057
Breckinridge Mill (Boundary Increase)	Fincastle	Daleville	5/20/80 3/17/99	7/30/80 5/30/02	011-0187
Roaring Run Furnace	Eagle Rock	Strom	6/15/76	3/21/83	011-0063
Bessemer Archeological Site	Eagle Rock	Eagle Rock	9/16/82	12/15/84	011-0188
Wiloma	Fincastle	Oriskany	10/18/83	11/22/85	011-0039
Wheatland Manor	Fincastle	Salisbury	10/8/91	2/5/92	011-0038
Annandale	Gillmore Mills	Arnold Valley	12/09/92	2/11/93	011-0041
Varney's Falls Dam and Lock	Gillmore Mills	Arnold Valley	8/18/93	10/14/93	011-0068
Anderson House	Haymakertown	Daleville	9/17/97	2/25/99	011-0056
Buchanan Historic District	Buchanan	Buchannan	9/14/98	1/27/99	180-0028
Bowyer-Holladay House	Fincaste	Daleville	3/17/99	6/10/99	011-0028
Catawba Furnace	-	Catawba	3/17/99	Pending	011-0040
Hawthorne Hall	Fincastle	Oriskany	12/01/99	1/28/00	011-0037
Thomas D. Kinzie House	Troutville	Daleville	6/13/01	4/26/02	011-5034
Greyledge	Buchanan	Buchannan	9/12/01	2/5/02	011-0010
Lauderdale	Buchanan	Villamont	9/5/07	10/31/07	011-0048
Franklin County and Towns of Boones Mill and Rocky Mount					
Booker T. Washington National Monument	Rocky Mount	Moneta	1/16/73	10/15/66	033-0015
Washington Iron Furnace	Rocky Mount	Rocky Mount	10/17/72	3/20/73	157-0029
Woods-Meade	Rocky Mount	Rocky Mount	10/20/81	7/8/82	157-0003

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
House					
Otter Creek Archaeological Site	Ferrum	Ferrum	4/16/85	5/9/85	033-0288
The Farm	Rocky Mount	Rocky Mount	2/21/89	11/2/89	157-0021
Brooks-Brown House	Dickinson	Penhook	8/15/89	11/2/89	033-0128
Greer House	Rocky Mount	Rocky Mount	2/20/90	12/28/90	157-0023
Hook-Powell-Moorman Farm	Hales Ford	Goodview	4/28/95	7/21/95	033-0022
Cahas mountain Rural Historic District	Boones Mill	Bent Mtn., Boones Mill, Callaway, Garden City	3/20/96	6/7/96	033-0393
Waverly	Burnt Chimney	Redwood	6/19/96	11/7/96	033-0028
Finney-Lee House	Snow Creek	Snow Creek	3/19/97	5/23/97	033-0179
Jubal A. Early Homeplace	Boones Mill	Garden City	9/17/97	12/11/97	033-0006
Burwell-Holland House	Glade Hill	Penhook	9/14/98	6/6/02	033-0003
Rocky Mount Historic District (Boundary Increase)	Rocky Mount	Rocky Mount	3/17/99 3/20/08	6/11/99 5/15/08	157-5002
Evergreen	Rocky Mount	Boones Mill	9/15/99	12/9/99	033-0214
Bowman Farm	Boones Mill	Callaway	12/1/99	4/3/00	033-0283
Holland-Duncan House	Moneta	Moneta SW	12/1/99	1/28/00	033-0046
Booth-Lovelace House	Hardy	Hardy	6/12/02	9/14/02	033-0066
Bleak Hill	Callaway	Ferrum	9/11/02	11/21/02	033-0002
Gwin Dudley Home Site (Twin Chimneys)	Wirtz	Moneta SW	6/6/07	1/30/08	033-5172
Piedmont Mill Historic District		Redwood	12/18/08	2/27/09	033-5224
City of Roanoke					
Saint Andrew's Roman Catholic Church	Roanoke	Roanoke	10/17/72	5/7/73	128-0030
Fire Station No. One	Roanoke	Roanoke	9/19/72	5/7/73	128-0033
Lone Oaks	Roanoke	Bent Mountain	1/16/73	4/11/73	128-0010
Buena Vista	Roanoke	Roanoke	1/15/74	7/30/74	128-0001
Monterey	Roanoke	Roanoke	4/16/74	7/30/74	128-0035
Belle Aire*	Salem	Salem	10/21/75	4/15/75	128-0052
Crystal Spring Steam Pumping Station	Roanoke	Garden City	12/28/79	5/23/80	128-0039
Mountain View	Roanoke	Roanoke	6/17/80	10/31/80	128-0022
First National Bank	Roanoke	Roanoke	2/16/82	6/14/82	128-0040

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
Colonia National Bank	Roanoke	Roanoke	9/16/82	2/17/83	128-0044
Harrison School	Roanoke	Roanoke	5/18/82	9/9/82	128-0043
Roanoke City Market Historic District (Boundary Increase)	Roanoke	Roanoke	9/16/82 9/12/01	4/20/83 6/6/02	128-0045
Roanoke Warehouse Historic District	Roanoke	Roanoke	9/16/82	3/29/83	128-0046
Boxley Building	Roanoke	Roanoke	10/18/83	3/8/84	128-0047
Southwest Historic District	Roanoke	Roanoke	4/16/85	6/19/85	128-0049
Roanoke Firehouse No. 6	Roanoke	Roanoke	4/17/90	1/24/91	128-0051
Campbell Avenue Complex	Roanoke	Roanoke	8/21/90	1/24/91	128-0206
Patrick Henry Hotel	Roanoke	Roanoke	4/17/91	11/8/91	128-0235
Saint John's Episcopal Church	Roanoke	Roanoke	6/19/91	9/8/94	128-0236
Huntingdon	Roanoke	Roanoke	8/21/91	2/16/96	128-0005
Mount Moriah Baptist Church and Cemetery	Roanoke	Roanoke	6/15/94	5/31/96	128-0234
Hotel Roanoke	Roanoke	Roanoke	10/18/95	12/2/96	128-0025
Coffee Pot	Roanoke	Garden City	3/20/96	5/31/96	128-0050
Gainsboro Library	Roanoke	Roanoke	9/18/96	12/2/96	128-0256
Norfolk & Western Railway Company Historic District	Roanoke	Roanoke	9/14/98	1/27/99	128-5432
Roanoke Star	Roanoke	Roanoke	9/15/99	11/15/99	128-0352
Roanoke Historic District (Change and Boundary Increase)	Roanoke	Roanoke	6/12/02 10/11/05 12/06/06	9/14/02 10/11/05 3/29/07	125-5761

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
Southeast Roanoke Neighborhood Historic District	-	Roanoke	-	DOE 10/18/02	128-5865
Grandin Road Commercial Historic District	Roanoke	Roanoke	9/11/02	11/27/02	128-5785
Burrell Memorial Hospital	Roanoke	Roanoke	3/19/03	9/22/03	128-5863
Virginia Railway Passenger Station	Roanoke	Roanoke	3/19/03	5/22/03	128-5461
Boxley-Sprinkle House	Roanoke	Garden City	9/8/04	11/27/04	128-5978
Henry Street Historic District	Roanoke	Roanoke	9/8/04	11/27/04	128-5764
Gainsboro Historic District	Roanoke	Roanoke	9/14/05	11/16/05	128-5762
Virginia Can Company	Roanoke	Roanoke	12/7/05	2/22/06	128-5455
Roanoke Apartments	Roanoke	Roanoke	6/8/06	11/9/06	128-6066
Salem Avenue/Roanoke Automotive Commercial Historic District (Boundary Increase & Amendment)	Roanoke	Roanoke	6/6/07 3/20/08 9/20/07	8/8/07 5/15/08 6/4/08	128-6065
H.L. Lawson & Son Warehouse	Roanoke	Roanoke	6/19/08	9/05/08	128-5191-0006
Roanoke County and Town of Vinton					
Hollins College Quadrangle	Hollins	Roanoke	5/21/74	11/5/74	080-0055
Old Tombstone	Roanoke	Roanoke	7/19/77	3/25/80	080-0059
Harshbarger House	Roanoke	Roanoke	10/8/91	10/15/92	080-0013

Name of Historic Site	City/Town	Quadrangle	VLR Listing	NRHP Listing	NRHP File #
Johnsville Old German Baptist Meetinghouse	Catawba	Glenvar	9/14/98	10/30/98	080-0122
Black Horse Tavern/Bellvue Hotel & Office	Roanoke	Roanoke	6/13/01	1/24/02	080-5143
Starkey Elementary School	-	Garden City	6/13/01	1/24/02	080-0348
Pleasant Grove	Salem	Glenvar	3/19/03	5/22/03	080-0025
City of Salem					
Williams-Brown House and Store	Salem	Salem	7/6/71	11/23/71	129-0010
Evans House	Salem	Salem	3/21/72	5/19/72	129-0017
Roanoke College, Main Campus Complex	Salem	Salem	5/16/72	3/7/73	129-0005
Salem Presbyterian Church	Salem	Salem	6/18/74	10/15/74	129-0009
Academy Street School	Salem	Salem	1/20/81	10/1/81	129-0002
Old Roanoke County Courthouse	Salem	Salem	3/17/87	5/14/87	129-0008
Salem Presbyterian Parsonage	Salem	Salem	8/21/91	1/28/92	129-0014
Salem Post Office	Salem	Salem	4/22/92	9/24/92	129-0037
Southwest Virginia Holiness Association Camp Meeting	Salem	Salem	10/18/95	1/22/96	129-0123
Downtown Salem Historic District	Salem	Salem	3/20/96	6/5/96	129-0075
Monterey	-	Salem	4/22/98	3/5/99	129-0012
McVitty House	Salem	Salem	6/18/03	10/23/03	129-0066
Preston House (Boundary Amendment)	Salem	Salem	3/16/05 3/8/06	5/26/05 5/03/06	129-5018

Source 1: *Virginia Landmarks Register, National Register of Historic Places,* Updated through DHR March 19, 2009 and NPS April 3, 2009 Announcements, http://www.dhr.virginia.gov/registers/RegisterMasterList.pdf April 21, 2009.
Source 2: National Register Information System, http://www.nr.nps.gov/ April 21, 2009.

4.2.5 Virginia's Indian Tribes

The Virginia Council on Indians (VCI) is a subcommittee of the national Association of Tribal Historic Preservation Officers created by the General Assembly to gain knowledge of the historic dealings and relationship between the Commonwealth of Virginia and the Virginia Indian Tribes. The Council's duties include studies and research regarding the Indian Tribes in Virginia and making recommendations to the Commonwealth on issues regarding Virginia Indians. A list of the Indian Tribes is available through the VCI. No Indian tribes are located within the region.

4.2.6 Unusual Geologic Formations, Natural Heritage Resources, and Special Soil Types

VDCR-NHR tracks natural heritage resources by County. The natural heritage resources include rare plant and animal species, rare and exemplary natural communities, and significant geologic features, primarily cave and karst resources. Karst features are found throughout the James and Roanoke watersheds, especially south and along the Route I-81 corridor through Roanoke and Botetourt counties, the City of Salem, the City of Roanoke, and a portion of Bedford County. Karst features are found within the Valley and Ridge physiographic province where carbonate-rich rocks such as limestone and dolomite reside (primarily in valleys). Physical connections between surface water and groundwater in karst regions make karst aquifers very vulnerable to water pollution.

VDCR rates caves throughout the region. A cave designated as "significant" such as those identified in Bedford, Botetourt, and Roanoke counties meet special criteria such as exceptional length or depth, the presence of rare species or ecosystems, or an abundance of beautiful mineral formations. Significant caves may be economically important, or have special biologic, geologic, or scenic attributes. VDCR currently maintains programs related to the protection of these significant caves and their attributes.

Natural Heritage Resources are presented in Table 4.2.6A.

Table 4.2.6A: Natural Heritage Resources

Category	Common Name	Scientific Name	Status
Bedford County			
Amphibians	Peaks of Otter Salamander	*Plethodon hubrichti*	
Birds	Winter Wren	*Troglodytes troglodytes*	

Category	Common Name	Scientific Name	Status
Bivalvia (Mussels)	Yellow Lance	*Elliptio lanceolata*	
Natural Community	Carolina Hemlock Forest	n/a	
	Eastern Hemlock – Hardwood Forest		
	High-Elevation Seepage Swamp		
	Montane Depression Wetland		
	Montane Mixed Oak/Oak Hickory Forest		
	Northern Red Oak Forest		
	Oak/Heath Forest		
	Piedmont/Mountain Floodplain Forest		
	Rich Cove/Slope Forest		
	Riverside Prairie		
Fish	Roanoke Logperch	*Percina rex*	FE/SE
Lepidoptera (Butterflies & Moths)	A Noctuid Moth	*Hadena ectypa*	
	Tawny Crescent	*Phyciodes batesii batesii*	
Odonata (Dragonfiles & Damselflies)	Piedmont Clubtail	*Gomphus parvidens*	
	Appalachian Snaketail	*Ophiogomphus incurvatus incurvatus*	
Significant Caves	Significant Cave	*n/a*	
Vascular Plants	Nodding Wild-rye	*Elymus canadensis*	
	Glade Spurge	*Euphorbia purpurea*	
	Kankakee Globe-mallow	*Lliamna remota*	
	Small Whorled Pogonia	*Isotria medeoloides*	FT/SE
	Highland Dog-hobble	*Leucothoe fontanesiana*	
	Gray's Lily	*Lilium grayi*	
	Starflower False Solomon's seal	*Maianthemum stellatum*	
	Large Purple-fringe Orchis	*Platanthera grandiflora*	
	Common Clammy-weed	*Polanisia dodecandra ssp. dodecandra*	
	Bog Goldenrod	*Solidago uliginosa var. uliginosa*	
	Freshwater Cordgrass	*Spartina pectinata*	
	Smooth Buttonweed	*Spermacoce glabra*	
	American Purple Vetch	*Vicia americana ssp. americana*	
Botetourt County and Towns of Buchanan, Fincastle, and Troutville			
Amphibians	Peaks of Otter Salamander	*Plethodon hubrichti*	
Birds	Loggerhead Shrike	*Lanius ludovicianus*	ST
	Appalacian Bewick's Wren	*Thryomanes bewickii altus*	SE

Category	Common Name	Scientific Name	Status
	Winter Wren	*Troglodytes troglodytes*	
Bivalvia (Mussels)	Yellow Lance	*Elliptio lanceolata*	
	Atlantic Pigtoe	*Fusconaia masoni*	ST
	James Spinymussel	*Pleurobema collina*	FE/SE
Collembola (Springtails)	A Cave Springtail	*Arrhopalites caedus*	
Natural Community	Central Appalachian Northern Hardwood Forest	n/a	
	Central Appalachian Shale Barren		
	High-Elevation Boulderfield Forest/Woodland		
	Limestone/Dolomite Barren		
	Montane Dry Calcareous Forest/Woodland		
	Montane Mixed Oak/Oak-Hickory Forest		
	Mountain/Piedmont Calcareous Cliff		
	Mountain/Piedmont Acidic Woodland		
	Northern Red Oak Forest		
	Pine-oak/Heath Woodland		
	Riverside Prairie		
Crustacea (Amphipods, Isopods & Decapods)	Vandel's Cave Isopod	*Caecidotea vandeli*	
	Racovitza's Terrestrial Cave Isopod	*Miktoniscus racovizai*	
	Montgomrey County Cave Amphipod	*Stygobromus fergusoni*	
Diplopoda (Millipedes)	Packard's Blind Cave Millipede	*Trichopetalum packardi*	
Fish	Roughhead Shiner	*Notropis semperasper*	
	Orangefin madtom	*Noturus gilberti*	ST
Lepidoptera (Butterflies & Moths)	Northern Metalmark	*Calephelis borealis*	
	Milne's Euchlaena Moth	*Euchlaena milnei*	
	Tawny Crescent	*Phyciodes batesii batesii*	
	A Noctuid Moth	*Polychrysia morigera*	
Mammals	Eastern Small-footed Bat	*Myotis leibii*	
Odonata (Dragonflies & Damselflies)	Appalachian Jewelwing	*Calopteryx angustipennis*	
	Rapids Clubtail	*Gomphus quadricolor*	
	Green-faced Clubtail	*Gomphus viridifrons*	
Reptiles	Coal Skink	*Eumeces anthracinus*	
	Pine Snake	*Pituophis melanoleucus*	

Category	Common Name	Scientific Name	Status
Significant Caves	Significant cave	*n/a*	
Vascular Plants	Cooper's Milkvetch	*Astragalus neglectus*	
	Piratebush	*Buckleya distichophylla*	
	A sedge	*Carex juniperorum*	SE
	Addison's Leatherflower	*Clematix addisonii*	
	A Hawthorn	*Crataegus mollis*	
	Houghton's Umbrella-sedge	*Cyperus houghtonii*	
	Oval-fruited Panic Grass	*Dichanthelium ovale var. ovale*	
	Smooth Coneflower	*Echinacea laevigata*	FE/ST
	Galde Spurge	*Euphorbia purpurea*	
	Kankakee Globe-mallow	*Lliamna remota*	
	Small-head Rush	*Juncus brachycephalus*	
	Gray's Lily	*Lilium grayi*	
	Virginia False-gromwell	*Onosmodium virginianum*	
	Yellow Nail-wort	*Paronychia virginianum*	
	Sword-leaved Phlox	*Phlox buckleyi*	
	Common Clammy-weed	*Polanisia dodecandra ssp. dodecandra*	
	Bog Goldenrod	*Solidago uliginosa var. uliginosa*	
	Narrow-leaved Blue-curls	*Trichostema setaceum*	
	Nodding Pogonia	*Triphora trianthophora*	
	Prostrate Blue Violet	*Viola walteri*	
Franklin County and Towns of Boones Mill and Rocky Mount			
Bivalvia (Mussels)	Yellow Lampmussel	*Lampsillis cariosa*	
Natural Community	Basic Oak-Hickory Forest	n/a	
	Low-Elevation Basic Outcrop Barren		
	Mountain/Piedmont Acidic Seepage Swamp		
	Mountain/Piedmont Basic Woodland		
	Mountain/Piedmont Acidic Woodland		
	Ultramafic Woodland/Barren		
Fish	Orangefin Madtom	*Noturus gilberti*	ST
	Roanoke Logperch	*Percina rex*	FE/SE
Non-vascular Plants	Keever's Bristle-moss	*Orthotrichum keeverae*	
Plecoptera (Stonefiles)	Virginia Stonefly	*Acroneuria kosztarabi*	

Category	Common Name	Scientific Name	Status
Reptiles	Bog Turtle	*Glyptemys muhlenbergii*	FT/SE
Trachoptera (Caddisflies)	A Caddisfly	*Heteroplectron americanum*	
	A caddisfly	*Phylocentropus auriceps*	
	A caddisfly	*Phylocentropus carolinus*	
	Appalachian Rhyacophilid Caddisfly	*Rhyacophila appalachia*	
Vascular Plants	Carolina Thistle	*Cirsium carolinianum*	
	Smooth Coneflower	*Echinacea laevigata*	FE/ST
	A Bluegrass	*Poa saltuensis*	
	Torrey's Mountain-mint	*Pycnanthemum torrei*	
	Northern Dropseed	*Sporobolus heterolepis*	
	Mountain Camellia	*Stewartia ovate*	
	Menge's Fame-flower	*Talinum mengesii*	
Roanoke County and the Town of Vinton			
Birds	Loggerhead Shrike	*Lanius ludovicianus*	ST
Coleoptera (Beetles)	A Rove Beetle	*Atheta annexa*	
	A Cave Beetle	*Pseudanophthalmus pusio*	
Collembola (Springtails)	A Cave Springtail	*Pseudosinella bona*	
Natural Community	Mountain Dry Calcareous Forest/Woodland	n/a	
	Mountain/Piedmont Acidic Woodland		
	Pine-oak/Heath Woodland		
Diplopoda (Millipedes)	Packard's Blind Cave Millipede	*Trichopetalum packardi*	
Fish	Orangefin Madtom	*Noturus gilberti*	ST
	Roanoke Logperch	*Percina rex*	FE/SE
Lepidoptera (Butterflies & Moths)	Frosted Elfin	*Callophrys irus*	
	Hoary Elfin	*Callophrys polios*	
	Persius Duskywing	*Erynnis persius persius*	
	Appalachian Grizzled Skipper	*Pyrgus Wyandot*	ST
	Regal Fritillary	*Speyeria idalia*	
Significant Caves	Significant Cave	n/a	
Vascular Plants	Piratebush	*Buckleya distichophylla*	
	Chestnut Lipfern	*Cheilanthes eatonii*	
	Addison's Leatherflower	*Clematis addisonii*	
	Smooth Coneflower	*Echinacea laevigata*	FE/ST
	Mountain Sandwort	*Minuartia groenlandica*	
	Plains Muhly	*Muhlenbergia cuspidate*	

Category	Common Name	Scientific Name	Status
	Snowberry	*Symphoricarpos albus var. albus*	
	Velvetleaf Blueberry	*Vaccinium myrtilloides*	
City of Roanoke			
Birds	Loggerhead Shrike	*Lanius ludovicianus*	ST
Fish	Roanoke Logperch	*Percina rex*	FE/SE
Odonata (Dragonflies & Damselflies)	Zebra Clubtail	*Stylurus scudderi*	
City of Salem			
Fish	Orangefin Madtom	*Noturus gilberti*	ST
	Roanoke Logperch	*Percina rex*	FE/SE
Lepidoptera (Butterflies & Moths)	Frosted Elfin	*Callophrys irus*	
	Hoary Elfin	*Callophrys polios*	
	Appalachian Grizzled Skipper	*Pyrgus wyandot*	ST
	Regal Fritillary	*Speyeria idalia*	
Vascular Plants	Dwarf Chinquapin Oak	*Quercus prinoides*	

Source: http://192.206.31.46/cfprog/dnh/naturalheritage/select_counties.cfm April 21, 2009.

Active and Inactive Mine Sites

Because of their potential impact to natural resources by stream sedimentation from non-vegetated soils, acid drainage from tailings and waste piles, groundwater degradation, and waste dumps, active and inactive mine sites were reviewed and mapped. Information on Virginia's Economic Geology (mineral resources) was provided by the Department of Mines, Minerals and Energy (DMME) – Division of Geology and Mineral Resources. Primary mineral resources in the Valley and Ridge Physiographic Province include industrial minerals barite, silica, gypsum, and salt; high-calcium limestone; metals iron, manganese, zinc, lead, and pyrite; coal; gas and oil; and aggregate. Primary mineral resources in the Piedmont Physiographic Province include industrial minerals feldspar, mica, kyanite, vermiculite, and barite; metals iron, manganese, copper, gold, pyrite, and tungsten; granite, slate, and marble; and aggregate. Primary mineral resources in the Blue Ridge Physiographic Province include industrial minerals feldspar, phosphate, and kaolin; metals iron, manganese, copper, and titanium; soapstone; and aggregate.

Active mines within the region include open pit and quarry type mines. There are eight active mines in Bedford County (sand and gravel, granite, limestone, quartz sand), seven in Botetourt County (limestone and clay), one in Franklin County (granite), and three in Roanoke County (limestone, shale, and dolomite). Active and inactive mines are mapped on Figure 4.2.6 for the region. Not all mine locations have been field verified by DMME and are considered approximate.

Inactive mines include open pit, quarry, crushed stone quarry, shaft, adit, core hole, or prospect mines. Some adits and shafts have collapsed and are under review by DMME. Primary commodities of inactive mines includes the following: iron, manganese, coal, limestone, sandstone, quartzite, vein quartz, shale, barite, clay, lead, travertine-marl, talc, metagraywacke, soapstone, granite, copper, asbestos, gold, sand and gravel, phosphate, and schist.

In 1996, the General Assembly of Virginia amended state statutes governing localities' comprehensive planning to include mineral resources among the key considerations in planning for future growth. To aid in this process, DMME initiated a program to deliver geologic and mineral resource information to the counties, municipalities, and regional planning authorities. This information is not included in this Plan.

Figure 4.2.6: Mine Site Map

Urban Soils

Urban soils are found in watersheds that provide drinking water, food, waste utilization, and natural resources to communities according to USDA NRCS. Urban soils can also be located in city park areas, recreational areas, community gardens, green belts, laws, septic absorption fields, sediment basins, and other uses. Urban lands are altered, reworked, or removed soil material. Commercial, industrial, and residential developments cover much of the surface of soils defined as Urban. Also, soils may be classified as Udorthents. These are categorized as excavations or fill material. The USDA NRCS web soil survey identifies the acreage of urban soils for each county and is presented in Table 4.2.6B.

Table 4.2.6B: Urban Soils

Survey Area	Unit Name	Acreage of Survey Area	Percent of Survey Area
Bedford County	None Listed		
Botetourt County	Udorthents	462	0.2
Botetourt County	Udorthents-Urban Land Complex	1917	0.7
Botetourt County	Frederick-Urban Land Complex (2-15% slopes)	287	0.1
Botetourt County	Frederick-Urban Land Complex (15-30% slopes)	257	<0.1
Botetourt County	Tumbling-Urban Land Complex (2-15% slopes)	776	0.3
Franklin County	Minnieville-Urban Land Complex (8-15% slopes)	267	<0.1
Franklin County	Thurmont-Urban Land-Wintergreen Complex (8-15% slopes)	218	<0.1
Roanoke County	Udorthents-Urban Land Complex	6,103	3.1
Roanoke County	Urban Land	3,476	1.8
Roanoke County	Chiswell-Litz-Urban Land Complex (2-15% slopes)	5,106	2.6
Roanoke County	Chiswell-Litz-Urban Land Complex (15-35% slopes)	2,891	1.5
Roanoke County	Frederick-Urban Land Complex (2-15% slopes)	2,902	1.5
Roanoke County	Frederick-Urban Land Complex (15-30% slopes)	205	0.1
Roanoke County	Hayesville-Urban Land Complex (2-15% slopes)	1,213	0.6
Roanoke County	Hayesville-Urban Land Complex (15-30% slopes)	872	0.4
Roanoke County	Shottower-Urban Land	2,251	1.2

Survey Area	Unit Name	Acreage of Survey Area	Percent of Survey Area
	Complex (2-15% slopes)		
Roanoke County	Shottower-Urban Land Complex (15-25% slopes)	256	0.1
Roanoke County	Speedwell-Urban Land Complex (0-2% slopes)	1,864	1.0
Roanoke County	Tumbling-Urban Land Complex (2-15% slopes)	539	0.3

Source: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx April 21, 2009.

- Bedford County Soil Map v1 July 21, 2004, Soil Data v7 December 19, 2008.
- Botetourt County Soil Map v1 July 24, 2004, Soil Data v7 January 21, 2009.
- Franklin County Soil Map v6 September 22, 2008, Soil Data v7 January 5, 2009.
- Roanoke County Soil Map v1 October 8, 2004, Soil Data v6 December 23, 2008.

4.2.7 Wetlands

The National Wetlands Inventory (NWI) is a department under the USFWS, a bureau of the U.S. Department of Interior. NWI produces and provides information on the characteristics, extent, and status of the Nation's wetlands and deepwater habitats and other wildlife habitats.

The following definition is used by the USFWS for conducting the NWI, "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year." Hydrophytes are plants capable of growing in water or waterlogged soils/substrates; hydric soils are waterlogged soils that support plant growth; and nonsoil is a nonvegetated substrate like a mudflat or rock outcrop. This is different than the federal regulatory definition of a wetland, which is used to identify wetlands subject to federal regulations under the Clean Water Act. The federal definition includes only vegetated wetlands.

To categorize wetland plants, the federal government has compiled a list with plants identified based on four different classifications based on expected frequency to occur in wetlands (obligate, facultative wetlands species, facultative species, and facultative upland species). This list contains approximately 7,000 plant species. The NWI is also compiling a Plant Database based on technical literature that contains habitat information on approximately 5,200 plant species that have the potential to occur in wetlands. When completed, this computerized database will be available to all governmental agencies; however, this database is not currently active. Due to the vast nature of the plant databases, identification of specific local and regional wetlands plants is not included in this report.

Hydric soils form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils are important in land-use planning, conservation planning, and assessment of potential wildlife habitat. A combination of hydric soil, hydrophytic vegetation, and hydrologic properties define wetlands. Therefore, hydric soils may be an indicator of potential wetlands. Hydric soils are identified in Bedford, Botetourt, Franklin, and Roanoke counties as listed in the following table.

Table 4.2.7: Hydric Soils

Unit Name	Component Name	Percent Composition of Unit that is Classified Hydric	Landforms	Hydric Criteria[1]
Bedford County				
None Identified				
Botetourt County				
Ernest silt loam (0-7% slopes)	Andover	3	Depressions	2B3
Ernest silt loam (7-15% slopes)	Andover	3	Depressions	2B3
Ernest cobbly loam (0-15% slopes) very stony	Andover	3	Depressions	2B3
Purdy silty clay loam (0-4% slopes)	Purdy	85	Depressions, Stream terraces	2B3
Franklin County and Towns of Boones Mill and Rocky Mount				
None Identified				
Roanoke County and Cities of Roanoke and Salem and Town of Vinton				
Alderflats silt loam (0-4% slopes)	Alderflats	90	Depressions, Mountains	2B3
Clubcaf silt loam (0-2% slopes), occasionally flooded	Clubcaf	75	Depressions, Flood plains	2B3
Combs loam (0-2% slopes), occasionally flooded	Clubcaf	5	Depressions, Flood plains	2B3
Cotaco loam (2-7% slopes)	Purdy	3	Depressions, Stream	2B3

Unit Name	Component Name	Percent Composition of Unit that is Classified Hydric	Landforms	Hydric Criteria[1]
			terraces	
Cotaco loam (7-15% slopes)	Purdy	3	Depressions, Stream terraces	2B3
Derroc cobbly sandy loam (0-4% slopes), occasionally flooded	Clubcaf	5	Depressions, Flood plains	2B3
Purdy silt loam (0-4% slopes)	Purdy	85	Depressions, Stream terraces	2B3
Sindion loam (0-2% slopes), occasionally flooded	Clubcaf	5	Depressions, Flood plains	2B3
Speedwell loam (0-2% slopes), occasionally flooded	Clubcaf	5	Depressions, Flood plains	2B3
Speedwell-Urban land complex (0-2% slopes), occasionally flooded	Clubcaf	5	Depressions, Flood plains	2B3
Urban Land	Wet Spots	5	Depressions, Flood plains	2B3
Zoar silt loam (2-7% slopes)	Purdy	3	Depressions, Stream terraces	2B3

Source: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

- Bedford County Soil Map v1 July 21, 2004, Soil Data v7 December 19, 2008.
- Botetourt County Soil Map v1 July 24, 2004, Soil Data v7 January 21, 2009.
- Franklin County Soil Map v6 September 22, 2008, Soil Data v7 January 5, 2009.
- Roanoke County Soil Map v1 October 8, 2004, Soil Data v6 December 23, 2008.

1. 2B3 – Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Andic, Vitrandic, and Pachic subgroups, or Cumulic subgroups that are poorly drained or very poorly drained and have water table at less than or equal to 1.0 ft from the surface during the growing season if permeability is less than 6.0 in/h in any layer within 20 in.

Soils maps can be reviewed on-line through the USDA NRCS Web Soil Survey to help identify site specific soils.

NWI maps are compiled through photointerpretation techniques with limited field verification. Soil survey reports provide information on soil types and location specific to a region based on more extensive field investigations (e.g., hydric soils). The combination of NWI maps and soil survey data present valuable information relative to wetlands. Current NWI mapping (Figures 4.2.7.1A through 4.2.7.4A) indicates wetlands in all jurisdictions through the region. Hydric soils, as discussed above, are mapped on Figures 4.2.7.1B through 4.2.7.4B for the region. Based on NWI mapping the following acreages of wetlands were estimated: Bedford County – 355 acres; City of Bedford – 0.99 acres; Botetourt County – 795 acres; Franklin County – 367 acres; Roanoke County – 129 acres; City of Roanoke – 9 acres; City of Salem – 1 acre.

Figure 4.2.7.1A: Bedford County Wetland Map

Figure 4.2.7.1B: Bedford County Hydric Soil Map

Figure 4.2.7.2A: Botetourt County Wetland Map

Figure 4.2.7.2B: Botetourt County Hydric Soil Map

Figure 4.2.7.3A: Franklin County Wetland Map

Figure 4.2.7.3B: Franklin County Hydric Soil Map

Figure 4.2.7.4A: Roanoke County Wetland Map

Figure 4.2.7.4B: Roanoke County Hydric Soil Map

4.2.8 Riparian Buffers or Conservation Easements

Riparian Forest Buffers

The Virginia Department of Forestry (VDOF) provides information regarding the Commonwealth's forest cover as environmental and economic benefits, which include economic income and employment, water quality protection, habitat protection, and recreational opportunities. Conservation of Virginia's forestland is a primary goal of the VDOF. Current forested areas in each county are presented on the land use maps, Figures 4.2.9.1 through 4.2.9.5.

Conservation Easements

VDCR has established the Virginia Natural Heritage Program (VANHP), which represents a comprehensive effort to save Virginia's native plant and animal life and the ecosystem upon which they depend through inventory, conservation information provision, protection and stewardship. The VANHP has defined Natural Heritage Resources, or "NHRs," as rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The VANHP established the Virginia Conservation Lands Database, which is the Commonwealth's first comprehensive, continually maintained GIS data layer for Virginia's protected conservation lands. The database includes mapped boundaries and attributes for public and certain private lands having various conservation, recreation, and open space roles. Most federal, state, regional, and interstate lands are included, such as water and park authorities, parks and undeveloped or partially-developed lands owned by localities, lands owned as preserves by nonprofit conservation organizations, conservation easements held by the Virginia Outdoors Foundation (VOF), and land trusts. A map showing the major conservation lands for the region is included as Figure 4.2.8.

Additionally, the VOF maintains open-space easements across the Commonwealth. VOF easements are identified on the conservation lands map (Figure 4.2.8). The open-space easement is a legally documented agreement between a landowner and a public body, such as the VOF. The easements limit property development rights to protect natural and cultural resources. The following easements and acreages are maintained by the VOF at this time.

Figure 4.2.8: Major Conservation Land Maps

Table 4.2.8: VOF Easements

Locality	Number of Easements	Acreage
Bedford County	24	4,180.62
City of Bedford	1	44.92
Botetourt County	32	6,630.58
Franklin County	20	3,553.88
Roanoke County	7	1,182.85
City of Roanoke	1	116.04
City of Salem	-	-

Source: http://www.virginiaoutdoorsfoundation.org/VOF_pub-bycounty.php last updated April 17, 2008, accessed April 21, 2009.

4.2.9 Land Use and Land Coverage

Figures 4.2.9.1 through 4.2.9.4 illustrate land use and land cover information for each of the municipalities in this region.

A map of Bedford County, including the City of Bedford, showing land use and land cover information is included as Figure 4.2.9.1.

A map of Botetourt County, including respective towns, showing land use and land cover information is included as Figure 4.2.9.2.

A map of Franklin County, including respective towns, showing land use and land cover information is included as Figure 4.2.9.3.

A map of Roanoke County, including the cities of Salem and Roanoke and Town of Vinton, showing land use and land cover information is included as Figure 4.2.9.4.

Figure 4.2.9.1: Bedford County Land Use/Land Cover Map

Figure 4.2.9.2: Botetourt County Land Use/Land Cover Map

Figure 4.2.9.3: Franklin County Land Use/Land Cover Map

Figure 4.2.9.4: Roanoke County Land Use/Land Cover Map

4.2.10 Presence of Impaired Streams and Type of Impairment

The VDEQ, the State Water Control Board, and the USEPA regulate water resources and water pollution in Virginia. They administer programs created by the federal Water Pollution Control Act, commonly known as the Clean Water Act, the Federal Water Quality Act, and a 1984 amendment to Resource Conservation and Recovery Act (RCRA). The VDEQ conducts and compiles Water Quality Assessments for surface waterways throughout the state. As part of the assessment, monitoring reports are compared to numerical water quality standards to determine if the waterway is impaired. Each waterway that falls below certain water quality standards are identified on either a 305(b) or 303(d) report. The Final 305(b)/303(d) Water Quality Assessment Integrated Report was released on December 18, 2008. The Integrated Report satisfies the requirements of the U.S. Clean Water Act sections 305(b) and 303(d) and the Virginia Water Quality Monitoring, Information, and Restoration Act. Figure 4.2.10 illustrates the impaired water segments throughout the region.

The counties, cities, and towns included in the region are located in two river basins, the James River Basin and the Roanoke River Basin. Within the James River Basin no rivers, lakes, or estuaries identified as public water supply sources are listed as impaired. Similarly, no rivers or lakes identified as public water supply sources in the Roanoke River Basin are listed as impaired. Estuaries are not applicable for public water supplies in the Roanoke River Basin.

Figure 4.2.10: Impaired Water Segments throughout the Region.

4.2.11 Location of Point Source Discharges

Information on point source discharges in the region was collected from the USEPA Envirofacts Data Warehouse (EDW) and VDEQ databases. A National Pollutant Discharge Elimination System (NPDES) permit is required for all facilities where discharge pollutants from any point source enters waters of the United States. For Virginia, this includes storm water discharges from industrial facilities. Exclusions include vessels, runoff from fields and orchards, return flows from irrigation, land disposal of pollutants permitted by other Virginia programs, and discharges into otherwise permitted treatment systems. The Virginia Pollutant Discharge Elimination System (VPDES) Permit Program is regulated under 9 VAC 25-31 and is monitored and maintained by VDEQ. VPDES permits are the state equivalent of the NPDES permit and permit identification is the same.

The EDW contains data of USEPA-Regulated Facilities with permitted discharges to water. The database compiles information from the Permit Compliance System (PCS), the Safe Drinking Water Information System (SDWIS), and the National Contaminant Occurrence Database. Specifically, the PCS allows a review of information relative to permit issuance and expiration, and discharge and monitoring data. Information pertaining to permitted discharges to water from the PCS database and VDEQ database files is presented in Table 4.2.11.

Table 4.2.11: Active NPDES/VPDES Permits (Point Source Discharges)

Permit #*	Facility Name	Town/City	Type
Bedford County			
VA0020818	BCS – Body Camp Elem.	Bedford	Minor Municipal
VA0020826	BCS – New London Academy	Forest	Minor Municipal
VA0020851	BCS – Otter River Elem. School	Goode	Minor Municipal
VA0063738	BCS – Staunton River HS	Moneta	Minor Municipal
VA0020842	BCS – Stewartsville Elem.	Goodview	Minor Municipal
VA0020869	BCS – Thaxton Elem. School	Thaxton	Minor Municipal
VA0089052	Blue ridge Wood Preserving Inc.	Moneta	Minor Industrial
VA0091162	Boonsboro Country Club	Lynchburg	Minor Municipal
VA0054577	BP Products North America Inc.	Montvale	Minor Industrial
VA0091553	Cedar Rock WWTP	Goode	Minor Municipal
VA0051721	Colonial Pipeline Co.	Montvale	Minor Industrial
VA0027553	Eagle Eyrie Baptist Conference Center Sewage Treatment	Lynchburg	Minor Municipal
VA0003026	GP Big Island LLC	Big Island	Major Industrial
VA0001449	Gunnoe Sausage Co.,Inc.	Goode	Minor Industrial
VA0091502	Heptinstall Grocery	Huddleston	Minor Industrial

Permit #*	Facility Name	Town/City	Type
VA0051888	Lynchburg City Abert Water Filtration Plant	Lynchburg	Minor Industrial
VA0055328	Magellan Terminals Holdings LP	Montvale	Minor Industrial
VA0023515	Moneta Adult Detention Center	Moneta	Minor Municipal
VA0091669	Moneta Regional WWTP	Moneta	Minor Municipal
VA0087238	Montvale WWTP	Bedford	Minor Municipal
VA0001490	Motiva Enterprises LLC	Montvale	Minor Industrial
VA0072389	Ramsey's Mobile Home Park	Troutville	Minor Municipal
VA0074179	Smith Mountain Dam Visitor Center Sewage Treatment	Bedford	Minor Municipal
VA0051446	TransMontaigne Montvale Piedmont Terminal	Montvale	Minor Industrial
VA0026051	TransMontaigne Montvale Atlantic Terminal	Montvale	Minor Industrial
VA0091910	Western Energy Montvale Terminal	Montvale	Minor Industrial
VA0074870	Woodhaven Nursing Home	Montvale	Minor Municipal
VAR050032	Barr Laboratories Inc.	Forest	Ind. Storm Water
VAR051369	Bedford City – Hylton Site	Bedford	Ind. Storm Water
VAR051233	Bedford County Landfill, Permit #560	Bedford	Ind. Storm Water
VAR050138	BRC Co. Inc.	Bedford	Ind. Storm Water
VAR050719	Duval Auto Parts Inc.	Forest	Ind. Storm Water
VAR050731	East Coast Auto Source	Thaxton	Ind. Storm Water
VAR051222	Forestry Equipment of VA Inc.	Forest	Ind. Storm Water
VAR050010	Gammapar	Forest	Ind. Storm Water
VAR050456	Hydrocarbon Recovery Services Inc.	Montvale	Ind. Storm Water
VAR051765	J.C. Sales Inc.	Montvale	Ind. Storm Water
VAR051649	Royal Oak Farm Solid Waste Composting Facility	Evington	Ind. Storm Water
VAR050733	Rubatex International LLC	Bedford	Ind. Storm Water
VAR051316	Safety Kleen Systems Inc.	Vinton	Ind. Storm Water
VAR050214	Shredded Products Corp.	Montvale	Ind. Storm Water
VAR050257	Taylor Ramsey Corp.	Big Island	Ind. Storm Water
VAR050268	Valley Auto Parts	Blue Ridge	Ind. Storm Water
VAG840055	Boxley Materials Co.	Blue Ridge	Non-metallic Mineral Mining
VAG110177	Marshall Concrete Products	Moneta	Concrete Products
VAG750060	Terry Volkswagen Subaru	Forest	Car Wash
VAG402101	Behrens Residence	Bedford	Domestic Sewage
VAG402030	Jordantown Wesleyan Church	Vinton	Domestic Sewage
VAG402058	Long, Johnny Helen Property	Montvale	Domestic Sewage
VAG402000	Orange, Timothy Residence	Thaxton	Domestic Sewage
VA0020851	Bedford County – Otter River Elem. School	Goode	Sewerage System
VA0020842	Bedford County – Stewartsville Elem. School	Goodview	Sewerage System
VA0089052	Blue Ridge Wood Preserving Inc.	Moneta	Wood Preserving
VA0054577	BP Products North America Inc.	Montvale	Petroleum Bulk Stations and Terminals
VA0091533	Cedar Rock WWTP	Goode	Sewerage System
VA0051721	Colonial Pipeline Co.	Montvale	Refined Petroleum Pipelines

Permit #*	Facility Name	Town/City	Type
VA0051713	Colonial Pipeline Co.	Montvale	Refined Petroleum Pipelines
VA0003026	Georgia Pacific Cor. – Big Island Mill	Big Island	Paperboard Mills
VA0001449	Gunnoe Sausage Co. Inc.	Goode	Sausages and other Prepared Meat Prodcuts
VA0091502	Heptinstall Grocery	Huddleston	Gasoline Service Station
VA0055328	Magellan Terminals Holdings LP	Montvale	Special Warehousing and Storage, Not Elsewhere Classified
VA0091669	Moneta Regional WWTP	Moneta	Sewerage System
VA0087238	Montvale WWTP	Bedford	Sewerage System
VA0001490	Motiva Enterprises LLC	Montvale	Petroleum Bulk Stations
VA0020826	New London Academy	Forest	Sewerage System
VAR050214	Shredded Products	Montvale	Scrap and Waste Material
VA0063738	Staunton River High School	Moneta	Sewerage System
VA0020869	Thaxton Elem. School	Thaxton	Sewerage System
VA0026051	Transmontaigne Terminaling Inc.	Montvale	Petroleum Bulk Stations and Terminals
VA0051446	Transmontaigne Terminaling Inc.	Montvale	Petroleum Bulk Stations and Terminals
VA0091910	Western Energy Montvale Terminal	Montvale	Gasoline Service Station
VA0074870	Woodhaven Nursing Home	Montvale	Sewerage Systems
Botetourt County and Towns of Buchanan, Fincastle, and Troutville			
VA0076350	Botetourt Co. – Eagle Rock WWTP	Eagle Rock	Minor Municipal
VA0022225	Buchanan Town – STP	Buchanan	Minor Municipal
VA2260364	Fincastle Town – Regional STP	Fincastle	Minor Municipal
VA0089273	Glen Wilton Town	Glen Wilton	Minor Municipal
VA0072397	Roanoke Cement Co.	Troutville	Minor Municipal
VA0075451	Shenandoah Baptist Church – Camp Eagle	Fincastle	Minor Municipal
VA0023141	VDOT 181 Rest Area	Botetourt	Minor Municipal
VAR051570	Altec Industries Inc.	Daleville	Ind. Storm Water
VAR050712	Botetourt County Landfill	Troutville	Ind. Storm Water
VAR050141	Carris Plastics	Fincastle	Ind. Storm Water
VAR051460	Dynax America Corp USA	Botetourt Co.	Ind. Storm Water
VAR050183	Gala Industries Incorporated	Eagle Rock	Ind. Storm Water
VAR050277	General Shale Products LLC Plant No 35 +36	Blue Ridge	Ind. Storm Water
VAR050757	Metalsa Roanoke Inc.	Roanoke	Ind. Storm Water
VAR050221	MTI Groendyk	Buchanan	Ind. Storm Water
VAR051798	Oldcastle Lawn and Garden Inc.	Buchanan	Ind. Storm Water
VAR051568	Pepsi-Cola/Dr. Pepper of Roanoke	Hollins	Ind. Storm Water
VAR050270	Schwerman Trucking Company	Troutville	Ind. Storm Water
VAR051605	Tread Corporation	Roanoke	Ind. Storm Water
VAG840199	General Shale Brick Inc. – Roanoke Mine No 15	Blue Ridge	Non-metallic Mineral Mining
VAG840049	O-N Minerals Co. – Calara Plant	Buchanan	Non-metallic Mineral Mining

Permit #*	Facility Name	Town/City	Type
VAG840064	O-N Minerals Co. – Sherwood Plant	Buchanan	Non-metallic Mineral Mining
VAG840065	O-N Minerals Co. – Pico Quarry	Buchanan	Non-metallic Mineral Mining
VAG840048	O-N Minerals Co. – Rocky Point	Buchanan	Non-metallic Mineral Mining
VAG110013	Chandler Concrete of Virginia Inc. – Plant 703	Cloverdale	Concrete Products
VAG110024	Construction Materials Company	Troutville	Concrete Products
VAG250016	Gala Industries Incorporated	Eagle Rock	Cooling Water
VAG402041	Cloyd House	Troutville	Domestic Sewage
VAG402104	Flory and Foster Residence	Cloverdale	Domestic Sewage
VAG402043	Garland, John A. Residence	Fincastle	Domestic Sewage
VAG402097	Harlow, Ernest and Shirley Residence	Eagle Rock	Domestic Sewage
VAG402112	Sharp Residence – Mike	Daleville	Domestic Sewage
VAG402005	Somers, Donald Keith Eva Mae Residence	Fincastle	Domestic Sewage
VAG402009	Talbert, Donna Residence	Eagle Rock	Domestic Sewage
VAG402063	Vaughan Parcel 109-15	Blue Ridge	Domestic Sewage
VAG402059	Vaughan Parcel 109-15B	Botetourt	Domestic Sewage
VAG402020	Virginian Markette Inc.	Troutville	Domestic Sewage
VAG402010	Wingfield Residence Linda	Fincastle	Domestic Sewage
VA0076350	Botetourt County – Eagle Rock WWTP	Eagle Rock	Sewerage System
VA0022225	Buchanan STP	Buchanan	Sewerage System
VA0060909	Camp Virginia Jaycees STP	Blue Ridge	Sewerage System
VA0060364	Fincastle Regional STP	Fincastle	Sewerage System
VA0089273	Town of Glen Wilton	Glen Wilton	Sewerage System
VA0072389	Ramsey's Mobile Home Park	Troutville	Sewerage System
VA0072397	Roanoke Cement Co. – Cloverdale	Troutville	Cement, Hydraulic
VA0075451	Shenandoah Baptist Church	Fincastle	Sewerage System
VA0023141	VDOT 181 Rest Area - Botetourt	Troutville	Sewerage System
Franklin County and Towns of Boones Mill and Rocky Mount			
VA0067245	Boones Mill Town - Sewage Treatment Plant	Boones Mill	Minor Municipal
VA0029254	Ferrum Town - Sewage Treatment Plant	Ferrum	Minor Municipal
VA0092142	Franklin County - Sanitary Landfill	Rocky Mount	Minor Municipal
VA0091103	Franklin County Commerce Center WWTP	Rocky Mount	Minor Municipal
VA0090719	Franklin County Schools - Windy Gap Elementary	Rocky Mount	Minor Municipal
VA0088561	Franklin County Schools - Callaway Elementary	Callaway	Minor Municipal
VA0067555	Red Oak Manor STP	Rocky Mount	Minor Municipal
VA0085952	Rocky Mount Town Sewage Treatment Plant	Rocky Mount	Major Industrial
VA0055999	Rocky Mount Town Water Treatment Plant	Rocky Mount	Minor Industrial
VA0080071	Rocky Top Wood Preservers Inc	Rocky Mount	Minor Industrial
VAR051736	A and B Used Parts	Martinsville	Ind. Storm Water
VAR051705	Bousman Auto Salvage Yard	Glade Hill	Ind. Storm Water
VAR050217	Cooper Wood Products Incorporated	Rocky Mount	Ind. Storm Water
VAR050224	Erath Veneer Corp of Virginia	Rocky Mount	Ind. Storm Water

Permit #*	Facility Name	Town/City	Type
VAR050769	Ferguson Land and Lumber Company Inc	Rocky Mount	Ind. Storm Water
VAR050756	Fleetwood Homes Of Virginia - 19	Rocky Mount	Ind. Storm Water
VAR050223	Franklin County - Sanitary Landfill	Rocky Mount	Ind. Storm Water
VAR050545	Holleys Used Auto Parts Inc	Rocky Mount	Ind. Storm Water
VAR050160	Jacks Mountain Asphalt Plant	Union Hall	Ind. Storm Water
VAR051527	Lineal Technologies Inc	Rocky Mount	Ind. Storm Water
VAR050161	Mod U Kraf Homes LLC	Rocky Mount	Ind. Storm Water
VAR050218	Mountain Milk Hauling Inc	Rocky Mount	Ind. Storm Water
VAR051531	MW Manufacturers Incorporated	Rocky Mount	Ind. Storm Water
VAR051344	Rocky Mount Wastewater Treatment Plant	Rocky Mount	Ind. Storm Water
VAR050219	Shredded Products Corporation - Rocky Mount	Rocky Mount	Ind. Storm Water
VAR051571	Timberland Mulch and Farms Inc	Ferrum	Ind. Storm Water
VAR051278	Trinity Packaging Corp (D R Williams)	Rocky Mount	Ind. Storm Water
VAG840050	Jacks Mountain Quarry	Union Hall	Non-metallic Mineral Mining
VAG110001	Franklin Ready Mix Concrete Inc.	Rocky Mount	Concrete Products
VAG110017	Rocky Mount Ready Mix Inc.	Rocky Mount	Concrete Products
VAG750001	Duncan Jeep Chrysler Ford	Rocky Mount	Car Wash
VAG750129	Midpoint Chevrolet Pontiac	Rocky Mount	Car Wash
VAG830311	Plateau Plaza Exxon	Wirtz	Petroleum Contaminated Sites
VAG402008	Browning, Jack L. Residence	Hardy	Domestic Sewage
VAG402007	Hultquist Residence	Rocky Mount	Domestic Sewage
VAG402092	Pevarski, Rick Residence	Hardy	Domestic Sewage
VAG402116	Wilson Residnece – Emma	Boones Mill	Domestic Sewage
VA0067245	Boones Mill STP	Boones Mill	Sewerage System
VA0088561	Callaway Elem. School	Callaway	Sewerage System
VA0029254	Ferrum STP	Ferrum	Sewerage System
VA0092142	Franklin County Sanitary Landill	Rocky Mount	Refuse Systems
VA0091103	Franklin County Commerce Center	Rocky Mount	Sewerage System
VA0090719	Franklin County Schools	Rocky Mount	Sewerage System
VA0004162	International Paper	Franklin	Pulp Mills
VA0067555	Red Oak Manor STP	Rocky Mount	Nursing and Personal Care Facilities, Not Elsewhere Classified
VA0085952	Rocky Mount STP	Rocky Mount	Sewerage System
VA0055999	Rocky Mount WTP	Rocky Mount	Water Supply
VA0080071	Rocky Top Wood Preservers Inc.	Rocky Mount	Wood Preserving
VA0076015	Ronile Inc.	Rocky Mount	Finishers of Textiles, Not Elsewhere Classified
VA0091570	VDOT Franklin	Franklin	Highway and Street Construction except Elevated Highways
VAU001585	Worley Ready Mix Concrete Inc.	Rocky Mount	Highway and Street Construction except Elevated Highways
Roanoke County and Town of Vinton			
VA0087092	American Electric Power - Niagara Hydro Plant	Vinton	Minor Industrial

Permit #*	Facility Name	Town/City	Type
VA0029475	DMHMRSAS - Catawba Hospital	Catawba	Minor Municipal
VA0001465	Falling Creek Water Filter Plant	Vinton	Minor Industrial
VA0001431	Kinder Morgan Southeast Terminals LLC - Roanoke	Roanoke	Minor Industrial
VA0001333	Koppers Inc	Salem	Minor Industrial
VA0086541	Marathon Petroleum Company LLC - Roanoke Terminal	Roanoke	Minor Industrial
VA0001473	Western VA Water Authority - Carvins Cove Water FP	Roanoke	Minor Industrial
VAR050011	Architectural Concrete Products Incorporated	Daleville	Ind. Strom Water
VAR050027	Auto Salvage and Sales Incorporated	Vinton	Ind. Strom Water
VAR050179	CEI - Roanoke	Roanoke	Ind. Strom Water
VAR050177	Coca-Cola Bottling Company Consolidated	Roanoke	Ind. Strom Water
VAR051698	Country South LLC - CDD Landfill	Boones Mill	Ind. Strom Water
VAR050519	FedEx Freight East Incorporated - Roanoke	Roanoke	Ind. Strom Water
VAR050175	GE Drives and Controls Incorporated	Salem	Ind. Strom Water
VAR050176	John W Hancock Jr LLC dba New Millennium Bldg Syst	Salem	Ind. Strom Water
VAR050461	L H Sawyer Paving Co Inc - Asphalt Plant	Salem	Ind. Strom Water
VAR051803	Mennel Milling Company of Virginia	Roanoke	Ind. Strom Water
VAR050144	North 11 Asphalt Plant - Roanoke	Roanoke	Ind. Strom Water
VAR050520	O'Neal Steel Inc	Roanoke	Ind. Strom Water
VAR050747	Parts Unlimited	Vinton	Ind. Strom Water
VAR050148	Rowe Fine Furniture Inc - Salem	Salem	Ind. Strom Water
VAR050526	RR Donnelley and Sons Company - Roanoke	Roanoke	Ind. Strom Water
VAR051539	Smith Gap Regional Landfill	Roanoke	Ind. Strom Water
VAR050462	Southern States Cooperative Inc - Vinton Feed Mill	Vinton	Ind. Strom Water
VAR051699	Thomas Brothers Debris Landfill	Roanoke	Ind. Strom Water
VAR050448	United Parcel Service Inc - Roanoke	Roanoke	Ind. Strom Water
VAR051529	UPS Ground Freight Inc - Roanoke	Roanoke	Ind. Strom Water
VAR050143	Virginia Scrap Iron & Metal Incorporated	Roanoke	Ind. Strom Water
VAR051492	Virginia Transformer Corp	Roanoke	Ind. Strom Water
VAR051704	Whitlow Auto Crushers LLC	Roanoke	Ind. Strom Water
VAG840067	Rockydale Quarries/Adams Asphalt Plant	Roanoke	Non-metallic Minerals Mining
VAG110012	Chandler Concrete of Virginia Inc. – Seventh Street	Salem	Concrete Products
VAG110026	Salem Ready Mix Concrete, Inc.	Salem	Concrete Products
VAG750169	Cascade Car Wash	Vinton	Car Wash
VA0087092	APCO Niagara Hydroelectric	Vinton	Electric Services
VA0029475	DMHMRSAS - Catawba	Catawba	Sewerage System
VA0001465	Falling Creek Water Filtration Plant	Vinton	Water Supply
City of Roanoke			
VA0001252	Associated Asphalt Incorporated – Roanoke	Roanoke	Minor Industrial
VA0091065	Crystal Spring WTP	Roanoke	Minor Industrial

Permit #*	Facility Name	Town/City	Type
VA0088358	Fred Whitaker Company	Roanoke	Minor Industrial
VA0001597	Norfolk Southern Railway Co. – Shaffers Crossing	Roanoke	Minor Industrial
VA0001589	RES dba Steel Dynamics Roanoke Bar Division	Roanoke	Major Industrial
VA0025020	Western Virginia Water Authority Regional WPCP	Roanoke	Major Municipal
VAR051315	A D Weddle Company Inc	Roanoke	Ind. Strom Water
VAR050643	Akzo Nobel Coatings Incorporated - Roanoke	Roanoke	Ind. Strom Water
VAR050178	BFI Waste Systems LLC - Roanoke	Roanoke	Ind. Strom Water
VAR051802	C and P Welding and Steel Erection Inc	Roanoke	Ind. Strom Water
VAR050206	Con-way Freight, NRO - Roanoke	Roanoke	Ind. Strom Water
VAR050717	Cycle Systems Incorporated	Roanoke	Ind. Strom Water
VAR050437	Estes Express Lines Inc - 1924 Plantation Rd	Roanoke	Ind. Strom Water
VAR050180	FCI Roanoke	Roanoke	Ind. Strom Water
VAR050496	Federal Express Corp - ROAA Station	Roanoke	Ind. Strom Water
VAR051603	FreightCar America	Roanoke	Ind. Strom Water
VAR050134	Greater Roanoke Transit Company	Roanoke	Ind. Strom Water
VAR050743	Hanson Pipe and Precast Inc - Roanoke	Roanoke	Ind. Strom Water
VAR051480	J and J Asphalt Incorporated	Roanoke	Ind. Strom Water
VAR050539	Kenan Transport Co	Roanoke	Ind. Strom Water
VAR050436	Norfolk Southern Corp - Roadway Material Yard	Roanoke	Ind. Strom Water
VAR051518	Norfolk Southern Railway Co - East End Shops	Roanoke	Ind. Strom Water
VAR050275	Old Dominion Auto Salvage	Roanoke	Ind. Strom Water
VAR051199	Pitt Ohio Express Roanoke Terminal - Plantation Rd	Roanoke	Ind. Strom Water
VAR051478	Precision Steel	Roanoke	Ind. Strom Water
VAR050522	Progress Rail Services Corp - Roanoke	Roanoke	Ind. Strom Water
VAR050273	Ralph Smith Inc	Roanoke	Ind. Strom Water
VAR051664	Roanoke City Schools - Transportation Facility	Roanoke	Ind. Strom Water
VAR050272	Roanoke Regional Airport	Roanoke	Ind. Strom Water
VAR051642	Semco Duct and Acoustical Products Incorporated	Roanoke	Ind. Strom Water
VAR051516	Semco Inc	Roanoke	Ind. Strom Water
VAR050530	Shenandoah Auto Parts	Roanoke	Ind. Strom Water
VAR051262	Shorewood Packaging Corporation - Roanoke	Roanoke	Ind. Strom Water
VAR050775	Star City Auto Parts Inc	Roanoke	Ind. Strom Water
VAR050274	USPS Roanoke Vehicle Maintenance Service	Roanoke	Ind. Strom Water
VAR050135	Virginia Scrap Iron & Metal Company Inc	Roanoke	Ind. Strom Water
VAR050208	Walker Machine and Foundry Corp	Roanoke	Ind. Strom Water
VAR050460	Yellow Freight System Inc - Roanoke	Roanoke	Ind. Strom Water
VAG110125	Blue Ridge Ready Mix – Roanoke Plant	Roanoke	Concrete Products
VAG110018	Chandler Concrete of Virginia – Norfolk Ave	Salem	Concrete Products
VAG750059	ProWash USA	Roanoke	Car Wash

Permit #*	Facility Name	Town/City	Type
VAU001601	AD Weddle Salvage	Roanoke	Motor Vehicle Parts, Used
VA0074179	AEP – Smith Mountain Lake Dam	Roanoke	Sewerage System
VA0001252	Associated Asphalt Inc.	Roanoke	Petroleum Bulk Stations and Terminals
VA0091065	Crystal Spring WTP	Roanoke	Water Supply
VA0088358	Fred Whitaker Co.	Roanoke	Finishers of Textiles, Not Elsewhere Classified
VAU001593	Lightweight Block Co., Inc.	Roanoke	Concrete Block and Brick
VA0086541	Marathon Ashland – Roanoke Terminal	Roanoke	Petroleum Bulk Stations and Terminals
VA0001431	Motiva Enterprises LLC	Roanoke	Petroleum Bulk Stations and Terminals
GA0002364 (Noted as GA not VA on EPA Search Results)	Norfolk Southern Corp.	Roanoke	Railroad Switching and Terminal Establishments
VA0001597	Norfolk Southern Railway	Roanoke	Railroads, Line-haul Operating
VA0001589	Roanoke Electric Steel Corp.	Roanoke	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills
VAR050776	Star City Auto Parts	Roanoke	Motor Vehicle Parts, Used
VA0025020	Western Virginia Water Authority	Roanoke	Sewerage Systems
VAU000027	Wise Recycling	Roanoke	Scrap and Waste Material
City of Salem			
VA0077895	Roanoke Moose Lodge	Salem	Minor Municipal
VAR050174	Carbone of America Corporation	Salem	Ind. Strom Water
VAR050507	FedEx National LTL Inc - Salem	Salem	Ind. Strom Water
VAR050150	Graham White Manufacturing Company	Salem	Ind. Strom Water
VAR051766	Hancock Rack Syst dba New Millenium Building Syst	Salem	Ind. Strom Water
VAR050744	Hanson Pipe and Precast Inc - Salem 1 Plant	Salem	Ind. Strom Water
VAR050745	Hanson Pipe and Precast Inc - Salem Plant 2	Salem	Ind. Strom Water
VAR050146	Hedge Metal Company Incorporated	Salem	Ind. Strom Water
VAR050145	Holland-Richards Vault Service	Salem	Ind. Strom Water
VAR051245	KIK Virginia Incorporated	Salem	Ind. Strom Water
VAR050741	Medeco Security Locks Inc	Salem	Ind. Strom Water
VAR050762	Novozymes Biologicals Inc - 111 Kessler Mill Road	Salem	Ind. Strom Water
VAR051672	Novozymes Biologicals Inc - 525 Branch Drive	Salem	Ind. Strom Water
VAR051227	Old Virginia Brick Co Inc - Salem	Salem	Ind. Strom Water
VAR050506	Timber Truss Housing Systems Inc	Salem	Ind. Strom Water
VAR051677	Valley Proteins Incorporated - Salem	Salem	Ind. Strom Water

Permit #*	Facility Name	Town/City	Type
VAR050457	Virginia Blue Ridge Hauling - Salem Hauling	Salem	Ind. Strom Water
VAR050515	Yokohama Tire Corp	Salem	Ind. Strom Water
VAG402012	Lewis Calvin Leon Residence	Salem	Domestic Sewage
VAU000029	Hedge Metal Co. Inc.	Salem	Scrap and Waste Material
VA0001333	Koppers Inc.	Salem	Wood Preserving
VA0077895	Roanoke Moose Lodge	Salem	Sewerage System

Source: Databases provided from DEQ. October 2008.
http://www.epa.gov/enviro/html/pcs/pcs_query_java.html April 21, 2009.

4.2.12 Other Potential Threats to the Existing Water Quantity and Quality

Geologic Events

The Virginia Department of Emergency Management (VDEM) has identified geologic events that may occur throughout the Commonwealth including earthquakes, landslides, sinkholes, shoreline erosion, and other geologic hazards. However, the VDEM is not responsible for tracking geologic events through the Commonwealth; their primary goal is to provide emergency preparedness during such events. The presence of increased likelihood of geologic hazards such as these is often dependent on the underlying geology or soil type. In some instances, geologic hazards are enhanced by man-made activities.

Virginia has a moderate earthquake risk, though major faults and high-strain zones are mapped throughout the Commonwealth. Portions of four major fault or high strain zones are mapped within the region: the Staunton-Pulaski Fault, Blue Ridge Fault, Fries Zone, and the Rockfish Valley Zone. Earthquakes in Virginia are tracked at the Virginia Tech Seismological Observatory (VTSO) at Virginia Tech in Blacksburg, Virginia. According to a representative from the VTSO earthquakes with a magnitude of 5.0 or greater have the potential to affect water resources, primarily residential drinking water wells. Over 160 earthquakes have occurred in Virginia since 1977 with only 16% of those with magnitudes sufficient to be felt. Only one earthquake is documented greater than 5.0 in Virginia, which occurred on May 31, 1897 in Giles County and registered as a magnitude 5.8.

Landslides can occur throughout the Commonwealth and the region primarily on steep slopes, such as those of the Blue Ridge Mountains. Additionally, man-made changes such as slope modification or drainage alteration may increase the likelihood of landslides. A source of landslide tracking throughout the state could not be identified and is not conducted by DMME as a geologic hazard. However, regional Virginia Department of Transportation (VDOT) residencies may have specific local landslide data along major roadways and highways, but a centralized database is not maintained by VDOT.

Based on the review by VDEM, the most likely area for sinkhole formation and subsidence is in the Valley and Ridge province and limited areas of the Piedmont province. The distribution of karst features within Roanoke and Botetourt counties increases the risk for sinkhole formation or subsidence across the karst regions. Areas over underground mines are also susceptible to sinkhole formation.

Shoreline erosion can occur along rivers and lakes within the region. The USDA NRCS web soil survey identifies a general acreage of surface water in each locality as described in Table 4.2.7. Shoreline erosion along rivers and lakes can be reduced if sufficient riparian buffers exist (see Section 4.2.8).

Table 4.2.12.1: Surface Water Acreages from USDA Soil Survey

Survey Area	Acreage of Survey Area	Percent of Survey Area
Bedford County	11,551	2.5
City of Bedford	6	0.1
Botetourt County	2,424	0.9
Franklin County	13,645	3.0
Roanoke County	302	0.2
City of Roanoke	92	<0.1
City of Salem	57	<0.1

Source: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx April 21, 2009.
- Bedford County Soil Map v1 July 21, 2004, Soil Data v7 December 19, 2008.
- Botetourt County Soil Map v1 July 24, 2004, Soil Data v7 January 21, 2009.
- Franklin County Soil Map v6 September 22, 2008, Soil Data v7 January 5, 2009.
- Roanoke County Soil Map v1 October 8, 2004, Soil Data v6 December 23, 2008.

Other hazards including expansive soils, frost heave, and radon emission are typically localized, but may exist in the region.

Water Quality Assessments

Chapter 5.1 of the 2008 Final 305(b)/303(d) Water Quality Assessment Integrated Report discusses groundwater protection programs. The Piedmont Physiographic Province is identified with a diverse geology with a wide range of groundwater quality and availability. This area is noted as having a low to moderate pollution potential. The Blue Ridge Physiographic Province is identified with impervious rock types and low well yields. Pollution potential is high because of potential rapid movement of water in fractures. A number of programs exist in an effort to reduce potential impact to water resources. These include: wellhead protection programs; the Groundwater Management Act of 1992; the Storage Tank Compliance Program; the Storage Tank Remediation Program; Waste Permitting; Remediation Programs; the Pesticide Disposal Program; Pesticides and Groundwater Management; the Karst Program; and the Source Water Assessment Program.

Environmental Management

A number of environmental management practices are tracked through state regulatory agencies and the USEPA including air permits, toxic release reporting, hazardous waste activities including superfund sites, and water discharges. The USEPA EDW maintains a listing of these sites; Table 4.1.12.2 provides a breakdown by county. Mapping of these facilities can be found on the USEPA EDW interactive mapper through the USEPA website.

Table 4.2.12.2: Environmental Management Sites in Bedford County

Bedford County	
Air	
Facilities that produce and release air pollutants.	80
Toxics	
Facilities that have reported toxic releases.	13
Waste (see note below)	
Facilities that have reported hazardous waste activities.	75
Number of Large Quantity Generators	1
Number of Small Quantity Generators	9
Number of Transporters	1
Number of Treatment, Storage, or Disposal Facilities	0
Potential hazardous waste sites that are part of Superfund that exist.	2
Sites not on the National Priority List (NPL).	1
Facilities that generate hazardous waste from large quantity generators.	0
Water	
Facilities issued permits to discharge to waters of the United States.	25
Transient Non-Community Water Systems that do not consistently serve the same people (e.g.	19

Bedford County	
rest stops, campgrounds, gas stations).	
Community Water Systems that serve the same people year-round (e.g. in homes or businesses).	25
Non-Transient Non-Community Water Systems that serve the same people, but not year-round (e.g. schools that have their own water system).	11

Table 4.2.12.3: Environmental Management Sites in Botetourt County

Botetourt County	
Air	
Facilities that produce and release air pollutants.	45
Toxics	
Facilities that have reported toxic releases.	10
Waste (see note below)	
Facilities that have reported hazardous waste activities.	40
Number of Large Quantity Generators	2
Number of Small Quantity Generators	11
Number of Transporters	0
Number of Treatment, Storage, or Disposal Facilities	0
Potential hazardous waste sites that are part of Superfund that exist.	2
Sites not on the National Priority List (NPL).	2
Facilities that generate hazardous waste from large quantity generators.	0
Water	
Facilities issued permits to discharge to waters of the United States.	9
Transient Non-Community Water Systems that do not consistently serve the same people (e.g. rest stops, campgrounds, gas stations).	15
Community Water Systems that serve the same people year-round (e.g. in homes or businesses).	34
Non-Transient Non-Community Water Systems that serve the same people, but not year-round (e.g. schools that have their own water system).	12

Table 4.2.12.4: Environmental Management Sites in Franklin County

Franklin County	
Air	
Facilities that produce and release air pollutants.	64
Toxics	
Facilities that have reported toxic releases.	15
Waste (see note below)	
Facilities that have reported hazardous waste activities.	69
Number of Large Quantity Generators	2
Number of Small Quantity Generators	19
Number of Transporters	2
Number of Treatment, Storage, or Disposal Facilities	2
Potential hazardous waste sites that are part of Superfund that exist.	2
Sites not on the National Priority List (NPL).	2
Facilities that generate hazardous waste from large quantity generators.	0
Water	
Facilities issued permits to discharge to waters of the United States.	14
Transient Non-Community Water Systems that do not consistently serve the same people (e.g. rest stops, campgrounds, gas stations).	36
Community Water Systems that serve the same people year-round (e.g. in homes or businesses).	46
Non-Transient Non-Community Water Systems that serve the same people, but not year-round	15

Franklin County	
(e.g. schools that have their own water system).	

Table 4.2.12.5 Environmental Management Sites in Roanoke County

Roanoke County	
Air	
Facilities that produce and release air pollutants.	246
Toxics	
Facilities that have reported toxic releases.	48
Waste (see note below)	
Facilities that have reported hazardous waste activities.	413
Number of Large Quantity Generators	8
Number of Small Quantity Generators	57
Number of Transporters	3
Number of Treatment, Storage, or Disposal Facilities	1
Potential hazardous waste sites that are part of Superfund that exist.	9
Sites deleted from the Final NPL.	1
Sites not on the National Priority List (NPL).	1
Facilities that generate hazardous waste from large quantity generators.	0
Water	
Facilities issued permits to discharge to waters of the United States.	19
Transient Non-Community Water Systems that do not consistently serve the same people (e.g. rest stops, campgrounds, gas stations).	10
Community Water Systems that serve the same people year-round (e.g. in homes or businesses).	14
Non-Transient Non-Community Water Systems that serve the same people, but not year-round (e.g. schools that have their own water system).	8

Source: http://www.epa.gov/enviro/index.html accessed April 16, 2009.

Waste sites listed include those classified as large quantity generators (LQG), small quantity generators (SQG), and transport, storage and disposal (TSD) facilities. A LQG site can generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. A SQG site can generate between 100 kg and 1,000 kg of hazardous waste per month. TSD facilities are those that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. Violations of individual facilities were not reviewed.

Petroleum Releases

Releases of petroleum or regulated substances into the environment, once reported to VDEQ, are monitored during characterization and possible remediation of the release. Depending on the nature of the release, impact to surface or subsurface water sources may occur. Release incidences once characterized and/or remediated are considered closed. However, these files may be re-opened and additional activities required if conditions warrant further investigation. Therefore, VDEQ tracks active incidences (Open) and inactive incidences (Closed). The following is a summary of petroleum release files from January 1, 1988 to October 2008 as provided by VDEQ:

- Bedford County – 16 Open, 122 Closed
- Botetourt County – 11 Open, 119 Closed
- Franklin County – 12 Open, 139 Closed
- Roanoke County – 14 Open, 200 Closed
- Roanoke City – 17 Open, 334 Closed
- Salem City – 4 Open, 112 Closed

Voluntary Remediation Sites

The Voluntary Remediation Program (VRP) was designed to encourage hazardous substance cleanups throughout the state. Once completed land use controls, also known as institutional or engineering controls, may exist for the site. These can include groundwater (GW) restrictions, subsurface excavation (EXC) restrictions, residential development (RES) restrictions, or other restrictions beyond GW, EXC, or RES. Table 4.2.12.6 identifies the completed and planned VRO sites within the region and any land use controls that exist.

Table 4.2.12.6: VRP Sites (Completed and Planned)

VRP #	Facility Name	Town/City/ County	Land Use Controls
VRP00222	Flexo Building Sites	Bedford County	GW RES
VRP00348	Tuna Associates	Botetourt County	GW RES
VRP00163	Dragon Corporation	City of Roanoke	NONE
VRP00191	Orkin		RES
VRP00195	Singer Furniture		GW RES EXC
VRP00219	Universal Ball		GW RES
VRP00231	Deanwood Property CD-2		GW RES EXC
VRP00267	Litton NAS		NONE
VRP00276	Terminix		GW EXC OTHER
VRP00284	South Jefferson Redevelopment-Site #1		GW RES EXC OTHER
VRP00286	South Jefferson Redevelopment-Site #2		GW RES
VRP00289	South Jefferson Redevelopment-Site #3		GW RES
VRP00296	Brambleton Avenue-Triple J Investors		GW
VRP00298	South Jefferson Redevelopment-Site #4		GW RES
VRP00309	Professional Cleaners of Roanoke		NONE
VRP00312	South Jefferson Redevelopment-Site #5		GW RES EXC

VRP #	Facility Name	Town/City/ County	Land Use Controls
VRP00329	General Electric Industrial Systems		NONE
VRP00358	Outpatient Surgery Center Facility		GW RES
VRP00369	Former Marsteller Facility		GW RES OTHER
VRP00380	Franklin Roan/Elm Avenue Parcel		GW RES
VRP00396	Bartlett Tree Expert Company		RES
VRP00424	The Contractor Yard, Inc.		NONE
VRP00436	Park Street Housing		GW
VRP00164	Norfolk Southern West End Material Yard		Planned Sites
VRP00394	Riverdale Development/Former American Viscose Lagoons		
VRP00401	Tract 5 – Norfolk Southern (NS) Roanoke River Sites		
VRP00402	Tract 6 – NS Roanoke River Sites		
VRP00403	Tract 7 – NS Roanoke River Sites		
VRP00404	Tract 8 – NS Roanoke River Sites		
VRP00405	Tract 9 – NS Roanoke River Sites		
VRP00408	Virginia Scrap Iron		
VRP00455	Virginia Scrap Metal		
VRP00208	Medeco Security Locks, Inc.- Acid/Alkali Basin	Roanoke County	EXC
VRP00486	Vinton Dry Cleaner		Planned Site
VRP00199	Perma Clean Cleaners & Laundry, Inc.	City of Salem	GW
VRP00224	Medeco-WWT Basin		NONE
VRP00450	Old Salem Tannery (former)		GW RES OTHER

http://www.deq.virginia.gov/vrp/public.html last updated February 13, 2009 accessed April 22, 2009.

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5.0 PROJECTED WATER DEMAND INFORMATION

As population in the Region increases so will the demand for water. By examining past trends, current conditions, and future projections, a plan can be developed to prepare for future water demands. As required by the Regulations, an analysis of population growth and water demand projections is detailed in the following section of the Plan. Projections of future water demand for the region are based on existing data from municipalities, VDH, and VDEQ as well as population and employment projections from the U.S. Census Bureau and the Virginia Employment Commission (VEC), respectively.

5.1 Population Data

5.1.1 Historical Population and Growth Trends

Past population trends provide a good starting point when estimating future growth and water demands. The U.S. Census Bureau provides historical data for counties and cities only; therefore, it was assumed that the towns in the region have the same rate of change in population as their respective county. The historical population and decennial growth rate percentage for each jurisdiction over the past 40 years is presented in Tables 5.1.1A and 5.1.1B, respectively.

Table 5.1.1A: Historical Population by Jurisdiction.

Jurisdiction	Census 1960	Census 1970	Census 1980	Census 1990	Census 2000
Bedford County	31,028	26,728	34,927	45,656	60,371
Botetourt County	16,715	18,193	23,270	24,992	30,496
Franklin County	25,925	26,858	35,740	39,549	47,286
Roanoke County	61,693	67,339	72,945	79,332	85,778
City of Roanoke	97,110	92,115	100,220	96,397	94,911
City of Salem	---	21,982	23,958	23,756	24,747

Table 5.1.1B: Historical Population Growth Rate Percent by Jurisdiction.

Jurisdiction	1960-1970	1970-1980	1980-1990	1990-2000	Average
Bedford County	-13.86	30.68	30.72	32.23	19.94
Botetourt County	8.84	27.91	7.40	22.02	16.54
Franklin County	3.60	33.07	10.66	19.56	16.72
Roanoke County	9.15	8.33	8.76	8.13	8.59
City of Roanoke	-5.14	8.80	-3.81	-1.54	-0.43
City of Salem	---	8.99	-0.84	4.17	4.11

5.1.1.1 Bedford County

Bedford County has experienced the highest growth rate in the region. Bedford County's location between the City of Lynchburg and Roanoke County and City has had a substantial impact on population growth in the late twentieth century. In addition, the development of Smith Mountain Lake in the 1960s has attributed to growth in the county. The area around Smith Mountain Lake began to see significant second home development during the mid-1970s and has also become a popular location for retirees. Bedford County has experienced an average decennial growth rate of approximately 20% since 1960 and according to the Bedford County Comprehensive Plan, the county has experienced an annual growth rate of approximately 2.75%.

5.1.1.2 Botetourt County

Botetourt County has experienced significant growth since 1970. Botetourt County's location near Roanoke County and City has had a substantial impact on population growth. Botetourt County has experienced an average decennial growth rate of approximately 17% since 1960. The majority of this growth has occurred in the southern portion of the county.

5.1.1.3 Franklin County

Franklin County has also experienced significant growth since 1970. Franklin County has experienced an average decennial growth rate of approximately 17% since 1960. The development of Smith Mountain Lake in the 1960s has attributed to the growth in the county. The area around Smith Mountain Lake began to see significant second home development during the mid-1970s and has also become a popular location for retirees. Franklin County's location near Roanoke City has also had an impact on population growth.

5.1.1.4 Roanoke County

According to the Roanoke County Comprehensive Plan, Roanoke County has experienced steady growth in the last 25 years. Roanoke County has experienced an average decennial growth rate of approximately 9% since 1960. The majority of this growth has occurred around the City of Roanoke.

5.1.1.5 City of Roanoke

According to the City of Roanoke Comprehensive Plan, the city population has remained relatively stable with no large population gains or losses in the past 20 years. The City's efforts to diversify its economy, develop a strong downtown, and strengthen its neighborhoods have been credited to the City's success in retaining a relatively stable population base in the face of the trend for the city to experience more significant population loss. The City has experienced a slight but steady population decrease since 1980 and expects a slight but steady population decrease to continue.

5.1.1.6 City of Salem

The City of Salem became an independent city in 1968, and prior to that time, the city's population was included in population for Roanoke County. According the City of Salem Comprehensive Plan, the City of Salem grew 4.2% between 1990 to 2000 and is expected to grow another 4.7% by 2010. The City of Salem has experienced an average decennial growth rate of approximately 4% since 1970.

5.1.2 Current Population and Future Population Projections

The current population by jurisdiction based on the Census is presented in Table 5.1.2A. Please note that the county populations do not include the towns within their respective county.

Table 5.1.2A: Current Population by Jurisdiction (2007)

Name of Locality	Population
Bedford County	60,371
Botetourt County*	28,472
Franklin County*	42,935
Roanoke County*	77,996
City of Roanoke	94,911
City of Salem	24,747

Name of Locality	Population
Town of Boones Mill	285
Town of Buchanan	1,233
Town of Fincastle	359
Town of Rocky Mount	4,066
Town of Troutville	432
Town of Vinton	7,782
Total Population for Region	343,589

*County population minus towns within.

The percent change in population for each county was determined by comparing the population in the year 2000 (U.S. Census Bureau) and the estimated population in 2030 (Virginia Employment Commission). Once the percent change in population was determined for each county and city, the percentage was used to project the population through 2060. Please note that the U.S. Census Bureau only provides information for counties and cities; therefore, it was assumed that the average annual percent change in population for the towns was the same as its respective county. Future population projections through 2060 are presented in Table 5.1.2B.

Table 5.1.2B: Projected Population and Growth Rate by Jurisdiction

Jurisdiction	2000	2010	2020	2030	2040	2050	2060	Annual Growth %
Bedford County	60,371	68,091	75,963	84,745	94,542	105,472	117,665	4.0-1.1
Botetourt County	30,496	33,108	35,677	38,445	41,428	44,642	48,105	0.75
Franklin County	47,286	52,184	57,075	62,425	68,276	74,676	81,676	0.90
Roanoke County	85,778	88,022	90,112	92,252	94,443	96,686	98,983	0.24
City of Roanoke	94,911	97,393	99,707	102,075	104,499	106,981	109,522	0.24
City of Salem	24,747	24,747	24,747	24,747	24,747	24,747	24,747	0.00

Bedford County has been experiencing significant growth for the past 30 years and is expected to grow even more rapidly in the next 10 years. Much of this growth is a result of Bedford County's location between the City of Lynchburg and Roanoke County and City. In addition, the county is experiencing significant growth around Smith Mountain Lake. Bedford County is projected to grow at 4% through 2018 and then at 1.1% through 2060.

5.1.3 Future Growth

The RVARC planning group recognizes the importance of communication between the water utilities in the region and the planning staff for each jurisdiction. As part of the planning process individual meetings were held with county planning staff to review comprehensive plans and discuss future growth in an effort to make sure the areas the planning staff identified as potential growth areas were the same areas the water utilities identified as future growth and expansion areas. These future growth areas were compared to existing infrastructure, which will aid both the water utilities and planning staff in evaluating growth areas. By working together, the water utilities and planning staff will be able to determine whether infrastructure expansion is needed and feasible as well as determine areas where it may be difficult to expand infrastructure and where alternative water sources will need to be evaluated. A map showing future growth areas in the region is presented in Figure 5.1.3.

Figure 5.1.3: Map Showing Future Growth Areas in the Region

5.2 Demand Projection Methodology

The annual percent change in population for each jurisdiction was determined by comparing the population in the year 2000 (U.S. Census Bureau) and the estimated population in 2030 (VEC). Once the percent change in population was determined, that percentage was used to project the population through the year 2060. The percent change in population was then used to project water demand by applying it to water demands that are influenced by changes in population such as residential demand. For jurisdictions where a population decrease was anticipated, a projection of zero growth was assumed.

For demand categories that are more influenced by changes in employment, such as commercial and industrial demands, the average annual projected percent change in employment (per the VEC) was used.

5.2.1 Public Community Water Systems

Population estimates within the planning area served by each existing community water system were supplied by the jurisdiction or VDH. The current total demand was provided by the jurisdiction or VDEQ. In addition, the jurisdiction also provided water demand disaggregated into the following categories of use when available:

- Residential
- Commercial, institutional and light industrial
- Heavy Industrial
- Military
- Water used in water production processes
- Unaccounted for water losses
- Sales to other community water systems
- Other

When the jurisdiction did not provide disaggregate information, assumptions were made in order to calculate the demand for each category and are presented in more detail in the demand projection calculations in Appendix D.

In order to project the demand for public community water systems, the average annual percent change in population from 2000 to 2030 was applied to the residential demand. The commercial, institutional, industrial, military, production process, unaccounted-for-water, sales and other demand projections were established by applying the annual average percent change in employment from 2002 to 2012 to the current demand for each category. The annual average percent change in employment was applied since these categories are more likely influenced by changes in employment.

For each town it was assumed that the residential demand increased at the same rate as the annual average percent change in population. When calculating the annual average percent change in population for a town, it was assumed that the town's population will increase at the same rate as the respective county since the U.S. Census Bureau does not provide data for towns. In addition, it was assumed that towns have the same rate of change in employment as their respective county.

Once the demands were projected through 2060 in each category, all of the demands are summed to give the total annual average demand for each public water system. The peak monthly demand and the average monthly demand were provided by each jurisdiction and used to calculate a peaking factor. The peaking factor was then applied to the annual average demand and projected through 2060. When the locality did not provide the peak monthly demand, a peaking factor of 1.2 was assumed.

To account for the unanticipated arrival of unique large demand users (e.g., a bottling plant like Coca-Cola in WVWA service area, which uses approximately 135 MG), it will be assumed that a new large demand user will begin operation every ten years until 2060.

5.2.2 Private Community Water Systems

In order to project the future demands for private community water systems the annual average percent change in population was applied to the total demand from all of the private community systems in each jurisdiction. Since these water systems are serving a community, it is assumed that the growth in these areas will be the same as the percent change in population for the jurisdiction.

5.2.3 Self-Supplied, Non-Agricultural Using Greater Than 300,000 Gallons of Water Per Month

In order to project the future demands for self-supplied, non-agricultural users the annual average percent change in employment was applied to the total demand from each of these users for each jurisdiction.

5.2.4 Self –Supplied, Agricultural Users Using Greater Than 300,000 Gallons of Water Per Month

Information on self-supplied, agricultural users using greater than 300,000 gallons of water per month was very limited or unavailable. Agricultural information for each county was collected from the USDA NASS 2002 Census of Agriculture. General information on livestock (e.g., number of head of cattle) and crops (e.g., type of crop planted) was available and was used to make a general estimate of water used by self-supplied, agricultural users in the region. Agriculture in the region is not expected to increase in the future and in many areas of the region will likely decrease as growth occurs. To be conservative agricultural projections were maintained at the current rate throughout the planning period.

5.2.5 Self-Supplied, Individual Well Users Using Less Than 300,000 Gallons of Water Per Month

To determine an estimate of residences and businesses that are self-supplied and served by individual groundwater wells withdrawing less than 300,000 gallons per month, the population served by both public and private community water systems was determined. Population served by public community water systems was provided by the jurisdiction or VDH. Population served by private community water systems was provided by VDH. The total population for each jurisdiction was provided by the 2000 U.S. Census Bureau.

A summary of the population served by individual wells by jurisdiction is included in Table 5.2.5. The population served by individual wells was estimated by subtracting the population served by public and private community water systems from the total population. It is important to note that the total county populations do not include the towns within the respective county. In addition, the City of Salem and many of the towns serve areas in their respective county that are outside the city/town limits. The population served by the respective public community water system outside the city/town limits and in the respective county is included in the

‘Population Served by Public CWS’ for the respective county. For example, the total population for the Town of Vinton in 2000 was approximately 7,782 people. The Town of Vinton public community water system serves approximately 13,000 people. The additional 5,218 people served by the Town of Vinton public community water system are located in the eastern portion of Roanoke County and were included in the ‘Population Served by Public CWS’ for Roanoke County in Table 5.2.5.

Table 5.2.5: Population Served by Community Water Systems and Individual Wells

Jurisdiction	Total Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells
Bedford County	60,371	17,993	3,742	38,636
Botetourt County*	28,472	4,780	9,049	14,643
Franklin County*	42,935	4,832	4,754	33,349
Roanoke County*	77,996	62,332	1,113	14,551
City of Roanoke	94,911	94,911	0	0
City of Salem**	24,747	24,682	65	0
Town of Boones Mill**	285	285	0	0
Town of Buchanan	1,233	1,230	0	3
Town of Fincastle**	359	359	0	0
Town of Rocky Mount**	4,066	4,066	0	0
Town of Troutville**	432	432	0	0
Town of Vinton**	7,782	7,782	0	0
Total	343,589	221,854	20,390	101,345

* Total county population does not include the towns within the respective county.
**City/Towns serve areas in respective county outside the city/town limits. The population served by the respective public CWS is included in the 'Population Served by Public CWS' for the respective county.

Water used by self-supplied, individual well users was estimated based on the assumption of 75 gpd per person. Future demands were then projected by applying the average annual percent change in population for each jurisdiction.

5.3 Amendments to Methodology

5.3.1 Bedford County

Since Bedford County is experiencing significant growth, the BCPSA is expecting an increase in the number of connections to their public community water systems. An increase in number of connections to the High Point service area will be a result of continued growth around Smith Mountain Lake. In addition, the Forest and New London service area as well as the Stewartsville Consecutive service area will see an increase in number of connections due to Bedford County's location between the City of Lynchburg and Roanoke County and City. Based on the projected growth rates for these areas in the county, a 4% annual growth rate was applied to project residential demand through 2018 and a 1.1% change in population was then applied to project demand through 2060.

5.3.2 Botetourt County

An annual average percent change in employment of 1.00% was used for Botetourt County instead of the 1.45% annual average percent change in employment from VEC based on input from County staff.

5.3.3 Franklin County

No amendments to the demand projection methodology were made for Franklin County.

5.3.4 Roanoke County/City of Roanoke

No amendments to the demand projection methodology were made to WVWA projections for Roanoke County or the City of Roanoke.

5.3.5 City of Salem

No amendments to the demand projection methodology were made for the City of Salem.

5.3.6 Town of Boones Mill

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Boones Mill.

5.3.7 Town of Buchanan

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Buchanan.

5.3.8 Town of Fincastle

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Fincastle.

5.3.9 Town of Rocky Mount

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Rocky Mount.

5.3.10 Town of Troutville

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Troutville.

5.3.11 Town of Vinton

The VEC does not have specific data on projected population in 2030 for the Town as the Town is included in Roanoke County. The Town of Vinton estimates the rate of population increase to be 0.22% for the town and 0.604% for East Roanoke County. The resultant weighed average rate of population increase is 0.377% for the area served by the Town of Vinton.

In addition, the unanticipated arrival of a unique large demand users (e.g., a bottling plant like Coca-Cola, was not included in the projections for the Town of Vinton.

5.4 Projected Water Demand Results

5.4.1 RVARC

The total projected demand for each jurisdiction though 2060 is presented in Table 5.4.1.

Table 5.4.1: Total Projected Water Demand by Jurisdiction.

Jurisdiction	Total Projected Demand for RVARC (MG/Year)					
	2010	2020	2030	2040	2050	2060
Bedford County	6,116	6,983	7,789	8,695	9,715	10,861
Botetourt County	1,206	1,447	1,699	1,965	2,246	2,543
Franklin County	2,283	2,599	3,026	3,499	4,025	4,610
WVWA	9,919	11,135	12,509	14,064	15,829	17,834
City of Salem	2,210	2,643	3,078	3,558	4,093	4,689
Town of Boones Mill	27	30	34	38	42	47
Town of Buchanan	98	108	119	132	147	163
Town of Fincastle	32	35	39	43	47	52
Town of Rocky Mount	386	430	480	536	599	670
Town of Troutville	80	91	104	120	137	157
Town of Vinton	475	515	560	612	669	734

5.4.2 Bedford County

The projected water demands for the public community water system (BCPSA) in Bedford County are presented in Figure 5.4.2A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Bedford County are presented in Figure 5.4.2B. The total projected water demand for Bedford County is presented in Figure 5.4.2C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.2A: Bedford County Annual Average Public CWS Demand Projections

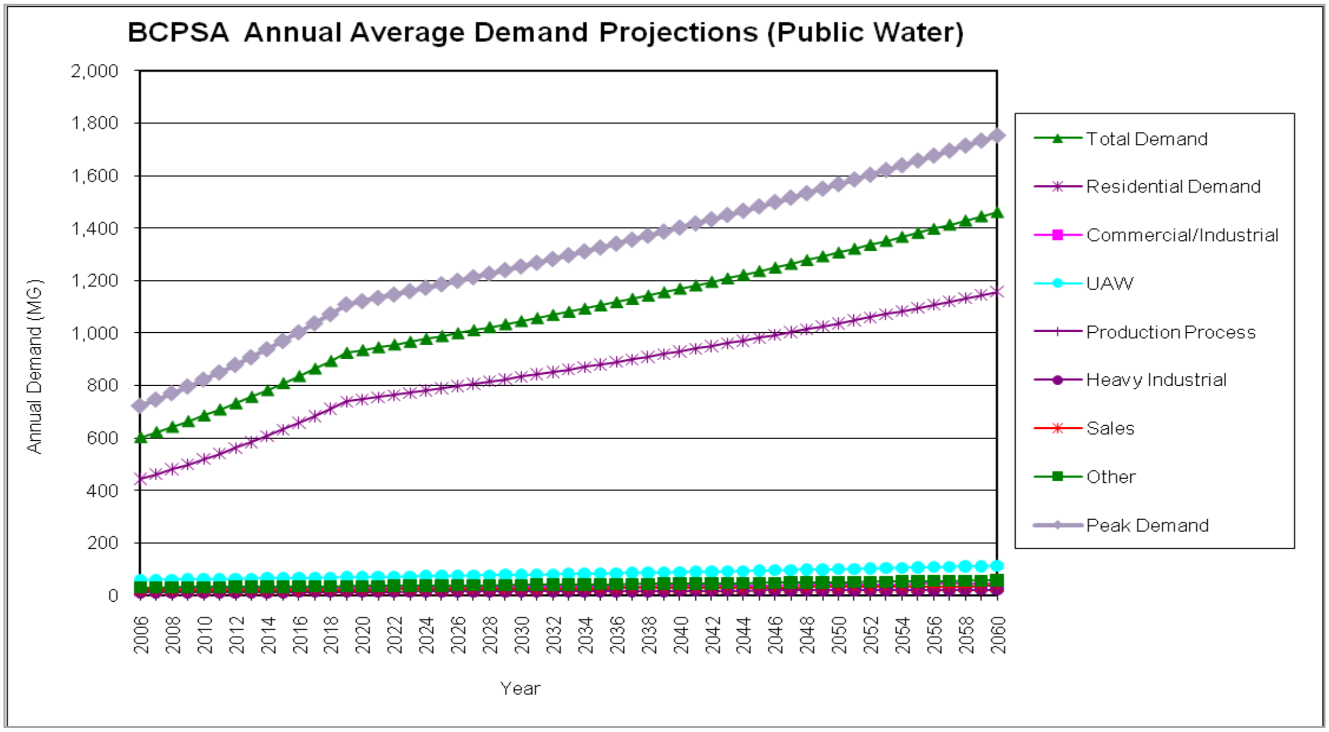


Figure 5.4.2B: Bedford County Annual Average Private Demand Projections

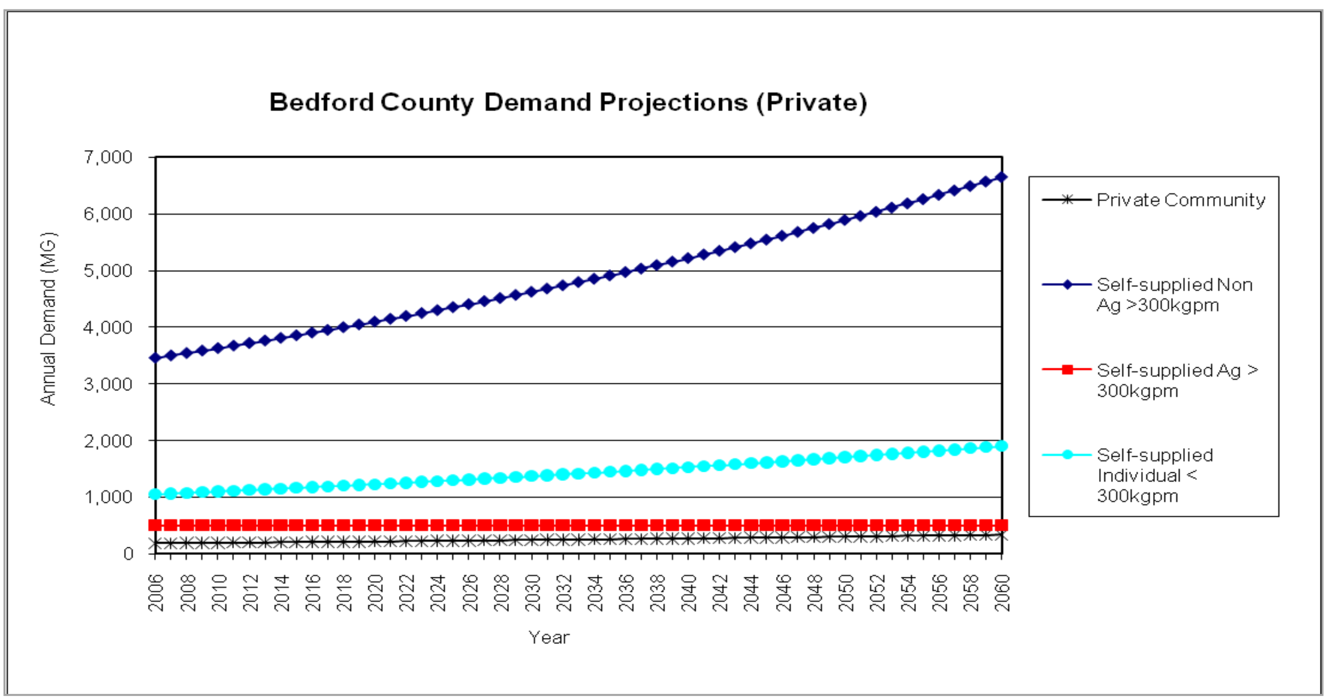
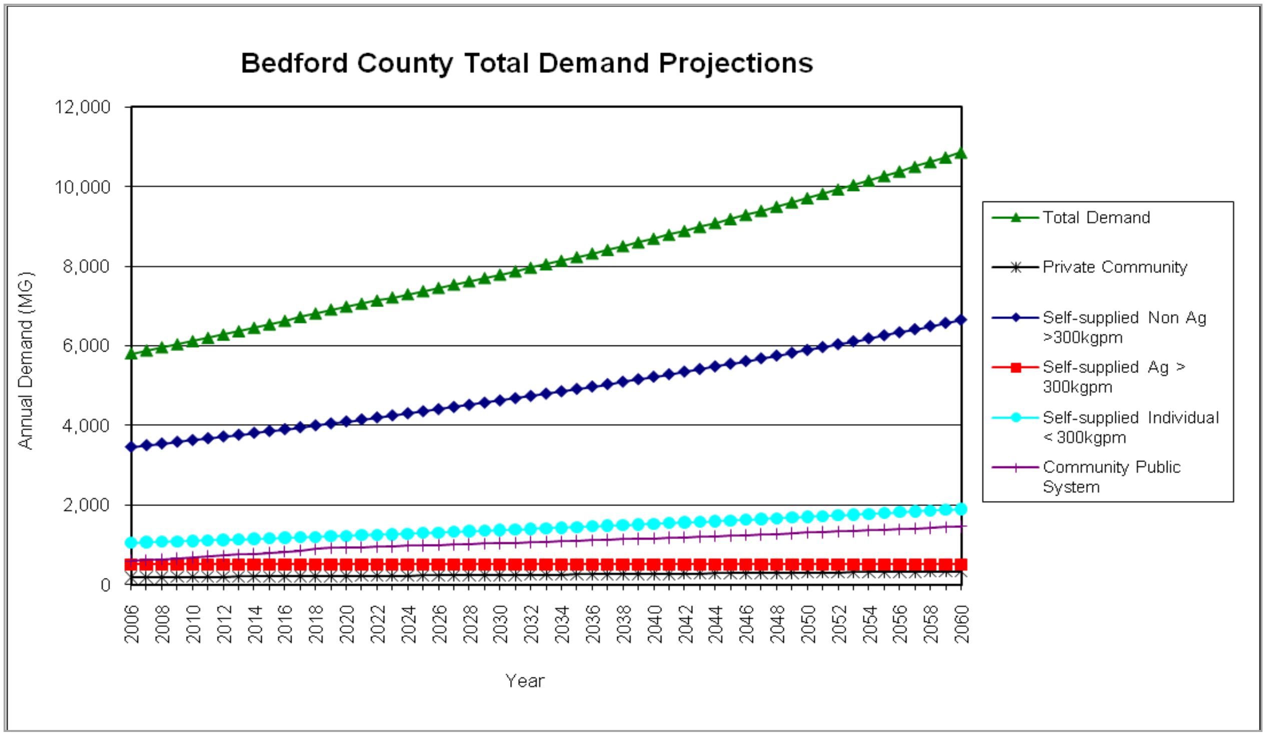


Figure 5.4.2C: Bedford County Annual Total Demand Projections



5.4.3 Botetourt County

The projected water demands for the public community water systems in Botetourt County are presented in Figure 5.4.3A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Botetourt County are presented in Figure 5.4.3B. The total projected water demand for Botetourt County is presented in Figure 5.4.3C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.3A: Botetourt County Annual Average Public Water Demand Projections

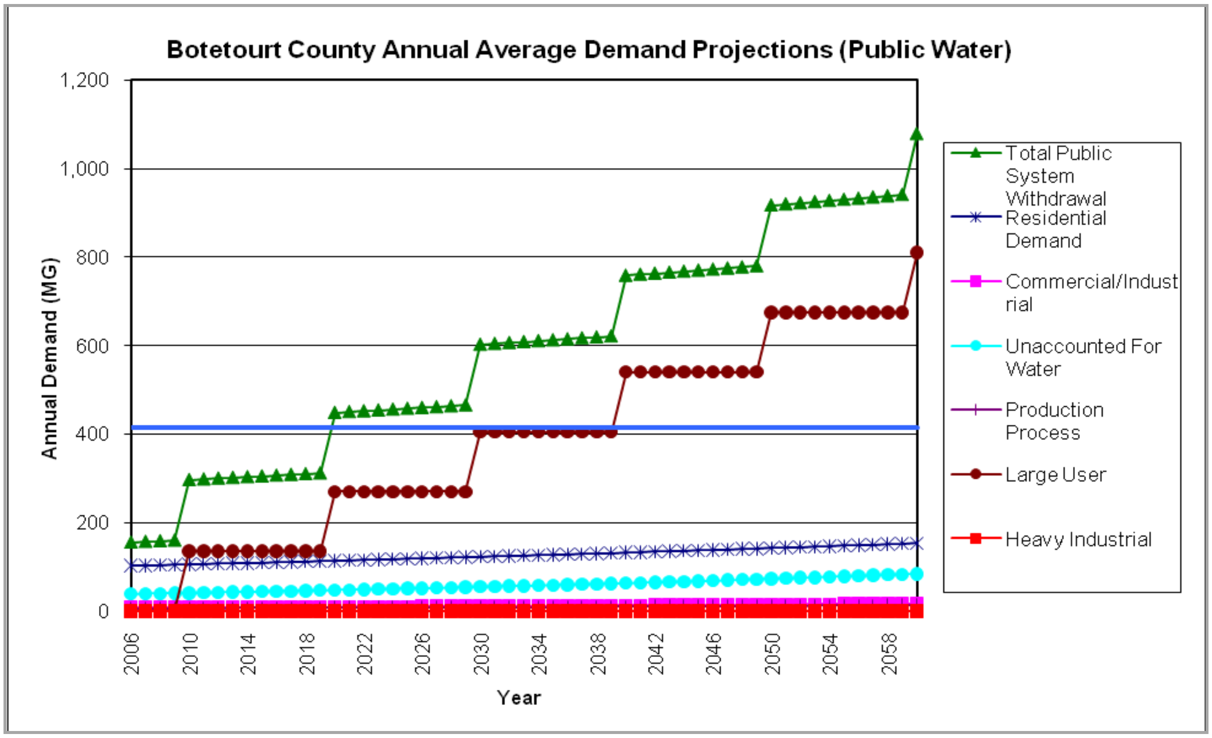


Figure 5.4.3B: Botetourt County Annual Average Non-Public Water Demand Projections

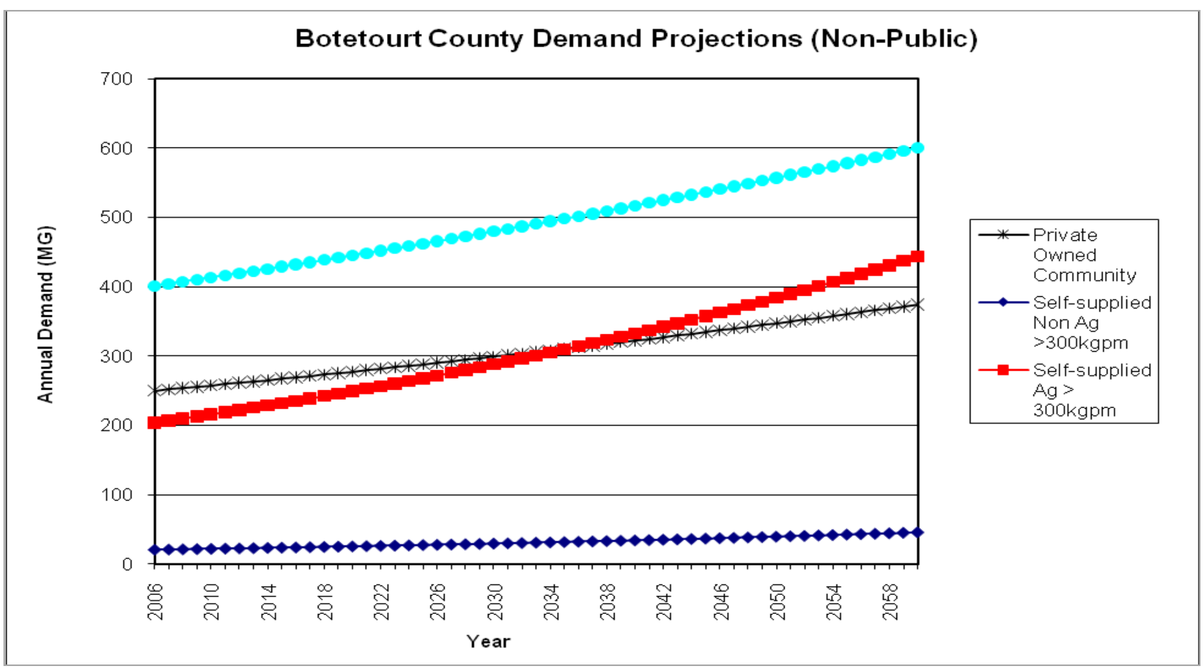
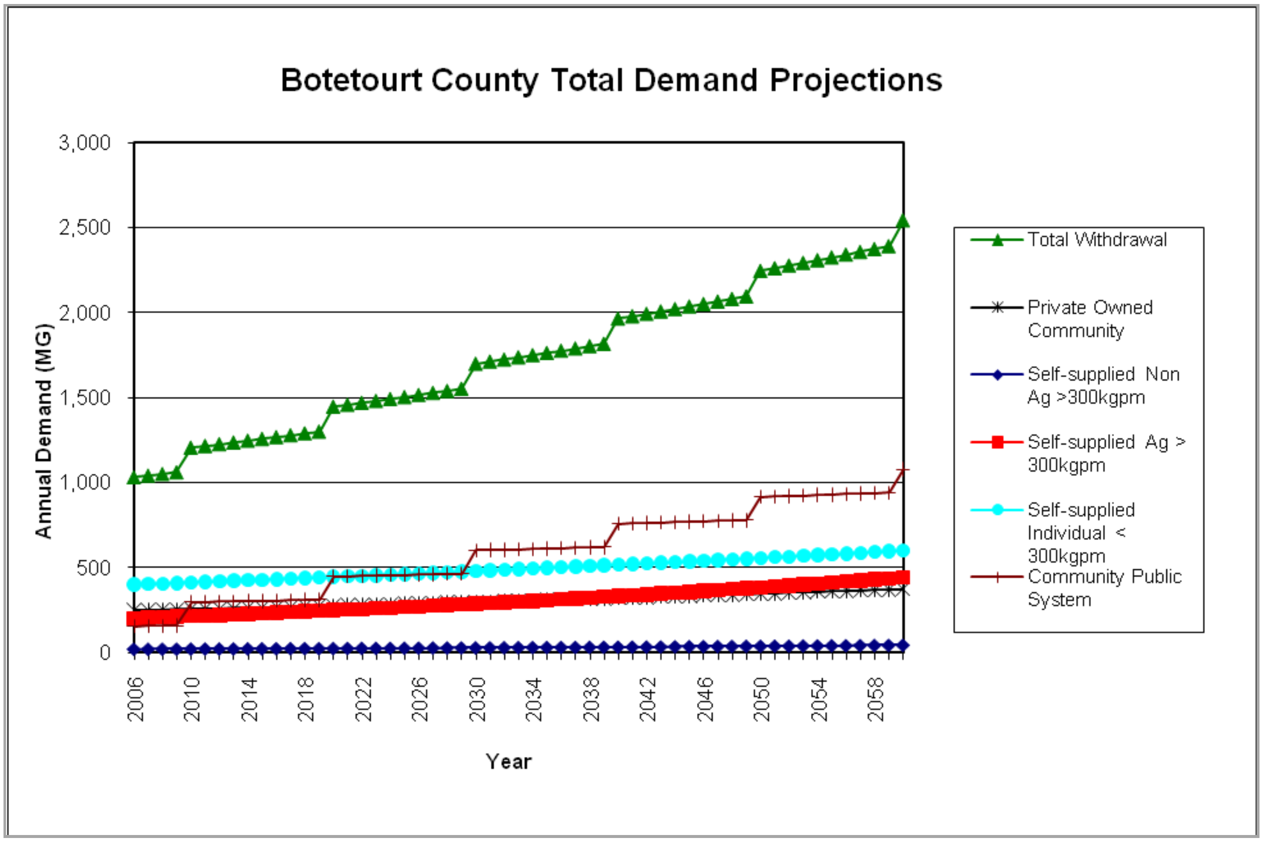


Figure 5.4.3C: Botetourt County Annual Total Demand Projections



5.4.4 Franklin County

The projected water demands for the public community water systems in Franklin County are presented in Figure 5.4.4A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Franklin County are presented in Figure 5.4.4B. The total projected water demand for Franklin County is presented in Figure 5.4.4C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.4A: Franklin County Annual Average Public Water Demand Projections

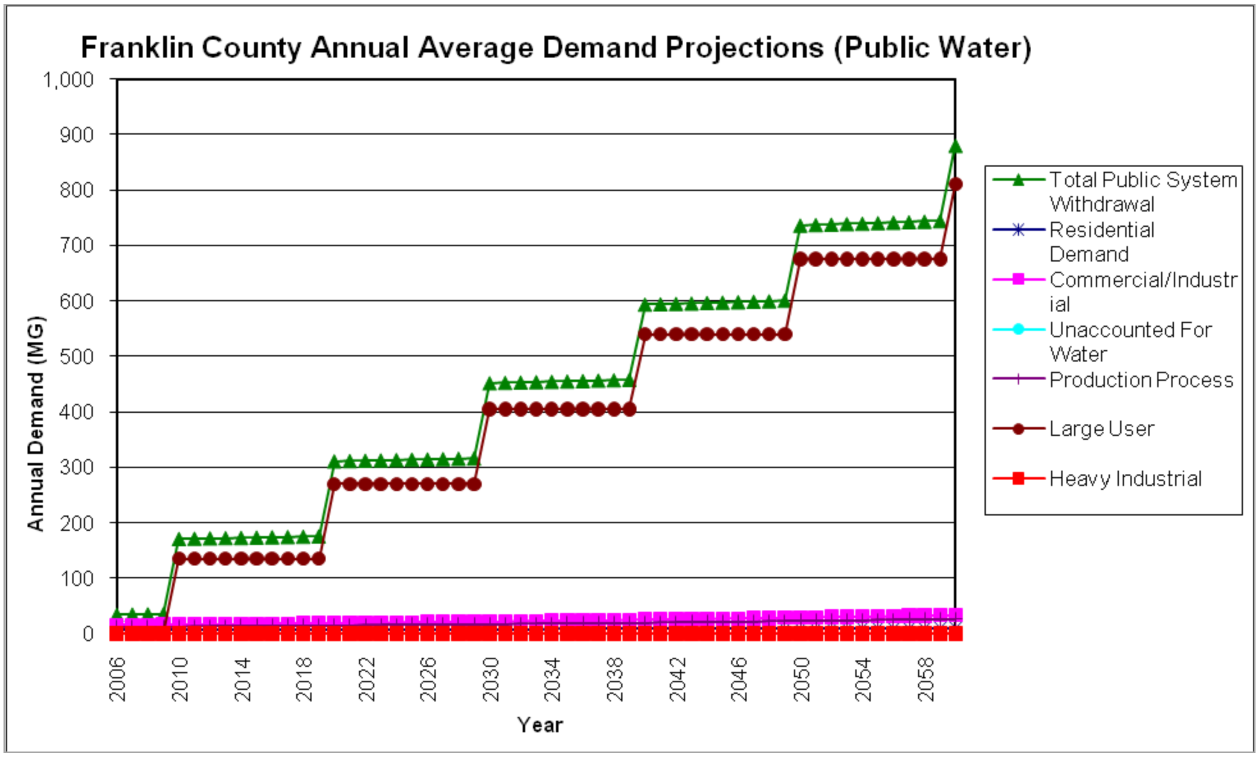


Figure 5.4.4B: Franklin County Annual Average Non-Public Water Demand Projections

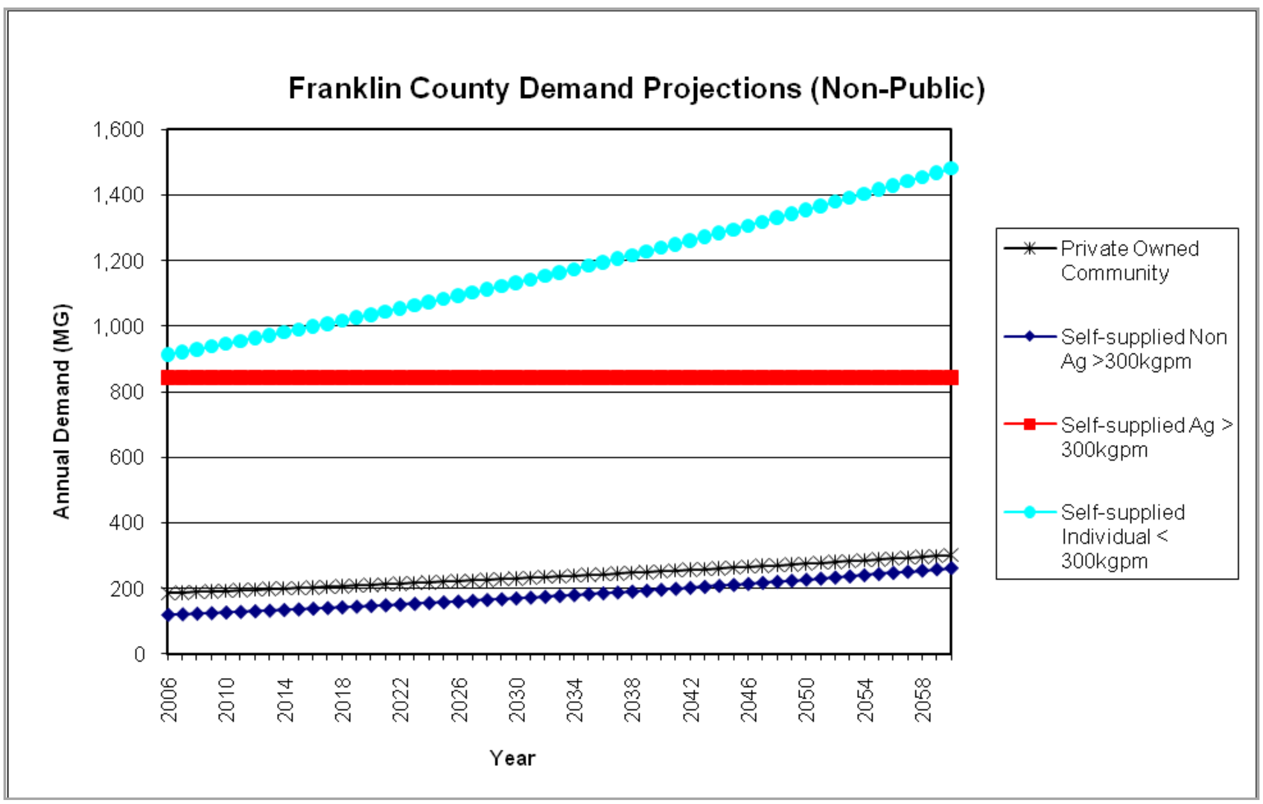
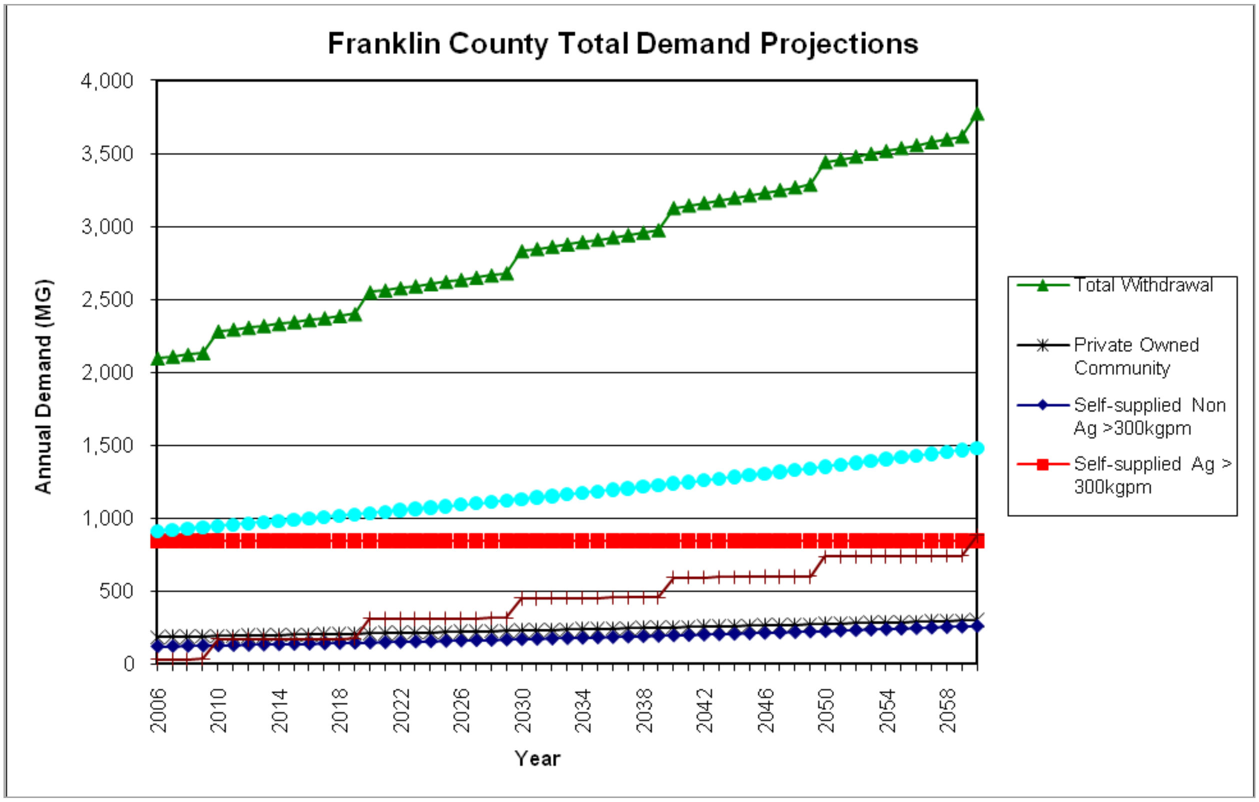


Figure 5.4.4C: Franklin County Annual Total Demand Projections



5.4.5 Roanoke County and City of Roanoke

The projected water demands for the public community water system (WVWA) in Roanoke County and the City of Roanoke are presented in Figure 5.4.5A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Roanoke County and the City of Roanoke are presented in Figure 5.4.5B. The total projected water demand for Roanoke County and the City of Roanoke is presented in Figure 5.4.5C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.5A: WVWA Annual Average Public Water Demand Projections

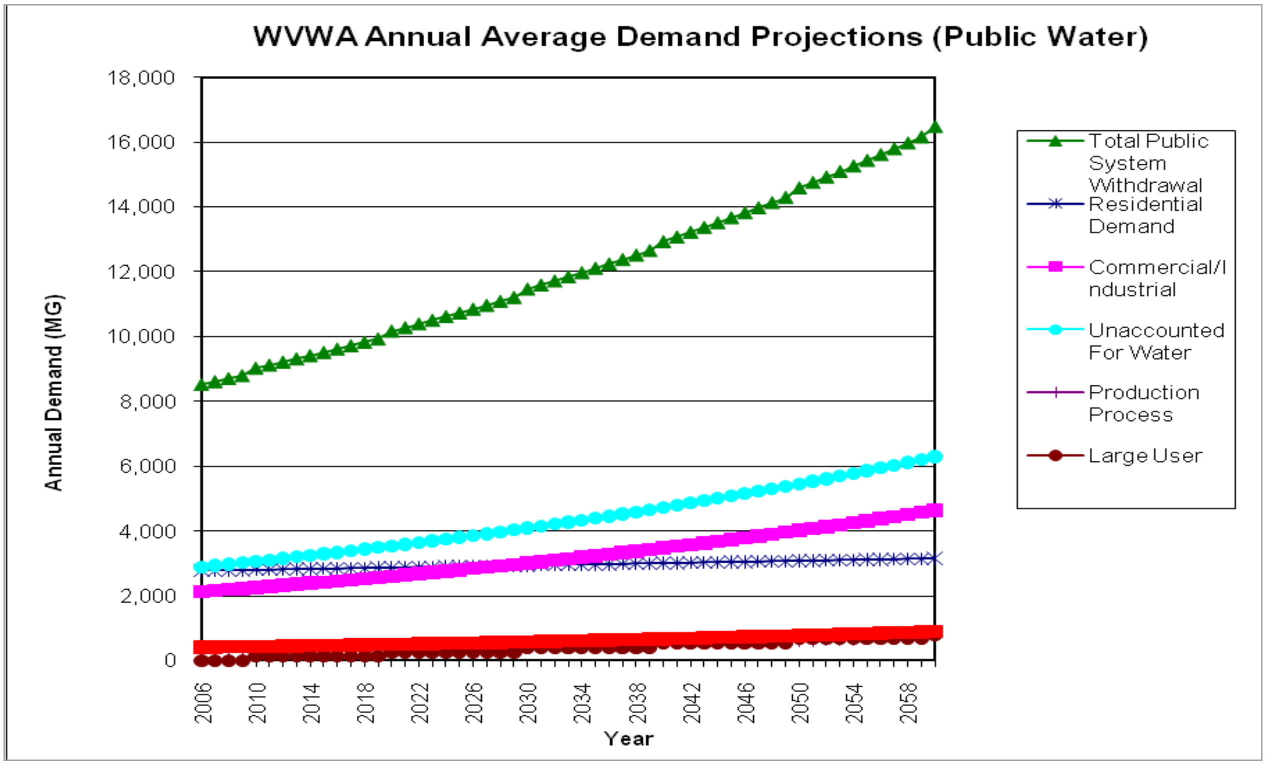


Figure 5.4.5B: WVWA Annual Average Non-Public Water Demand Projections

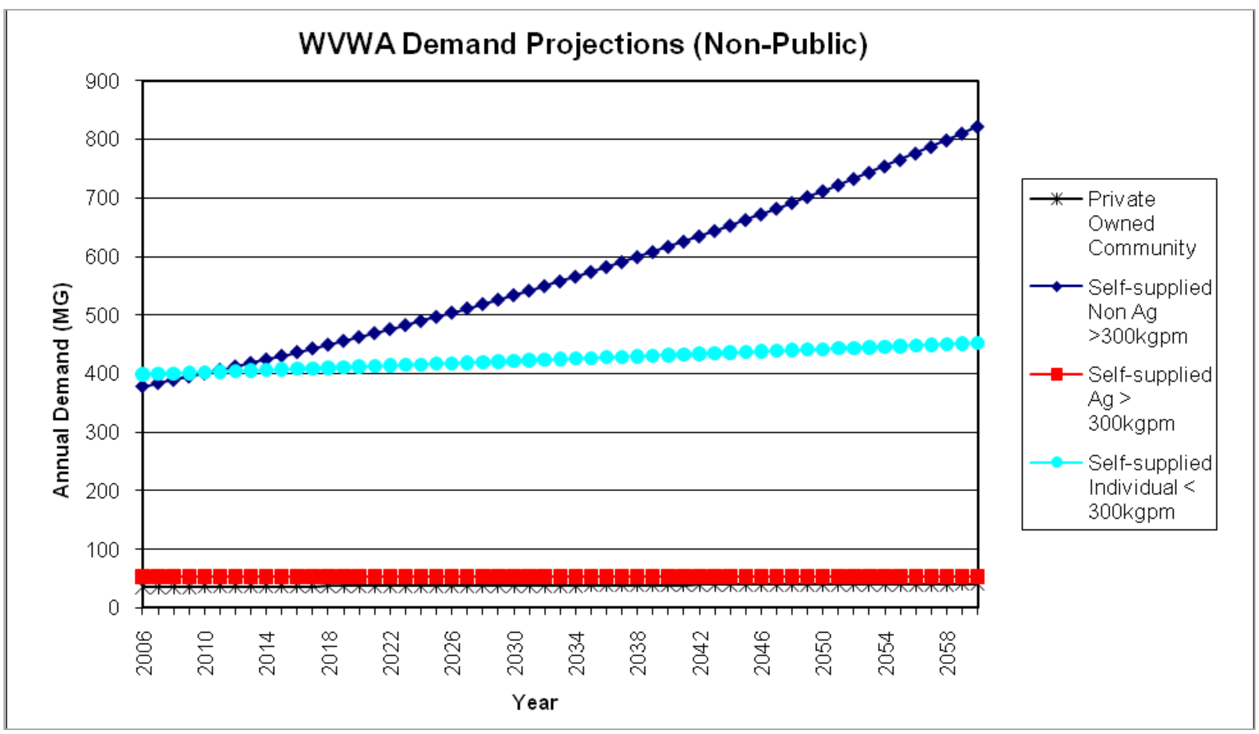
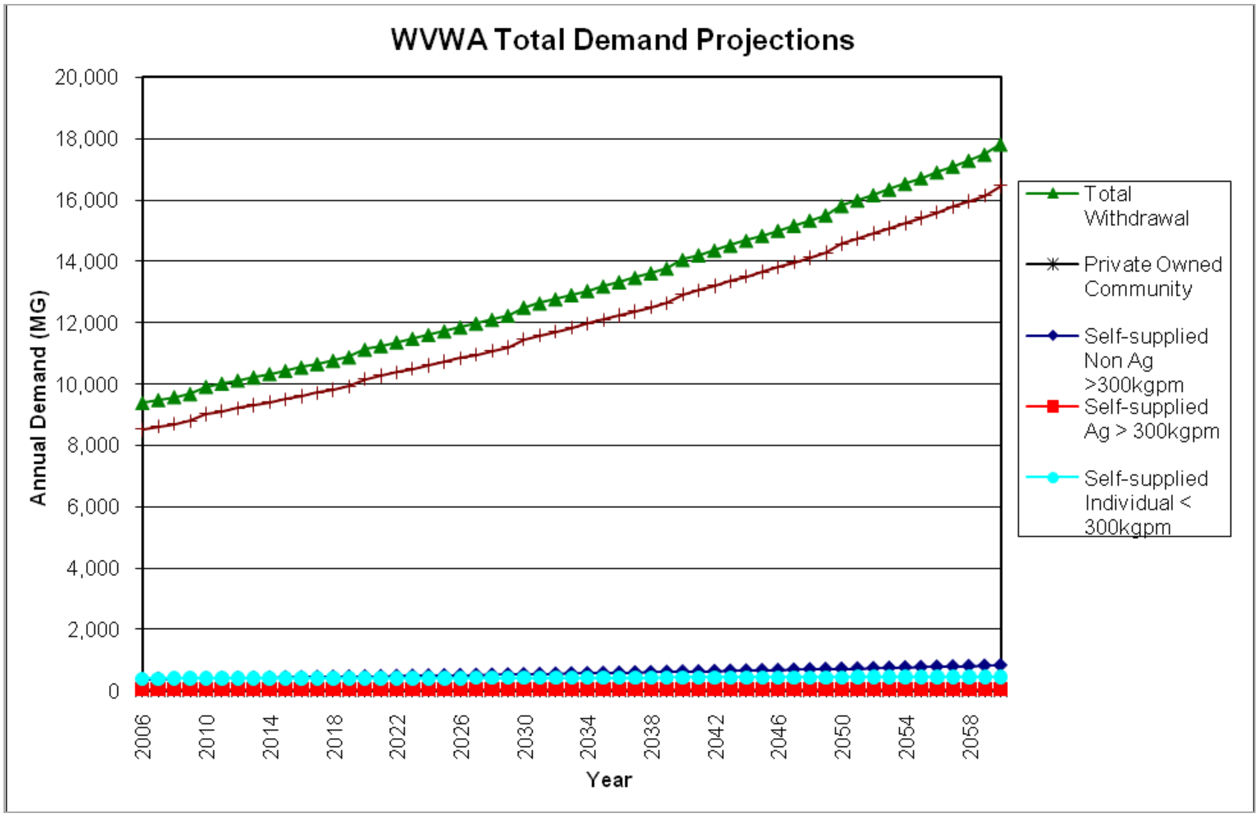


Figure 5.4.5C: WVWA Annual Total Demand Projections



5.4.6 City of Salem

The projected water demands for the public community water system in the City of Salem are presented in Figure 5.4.6A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the City of Salem are presented in Figure 5.4.6B. The total projected water demand for the City of Salem is presented in Figure 5.4.6C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.6A: City of Salem Annual Average Public Water Demand Projections

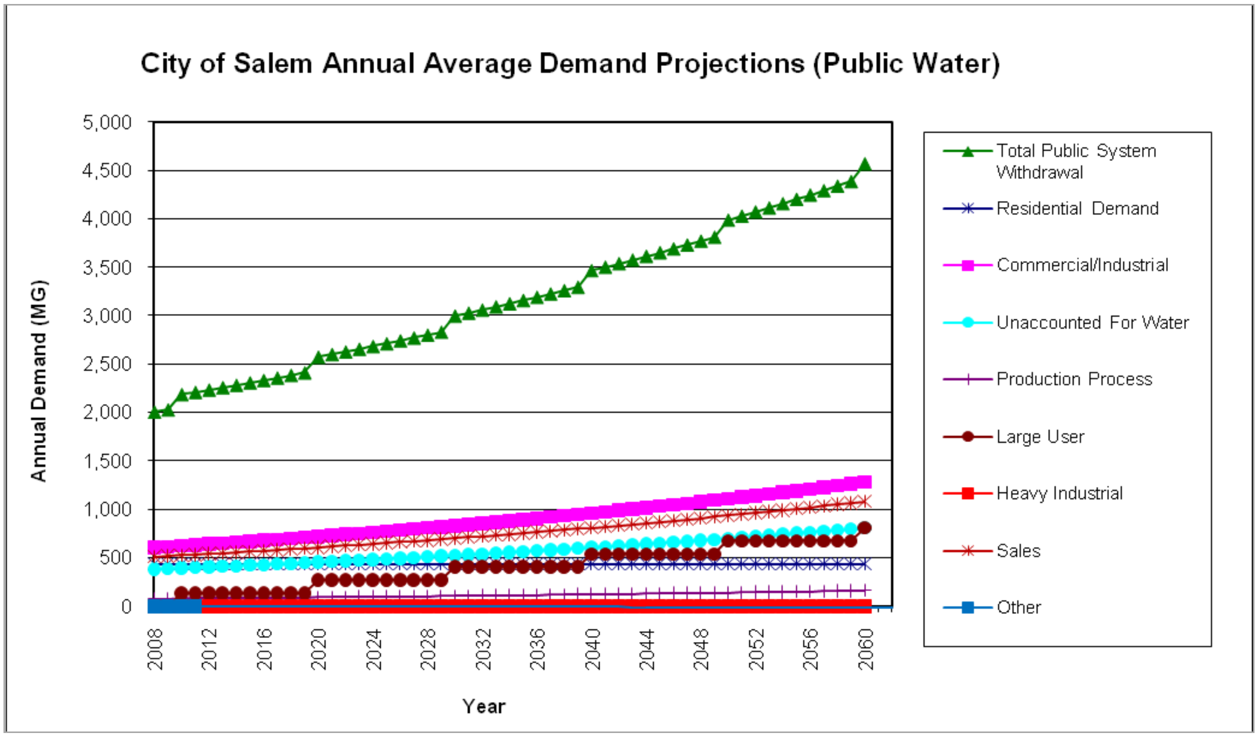


Figure 5.4.6B: City of Salem Annual Average Non-Public Water Demand Projections

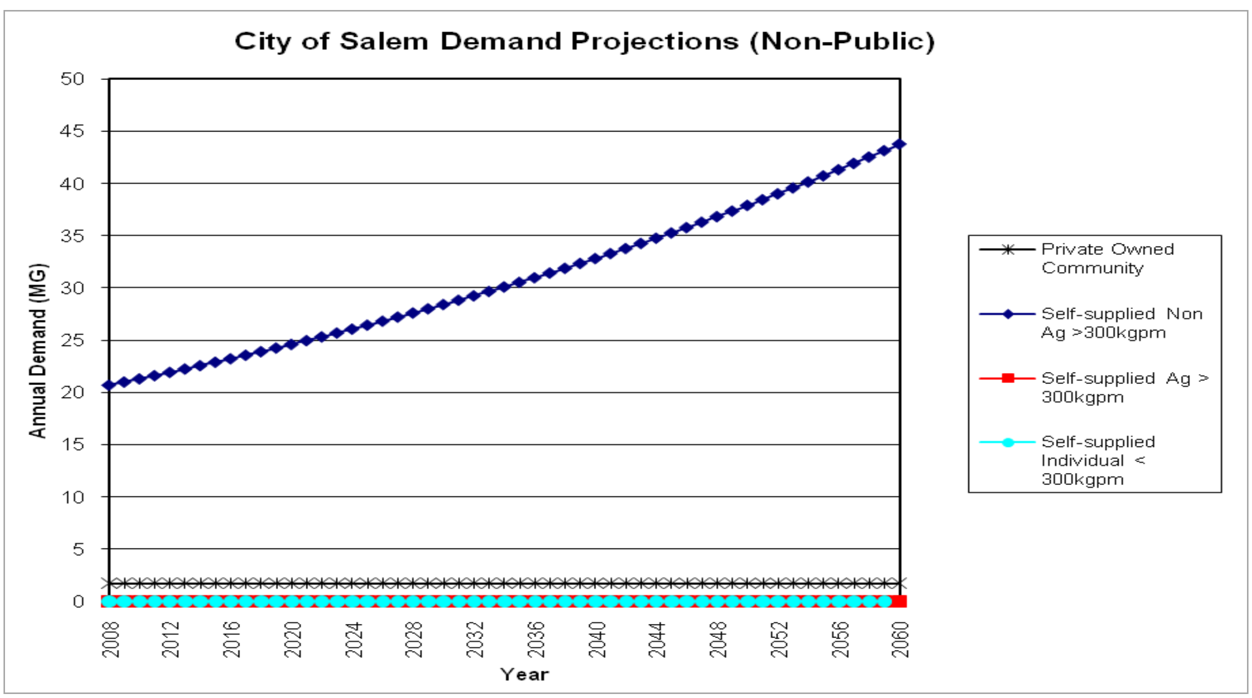
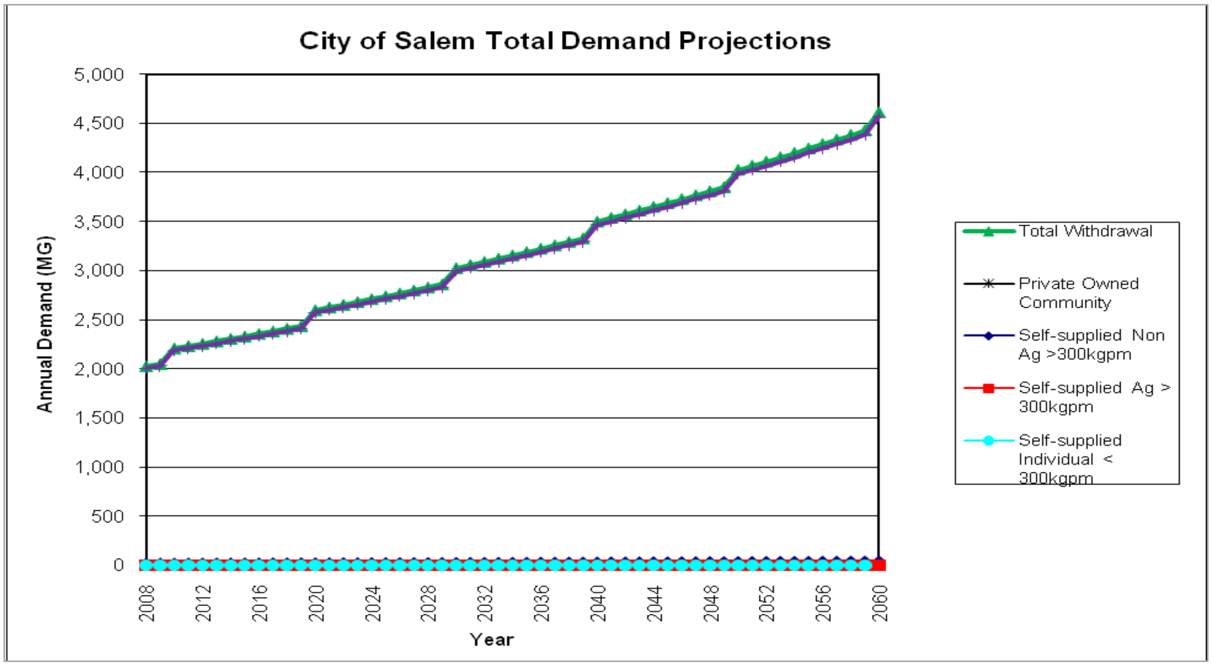


Figure 5.4.6C: City of Salem Annual Total Demand Projections



5.4.7 Town of Boones Mill

The projected water demands for the public community water system in the Town of Boones Mill are presented in Figure 5.4.7A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Boones Mill are presented in Figure 5.4.7B. The total projected water demand for the Town of Boones Mill is presented in Figure 5.4.7C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.7A: Town of Boones Mill Annual Average Public Water Demand Projections

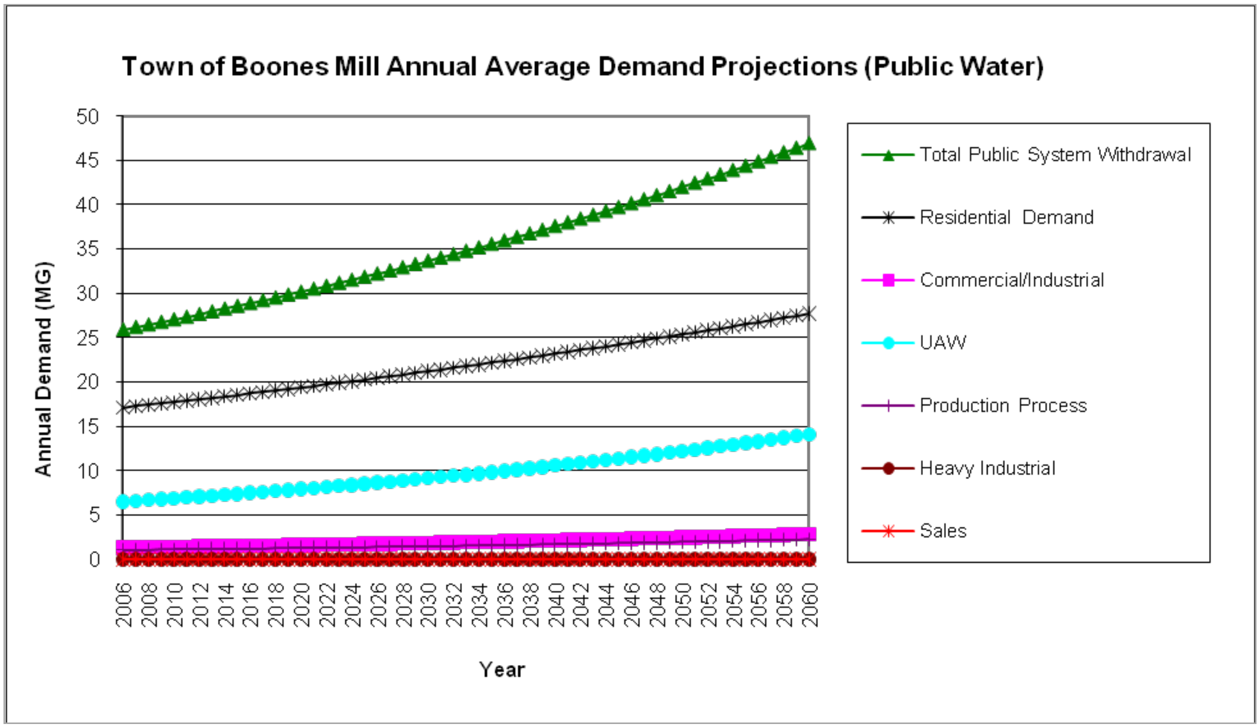


Figure 5.4.7B: Town of Boones Mill Annual Average Non-Public Water Demand Projections

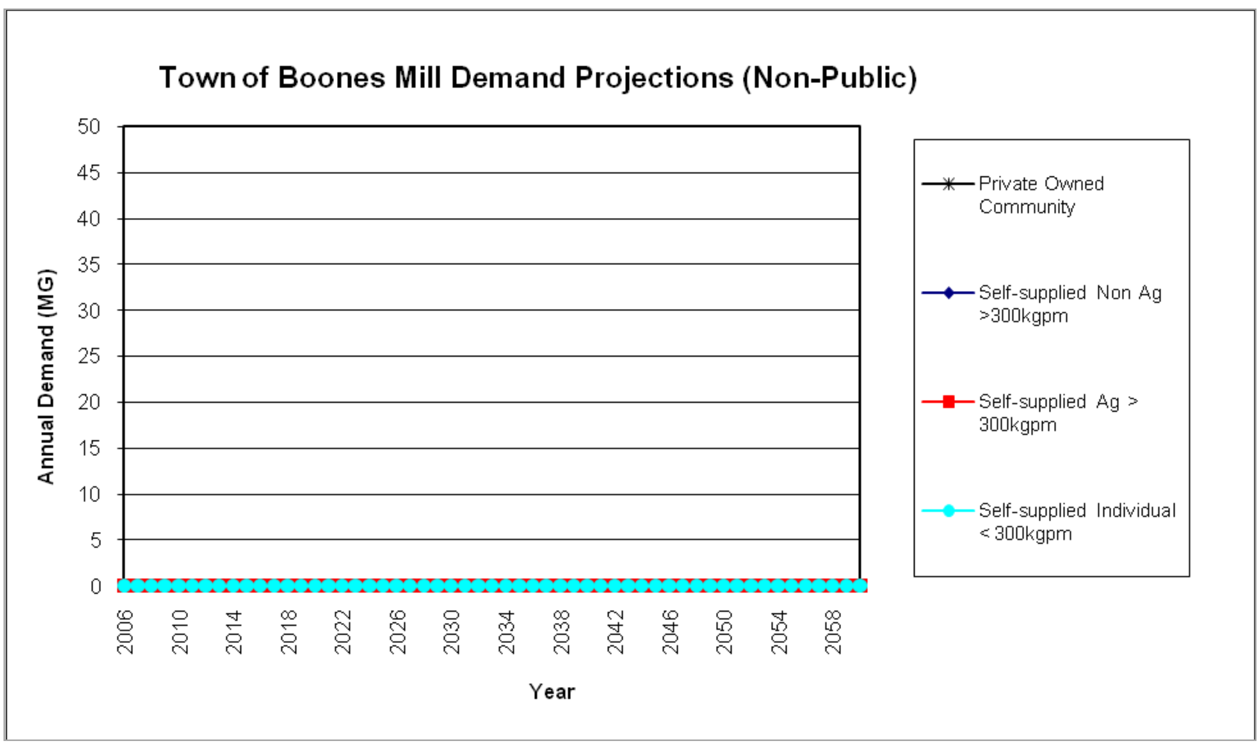
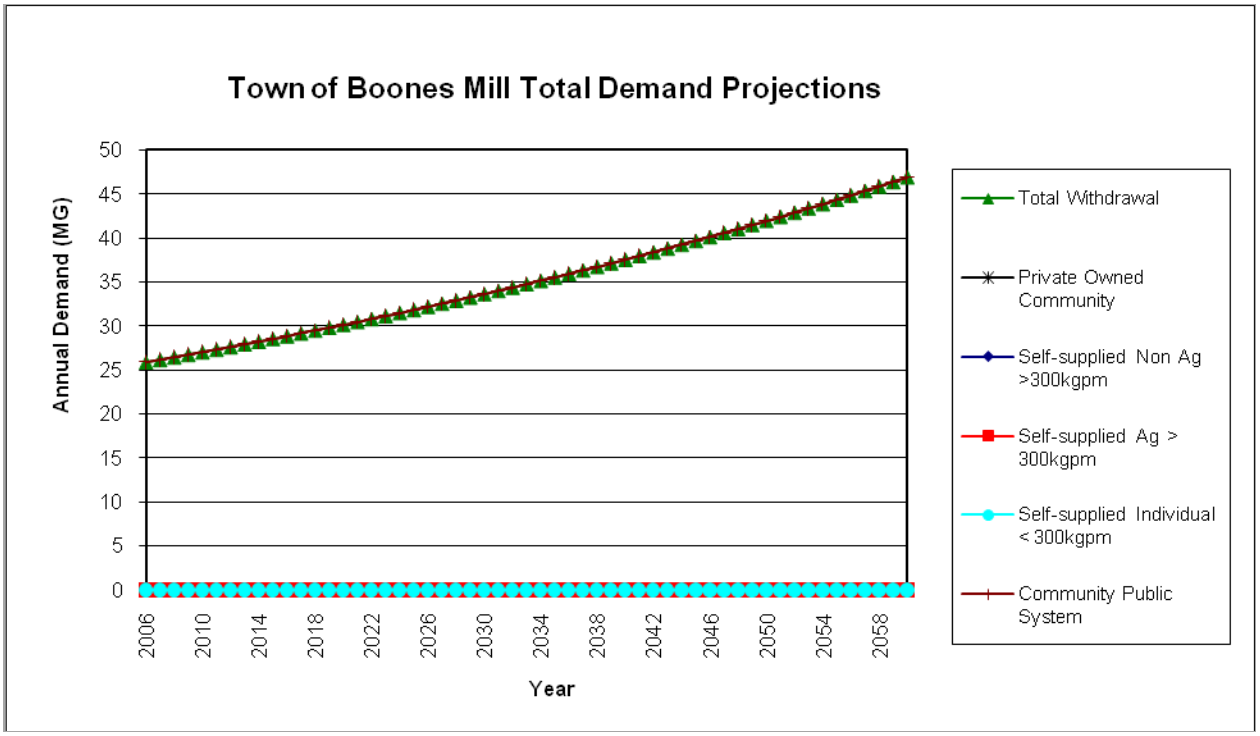


Figure 5.4.7C: Town of Boones Mill Annual Total Demand Projections



5.4.8 Town of Buchanan

The projected water demands for the public community water system in the Town of Buchanan are presented in Figure 5.4.8A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Buchanan are presented in Figure 5.4.8B. The total projected water demand for the Town of Buchanan is presented in Figure 5.4.8C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.8A: Town of Buchanan Annual Average Public Water Demand Projections

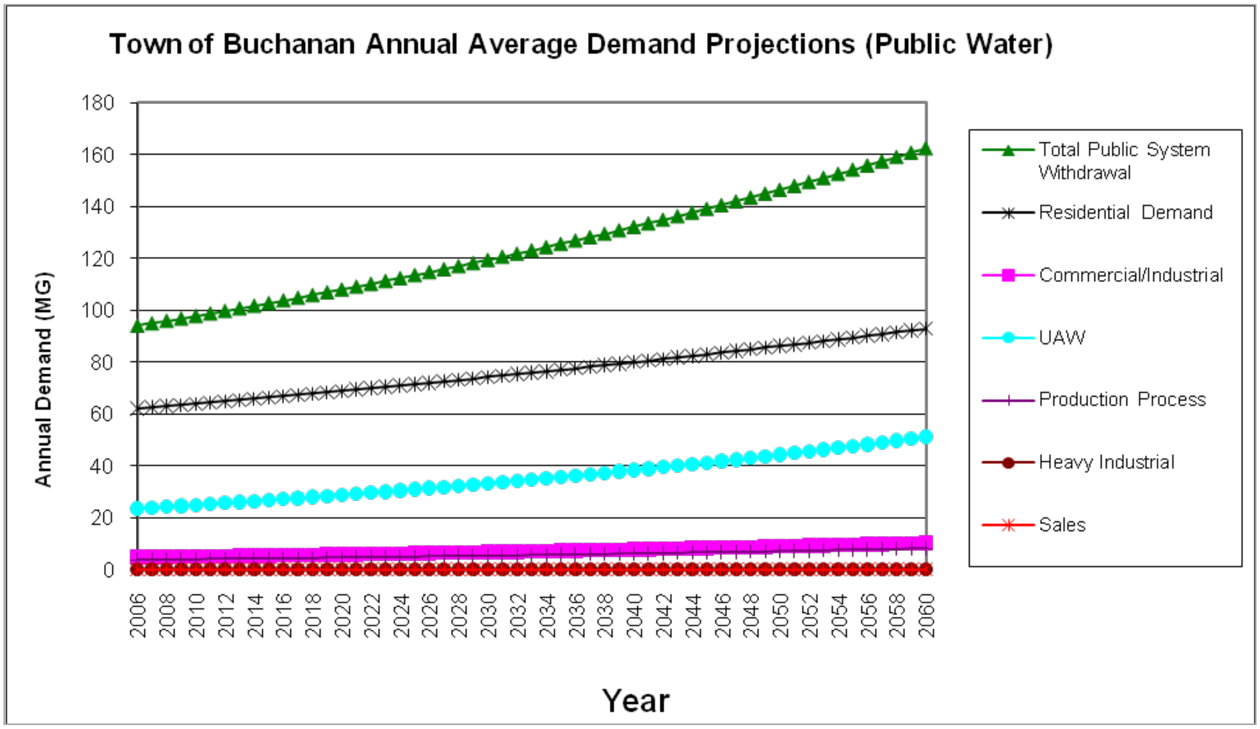


Figure 5.4.8B: Town of Buchanan Annual Average Non-Public Water Demand Projections

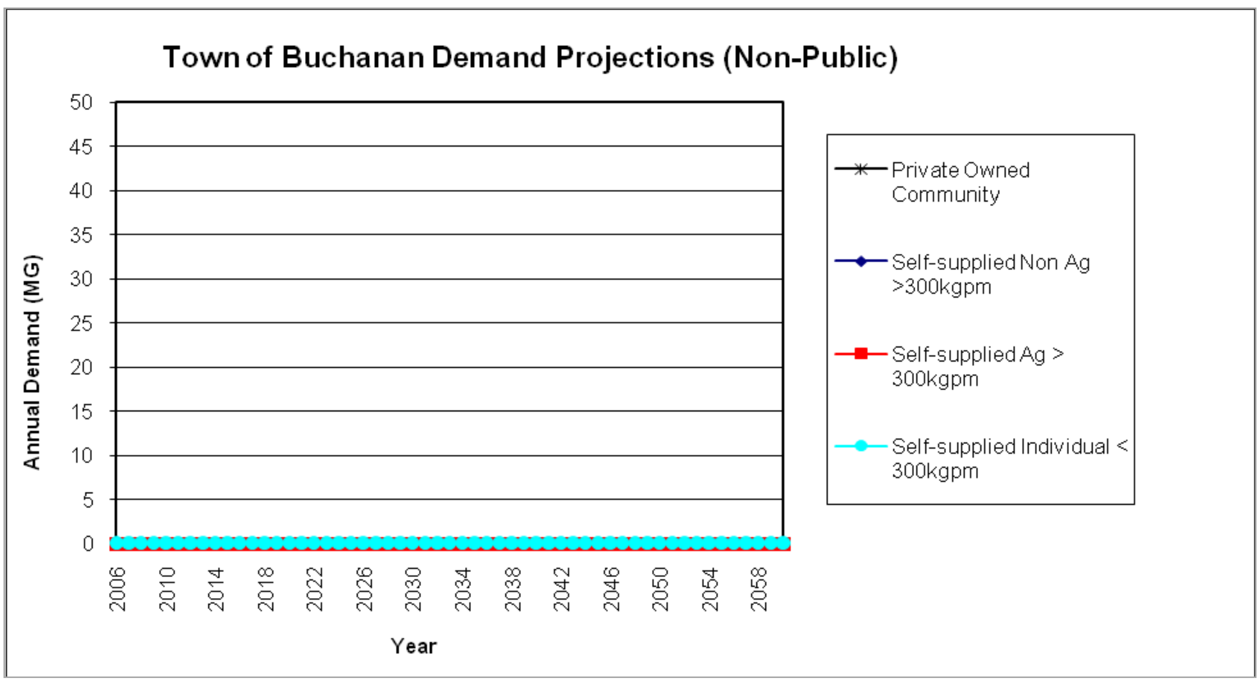
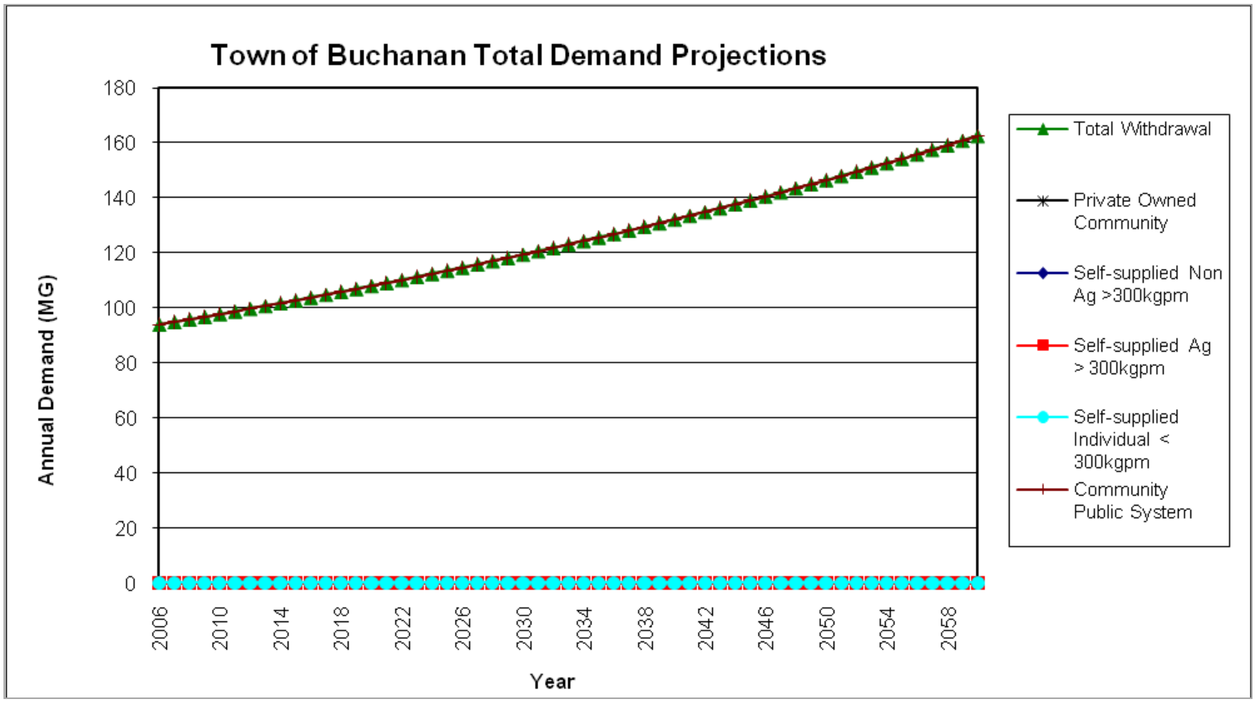


Figure 5.4.8C: Town of Buchanan Annual Total Demand Projections



5.4.9 Town of Fincastle

The projected water demands for the public community water system in the Town of Fincastle are presented in Figure 5.4.9A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Fincastle are presented in Figure 5.4.9B. The total projected water demand for the Town of Fincastle is presented in Figure 5.4.9C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.9A: Town of Fincastle Annual Average Public Water Demand Projections

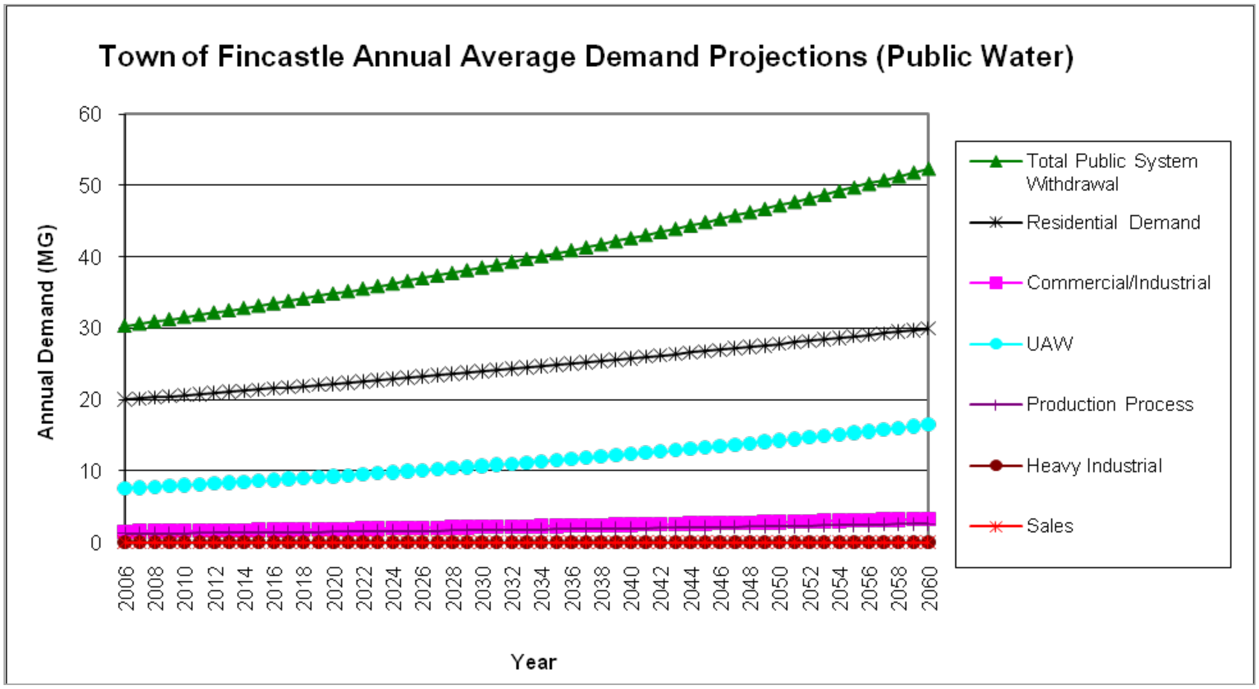


Figure 5.4.9B: Town of Fincastle Annual Average Non-Public Water Demand Projections

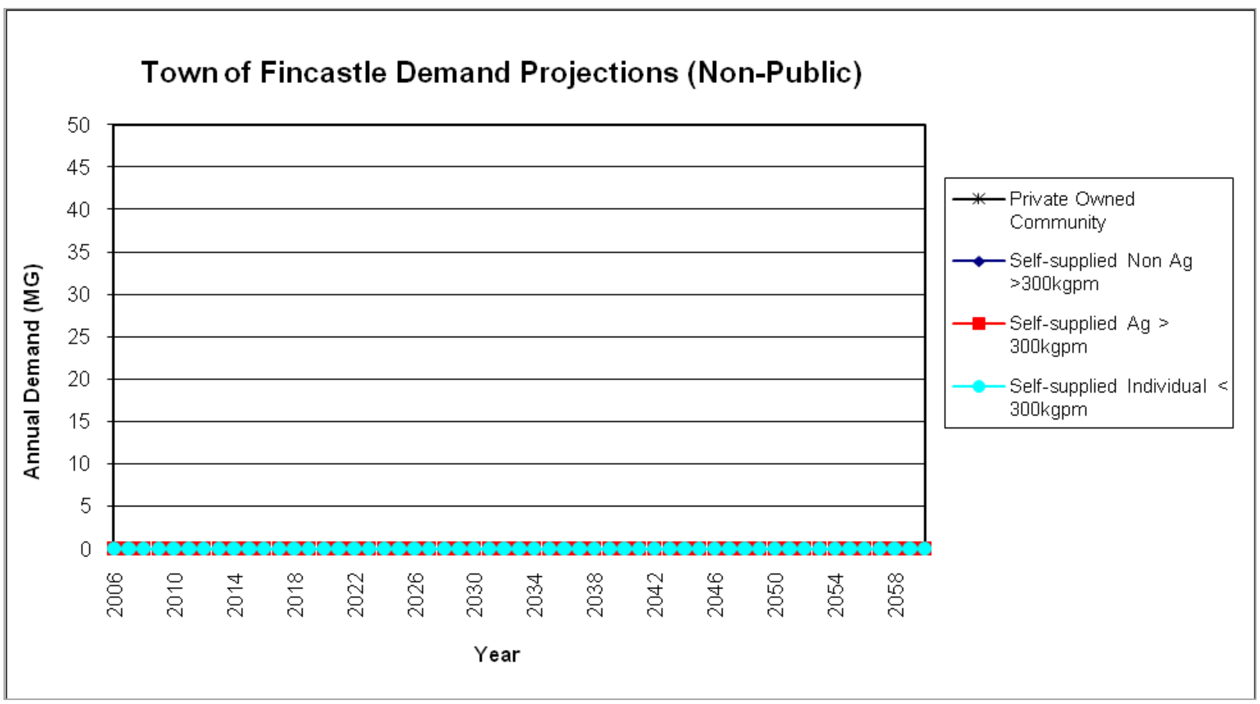
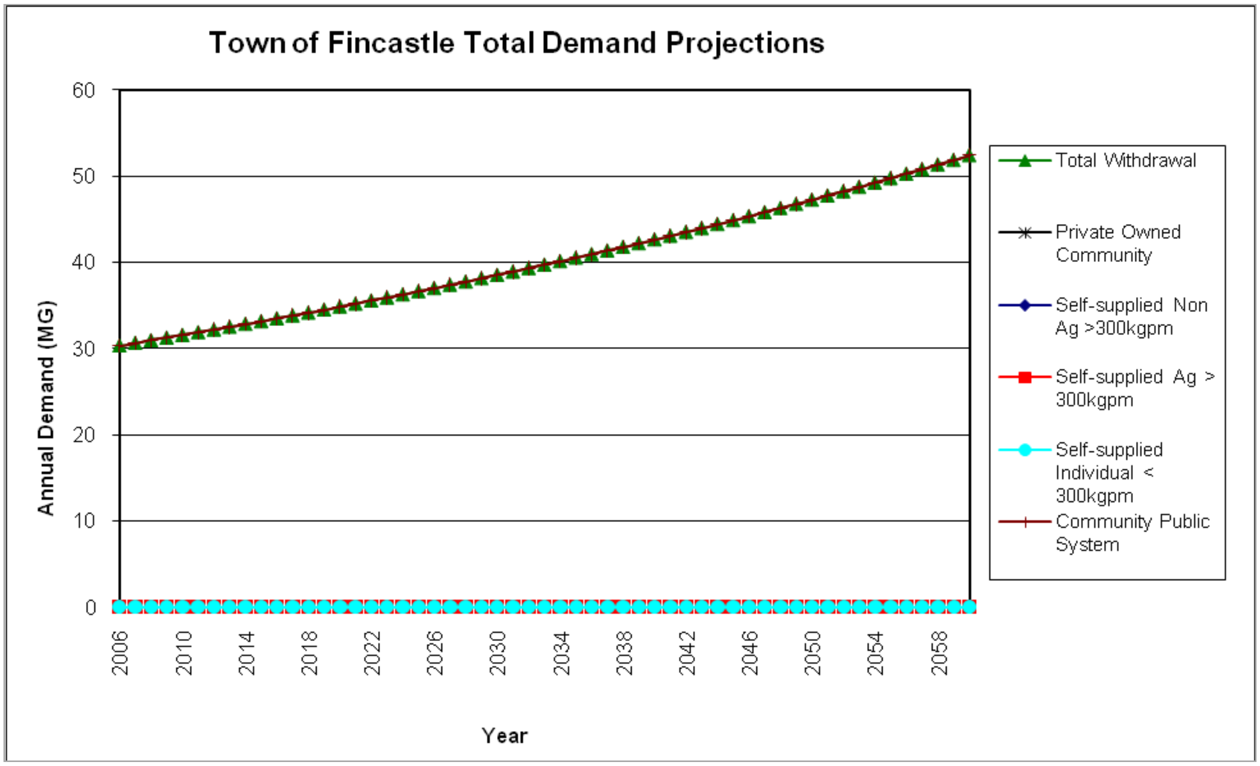


Figure 5.4.9C: Town of Fincastle Annual Total Demand Projections



5.4.10 Town of Rocky Mount

The projected water demands for the public community water system in the Town of Rocky Mount are presented in Figure 5.4.10A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Rocky Mount are presented in Figure 5.4.10B. The total projected water demand for the Town of Rocky Mount is presented in Figure 5.4.10C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.10A: Town of Rocky Mount Annual Average Public Water Demand Projections

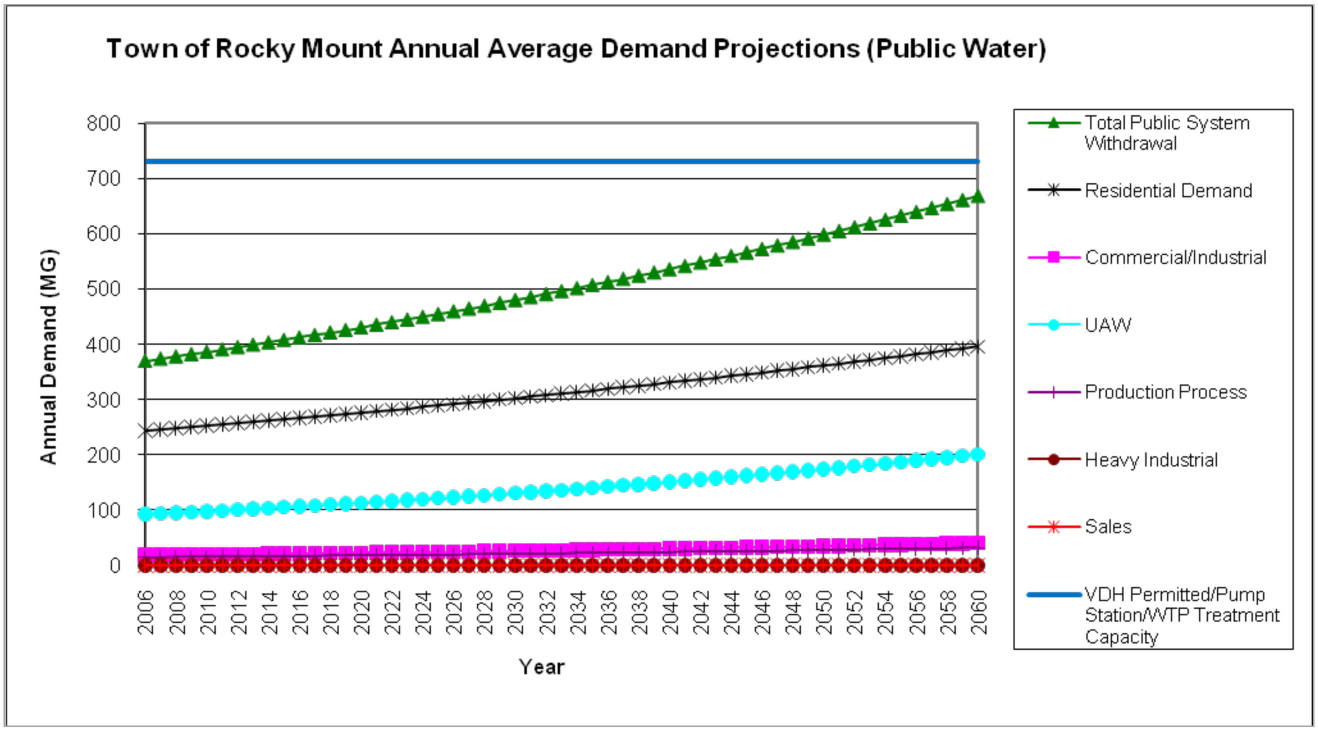


Figure 5.4.10B: Town of Rocky Mount Annual Average Non-Public Water Demand Projections

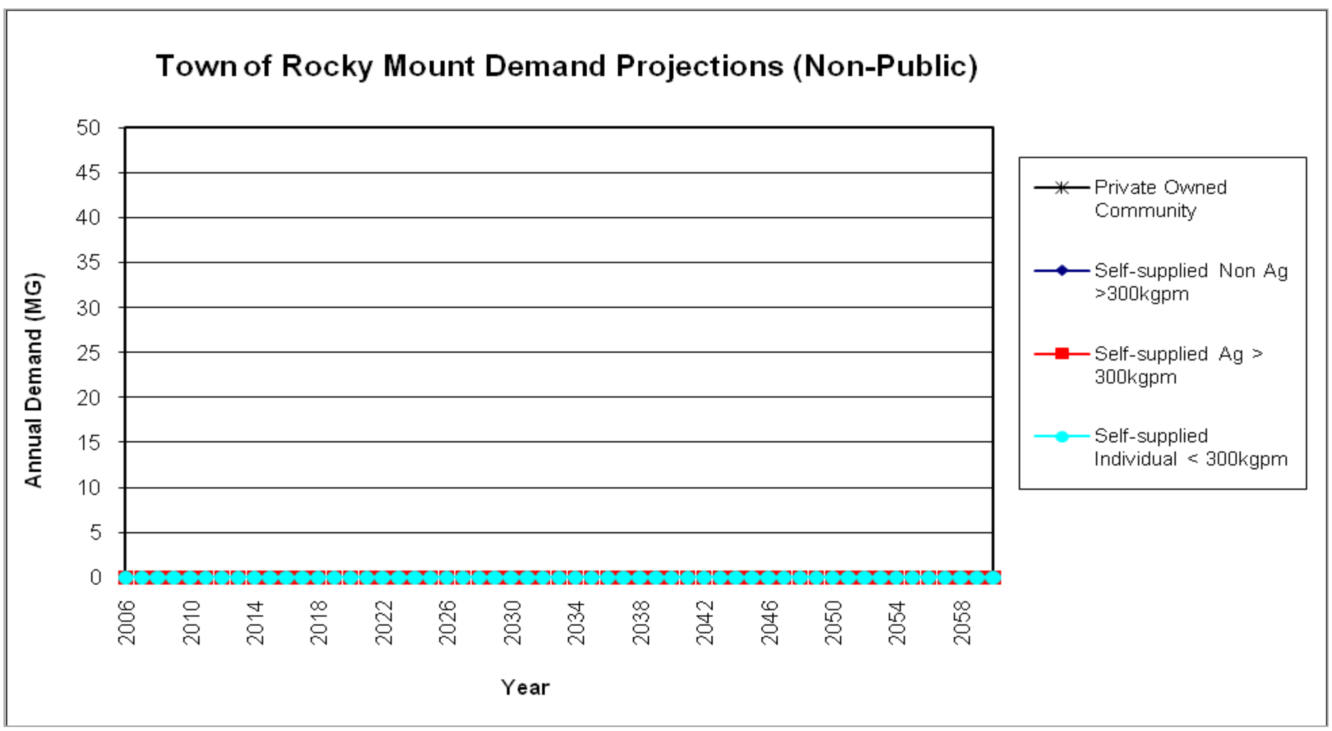
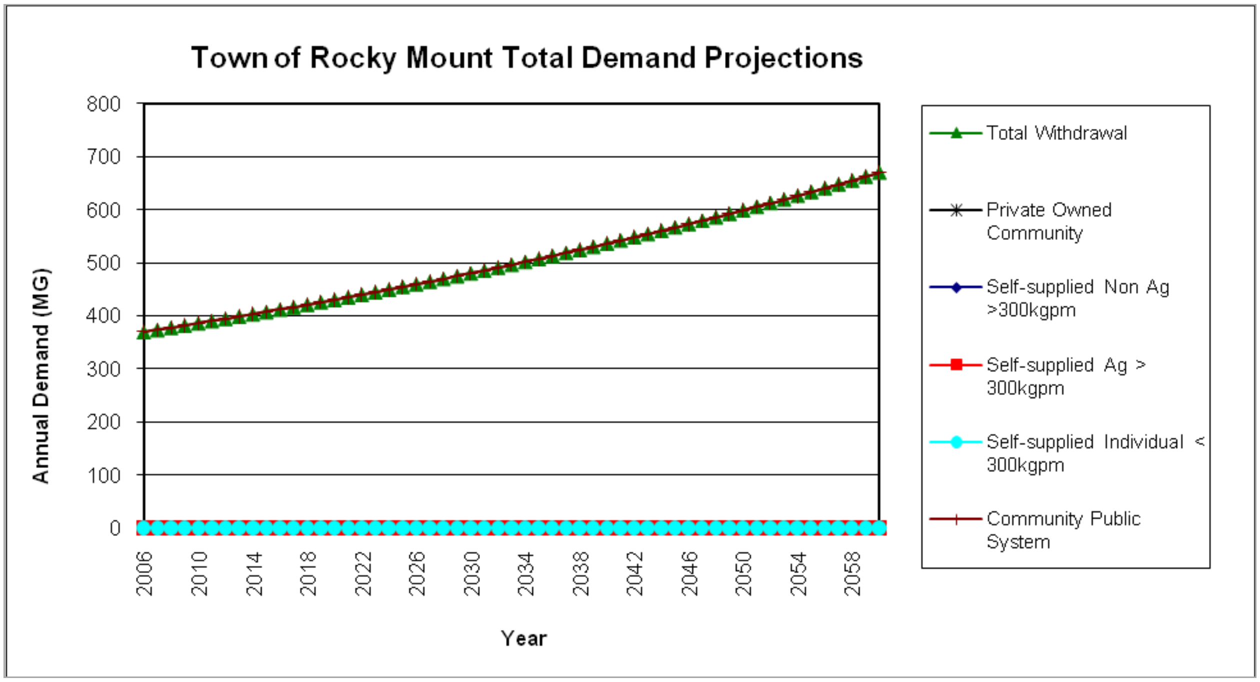


Figure 5.4.10C: Town of Rocky Mount Annual Total Demand Projections



5.4.11 Town of Troutville

The projected water demands for the public community water system in the Town of Troutville are presented in Figure 5.4.11A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Troutville are presented in Figure 5.4.11B. The total projected water demand for the Town of Troutville is presented in Figure 5.4.11C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.11A: Town of Troutville Annual Average Public Water Demand Projections

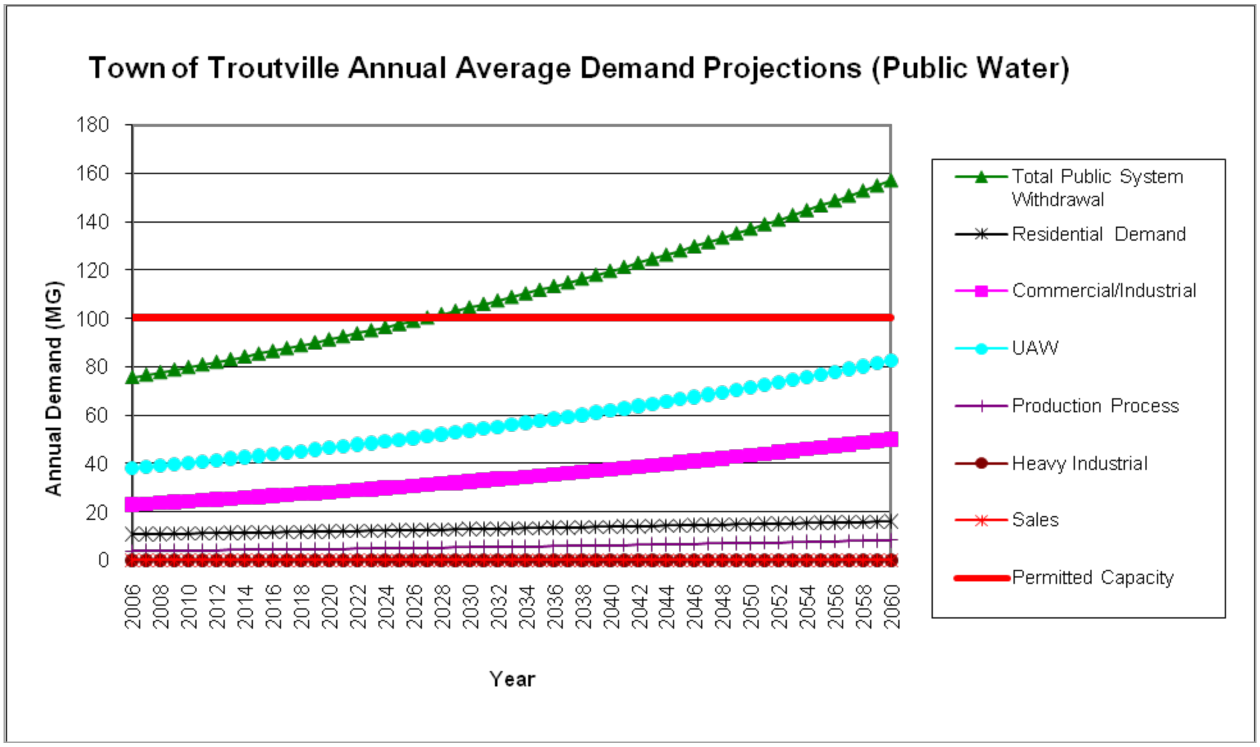


Figure 5.4.11B: Town of Troutville Annual Average Non-Public Water Demand Projections

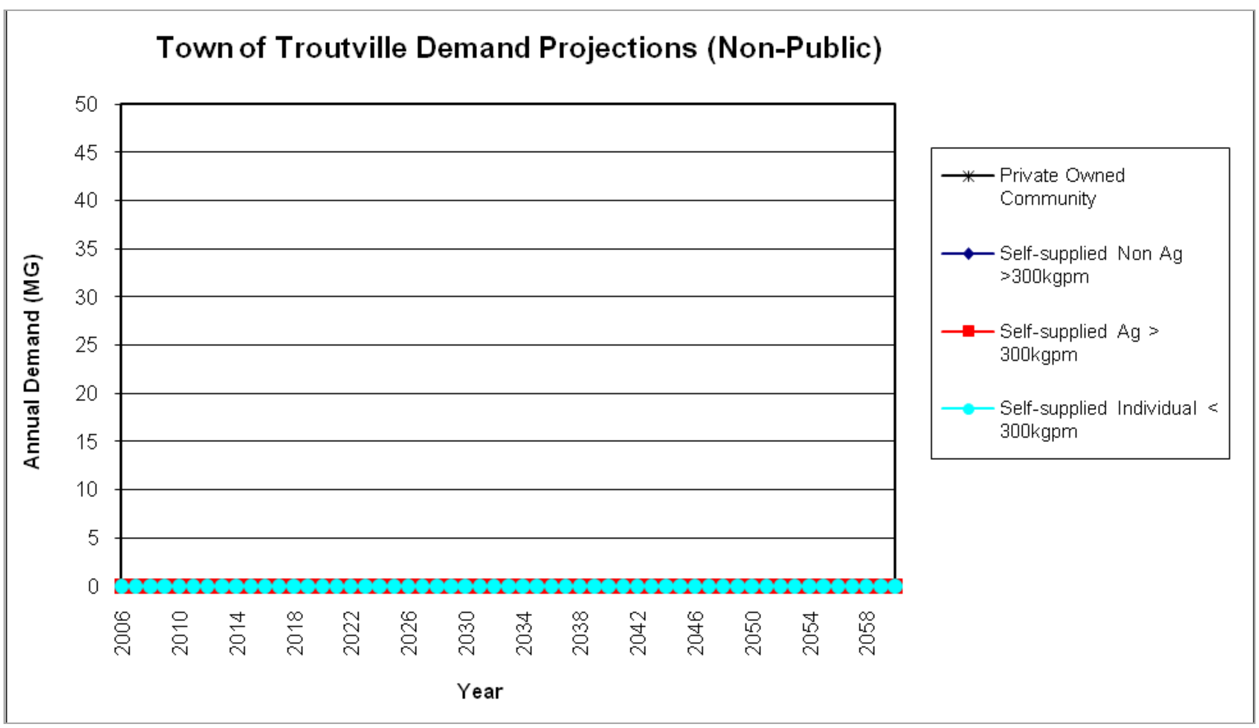
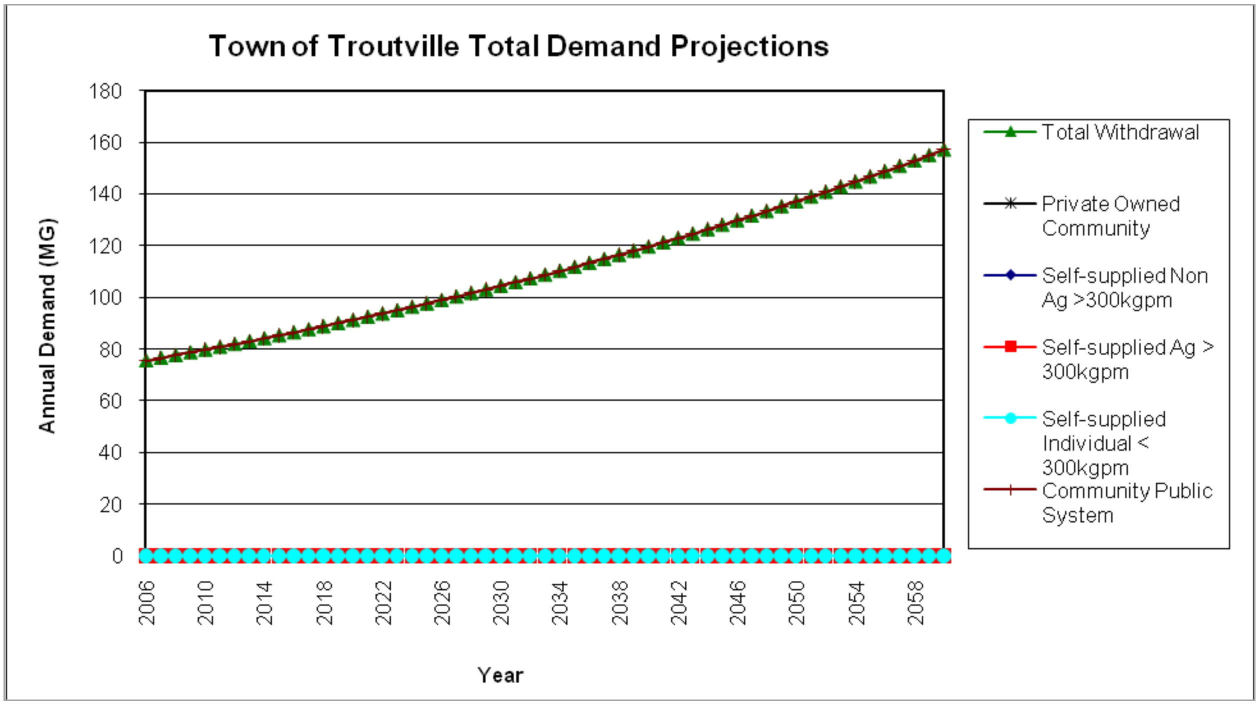


Figure 5.4.11C: Town of Troutville Annual Total Demand Projections



5.4.12 Town of Vinton

The projected water demands for the public community water system in the Town of Vinton are presented in Figure 5.4.12A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Vinton are presented in Figure 5.4.12B. The total projected water demand for the Town of Vinton is presented in Figure 5.4.12C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.12A: Town of Vinton Annual Average Public Water Demand Projections

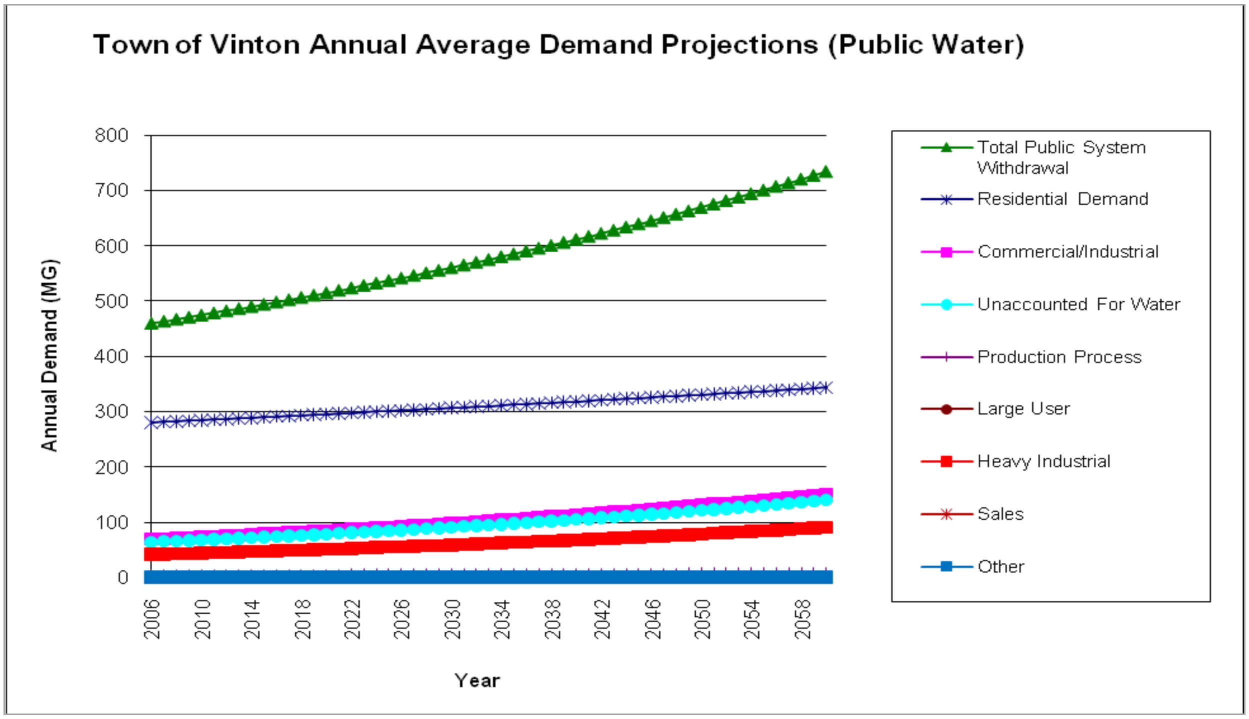


Figure 5.4.12B: Town of Vinton Annual Average Non-Public Water Demand Projections

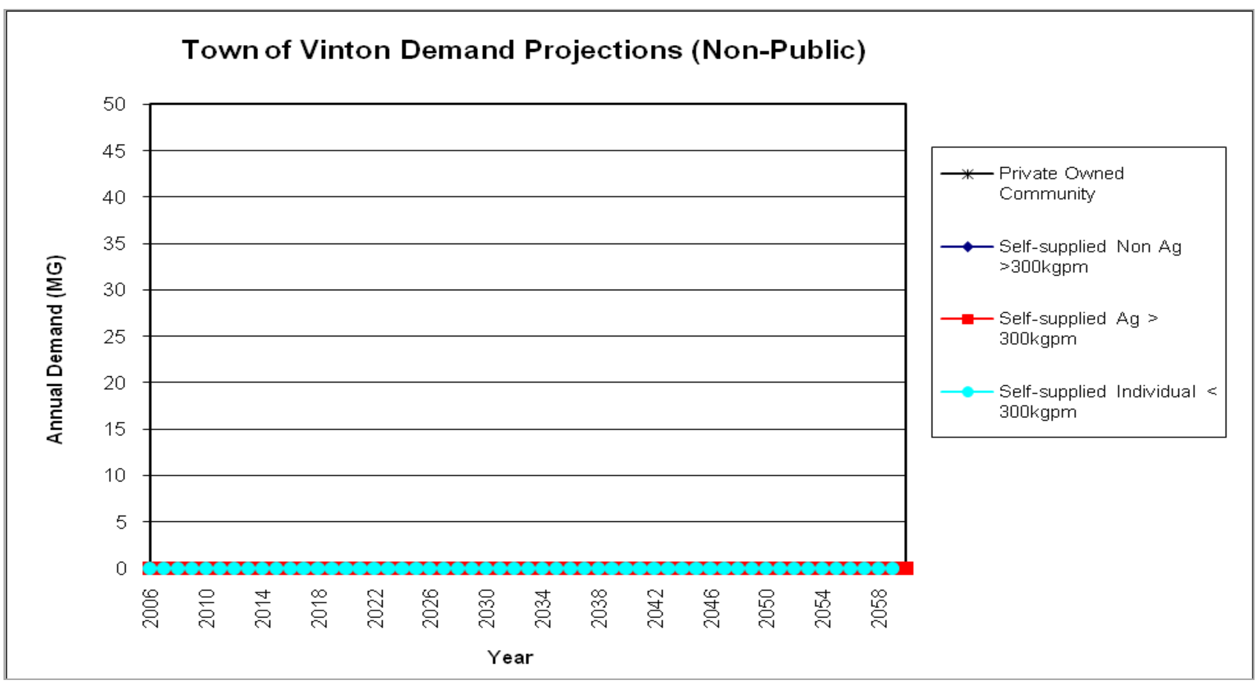
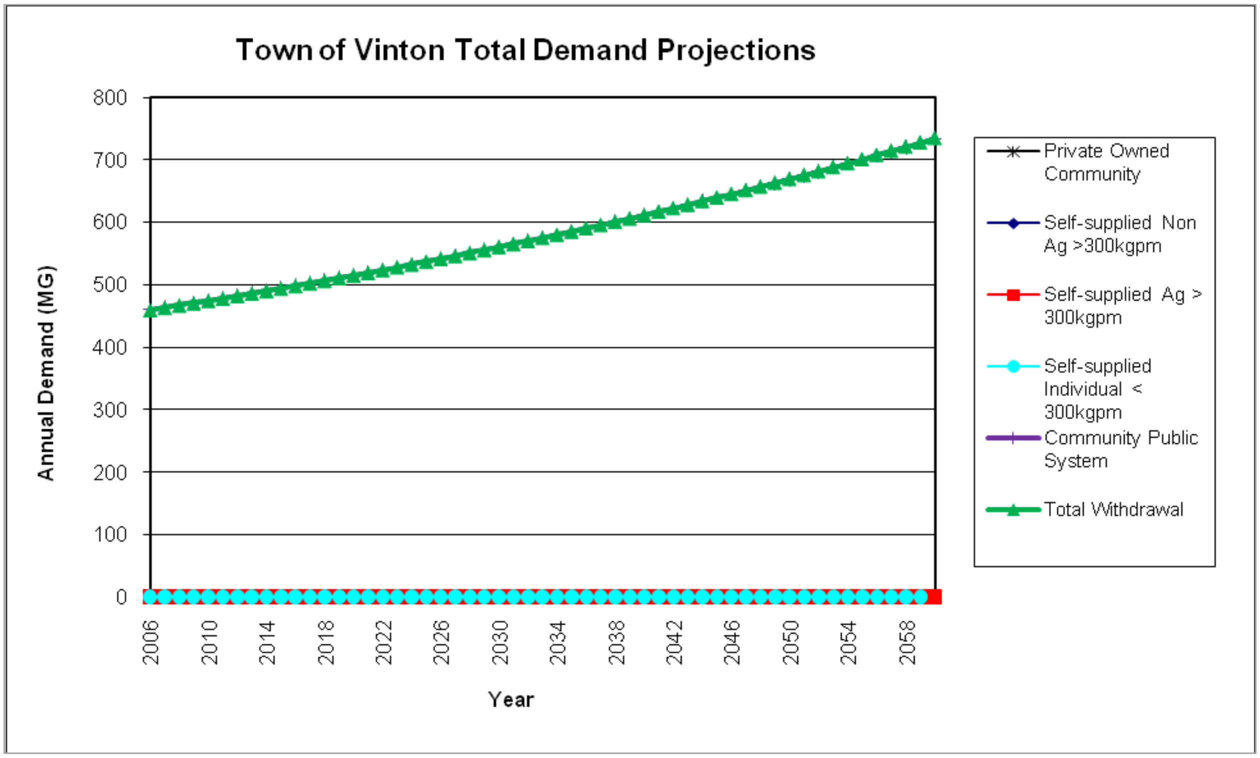


Figure 5.4.12C: Town of Vinton Annual Total Demand Projections



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6.0 WATER DEMAND MANAGEMENT INFORMATION

The Local and Regional Water Supply Planning Regulation (9 VAC 25-780-110) requires the Plan to address conservation as a part of overall water demand management in accordance with practices for more efficient water use, water conservation measures through reduction of use, and practices to reduce water loss.[1] Water conservation as part of overall water demand management is described in the following sections.

6.1 Practices for More Efficient Use

As required by 9 VAC 25-780-110, the RVARC Plan will include information that describes practices for more efficient use of water that are used within the region. The type of measures described may include, but are not limited to, the adoption and enforcement of the Virginia Uniform Statewide Building Code (VUSBC) sections that limit maximum flow of water closets, urinals and appliances; use of low-water use landscaping; and increases in irrigation efficiency. This section describes practices for more efficient water use in the RVARC region. Information regarding practices for more efficient water use was not provided by the towns of Boones Mill, Buchanan, Rocky Mount, and Troutville or BCPSA.

6.1.1 Virginia Uniform Statewide Building Codes

The VUSBC is a state regulation promulgated by the Virginia Board of Housing and Community Development (Board). The Board is appointed by the Governor of Virginia for the purpose of establishing minimum regulations to govern the construction and maintenance of buildings and structures. The provisions of the VUSBC are based on nationally recognized building and fire codes published by the International Code Council, Inc. The 2003 editions of the International Codes are incorporated by reference into the VUSBC.

The following jurisdictions in the RVARC region have adopted the VUSBC: the cities of Bedford (1973), Roanoke (1994), and Salem (2000); the counties of Botetourt, Franklin, and Roanoke; and the Town of Vinton (1982). The VUSBC requires 1.6 gallon-per-flush toilets and limits the maximum allowable flow rates for showerheads and faucets to 1.5 gallons-per-minute.

[1] 9 VAC 25-780-110 A.

The codes are generally enforced in the region by the County Building Official through plan reviews and routine inspections.

Section 104.1 of the VUSBC includes a provision for small localities to enter into an agreement with another governing body to enforce the code. The Town of Vinton has an agreement with Roanoke County. Roanoke County enforces the codes for the Town of Vinton.

6.1.2 Other Practices for Water Use Efficiency

The following implement practices for more efficient water use: WVWA, City of Bedford, City of Salem, and the Town of Vinton. Practices for more efficient water use include, but are not limited to, practices to increase irrigation efficiency, participating in the U.S. Environmental Protection Agency (USEPA) WaterSense Program, adopting ordinances declaring wasteful water use unlawful, and other practices.

The following are currently implementing practices to increase irrigation efficiency (i.e., not offering sewer credits during irrigation months, requiring irrigators to invest in irrigation meters, water recycling, etc.): WVWA, City of Bedford, City of Salem, and Town of Vinton. The WVWA charges customers a higher rate for water consumption that is for irrigation purposes. Customers may purchase irrigation meters, which are read as part of their regular meter reading. In addition, as part of the WVWA Drought Contingency Plan, residential sewer exemption credits will be suspended when Mandatory Water Restrictions are in effect. No sewer credits are allowed in the City of Salem and residents with irrigation systems have separate irrigation meters for measuring irrigation volumes. The City of Bedford requires irrigators to invest in a separate water tap with meter. Finally, irrigation meters are not currently required in the Town of Vinton, but are available if requested by a customer.

WaterSense is a partnership program sponsored by the USEPA designed to protect the nation's future water supply by promoting and enhancing the market for water-efficient products and services. The WVWA is listed as a WaterSense partner. In addition, Mr. J. Felice Hall and Mr. Robert Latham are WaterSense landscape irrigation professionals in the area.

The Town of Vinton has adopted an ordinance/policy declaring excessive water use unlawful. A customer using an excessive amount of water can receive a written order from the Town to cease and desist. Failure to comply with the written order is considered a class one misdemeanor. A copy of the Town of Vinton ordinance is included in Appendix B.

The WVWA implements water use efficiency measures through a meter replacement program and on-going Capital Improvement Plan (CIP) to replace or rehabilitate aging and failing infrastructure. In addition, the WVWA is currently working with Draper Aden to create zones within their service area. For each zone, a study is being conducted to compare the amount of water that is being produced to the amount of water that is being billed. The purpose of the study is to help the WVWA identify sources of unaccounted for water. Finally, the WVWA adopted a Drought Contingency Plan (Resolution No. 116) in November 2007. The Drought Contingency Plan will be discussed in more detail in the Drought Response and Contingency Plan section of the Plan as required by 9 VAC 25-780-120.

In addition to the practices discussed above, the City of Bedford implements additional practices for more efficient water use. The City of Bedford encourages conservation through their Erosion & Sediment Control Program as well as water recycling (e.g., car washes). They also publish public education brochures describing methods to reduce home water use and place water conservation information on the City's website to reduce water use in the home.

6.2 Water Conservation Measures through Reduction of Use

As required by 9 VAC 25-780-110, the RVARC Plan will include information describing the water conservation measures used within the planning area to conserve water through the reduction of use. The types of measures to be described may include, but are not limited to, technical, educational and financial programs. This section describes water conservation measures through reduction of use in the RVARC region. Information regarding water conservation measures through reduction of use was not provided by Bedford County and the towns of Boones Mill, Buchanan, Rocky Mount, and Troutville.

6.2.1 Technical Programs

The following implement technical programs to address water conservation through reduction of use: WVWA, City of Salem, City of Bedford, Botetourt County, Town of Fincastle, and the Town of Vinton. Practices to address water conservation through reduction of use may include, but are not limited to, adjusting standard operating procedures at facilities to reduce water use, installation of low-flow and/or no-flow fixtures (e.g., faucets, showers, urinals) in government buildings and facilities, offering "yard taps" to customers, using Clean Water State Revolving Funds (CWSRF) or Drinking Water State Revolving Funds (DWSRF) to upgrade/retrofit facility fixtures, build new facilities, or purchasing efficient landscape irrigation equipment for publicly owned facilities (e.g., buildings, parks, golf courses).

The City of Salem adjusted their standard operating procedures to improve water conservation by extending filter run times to 80 hours, which was approved by the Virginia Department of Health (VDH), in order to reduce backwash water volume. Filter maintenance is completed on a regular basis in order to keep water quality at its best and to minimize waste.

The following have installed low-flow and/or no-flow fixtures in their facility and/or government buildings and facilities in an effort to increase water savings to the locality through the reduction of use: WVWA, City of Bedford, City of Salem, Botetourt County, Town of Fincastle, and the Town of Vinton.

The WVWA installed low-flow urinals, toilets, showerheads, and faucets in their Spring Hollow and Crystal Springs Water Treatment Plants (WTP). The Carvins Cove WTP has been retrofitted with low-flow toilets. In addition, water conservation devices are being installed in all new construction in the City of Roanoke and Roanoke County and existing buildings are retro-fitted as needed. The City of Roanoke is currently developing plans for its first Leadership in Energy and Environmental Design (LEED) certified building (the Williamson Road Fire Station). In addition, the new regional jail facility under construction in Roanoke County will also be LEED certified and will utilize captured rainwater for laundry operations and use vacuum assisted plumbing to minimize water use.

The City of Bedford installs low-flow and/or no-flow toilets in accordance with VUSBC. The City of Salem and Town of Fincastle install low-flow fixtures in all new construction and in older facilities that are renovated. In addition, the new WTP in Salem constructed in 2004-2005 followed the City's building code for low-flow fixtures.

Botetourt County and the Town of Vinton replace old fixtures in their facilities and government buildings with low-flow and/or no-flow fixtures when needed or when buildings are renovated. The Town of Vinton recently renovated two buildings and installed low-flow fixtures.

In an effort to increase customer awareness of outdoor water use, the WVWA provides irrigation meters to its customers for purchase. The irrigation meters are read as part of the regular meter reading cycle. In addition, provisions are made for installation of a "yard tap" in the Town of Vinton, if one is requested by a customer.

Finally, the WVWA received a $400,000 low interest loan in 2007 through DWSRF to rehabilitate approximately 2,650 feet of 12-inch water line along the Orange Avenue and Route 460 corridor. The water line had frequent water main breaks. The WVWA is also using $200,000 in grant funds from the DWSRF for engineering work on the Falling Creek dam.

6.2.2 Educational Programs

The following implement educational programs to address water conservation through reduction of use: WVWA, City of Salem, City of Bedford, Botetourt County, and the Town of Vinton.

The WVWA has a full-time employee dedicated to education outreach and public relations. In 2007, approximately 5,000 residents participated in a classroom or civic presentation about water conservation, leak detection, and/or leak repair. The WVWA also partnered with the local cable access channel to broadcast a program on leak detection. This program airs twice a day on the cable channel and is available for download from the WVWA water conservation web page. The water conservation web page also provides tips for customers on leak detection and repair, information on the amounts of water used around the home, and information for ordering a free water conservation kit. The water conservation kit contains a low-flow shower head, faucet aerators, leak detection tablets for toilet tanks, and a toilet bank to reduce the amount of water used with each flush. Finally, the WVWA has also developed water conservation games, power point presentations, and demonstrations that are used at area festivals and civic events.

The City of Salem maintains water conservation pamphlets at their WTP and periodically speaks with different groups within the City about water conservation. The City of Bedford has sent out brochures in the past discussing water conservation and additional information is placed on the City's website.

Botetourt County staff have previously conducted field trips, workshops, forums, and meetings to educate and inform citizens. Staff also partner with cooperating agencies to educate children in the County's public schools. Finally, the County developed the Environmental Stewardship Brochure, which addresses smart lawn care practices.

Finally, the Town of Vinton publishes utility newsletters or alerts periodically, which are distributed with the bimonthly customer bills. The most recent newsletter was published in January 2008.

6.2.3 Financial Programs

The following implement financial programs or practices to address water conservation through reduction of use: WVWA, City of Salem, Town of Fincastle, and the Town of Vinton. Financial programs or practices include, but are not limited to, a water conservation rate structure that encourages reduction of water use by increasing water rates with increasing water usage.

The WVWA customer rates are based on a minimum use fee and volume fees for consumption. Customer rates are higher for residential customers whose monthly consumption is above 10,000 gallons, for commercial customers whose monthly consumption is above 75,000 gallons, and for industrial customers whose consumption is above 375,000 gallons. In addition, water used for irrigation purposes is charged at higher rate.

The customer rates for the City of Salem are also based on a minimum use fee as well as volume fees for consumption. Basic service for customers ranges from $5.00 to $20.00 depending on customer class. Volume fees for consumption are $4.57 per thousand gallons for the first 5,000 gallons, $4.21 per thousand gallons for 5,001-75,000 gallons, and $4.20 per thousand gallons for anything above 75,000 gallons.

On December 1, 2007, the Town of Fincastle implemented a new rate structure. Customers are charged a flat fee of $19.75 for the first 2,000 gallons of water consumed. Additional water consumption is charged at a rate of $3.75 per thousand gallons.

Finally, the Town of Vinton is currently completing a rate study and will eliminate the current declining block rate structure when complete.

6.3 Practices to Reduce Water Loss

As required by 9 VAC 25-780-110, the RVARC Plan will include information that describes practices to address water loss in the maintenance of water systems to reduce unaccounted for water loss. The types of items to be described may include, but are not limited to, leak detection and repair and old distribution line replacement. This section describes practices to reduce water loss in the RVARC region. Information regarding practices to reduce water loss was not provided by Bedford County and the towns of Boones Mill, Buchanan, Rocky Mount, and Troutville.

6.3.1 Connection Meters

Botetourt County, City of Bedford, Town of Fincastle and Town of Vinton all have both source and service connection meters. Botetourt County reads source and service meters on a monthly basis and meters are replaced on an as needed basis. The City of Bedford reads both source and service meters on a monthly basis. Meters are automatically read using an AMR system, which has been in place for approximately 2.5 years. The meter readers turn in maintenance requests and replacement orders to the Public Works Service Department. The City is also working on plan to complete regular water audits of the system in an effort to ensure correct meter readings.

The Town of Fincastle reads source and service meters on a monthly basis. All meters are replaced as needed.

The Town of Vinton reads source and service meters on a monthly and bimonthly basis, respectively. The Town maintains an automated inventory of all installed meters. Beginning in 2007, 2–inch meters and above were tested in place as an initial testing program. Beginning in January 2008, the Town implemented a planned meter replacement program. The replacement program is beginning with those meters that have been in service for the longest amount of time service.

The City of Salem and the WVWA only have service connection meters. The City of Salem reads service meters on a monthly basis and tests large meters (2-inch and larger) annually. Residential meters are replaced as necessary.

The WVWA reads service meters on a bimonthly basis and an inventory of all meters is maintained in an internal database. Meter maintenance and testing is driven by service work orders generated by customer or technician requests. In addition, the WVWA implements a meter replacement program and is working towards a goal of replacing all meters on a 10-year cycle. Approximately 3,600 meters per year are currently being replaced with new GPM meters and electronic read meters. This represents a $500,000 investment on the part of the WVWA to identify and replace old meters. Because of the success of their meter replacement program and a more efficient configuration of routes, the WVWA was able to switch to bi-monthly meter readings in the summer of 2006 from quarterly meter readings allowing customers to more quickly identify possible water leaks.

6.3.2 Leak Detection

The following have implemented leak detection practices to reduce water loss: WVWA, City of Salem, City of Bedford, and Town of Vinton. Leak detection practices include, but are not limited to, regularly scheduled water audits, development of education programs to reduce customer-side water loss such as offering leak detection tablets and conducting customer leak detection audits.

The WVWA is conducting a new water audit with Draper Aden to identify specific areas of unaccounted for water within their service area. The service area will be divided into service zones allowing WVWA to track water production and water use better. In addition, the WVWA has water operators, utility line workers, and meter readers in the field each day. All field crew members are trained to spot potential water breaks. By using the newest equipment available, the WVWA is able to quickly identify and repair problems.

In July 2007, the WVWA switched to bi-monthly meter reading in an effort to alert customers sooner about possible leaks. WVWA customers receive monthly bills for water consumption and sewer services. The WVWA billing team reviews each customer bill and if a customer's consumption is 2-3 times higher than their normal consumption for that time period, a high usage letter is enclosed with the customer's bill. This letter informs the customer that their high usage could be the result of undetected leaks. The letter provides step-by-step instructions on detecting toilet leaks as well as possible sources of other leaks. The letter also contains information about repairing toilet and faucet leaks. Leak detection tablets and water saver kits are available free to charge to any customer.

The City of Bedford completes water audits on a quarterly basis or when there is a noticeable increase in unaccounted for water. Water operators survey the entire water system using a device that monitors frequency changes in the water pipe when water is being released under pressure. This method is able to alert the City of a possible water leak in a certain area and with further investigation, the leak can usually be found within a few feet.

City of Salem has purchased leak detection equipment, completes monthly audits, and checks their system for leaks on a regular basis.

The Town of Vinton monitors unaccounted for water on a monthly basis and is in the early stages of developing a proactive leak detection program. In addition, the Town of Vinton periodically publishes utility newsletters or alerts, which are distributed with the bimonthly customer bills. The most recent newsletter was published in January 2008.

6.3.3 Line Replacement

The following have programs or operating strategies in place for the repair or replacement of water mains, service connections, fire hydrants, valves, etc. to reduce water loss: WVWA, City of Bedford, City of Salem, Botetourt County, Town of Fincastle, and the Town of Vinton.

The WVWA service area is monitored 24-hours a day through a Supervisory Control And Data Acquisition (SCADA) system. If a problem is detected by the SCADA system or a customer reports a possible water main break, water operation crews are dispatched to investigate the problem. Utility Line Service (ULS) crews are available 24-hours a day to repair breaks in water mains and service connections. In addition, ULS crews monitor and test the valves in the system on a regular basis. In addition, fire hydrants are flow tested and monitored in conjunction with the local Fire Departments to ensure they remain in proper working condition.

The City of Salem tests fire hydrants and valves on a regular basis and any defects are noted and scheduled for repair and/or replacement.

The City of Bedford, Botetourt County, Town of Fincastle, and the Town of Vinton conduct regular checks for water leaks in their system. Water line breaks and leaks are repaired as soon as they are identified. In addition, Vinton Public Works Staff and Police Department are always alert for signs of possible leaks and report them promptly. Vinton Residents similarly notify the Public Works Department and the suspected location is investigated immediately. The Town of Vinton also keeps an annual log of all breaks in an effort to monitor trends, pressure zones, neighborhoods, streets, etc.

The WVWA, City of Bedford, Town of Fincastle, and the Town of Vinton use local CIP funds to upgrade existing facility infrastructure, water mains, lines, fire hydrants, valves, etc., to reduce water loss. The City of Bedford uses the funding to upgrade line size for fire protection and purchase leak detection equipment. The WVWA's CIP budgets for significant infrastructure improvements in their service area. Through 2011, over $14,000,000 has been budgeted to replace aging or failing water lines. Efforts are also made to apply for funding through DWSRF to upgrade infrastructure in critical need of repair.

6.3.4 Other

The WVWA, Franklin County, and the Town of Vinton each have a practice or policy in an effort to track unauthorized connections (e.g., tapping of fire hydrants). The WVWA uses several means to identify unauthorized connections, including physical inspections by meter readers in the field, continual monitoring of fire hydrant meter program and comparing their database of previous customers with the local gas company list of current customers. If a former WVWA customer is identified as an active gas customer, then that property is inspected for a potential unauthorized connection. If an unauthorized connection is discovered, the WVWA works with the housing inspectors and police forces in either the City of Roanoke or Roanoke County to discontinue the unauthorized use.

Franklin County provides an authorization card to contractors giving them permission to connect to and use fire hydrants. If a contractor or other person(s) is seen using a fire hydrant, employees from the Sheriff's Department or Public Works Department will ask to see their authorization card. If the contractor or other person(s) does not have an authorization card, they are reported to the proper authorities

The Town of Vinton public works staff monitor for unauthorized connections to fire hydrants. If an unauthorized user is identified or unauthorized equipment is found, the unauthorized user is confronted directly and equipment may be confiscated.

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7.0 DROUGHT RESPONSE AND CONTINGENCY PLANS

The Local and Regional Water Supply Planning Regulation requires the Plan to develop a Drought Response and Contingency Plan (9 VAC 25-780-120) for community water systems and self-supplied users who withdraw more than an average of 300,000 gallons per month of water. The Drought Response and Contingency Plan addresses the unique characteristics of the water source being utilized and the nature of the beneficial use of water as well as following three graduated stages of responses to the onset of drought conditions as required by the regulation. In addition, the Drought Response and Contingency Plan includes local ordinances adopted by each locality describing the procedures for the implementation and enforcement of the Drought Response and Contingency Plan. A copy of the Drought Response and Contingency Plan for the region is included in Appendix E.

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8.0 STATEMENT OF NEED

In accordance with the Regulations (9 VAC 25-780-130), a water supply plan shall determine the adequacy of existing water sources to meet current and projected demand based upon the information and analyses conducted by 9 VAC 25-780-70 through 9 VAC 25-780-110, and provide a Statement of Need for the water systems covered by the Plan. In addition, the plan shall present alternatives to remedy the inadequacies discovered in these analyses.

The following discussion evaluates water demand projections for each system in the Planning Region as compared to limiting supply capacity in order to estimate whether a water supply surplus or deficit will result from future demand through the planning period (i.e., through the year 2060). Based upon this analysis, a Statement of Need is presented for the systems included in the Planning Region that are projected to experience a water supply deficit. Table 8.2.12. An additional 25.19 MGD of water demand may be added to the public systems region-wide by 2060 if public systems are expanded to serve private systems and individual well owners (Table 8.2.12).

8.1 Methodology

As population and commerce increase in the region, the demand for water will increase. Water demand projections were presented in Section 5.0, and known capacities of water resources identified. Projected water demand through the planning period (through 2060) was compared to limiting capacity to identify a current or future surplus or deficit. Assumptions were made regarding economic and demographic trends, as discussed below. Table 8.1.1 below summarizes the total existing capacity, along with the limiting capacity factor for each community in the RVARC region.

Table 8.1.1 Summary of PWS Capacities for RVARC Localities

Community	Total Existing PWS Capacity (MG yr^{-1})	Total Existing PWS Capacity (MGD)	Limiting Factor
Bedford County	297	0.81	VDH Permitted Capacity (0.813 MGD)
Botetourt County	415	1.14	VDH Permitted Capacity (1.14 MGD)
Franklin County	163	0.45	System Capacity (0.450 MGD)
Western Virginia Water Authority	16,783	46.00	Safe Source Yield: Crystal Spring (3.50 MGD), Carvins Cove (18.00 MGD), Falling Creek/Beaver Dam (1.45 MGD), Spring Hollow (23.00 MGD)
City of Salem	3,653	10.00	Roanoke River and Pump Station Yield Capacity (8.00 MGD), Muse Spring Well VDH Permitted Capacity (2 MGD)
Town of Boones Mill	30	0.08	VDH Permitted Capacity and WTP Capacity (0.08 MGD)
Town of Buchanan	276	0.76	VDH Permitted Capacity (0.756 MGD)
Town of Fincastle	78	0.21	VDH Permitted Capacity (0.212 MGD)
Town of Rocky Mount	731	2.00	VDH Permitted Capacity and WTP Capacity (2.00 MGD)
Town of Troutville	100	0.27	VDH Permitted Capacity (0.274 MGD)
Town of Vinton	890	2.44	System Capacity (2.44 MGD)

8.2 Statements of Need (presented by water system)

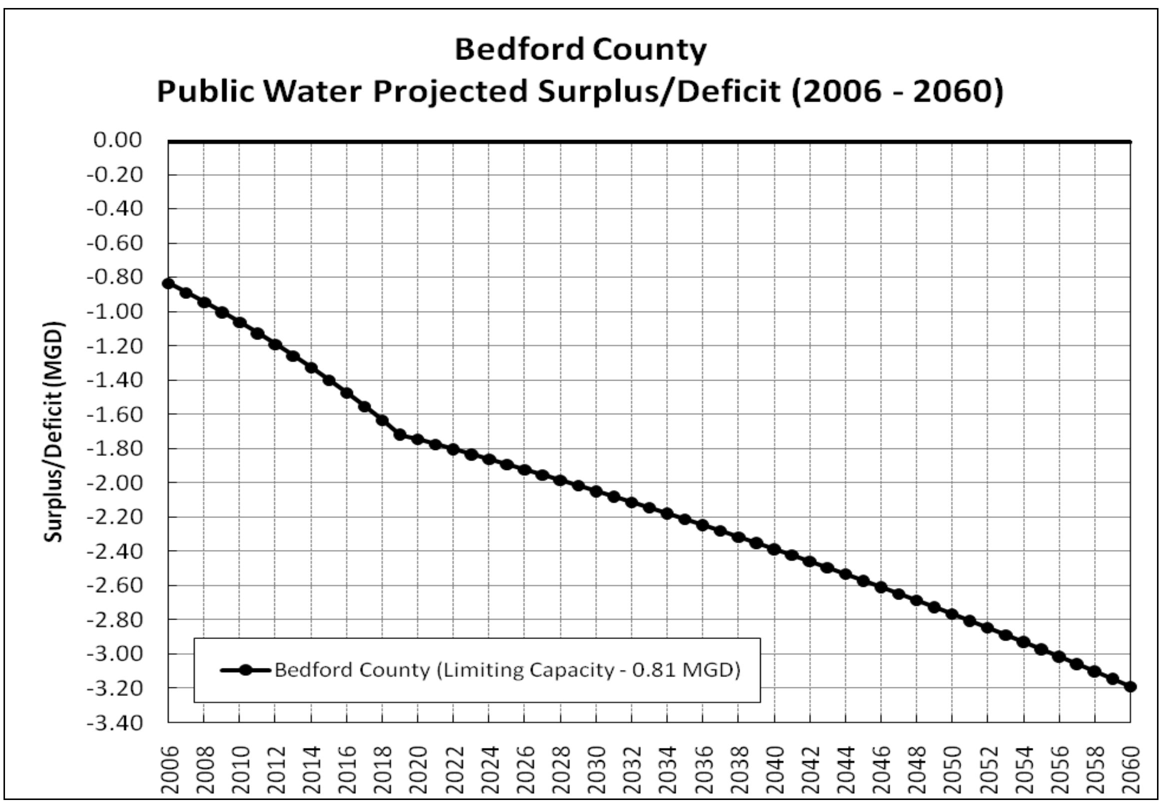
Water supply surplus or deficit results for each water system addressed in the Planning Region are identified in the following sections along with graphical representation of the surplus/deficit expected for each utility from 2006 through 2060. A Statement of Need, if applicable is presented for the water systems that are projected (or currently experience) a deficit in water supply. Table 8.2.12 summarizes the Statement of Need for all water systems included in this Water Supply Plan.

8.2.1 Bedford County

A graph showing the projected public water supply surplus/deficit for Bedford County is presented in Figure 8.2.1. Based on water produced by BCPSA, the BCPSA would already be experiencing a water supply shortage without current purchasing arrangements. The BCPSA relies on bulk water purchases, which are not reflected in Figure 8.2.1. An existing agreement with WVWA provides service to the Stewartsville area in western Bedford County and an agreement with the City of Lynchburg provides service to the Boonsboro, Forest and New London areas in eastern Bedford County. A majority of water demands in Bedford County occur within the Forest system, the Lakes systems along Smith Mountain Lake and in the western County area near Stewartsville.

Continued growth is expected and if no action is taken to secure additional source water, Bedford County will experience a deficit of 3.20 MGD by 2060, based on a limiting capacity of 0.81 MGD (*Statement of Need*). However, BCPSA purchases approximately 1.4 MGD from the City of Lynchburg, which is almost twice the total capacity of BCPSA's own system. Assuming that the amount of water purchased from Lynchburg remains the same, BCPSA is expected to experience a shortage around the Year 2015. BCPSA is applying for additional withdrawal capacity from Smith Mountain Lake for its High Point Water Treatment Plant.

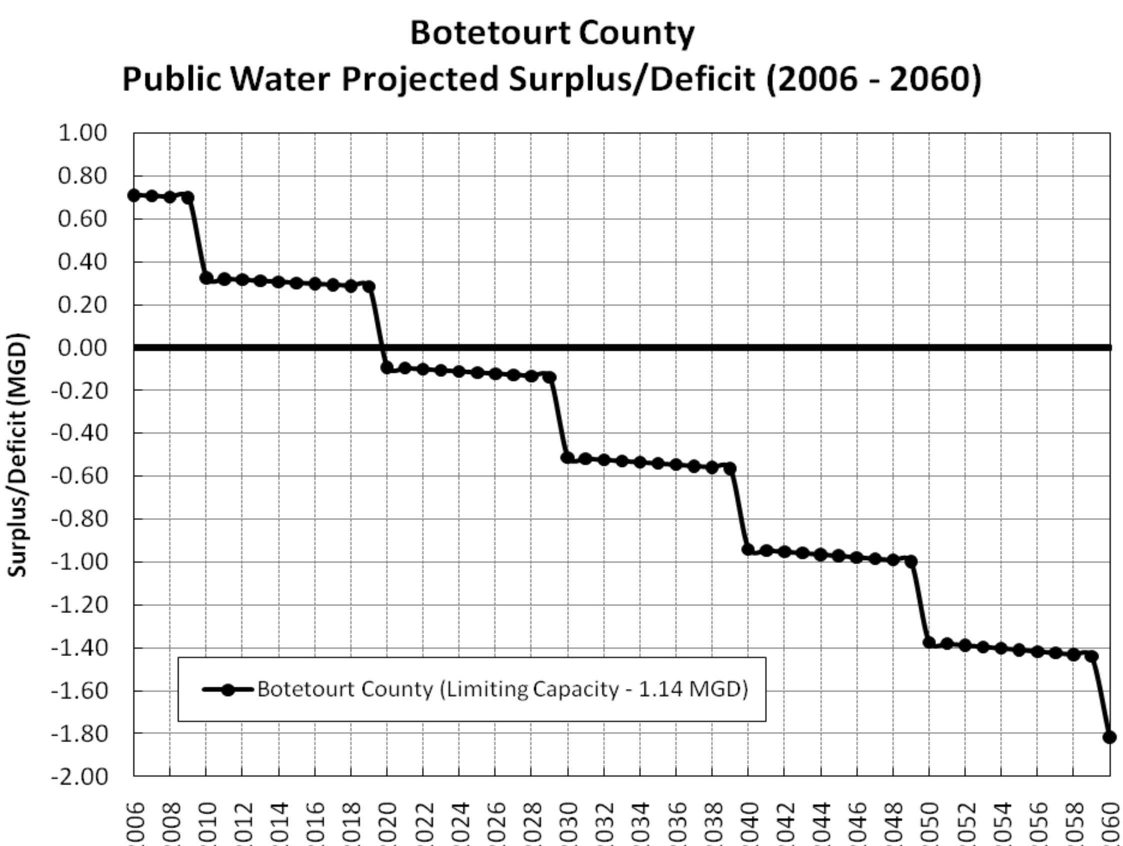
Figure 8.2.1: RVARC Water Supply Plan Statement of Needs - Bedford County



8.2.2 Botetourt County

Botetourt County currently maintains a surplus of 0.70 MGD based on a limiting capacity of 1.14 MGD. As demands within the region increase, Figure 8.2.2 shows a deficit occurring around year 2020, at which point, increased proposed industry entering the County will require additional source water. If additional source water is not obtained by 2060, the water deficit will be approximately 1.8 MGD (*Statement of Need*). Public water supply in Botetourt County is based upon groundwater located in the southern area of the County near at Greenfield and Wetherwood, the most populated and most commercialized area of the County. Botetourt County purchases water at two locations from the Western Virginia Water Authority and from the Town of Troutville (emergency basis). The demands on the system are centered in Greenfield, East Park and Cloverdale. Efforts are underway to provide interconnections at these three demand centers and eliminate the purchase of water from WVWA.

Figure 8.2.2: RVARC Water Supply Plan Statement of Needs – Botetourt County

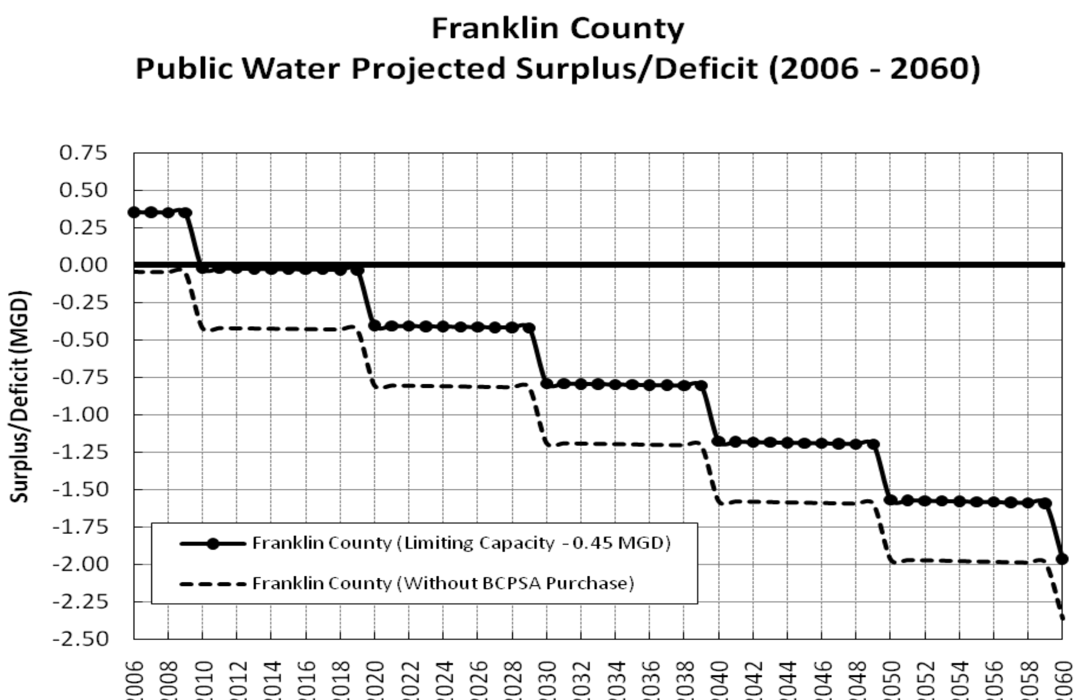


8.2.3 Franklin County

A graph showing the projected public water supply surplus/deficit for Franklin County is presented in Figure 8.2.3. Franklin County is currently experiencing a source water surplus of approximately 0.35 MGD based on a limiting system capacity of 0.45 MGD (includes purchased water from BCPSA). However, due to projected increases in industrial demand, Franklin County may experience water supply deficits in the near future. The supply deficit is estimated initially at 0.02 MGD, and without capacity increases will increase to approximately 2.00 MGD by the year 2060 (*Statement of Need*).

Franklin County is dominated by private water systems, with only a few locations having public water. Public water is generally supplied by the local towns, including Rocky Mount, Boones Mill and Ferrum Water and Sewer Authority. Currently, water supply along the southern Smith Mountain Lake shore (0.40 MGD) is being provided through an agreement between Franklin County and Bedford County Public Service Authority. On November 5, 2009, Franklin County officially became a member of the WVWA.

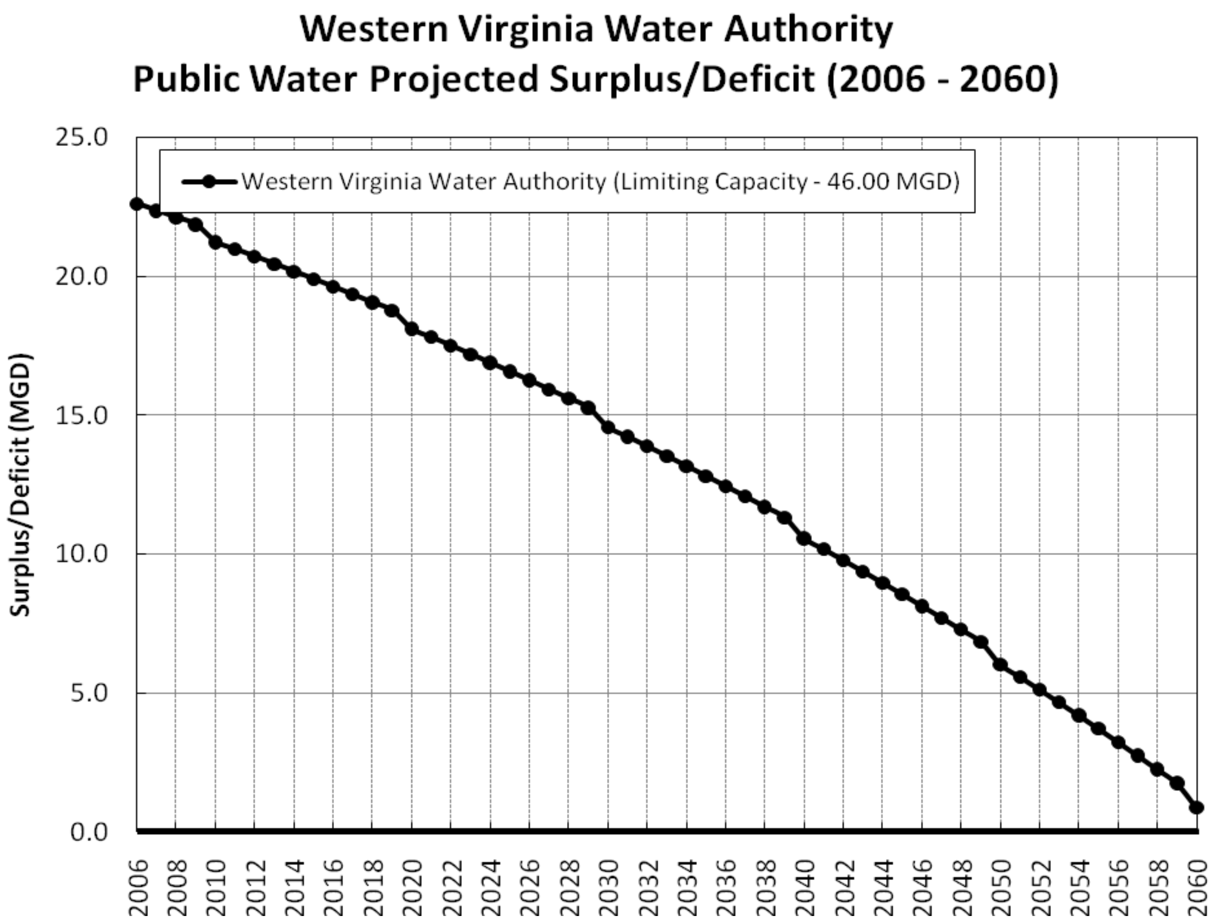
Figure 8.2.3: RVARC Water Supply Plan Statement of Needs – Franklin County



8.2.4 Roanoke County/Roanoke City (Western Virginia Water Authority)

Water supply for Roanoke County and the City of Roanoke is provided by Western Virginia Water Authority (WVWA). The majority of water used in these areas is provided by the public water system. A graph showing the projected public water supply surplus/deficit for the WVWA is presented in Figure 8.2.4. The Authority is currently experiencing a water surplus of approximately 22 MGD. The public water supply is projected to maintain a surplus throughout the planning period (Figure 8.2.4). The current capacity of various sources listed in Table 8.1.1 is 46.00 MGD.

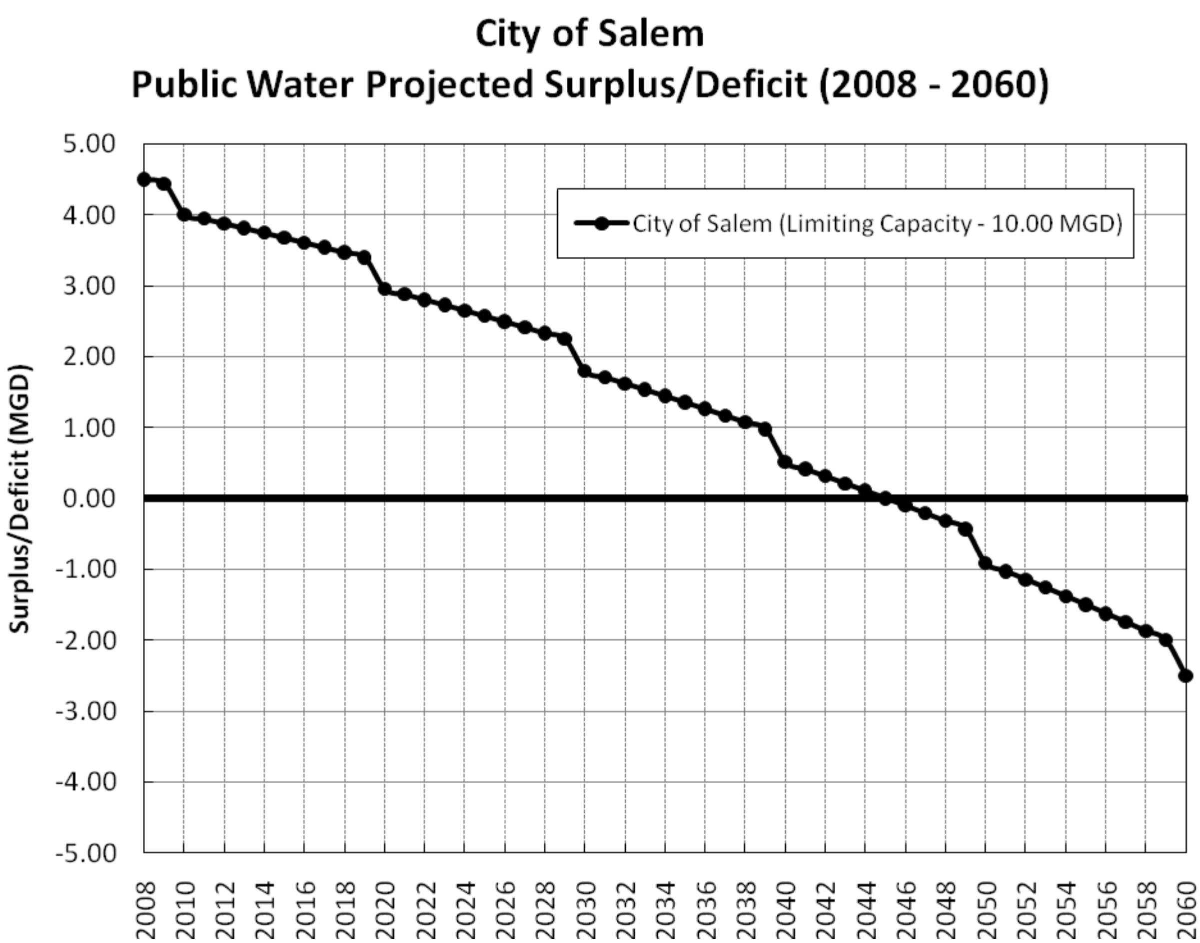
Figure 8.2.4: RVARC Water Supply Plan Statement of Needs – Western Virginia Water Authority



8.2.5 City of Salem

A graph showing the projected public water supply surplus/deficit for the City of Salem is presented in Figure 8.2.5. Water supply in the City of Salem is provided by the public water system. The projections for demand and the need for new facilities are documented below. The City of Salem maintains a surface water source (Roanoke River) with limiting capacity of 8.00 MGD, and a groundwater source (Muse Spring Well) with a VDH capacity of 2.0 MGD, which currently provide the City with a water surplus of approximately 4.5 MGD. However, Figure 8.2.5 shows that by 2046, the City of Salem is projected to experience a water supply deficit of 0.2 MGD at the current growth rate, increasing to almost 2.5 MGD by 2060 if alternative sources or options are not implemented (*Statement of Need*). Data for years 2006 and 2007 were not considered for the City of Salem analysis since data was not available.

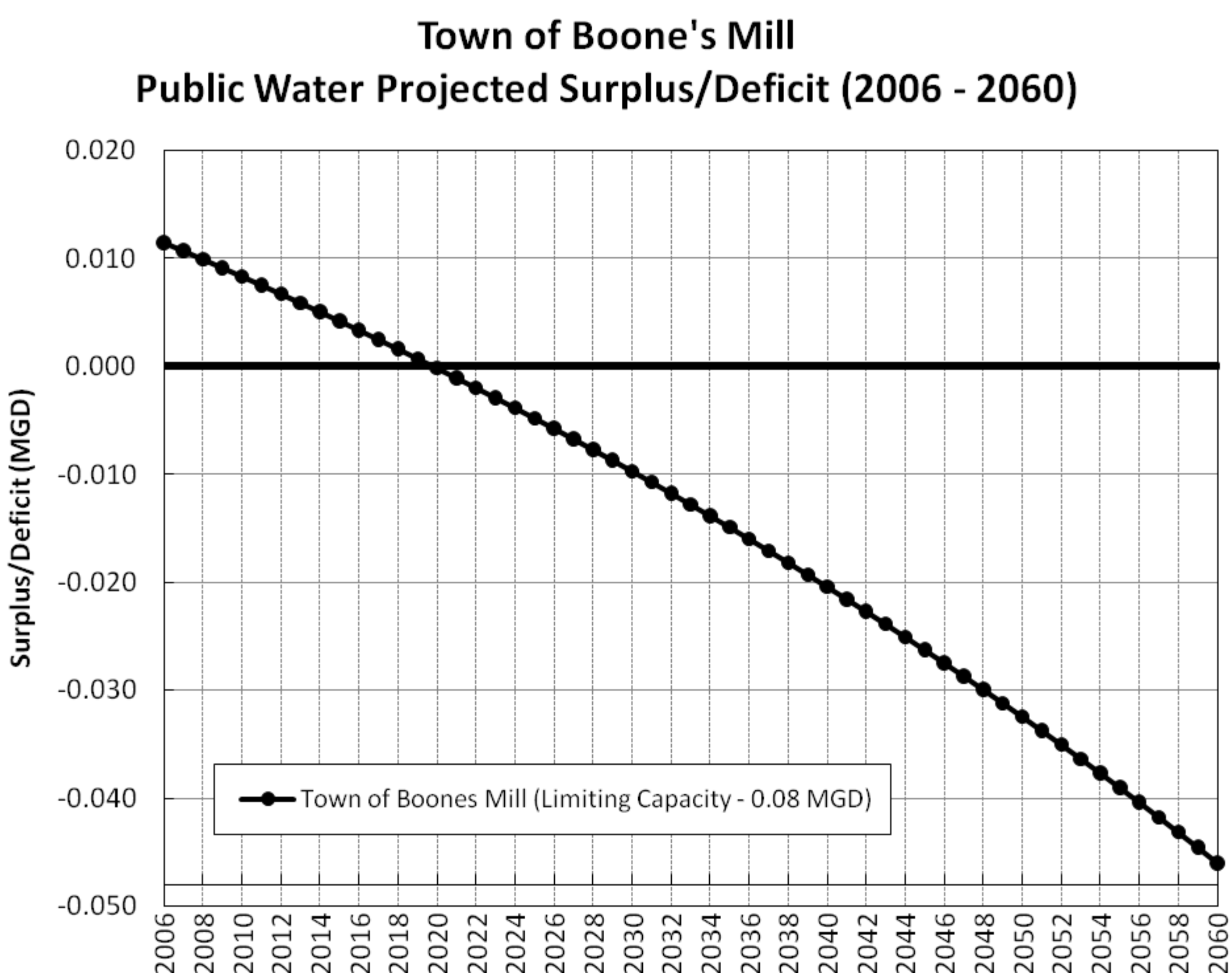
Figure 8.2.5: RVARC Water Supply Plan Statement of Needs – City of Salem



8.2.6 Town of Boones Mill

A graph showing the projected public water supply surplus/deficit for the Town of Boones Mill is presented in Figure 8.2.6. Currently, the Town of Boones Mill maintains a surplus of approximately 0.01 MGD based on existing water demands in the region, and a limiting capacity of 0.08 MGD. If no measures to obtain additional source water are explored, the Town of Boones Mill will experience a water deficit in approximatley 2020, with a total deficit of almost 0.48 MGD by 2060. The Town of Boones Mill relies on public water for virtually all of its water needs. System growth should be at a moderate pace over the next several decades.

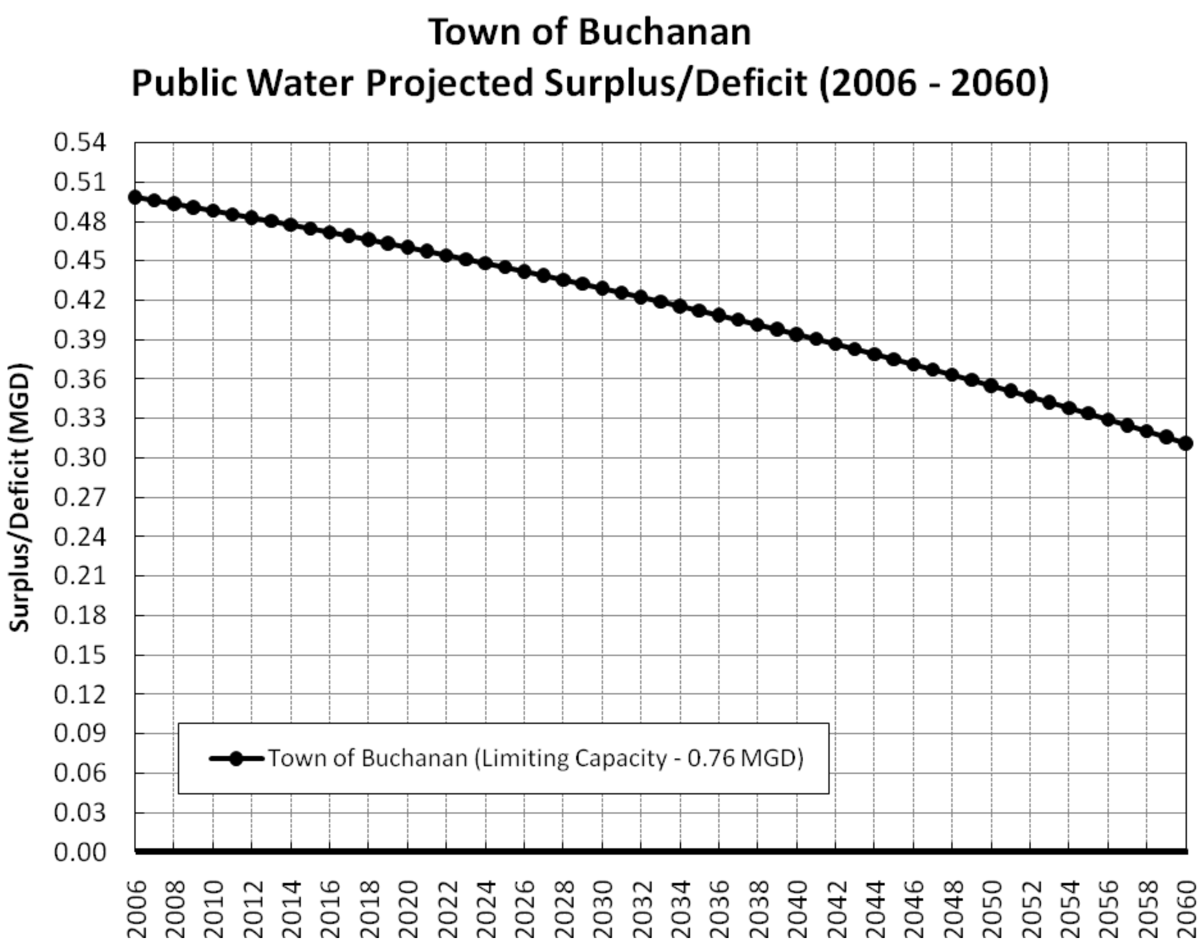
Figure 8.2.6: RVARC Water Supply Plan Statement of Needs - Town of Boones Mill



8.2.7 Town of Buchanan

A graph showing the projected public water supply surplus/deficit for the Town of Buchanan is presented in Figure 8.2.7. The Town of Buchanan is currently experiencing a water source surplus of approximately 0.50 MGD. Based on projected demands and proposed growth, the Town of Buchanan will not experience any deficits in water supply by 2060 and will in fact still have a surplus of about 0.30 MGD. The Town of Buchanan maintains groundwater wells with a VDH permitted capacity of 0.76 MGD.

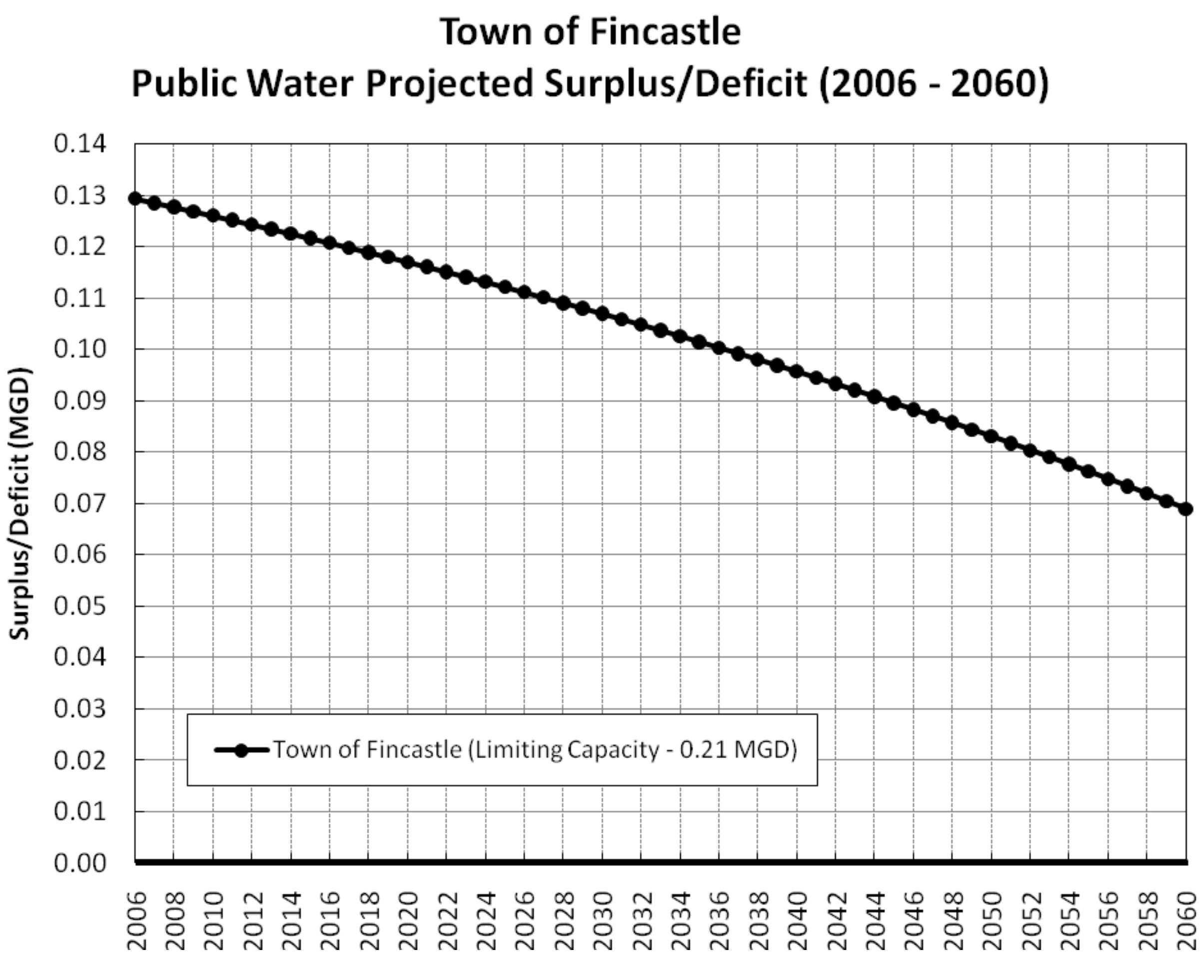
Figure 8.2.7: RVARC Water Supply Plan Statement of Needs - Town of Buchanan



8.2.8 Town of Fincastle

A graph showing the projected public water supply surplus/deficit for the Town of Fincastle is presented in Figure 8.2.8. The Town of Fincastle maintains groundwater wells with a VDH permitted capacity of 0.21 MGD. Based on current demands, the Town has a source water surplus of approximately 0.13 MGD with no projected deficit in water supply expected before 2060. If future growth continues as expected, the Town will maintain a water source surplus of approximately 0.07 MGD in 2060.

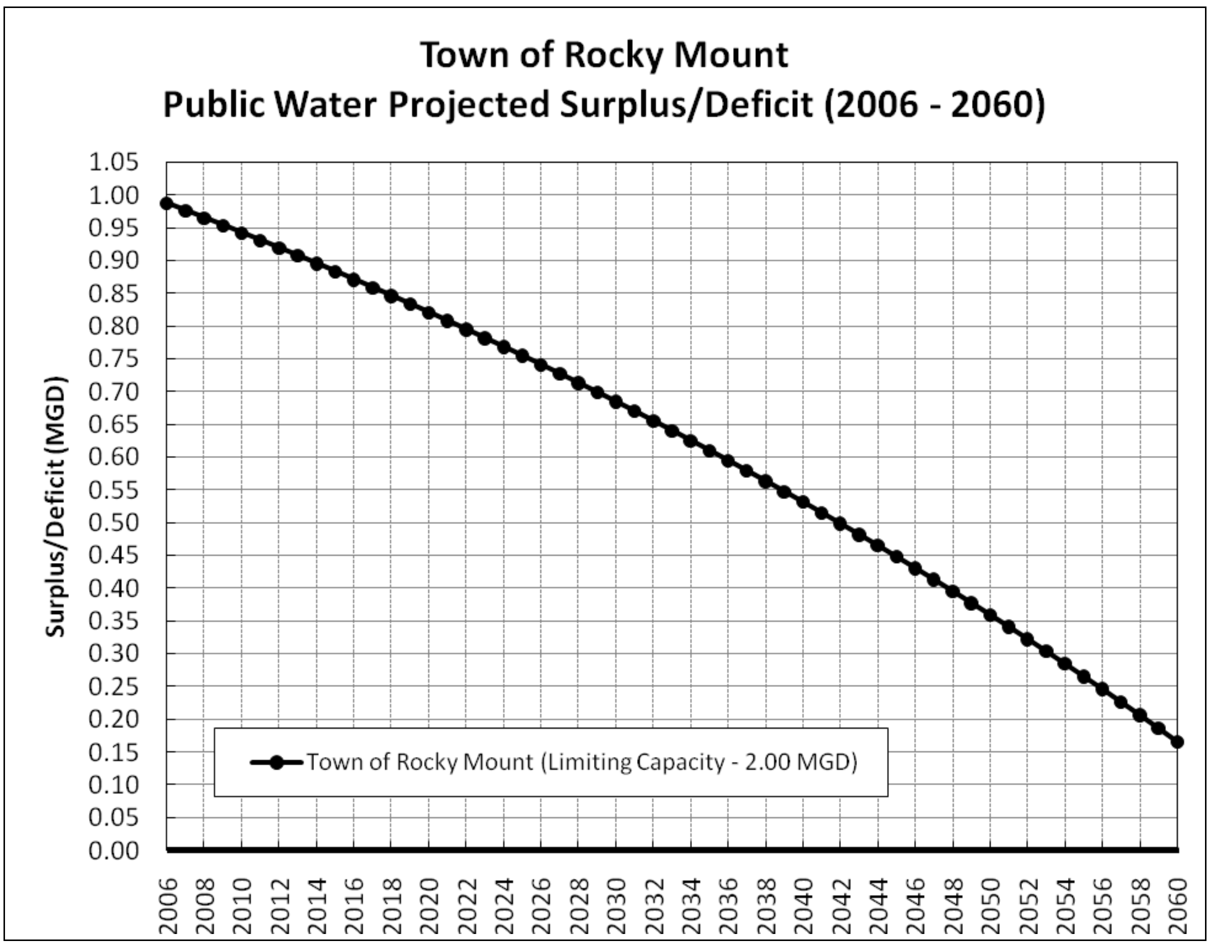
Figure 8.2.8: RVARC Water Supply Plan Statement of Needs - Town of Fincastle



8.2.9 Town of Rocky Mount

A graph showing the projected public water supply surplus/deficit for the Town of Rocky Mount is presented in Figure 8.2.9. The Town of Rocky Mount provides public water to the area within the limits of the Town of Rocky Mount and sells some water to Franklin County residents. The Town currently maintains a VDH permitted pump station and water treatment plant limited capacity of 2.00 MGD. Based on current demand projections, the Town of Rocky Mount has a water source surplus of approximately 1.0 MGD, and will maintain a source surplus through the planning period reaching 0.17 MGD in 2060.

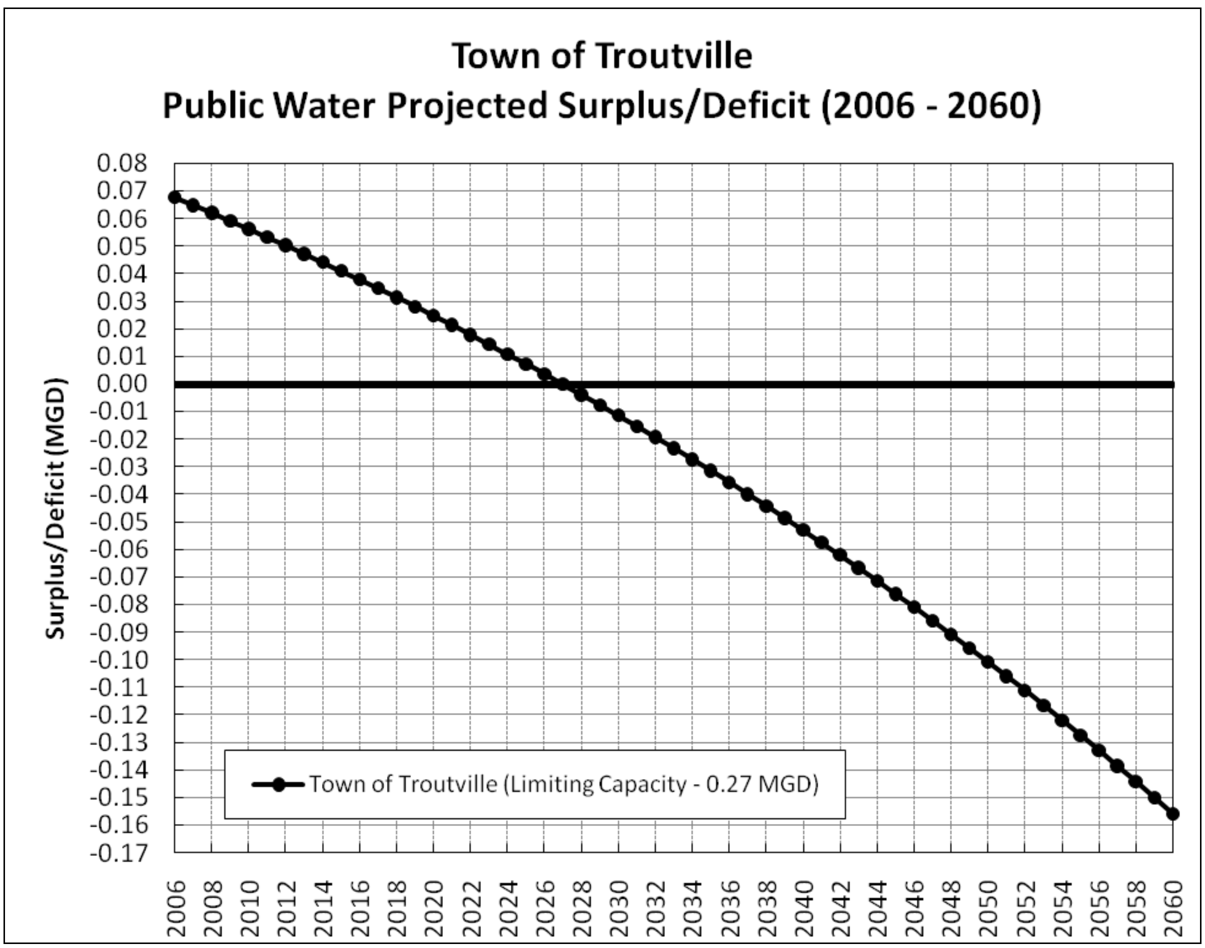
Figure 8.2.9: RVARC Water Supply Plan Statement of Needs - Town of Rocky Mount



8.2.10 Town of Troutville

A graph showing the projected public water supply surplus/deficit for the Town of Troutville is presented in Figure 8.2.10. The Town of Troutville operates a system which currently satisfies the public needs. It is projected that the Town system will continue to provide the minimum water required until approximately 2027. The current water surplus amount in the Town of Troutville is about 0.07 MGD with a VDH groundwater permitted limiting capacity of 0.27 MGD. If alternate sources are not implemented by 2060, the Town of Troutville will begin to experience a water supply deficit in 2028, increasing to 0.17 MGD by 2060 (*Statement of Need*).

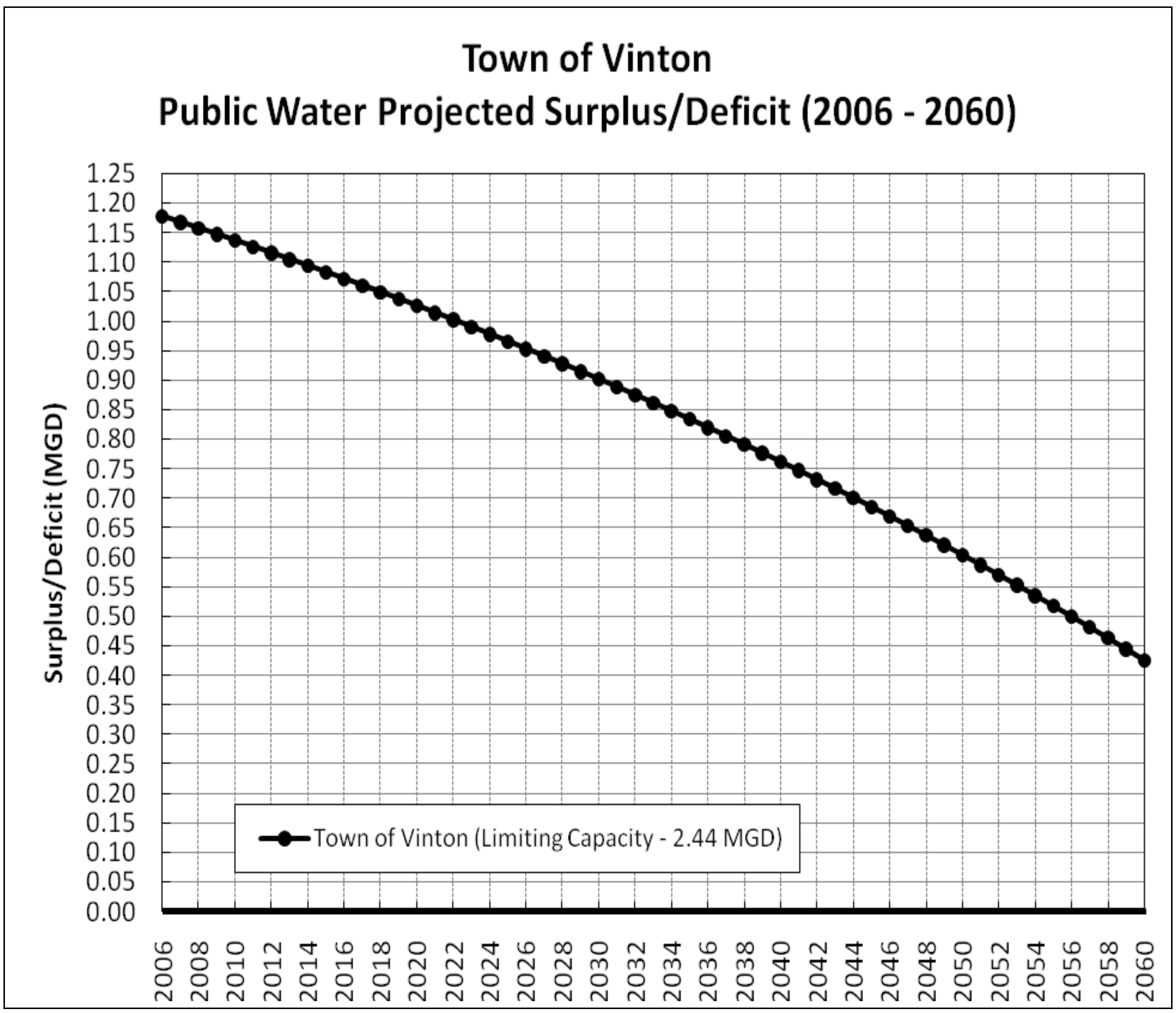
Figure 8.2.10: RVARC Water Supply Plan Statement of Needs - Town of Troutville



8.2.11 Town of Vinton

A graph showing the projected public water supply surplus/deficit for the Town of Vinton is presented in Figure 8.2.11. The Town of Vinton operates several wells to provide the required water supply. The town currently maintains a surplus of approximately 1.18 MGD with a source capacity limitation of 2.44 MGD. Based on projected demands and known growth information, the Town of Vinton is expected to have an adequate water supply (surplus) through 2060, with the surplus at that time being approximately 0.42 MGD. The potential exists for Vinton to share some of its resources with other localities in the future.

Figure 8.2.11: RVARC Water Supply Plan Statement of Needs - Town of Vinton



8.2.12 Regional Overview

Based upon the individual statements of need (presented above), a summary of the water supply surplus and deficits is summarized in Table 8.2.12. A regional public water supply deficit of 7.76 MGD will be realized if the existing public water systems decide not to implement any alternative water sources by 2060.

As a contingency Statement of Need, Public water supplies should consider the potential that some or all of the increased private demand projected through 2060 may be derived from public water systems (i.e., public water may be extended to replace or enhance private supplies). Thus, an additional 25.19 MGD of water demand may be added to the public systems region-wide by 2060 if public systems are expanded to serve private systems and individual well owners (Table 8.2.12).

Data presented in Table 8.2.12 are based on projected demands and current limiting capacities as reported by each community. The projections are made 50 years into the future, and as such incorporate approximations that limit to a reasonable degree the long-term accuracy. The results of the Statement of Need presented herein are approximate.

Table 8.2.122 Summary of 2060 Water Needs by Community and as the Total Region

Community	2060 Water Demand Projections			Total Existing PWS Capacity	Public WS Surplus or Deficit	Potential Additional Demand from Private WS
	Public Systems	Private Systems	Total			
	MGD	MGD	MGD	MGD	MGD	MGD
Bedford County	4.00	25.73	29.73	0.82	**-3.18**	9.40
Botetourt County	2.95	4.01	6.96	1.14	**-1.81**	4.01
Franklin County	2.41	7.91	10.32	0.45	**-1.96**	7.91
WVWA	45.08	3.75	48.83	46.00	**0.92**	3.75
City of Salem	12.50	0.12	12.62	10.00	**-2.50**	0.12
Town of Boones Mill	0.13	0.00	0.13	0.08	**-0.05**	0.00
Town of Buchanan	0.44	0.00	0.44	0.76	**0.32**	0.00
Town of Fincastle	0.14	0.00	0.14	0.21	**0.07**	0.00
Town of Rocky Mount	1.83	0.00	1.83	2.00	**0.17**	0.00
Town of Troutville	0.43	0.00	0.43	0.27	**-0.16**	0.00
Town of Vinton	2.01	0.00	2.01	2.44	**0.43**	0.00
Totals for Region	**71.92**	**41.52**	**113.65**	**64.17**	**-7.76**	**25.19**

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9.0 WATER SOURCE ALTERNATIVES EVALUATION

9.1 Description of Water Source Alternatives

9.1.1 Introduction

Numerous water supply source alternatives have been studied by members of the Roanoke Valley Allegheny Region Commission (RVARC) in the past as a part of their individual water supply planning processes and as part of prior collective efforts. Most recently, the Long Range Water Supply System Study, completed by Black & Veatch dated July 18, 2003, presented several alternative plans of action for meeting future water demands. In large part, the alternatives presented therein continue to represent the most feasible opportunities for increased water supply. The alternatives included the following (2009 present worth in millions of dollars in brackets):

Raw Water Augmentation of Spring Hollow Reservoir –

- New River Intake pumped to Wilson Creek (Roanoke River flow supplement) - Three options for capacity scenarios to serve a) Roanoke County, City of Salem and Town of Vinton [$30], b) plus City of Roanoke [$42] and c) plus Botetourt County [$60]

- New River Intake pumped to Spring Hollow Reservoir - Three options for capacity scenarios to serve a) Roanoke County, City of Salem and Town of Vinton [$37], b) plus City of Roanoke [$49] and c) plus Botetourt County [$69]

Finished Water Supplement to Spring Hollow System –

- Blacksburg Christiansburg VPI Water Authority water pumped to Spring Hollow – The option was subjected to two capacity scenarios to serve a) Roanoke County, City of Salem, Town of Vinton and City of Roanoke [$49] and b) plus Botetourt County [$66]

Raw Water Augmentation of Carvins Cove Reservoir –

- Roanoke River Intake to Carvins Cove – Two options considered for service to Roanoke County, City of Salem, Town of Vinton and City of Roanoke, a) to keep reservoir at existing volume [$34] and b) to raise level and increase volume [$36]

- Pumping from Spring Hollow Reservoir to Carvins Cove - Two options considered for service to Roanoke County, City of Salem, Town of Vinton and City of Roanoke, a) to keep reservoir at existing volume [$10] and b) to raise level and increase volume [$12]
- New River Intake pumped to Catawba Creek – Two options for capacity scenarios, a) to serve Roanoke County, City of Salem, Town of Vinton, City of Roanoke and Botetourt County [$90] and b) service to all RVARC jurisdictions [$171]
- New River Intake pumped to Carvins Cove – Two options for capacity scenarios, a) to serve Roanoke County, City of Salem, Town of Vinton, City of Roanoke and Botetourt County [$92] and b) service to all RVARC jurisdictions [$168]
- Expansion of Carvins Cove – To serve only City of Roanoke [$2]
- James River Intake to Carvins Cove – To serve all RVARC jurisdictions [$125]
- Smith Mountain Lake Intake to Carvins Cove – Three options for capacity scenarios, a) Roanoke County, City of Salem, Town of Vinton and City of Roanoke [$35], b) plus Botetourt County [$53] and c) all RVARC jurisdictions [$151]
- Smith Mountain Lake Regional Water Treatment Plant Expansion – Three options for capacity scenarios, a) Bedford County and Franklin County [$55], b) plus Roanoke County, City of Salem, Town of Vinton and City of Roanoke [$126] and c) all RVARC jurisdictions [$163]

One of the conclusions presented in the prior report was that the least expense option for serving the deficiencies of the overall region, using just one alternative plan, was the pumping of James River water to Carvins Cove. At a 2003 present worth of $125 Million, the option was about 70 to 80% of the cost of the other single options. Further evaluation of the costs shows that the region may best be divided in two sections for the most economical future service solution. With the expansion of the Smith Mountain Lake Regional Water Treatment Plant in Bedford County, for service to meet the deficiencies of Bedford County and Franklin County, a 2003 present worth of $55 Million was identified. For an additional intake on Smith Mountain Lake, dedicated to pumping water into Carvins Cove, and providing service to Roanoke County, City of Salem, Town of Vinton, City of Roanoke and Botetourt County, a 2003 present worth of $53 Million was anticipated. The total of these two project, at a 2003 present worth of $108 Million would appear to reduce costs for the region. In addition, staged construction of the projects could allow for planned financing of the projects. The scope of the projects, and the associated costs, could be reduced with the inclusion of local projects within the region, which would increase capacity of individual systems, and reduce the system deficits.

In order to thoroughly assess the water source alternatives for the Region as a whole, several of these potential alternatives were re-evaluated in this Water Supply Plan. This may include alternatives that individual communities have already eliminated from their plans, as well as alternatives that are currently being implemented. Because this Water Supply Plan is a living document, future updates to the list of water supply alternatives may include new alternatives that have not been identified in this version of the Plan.

The water source alternatives are broken down by type of alternative, since one particular alternative may benefit more than one of the RVARC members. The categories of alternatives include the following:

- Groundwater Sources
- Reservoir/Surface Water Impoundments
- River or Stream Intakes
- Interconnections
- Reuse and Recycling (an alternative to reduce demand)
- Demand Management

A map showing the existing PWS service area, locations of stream intakes, wells, and reservoir intakes, and the locations of potential water source alternatives is included as Plate 1 in this Water Supply Plan. A map ID code has been included for each alternative in the following section that corresponds to a location on Figure 9.1.

A description of the Alternatives Evaluation and the outcome of the evaluation process are discussed in Section 9.2.

Figure 9.1: Regional Map Showing Potential Alternatives

9.1.2 Groundwater Sources

Botetourt County – New Groundwater Wells

Botetourt County relies upon groundwater for much of its supply to the County's municipal water system, which is fed from the high yield Greenfield and Wetherwood wells. The geology in the County is conducive to the development of other high capacity groundwater wells. If the County does not buy additional water from neighboring municipal systems (e.g., Western Virginia Water Authority), it is likely that groundwater development would provide for future capacity growth. This alternative is still conceptual in nature; therefore, the actual locations, number and depth of potential new groundwater wells are not known at this time. Additional study is required to determine this information.

Franklin County – New Groundwater Wells

Franklin County largely relies upon groundwater for supply of water outside the Town of Rocky Mount municipal water system and the area served by purchased water from Bedford County Public Service Authority. The geology in the County is conducive to the development of groundwater wells to serve modest needs. If the County does not buy water from neighboring municipal systems (e.g., Bedford County Public Service Authority), it is likely that groundwater development would provide for some future capacity growth. This alternative is still conceptual in nature; therefore, the actual locations, number and depth of potential new groundwater wells are not known at this time. Additional study is required to determine this information.

City of Salem – New Groundwater Wells

The City of Salem largely relies upon the Roanoke River (8.0 MGD) with additional supply from groundwater wells (2.5 MGD). The City of Salem currently has plans to install an additional well to increase their current capacity (10.5 MGD) up to 14 – 15 MGD.

Town of Boones Mill – New Groundwater Wells

The Town of Boones Mill is totally dependent upon groundwater (wells and springs) for supply of water in the Town's municipal water system. The geology in the Town is conducive to the development of groundwater wells to serve modest needs. If the Town does not buy water from neighboring municipal systems (e.g., Western Virginia Water Authority), it is likely that groundwater development would provide for future capacity growth. This alternative is still conceptual in nature; therefore, the actual locations, number and depth of potential new groundwater wells are not known at this time. Additional study is required to determine this information.

Town of Troutville – New Groundwater Wells

The Town of Troutville is totally dependent upon groundwater for supply of water in the Town's municipal water system. The geology in the Town is conducive to the development of groundwater wells to serve modest needs. If the Town does not buy water from neighboring municipal systems (e.g., Western Virginia Water Authority), it is likely that groundwater development would provide for future capacity growth. This alternative is still conceptual in nature; therefore, the actual locations, number and depth of potential new groundwater wells are not known at this time. Additional study is required to determine this information.

Town of Vinton – Develop Existing Groundwater Well

The Town of Vinton is dependent upon groundwater for supply of water in the Town's municipal water system. The Town is currently scheduled to experience a surplus by 2060; however, if demand becomes greater in the future, the Town plans to develop an existing groundwater well to increase their capacity.

9.1.3 Reservoir Alternatives

Bedford County Public Service Authority - Smith Mountain Lake Alternatives:

Bedford County Public Service Authority (BCPSA) currently owns and operates the High Point water treatment plant (WTP) located in the Smith Mountain Lake area (see Figure 9.1.3.1). High Point WTP receives raw water from Smith Mountain Lake and has a current rated design capacity of 1.0 MGD. BCPSA has a permitted withdrawal capacity of 0.5 MGD, restricted by Appalachian Electric Power (AEP) and the Federal Energy Regulatory Commission (FERC). Also, permit renewal negotiations are ongoing. The Virginia Department of Environmental

Quality (DEQ) will allow BCPSA to withdraw up to 0.999 MGD from Smith Mountain Lake. The finished water pumps can deliver 0.75 MGD with one pump in standby mode.

Based on the size of the lake and its use along with Leesville Lake as a pump-back electrical power generation/storage facility, it is believed that a relatively large volume of water could be withdrawn for water supply in the surrounding area without impacting downstream flows. An expansion of the existing BCPSA, or construction of a new WTP would be required to treat additional Smith Mountain Lake withdrawals. The 2008 Update to the 1994 Comprehensive Water and Wastewater Study for Bedford County, Virginia (Draper Aden Associates, February 12, 2009) looked at three potential options for utilizing Smith Mountain Lake water as a source for all areas of the County:

- Construct a new 2.0 MGD Lakes Regional WTP near Camp 24 to serve the Lakes area of Bedford County.
- Construct a new 5.0 MGD Lakes Regional WTP near Camp 24 to serve all of the Lakes area and other areas within Bedford County.
- Construct a new 10.0 MGD Lakes Regional WTP near Camp 24 to serve long term needs of Lakes Region, Stewartsville, the City of Bedford, Franklin County and other areas within Bedford County.

Lakes Region WTP with 2.0 MGD Capacity (Map ID R-1.2)

This alternative would involve expansion of the Highpoint plant to 2.0 MGD (see Figure 9.1.3.2), modifications to the plant pump station as well as the construction of a new water storage tank. It is expected that this plant would meet most of the long term needs of the Lakes area of Bedford County, but would not provide excess supply for other parts of the County or for sales to Franklin County. In 2008, the estimated cost of this alternative was approximately $4.2 million.

Lakes Region WTP with 5.0 MGD Capacity

This alternative would involve acquisition of property near Camp 24 (see Figure 9.1.3.2), construction of 14,000 linear feet of new 24-inch raw water line to the plant site, extensive modification of the raw water intake and pump station as well as the construction of a new microfiltration treatment plant. It is expected that this plant would meet all of the Lakes area water needs while supplying excess water to other parts of Bedford and Franklin County. In 2008, the estimated cost of this alternative was approximately $24.8 million.

Lakes Regional WTP with 10.0 MGD Capacity

This alternative would involve acquisition of property near Camp 24 (see Figure 9.1.3.2), construction of 14,000 linear feet of new 30-inch raw water line to the plant site, construction of a new raw water intake and pump station as well as the construction of a new microfiltration treatment plant. It is expected that this plant would meet all of the needs of the Lakes region, Stewartsville, the City of Bedford, Franklin County and other parts of Bedford County. In 2008, the estimated cost of this alternative was approximately $44.4 million.

While the Smith Mountain Lake alternatives are discussed here in the "Reservoir Alternative" section, these projects would involve some degree of interconnections to be able to supply excess water to other parts of the County, as well as to the City of Bedford.

The interconnection project that will be discussed in this section is the alternative that has been evaluated to utilize Smith Mountain Lake water from the Lakes Regional WTP through an interconnection with the City of Bedford. This alternative includes approximately 67,000 linear feet of 20-inch and 15,600 linear feet of 24-inch finished water main along Route 122. In 2008, the estimated cost of this alternative was approximately $12.9 million.

The water supply deficiency for Bedford County and Franklin County is nearly 5.5 MGD. This deficiency is partly due to a shortage of water treatment capacity and the agreements for BCPSA to purchase water from the City of Lynchburg, Western Virginia Water Authority and Town of Vinton. It is envisioned that the expansion of the water treatment plant on Smith Mountain Lake should be planned for 10 MGD, which will account for replacement of the purchase capacities and will allow BCPSA to plan for commercial and higher water use corridors as the system is expanded throughout the County. It may also allow BCPSA to become a seller of bulk water more often than a buyer. The project actions identified in this section correspond relatively closely to those in the 2003 study by Black & Veatch (B&V), with a cost of $57 Million, similar to the B&V reported cost of $54 Million and 2009 present worth of $55 Million.

Western Virginia Water Authority (WVWA) – Augmentation of Carvins Cove Reservoir

The augmentation of Carvins Cove Reservoir could be accomplished by developing additional raw water supplies dedicated to the reservoir and/or increasing the storage capacity of the reservoir. The source of additional flows for the reservoir could come from the New River, Roanoke River, James River or Smith Mountain Lake, as identified in the B&V study of 2003. Potential projects for augmentation would target resolution of the deficiencies in areas served by Western Virginia Water Authority, City of Salem and Town of Vinton (6.60 MGD in 2060) or would include service to satisfy Botetourt County deficiencies as well (8.60 MGD in 2060). The B&V report showed the least costly project to be augmentation of Carvins Cove Reservoir from Smith Mountain Lake, at a capital cost of $49 Million and 2003 present worth of $53 Million.

With augmentation of the Carvins Cove Reservoir, more of the existing capacity of the Carvins Cove Water Treatment Plant could be utilized. The permitted withdrawal rate of 14.1 MGD could be increased to better match the plant capacity of 28.0 MGD. The increased treatment capacity available would help resolve the future deficiencies of the northern and western parts of this region.

Western Virginia Water Authority (WVWA) – Spring Hollow Reservoir Augmentation

The augmentation of Spring Hollow Reservoir could be accomplished by developing additional raw water supplies dedicated to the reservoir and/or increasing the storage capacity of the reservoir. The source of additional flows for the reservoir could come from the New River or Roanoke River, as identified in the B&V study of 2003. Potential projects for augmentation would target resolution of the deficiencies in areas served by Western Virginia Water Authority, City of Salem and Town of Vinton (6.60 MGD in 2060) or would include service to satisfy Botetourt County deficiencies as well (8.60 MGD in 2060). The B&V report showed the least costly project to be augmentation of Spring Hollow Reservoir from the New River via Wilson Creek, at a capital cost of $55 Million and 2003 present worth of $60 Million.

With augmentation of the Spring Hollow Reservoir, the region would face expansion of the Spring Hollow Water Treatment Plant which could be increased to 30 to 36 MGD by installing filter units within the plant. Bays and piping are already in place, which would reduce overall costs associated with a plant upgrade.

9.1.4 River or Stream Intake Alternatives

New River Intake

The Blacksburg Christiansburg VPI Water Authority has an unrestricted intake along the New River, in Montgomery County. The intake could be used for the withdrawal of water and delivery to Spring Hollow Reservoir, Wilson Creek, Catawba Creek or Carvins Cove Reservoir. Project costs for these options, to serve the northern and western portions of this region, according to the B&V 2003 study, ranged from \$55 to \$85 Million. 2003 present worth of the projects ranged from \$60 to \$92 Million.

Smith Mountain Lake Intake

An intake on Smith Mountain Lake could be used for augmentation of Carvins Cove Reservoir. The intake could be used to deliver the deficiency of up to 10 MGD. For service to the northern and western areas of the region, according to the B&V study of 2003, the estimate of cost was \$49 Million and 2003 present worth was \$53 Million.

James River Intake

An intake on the James River could be used to supplement flow to Carvins Cove Reservoir. The intake could be used to deliver 15 MGD to the reservoir. The cost, according to the B&V study would be about \$116 Million and present value was \$125 Million. The capacity of the system would be enough to serve all four Counties, two Cities and the Town of Vinton in the region.

Roanoke River Intake

A new intake on the Roanoke River could be used to supplement flow to Carvins Cove. However, the capacities available would not be expected to be enough to serve the areas served by the other river alternatives. The 2060 deficiencies for Western Virginia Water Authority, City of Salem and Town of Vinton could be satisfied, but Botetourt County needs could not.

9.1.5 Interconnection Alternatives

General

There is a wealth of interconnection capacity existing between the jurisdictions in this region. In particular, past connections between the City of Roanoke and Roanoke County have been instrumental in leading to the development of the Western Virginia Water Authority. Water shortages in the past have lead to interconnections between the WVWA entities, Town of Vinton and City of Salem. Botetourt County purchases bulk water at two locations at the southern edge of the County. If there is a weak link in the regional interconnection scheme, it is in the area of interconnections between the four entities noted above and Bedford County and Franklin County. Reliance upon the same water system is becoming the norm in these two Counties. In general, this partially explains why the economics of these evaluations appear to encourage separate regional solutions for the northern and western jurisdictions (WVWA, Vinton, Salem and Botetourt) and the southern and eastern jurisdictions (Bedford and Franklin). No further interconnections between the counties are envisioned at this time.

WVWA, Franklin County and Bedford

With the WVWA interconnection to Franklin County by installing a water line to Wirtz Plateau and a proposed line to Burnt Chimney from Westlake, the ability to take treated water from the Authority system to Franklin County and the possibility of transporting treated water from Smith Mountain Lake to the existing Authority system make it possible to extend the Bedford County system from Route 122 to Goodview and connect to the WVWA system in Stewartsville.

9.1.6 Reuse and Recycling

A current trend in reducing potable water demands includes the reuse of treated wastewater effluent for non-potable uses, such as irrigation and industrial process water. In RVARC, Western Virginia Water Authority owns and operates the Regional Wastewater Treatment Plant (WWTP), with a design capacity of 22 MGD, which treats a large portion of the wastewater from the surrounding communities. Conceptually it makes sense to utilize the treated effluent from this WWTP at local facilities. To date, the opportunities to utilize effluent have been very limited. It will be beneficial to explore future opportunities, since the use of effluent can offset the need to expand water source, treatment or distribution facilities.

9.1.7 Water Demand Management

Water conservation is the conscious effort by a utility, business or individual to save water. Every gallon of water not used is one less to be stored, treated, and distributed. It also may represent one less gallon that must be heated for washing or bathing, thus saving energy costs, or one less gallon of water that must pass through some form of wastewater treatment before it is returned to the environment. Normal conservation practices can provide long-term benefits by permanently reducing water demands during normal operating conditions.

As discussed in Section 6.0, the RVARC members have adopted numerous water conservation measures, including the following:

- Adjustment of standard operating procedures to improve water conservation
- Installation of low-flow and/or no-flow fixtures in their facilities and/or government buildings and facilities
- Provided "yard taps" to their customers for purchase, so that customers can track their outdoor water use
- Implementation of educational programs to address water conservation through reduction of use
- Water conservation rate structures that encourage reduction of water use by increasing water rates with increasing water usage
- Incentive programs to customers that retrofit or replace older fixtures and appliances to reduce water use
- Leak detection and repair programs with regularly scheduled water audits
- Replacement of aging water distribution pipes
- Implementation of practices or policies to track unauthorized connections

Greater water conservation in the region could be achieved if all of the RVARC members implemented the measures listed above, as well as other water conservation measures, such as “smart” irrigation systems, outdoor water use allocation calculations (to support a conservation rate structure), informative billing, or a new ordinance with outdoor use provisions.

9.2 Evaluation of Alternatives

9.2.1 Overview of Screening Criteria

This section describes the methods used to evaluate potential water source alternatives for the RVARC members. Each water supply alternative has the potential to provide some public water supply benefit for one or multiple RVARC members; therefore, each alternative was evaluated with respect to the following feasibility or practicability criteria:

- Applicability – determine the degree to which the alternatives match the local and regional needs of the members
- Safe Yield or Reliable Capacity – look for some measure of the maximum quantity of water that may be withdrawn throughout a critical dry period without depleting the source. Reliable capacity may refer to the potential water treatment plant capacity or the capacity of a piped interconnection between communities.
- Potential Environmental Impacts – assessment of alternatives on the basis of general environmental suitability.
- Potential Human Impacts – stakeholder satisfaction is often very important for the viability of an alternative. Human impacts such as land acquisition or easements, traffic impacts, etc. factor into the screening criterion.
- Relative Cost – alternatives may be economically infeasible if they are too costly to implement relative to other options.
- Availability – some alternatives may have legal, regulatory or institutional issues that could severely delay or event prevent implementation.

Alternatives were rated as “good”, “fair”, or “poor” for each of the criteria. Alternatives could be eliminated from further consideration if a fatal flaw was recognized with respect to any one of the criterion. Remaining practicable alternatives were then carried forward for comparison against each other based on the aforementioned criteria.

As discussed in the Statement of Needs section, not all of the RVARC members are projected to experience a water supply deficit by the end of the planning horizon. However, the region as a whole is projected to have a deficit of approximately 13.4 MGD (4,890 MG/year) in 2060. Based on existing PWS capacities and projected 2060 demands, the following members are projected to experience a water supply deficit sometime within the planning horizon:

- Bedford County (2060 deficit = 3.20 MGD)
- Botetourt County (2060 deficit = 1.80 MGD)
- Franklin County (2060 deficit = 2.00 MGD)
- Roanoke County/Roanoke City (WVWA) (2060 deficit = 2.50 MGD)
- City of Bedford (2060 deficit = 0.32 MGD)
- City of Salem (2060 deficit = 4.50 MGD)
- Town of Troutville (2060 deficit = 0.16 MGD)

The deficits for Bedford County and Franklin County will occur earlier in the study period than those for the northern and western area of the region. With regard to regional projects, an emphasis on remedy to the deficits in Bedford County and Franklin County should be considered more immediate to satisfy regional needs. The following sections will highlight the alternatives that scored the best and worst under each screening criterion, and the reasons for those rankings. A summary of the top-ranked alternatives and the current status of these projects will also be presented.

9.2.2 Applicability

Lowest Rated Alternatives:

Alternatives also received a "poor" rating for the applicability criterion if the alternative does not meet the needs of the member, or would not be needed at the time that it is planned for implementation because other options that are in the pipeline will provide water supply needs. The following alternatives were not eliminated from consideration, but received "poor" applicability ratings:

- Groundwater Development Projects (6 each) – because these alternatives are not easily defined for capacity before project construction work starts, the value of the projects in meeting the water demands of the region cannot be well defined as the project is being evaluated. However, with a high probability of locating groundwater in certain areas, the development of wells is often lower cost than surface water supply development. In general, the applicability of groundwater projects would be for local service only (one jurisdiction).

- New River Intake pumped to Wilson Creek (3 options) – because the procedure of introducing raw water into a stream, and hoping to remove that water in the same quantities at a downstream destination is subject to some concern. In addition, this project transfers water between watersheds (i.e., interbasin transfer), which could be problematic environmentally.

Highest Rated Alternatives:

Several of the water source alternatives received "good" ratings for applicability because they met the needs of the community that they would benefit, or it was applicable for more than one community:

- Pumping from Spring Hollow Reservoir to Carvins Cove Reservoir – this alternative allows Carvins Cove Reservoir to be better utilized and should allow the Carvins Cove Water Treatment Plant to be utilized to a higher capacity. Western Virginia Water Authority, Town of Vinton, City of Salem and Botetourt County would be the beneficiaries.
- Smith Mountain Lake Intake to Carvins Cove Reservoir – this alternative uses the Roanoke River at the best location, an impoundment. The capacity available at this location should be readily available and water taken from the lake will be returned to the lake after use (i.e., no interbasin transfer). Western Virginia Water Authority, Town of Vinton, City of Salem and Botetourt County would be the beneficiaries.
- Smith Mountain Lake Regional Water Treatment Plant Expansion – this alternative increases the volumes of finished water available to the region, and it is central to the area of greatest growth. Bedford County and Franklin County will be the beneficiaries of this project.

9.2.3 Safe Yield or Reliable Capacity

Lowest Rated Alternatives:

Two alternatives received a "poor" rating for safe yield or reliable capacity:

- Roanoke River to Carvins Cove (2 options) – because the Roanoke River is somewhat limited in flow, and it may not always be able to be drawn, particularly in times of drought.
- Groundwater Development Projects (5 each) – because these alternatives are not easily defined for capacity before project construction work starts, the value of the projects in meeting the water demands of the region cannot be well defined as the project is being evaluated. However, with a high probability of locating groundwater in certain areas, the development of wells is often lower cost than surface water supply development. In general, the applicability of groundwater projects would be for local service only (one jurisdiction).

Highest Rated Alternatives:

Several of the water source alternatives received "good" ratings for safe yield or reliable capacity. An alternative received a "good" rating if the source met most or all of the needs of the benefitting community (or communities) and/or if the alternative provides a new source of supply to supplement an existing source, which provides additional reliability to a community's PWS. The following alternatives received a "good" rating for Safe Yield or Reliable Capacity:

- The Smith Mountain Lake Alternatives – based on the size of the lake and its use along with Leesville Lake as a pump-back electrical power generation/storage facility, a large volume of water is available to be withdrawn. Utilization of this lake as a source provides Bedford County with their own source, reducing their dependency on purchased water from Lynchburg. One of the Smith Mountain Lake options (the 10.0 MGD Lakes Regional WTP) would also provide water to the City of Bedford through an interconnection with Bedford County. While the City of Bedford is not projected to experience a water supply shortage by 2060, utilization of Smith Mountain Lake water would provide additional reliability to the City's PWS.

- The New River Intake Alternatives – based on the flow of the river, which has been sufficient to provide the needs of water supply systems through all past droughts. Although the capacity of the river is good, its distance from the region and the interbasin transfer considerations are significant factors against use of these alternatives.
- The James River Intake Alternatives – based on the flow of the river, which has been sufficient to provide the needs of water supply systems through all past droughts. Although the capacity of the river is good, its distance from Carvins Cove, the interbasin transfer considerations and competition for use of the river are significant factors against the use of this alternative.

9.2.4 Environmental Impacts

Lowest Rated Alternatives:

An alternative was rated "major" with regards to its environmental impacts if it would substantially impact wetlands, streams, or other environmental factors. While many of the alternatives have not been specifically assessed for environmental impacts, conceptual level evaluations resulted in the following alternatives receiving "major" ratings:

- Interbasin Transfer Projects – Any projects that take water from one basin and introduce it to another basin may cause minor environmental concerns or introduce political and legal challenges. These projects would have to be evaluated on a case by case basis.

Highest Rated Alternatives:

Several of the water source alternatives received "minor" ratings for the environmental impacts criterion. An alternative received a "minor" rating if the planned project did not involve substantial impacts to wetlands, streams or other environmental resources. The following alternatives received a "minor" rating for environmental impacts:

- Smith Mountain Lake Intake to Carvins Cove – This project is entirely within one drainage basin. Water taken from Smith Mountain Lake will be returned to the lake after use via the Roanoke River.
- Smith Mountain Lake Regional Water Treatment Plant (10 MGD) – The WTP would provide service at the center of population growth in the RVARC region. In addition, the

project lies between two large water suppliers and provides an opportunity for interconnection with the City of Lynchburg and/or Western Virginia Water Authority.

9.2.5 Human Impacts

Lowest Rated Alternatives:

An alternative was rated "major" with regards to its human impacts if it would require land acquisition, excessive easements or other impacts to the public. Conceptual level evaluations resulted in the following alternatives receiving "major" ratings:

- None noted

Highest Rated Alternatives:

Several of the water source alternatives received "minor" ratings for the human impacts criterion. An alternative received a "minor" rating if the planned project did not require land acquisition or excessive easements. The following alternatives received a "minor" rating for human impacts:

- Virtually All – Most of the project work considered in this study is free of significant human impact.

9.2.6 Relative Cost

Most of the alternatives that were evaluated for the Plan have been studied in the past, at which time cost estimates were developed. The B&V study of 2003 showed that the most economical division of service would be to have the existing Smith Mountain Lake Water Treatment Plant expanded to 10 MGD in anticipation of selling water to BCPSA customers, City of Bedford, Franklin County and possibly some users in City of Lynchburg or Western Virginia Water Authority.

Because Smith Mountain Lake has abundant capacity already available, it is the source which appears to be able to be used most economically 1) in the southern and eastern areas of the region with expansion of the BCPSA plant and 2) in the northern and western areas of the region for raw water augmentation of Carvins Cove Reservoir.

Cost Ratings for All Alternatives

Of the options considered, the least costly regional option appeared to be one where Smith Mountain Lake is used for production of finished water to serve Bedford County and Franklin County, and also used as a raw water supplement to Carvins Cove Reservoir. The total estimated cost of these options, according to the 2003 study by B&V was $103 Million and 2003 present value was estimated at $108 Million.

9.2.7 Availability

Lowest Rated Alternatives

Alternatives received a "poor" rating if there were legal, regulatory or institutional issues that could severely delay or even prevent implementation. The following alternatives received a "poor" rating with regards to availability of the project:

Intake Installation Projects – Where a new intake is to be placed in a river or reservoir, permitting will be an issue. In most cases, the justification for a new intake will allow the permit to be obtained.

Interbasin Transfer Projects – Where there will be interbasin transfers of water, regulatory obstacles may become a problem. If the transfer is significant enough, there may be no means to overcome the regulatory requirements and permits may not be available.

Highest Rated Alternatives

Alternatives received a "good" rating if minimal permitting would be required, and there was political and stakeholder support of the project. Many alternatives received a "fair" rating for this criterion because the project would require one or more minor permits that are not expected to delay implementation. The following alternatives received a "good" rating with regards to availability of the project:

- Pumping from Spring Hollow Reservoir to Carvins Cove Reservoir – this project would increase the capacity of Carvins Cove Reservoir and allow additional treatment at this location without the placement of a new intake or concern about interbasin transfer.

9.2.8 Summary of Evaluation

Alternatives were compared using the criteria described above, and were compared to each other to determine the short list of water source options that would satisfy the needs of the RVARC member (or members) with the least environmental and human impacts.

The following water source alternatives are recommended to satisfy the future demands of the RVARC members:

Bedford County and City of Bedford

The highest rated alternative to supply the future needs of the County and City of Bedford is the increase in capacity of the Smith Mountain Lake Regional Water Treatment Plant. BCPSA has recently completed a Master Plan for Water and Sewer Infrastructure. There is a desire to expand the plant in phases to meet the needs of Bedford County, then the City of Bedford, Franklin County and others as the needs are presented.

Botetourt County, Buchanan, Fincastle and Troutville

The highest rated alternative to supply the future needs of Botetourt County is the provision of new wells for the County alone. For a regional solution, the best alternative is purchase of water from Western Virginia Water Authority and the installation of a supplemental supply to Carvins Cove from Smith Mountain Lake.

Franklin County, Rocky Mount and Boone's Mill

One regional alternative received a "good" rating to supply the future needs of Franklin County. The construction of a new 10.0 MGD Lakes Regional Water Treatment Plant on Smith Mountain Lake and an interconnection to the BCPSA water system is recommended. At this time, the major limiting factor for obtaining additional supply from Smith Mountain Lake is the cost of a new WTP and the potential problems with a new withdrawal permit for that quantity of water.

Western Virginia Water Authority

For a regional solution, the best alternative is the installation of a supplemental supply to Carvins Cove from Smith Mountain Lake.

City of Salem

The highest rated alternative to supply the future needs for the City of Salem is current plans to install an additional groundwater well. For a regional solution, the best alternative is purchase of water from Western Virginia Water Authority and the installation of a supplemental supply to Carvins Cove from Smith Mountain Lake.

Town of Vinton

The Town of Vinton is currently scheduled to experience a surplus by 2060; however, if demand becomes greater in the future, the Town plans to develop an existing groundwater well. For a regional solution, the best alternative is purchase of water from Western Virginia Water Authority and the installation of a supplemental supply to Carvins Cove from Smith Mountain Lake.

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10.0 PUBLIC PARTICIPATION

The RVARC water supply planning group recognizes that preparation of a successful plan will be more likely with active participation of the general public, local governments (i.e., county boards of supervisors and city and town councils) as well as regional stakeholders.

10.1 Public and Regional Stakeholder Involvement

The RVARC water supply planning group recognizes that preparation of a successful plan will be more likely with active participation of the general public and regional stakeholders. Regional stakeholders include but are not limited to, elected officials, planning commissioners, Economic Development Authorities, Industrial Development Authorities, and local well drillers. In an effort to involve these parties, RVARC conducted one workshop during the planning process. The workshop was advertised in a paper of general circulation. In addition, RVARC mailed individual invitations to many of the stakeholders in the region. The workshop is discussed in more detail below. Documentation from the workshop is presented in Appendix F.

10.1.1 Workshop 1 – Informational Session

The first stakeholder workshop was conducted on May 21, 2008. The purpose of the first workshop was to educate the general public and regional stakeholders on the requirements of the regulation and the benefits of participating in a Regional Water Supply Plan. In addition, the workshop was set up with five workstations presenting the data collection efforts to date. Workstation one included handouts and materials regarding the regulatory requirements of the Plan; workstation two presented maps showing water source data collected for both the public and private community water systems in the region; workstation three presented maps showing future growth area in the region along with the population and household density; workstation four presented drafts of the demand projections (one from a rural jurisdiction and one from an urban jurisdiction); and workstation five presented a map showing existing regional cooperation between localities in the region. During the workshop, planning commissioners and elected officials as well as general public were given an opportunity to provide input into projections for growth and development and regional stakeholders provided input on areas where water supply is stressed by planned growth as well as providing possible solutions to those water supply issues.

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11.0 SUMMARY

The RVARC regional water supply planning group is made up of twelve local governments and two service authorities. Participating jurisdictions include the counties of Bedford, Botetourt, Franklin, and Roanoke; the cities of Roanoke and Salem; and the towns of Boones Mill, Buchanan, Fincastle, Rocky Mount, Troutville, and Vinton. The BCPSA and WVWA also participate. The BCPSA provides water service to Bedford County and the WVWA provides water service to the City of Roanoke and Roanoke County.

The Plan complies with the State Water Control Board's regulation 9 VAC 25-780, Local and Regional Water Supply Planning, and is a functional plan supporting sustainable growth and economic development. Local governments participating in the regional Plan notified VDEQ of their intent to participate in the Plan before the November 2, 2008 deadline. The Plan was submitted to the VDEQ prior to the November 2, 2011 deadline. A public hearing was held by each participating jurisdiction and the local governments passed resolutions approving the Plan and adopting other policies or ordinances that were developed during the planning process.

The RVARC region is located in the western-central portion of Virginia in the Valley and Ridge, and Blue Ridge and Western Piedmont Physiographic Provinces. According to the U.S. Census Bureau, the total population for the region in 2000 was estimated to be 343,589. The region is served by both surface water and groundwater sources. The major streams utilized in the region as water sources include the Roanoke River, Blackwater River, and Crystal Spring. The major reservoirs in the region utilized as water sources include Smith Mountain Lake, Carvins Cove Reservoir, Falling Creek Reservoir, and Spring Hollow Reservoir. Much of the region is also dependent upon groundwater as well as springs. The WVWA is one of the major water providers in the region selling water to the BCPSA, Franklin County, Roanoke County, City of Roanoke, and the Town of Troutville.

Based on projected demands and the total existing public community water system capacities for the each locality, the RVARC region is projected to experience a water supply deficit of approximately 7.76 MGD by the year 2060. It should be noted that there is some uncertainty associated with any specific estimate of future deficit (or surplus) 50 years into the future and that uncertainty increases further into the 50-year period. This deficit is based on current limiting capacities and total demands (excluding sales to jurisdictions).

Additional private demand (from groundwater and surface water sources) of approximately 25.19 MGD may be needed to supply residential and agricultural users outside the service areas of the public community water systems. It is important to note should any of the private community water systems become part of a public community water system, this may increase the future public community water system deficit projections.

Two water supply alternatives were identified as the most economical future solutions to meet the region's water supply needs. They are expansion of the Smith Mountain Lake Regional Water Treatment Plant (WTP) in Bedford County and an additional intake on Smith Mountain Lake to supplement Carvins Cove. The expansion of the Smith Mountain Lake Regional WTP in Bedford County would meet the deficiencies of Bedford County and Franklin County. A 2003 present worth of $55 Million was identified for this alternative. An additional intake on Smith Mountain Lake, dedicated to pumping water into Carvins Cove, would provide service to Botetourt County, Roanoke County, City of Salem, City of Roanoke, and Town of Vinton. A 2003 present worth of $53 Million was anticipated for this alternative. The total of these two projects, a 2003 present worth of $108 Million, would appear to reduce overall costs for the region. In addition, staged construction of the projects could allow for planned financing of the projects. The scope of the projects, and the associated costs, could be reduced with the inclusion of local projects within the region, which would increase capacity of individual systems, and reduce the system deficits.

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13.0 ACRONYMS

AMR	Automatic Meter Reading
BCPSA	Bedford County Public Service Authority
CIP	Capital Improvement Plan
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Funds
DCR	Department of Conservation and Recreation
DGIF	Department of Game and Inland Fisheries
DHR	Department of Historic Resources
DNH	Department of Natural Heritage
DWSRF	Drinking Water State Revolving Funds
EDW	Environfacts Data Warehouse
ERC	Equivalent Residential Connections
FC	Federal Candidate
FE	Federal Endangered
FS	Federal Species of concern
FT	Federal Threatened
gpd	gallons per day
gpm	gallons per minute
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LQG	Large Quantity Generators
MHP	Mobile Home Park
MG	Millions Gallons
MGD	Million Gallons per Day
NASS	National Agriculture Statistics Service
NESDIS	National Environmental Satellite, Data, and Information Service
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRWA	National Rural Water Association
NWI	National Wetland Inventory
OSSS	On-Site Septic System
PCS	Permit Compliance System
RCRA	Resource Conservation and Recovery Act
SCADA	Supervisory Control And Data Acquisition
SDWIS	Safe Drinking Water Information System
SE	State Endangered
SQG	Small Quantity Generator
SS	State Special concern
ST	State Threatened
SWAP	Source Water Assessment Plan
TSD	Transport, Storage, and Disposal
USDA	United States Department of Agriculture

USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
VAFWIS	Virginia Fish and Wildlife Information Service
VANHP	Virginia Natural Heritage Program
VCE	Virginia Cooperative Extension
VDEM	Virginia Department of Emergency Management
VDEQ	Virginia Department of Environmental Quality
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VDMR	Virginia Division of Mineral Resources
VDOT	Virginia Department of Transportation
VDOF	Virginia Department of Forestry
VLR	Virginia Landmark Register
VOF	Virginia Outdoors Foundation
VPDES	Virginia Pollution Discharge Elimination System
VRP	Voluntary Remediation Program
VRWA	Virginia Rural Water Association
VTSO	Virginia Tech Seismological Observatory
VUSBC	Virginia Uniform Statewide Building Code
WAP	Wildlife Action Plan
WFP	Water Filtration Plant
WHP	Wellhead Protection
WTP	Water Treatment Plan
WVWA	Western Virginia Water Authority

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1.0 INTRODUCTION

The Roanoke Valley Alleghany Regional Commission (RVARC) regional water supply planning group is made up of twelve local governments and two service authorities. Participating jurisdictions include the counties of Bedford, Botetourt, Franklin, and Roanoke; the cities of Roanoke and Salem; and the towns of Boones Mill, Buchanan, Fincastle, Rocky Mount, Troutville, and Vinton. The Bedford County Public Service Authority (BCPSA) and Western Virginia Water Authority (WVWA) also participate. The BCPSA provides water service to Bedford County and the WVWA primarily provides water service to the City of Roanoke and Roanoke County; however, the WVWA also provides water to the BCPSA, Franklin County, and the Town of Troutville.

1.1 Purpose of the Study and Regulation

The RVARC Regional Water Supply Plan (Plan) complies with the State Water Control Board's regulation 9 VAC 25-780, Local and Regional Water Supply Planning, and is a functional plan supporting sustainable growth and economic development. The purpose of the regulation is to establish a comprehensive water supply planning process for the development of local, regional, and state water supply plans. This process is designed to:

- Ensure that adequate and safe drinking water is available to all citizens within the region;
- Encourage, promote, and protect all other beneficial uses of the region's water resources;
- Encourage, promote, and develop incentives for alternative water sources; and
- Promote conservation.

Local governments participating in the regional plan notified VDEQ of their intent to participate in the Plan before the November 2, 2008 deadline. The Plan was submitted to the VDEQ prior to the November 2, 2011 deadline. A public hearing was held by each participating jurisdiction and the local governments passed resolutions approving the Plan as well as adopting other policies or ordinances that were developed during the planning process.

1.2 Regional Nature of the Study

The July 18, 2003 report titled "Long-Range Water Supply System Study for Bedford County, Botetourt County, Franklin County, Roanoke County, City of Roanoke, City of Salem, and the

Town of Vinton" prepared for the RVARC by Black & Veatch analyzed existing water supply system sources and facilities, considered future water needs, and identified possible solutions to satisfy anticipated growth in the Roanoke Valley over the next 50 years. From this study, the RVARC water supply planning group recognized the benefits of developing a regional water supply plan and began developing their Plan in accordance with the State Water Control Board's regulation 9 VAC 25-780, Local and Regional Water Supply Planning, in June 2006. The 2003 Long-Range Water System Supply Study contained much of the information required by the water supply regulation. Information from the study has been updated and incorporated into this RVARC Regional Water Supply Plan.

The RVARC water supply planning group is comprised of utility directors, water plant operators, county administrators, and city and town managers. Many of the participants in the region were already working together on water supply issues.

1.3 General Location and Description

The RVARC region is located in the western-central portion of Virginia in the Valley and Ridge, Blue Ridge, and Western Piedmont Physiographic Provinces. According to the U.S. Census Bureau, the total population of the region in 2000 was estimated to be 343,589. The region is served by both surface water and groundwater sources. The major streams utilized in the region as water sources include the Roanoke River and Blackwater River. The major reservoirs in the region utilized as water sources include Smith Mountain Lake, Carvins Cove Reservoir, Falling Creek Reservoir, and Spring Hollow Reservoir. Much of the region is also dependent upon groundwater and several springs. The WVWA is one of the major water providers in the region selling water to the BCPSA, Franklin County, Roanoke County, City of Roanoke, and the Town of Troutville. Figure 1.3 identifies the location of each jurisdiction in the RVARC regional water supply planning group.

Figure 1.3: Regional Overview Map