HALIFAX COUNTY
REGIONAL WATER SUPPLY PLAN
HALIFAX COUNTY, VIRGINIA

May 23, 2011

Prepared For:

Halifax County

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W. Bryant Claiborne, Vice Chairman
Douglas Bowman
J.T. Davis
Wayne Conner
William Fitzgerald
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George Nester, CM, AICP, County Administrator
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QA/QC RJM

Anderson & Associates, Inc.
Professional Design Services
Blacksburg, Virginia
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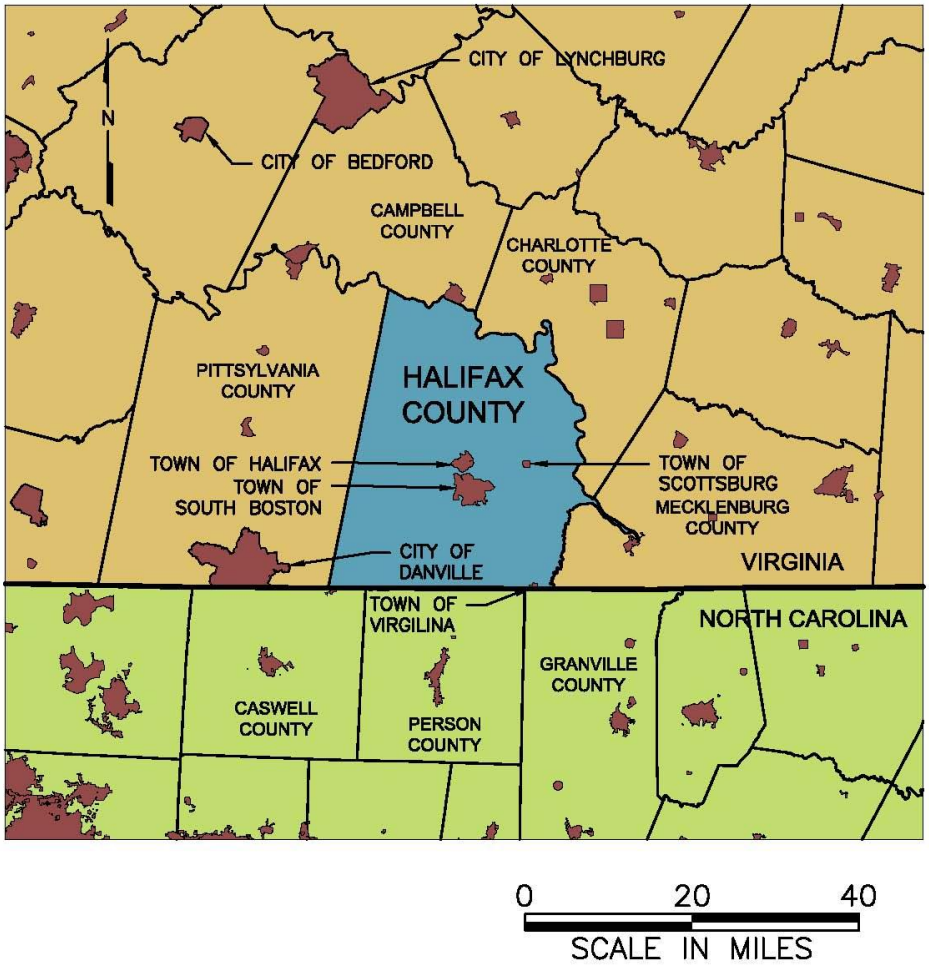
I. INTRODUCTION

A. Background

The County of Halifax (County) is located in the Commonwealth of Virginia (State), and it borders the State of North Carolina. The center of the County is approximately 95 miles southwest of Richmond, Virginia, 65 miles southeast of Roanoke, Virginia and 65 miles northeast of Greensboro, North Carolina. Figure 1 provides detail of the County's location in relationship to adjacent county's and towns. The County consists of 819.3 square miles of land, and 7.4 square miles of water.

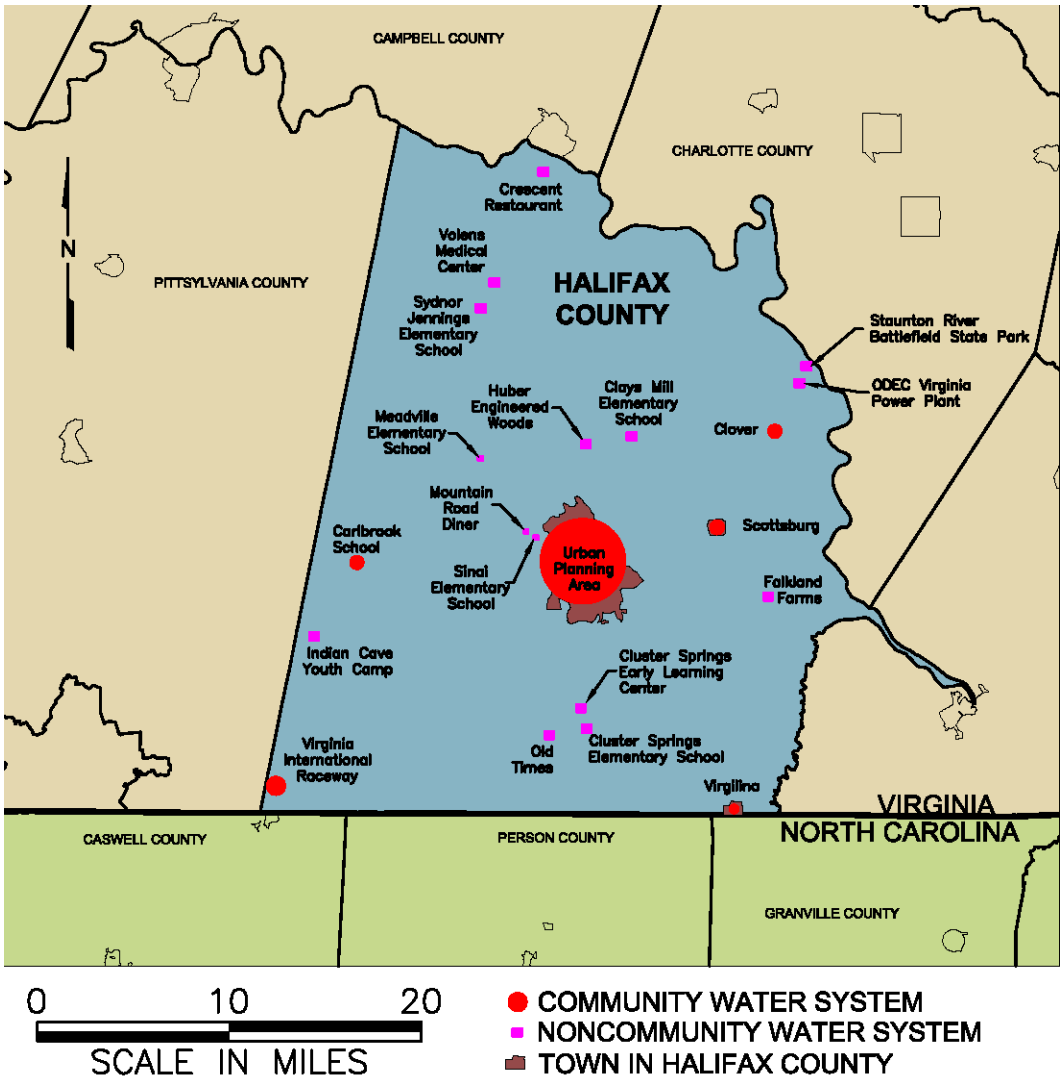
Figure 1 – Halifax County Vicinity Map



B. Existing Water Systems

Water is provided to the citizens of the County through multiple channels; private wells, community systems, and noncommunity systems. Although most of the County is served by private wells, a map of the community water systems and noncommunity water systems is provided in Figure 2. As can be seen in the map, there are six public community water systems; one is owned and operated by the Town of Scottsburg, one is owned and operated by the Town of Virgilina, three are owned and operated by the Halifax County Service Authority (HCSA), which includes the Urban Planning Area System that serves the Town of Halifax, and the Town of South Boston, and one is privately owned and operated by Carlbrook School.

Figure 2 – Halifax County Water Systems



II. (9VAC25-780-70) EXISTING WATER SOURCE INFORMATION

A. Current Information on Existing Water Sources

Data collection and preparation for Section 9VAC25-780-70 was performed by the HCSA during the year 2009. The water production and usage data used in the calculations is from either the year 2007, or 2008, and the census data used in the calculations is from the year 2000.

B. Community Water Systems: Ground Water

Information regarding the physical attributes of wells used in the production of ground water within Halifax County has been collected, and tabulated by the HCSA, in the Department of Environmental Quality's (DEQ) "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70B is included in Appendix A of this report.

C. Community Water Systems: Surface Water – Reservoirs

There are multiple reservoirs within Halifax County, including Kerr Reservior (Buggs Island Lake), Banister Lake, and Conner Lake. However none of the reservoirs are used to obtain surface water for use in a community water system. A printout of table 70C from the "SourceandUseDataSheets.xls" spreadsheet is included in Appendix A.

D. Community Water Systems: Surface Water – Streams

There are two streams that currently have intakes, and can be used as supply for a community water system; the Dan River, and the Banister River. However the Halifax Water Treatment Plant was taken out of use in 2009, and water from the Banister River is not currently used for supply. The DEQ spreadsheet has been completed, and table 70D is included in Appendix A.

E. Self-Supplied Users of Surface Water > than 300,000 Gallons per Month

The only self-supplied user of more than 300,000 gallons per month is the Clover Power Station jointly owned by the Old Dominion Electric Cooperative and Dominion Virginia Power. Information on this site is included in table 70E, 80B6, 80C of the DEQ spreadsheet, and is in Appendix A of this report.

F. Self-Supplied Users of Ground Water > than 300,000 Gallons per Month

Information on self-supplied users that use over 300,000 gallons per month of ground water has been collected, and tabulated. The data is presented in the DEQ "SourceandUseDataSheets" spreadsheet. A printout of table 70F is included in Appendix A of this report.

G. Water Purchased from Other Planning Areas

The Halifax County Regional Planning Area does not currently purchase water from outside of the planning area. This is summarized in Table 70G&H, provided in Appendix A of this report.

H. Water Sold to Other Planning Areas

The Halifax County Regional Planning Area does not currently sell water to areas outside of the planning area. This is summarized in Table 70G&H, provided in Appendix A of this report.

I. Agricultural Users that use > than 300,000 Gallons per Month

Agricultural water use has been gathered for Halifax County by the HCSA, and is presented in table 70I of the DEQ spreadsheet. Table 70I is located in Appendix A of this report.

J. Residences and Businesses that use < than 300,000 Gallons per Month

An estimate of the number of residences and businesses that are self-supplied ground water users has been calculated using table 70J of the DEQ "SourceandUseDataSheets.xls" spreadsheet. Table 70J can be found in Appendix A of this report.

K. Source Water Assessment Plans

There are no known source water assessment plans, or wellhead protection programs for sources of water in Halifax County. The Virginia Department of Health, Office of Drinking Water, has a Source Water Assessment Program, and this program has ranked the probability of water degradation. The list of sources in Halifax County is provided in Table 10 on Page 32.

III. (9VAC25-780-80) EXISTING WATER USE INFORMATION

A. Current Information on Existing Water Uses

Data collection and preparation for Section 9VAC25-780-80 was performed by the HCSA during the year 2009. The water production and usage data used in the calculations is from either the year 2007, or 2008, and the census data used in the calculations is from the year 2000.

B. Community Water Systems

1. Population

   The population of each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B1-3 is included in Appendix A of this report.

2. Connections

   The number of connections in each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B1-3 is included in Appendix A of this report.

3. Daily System Withdrawal

   The average and maximum daily withdrawal for each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B1-3 is included in Appendix A of this report.

4. Yearly and Monthly Water Used

   The average annual and average monthly water use for each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B4 is included in Appendix A of this report.

5. Peak Day Use by Month

   The peak day use for each month for each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B5 is included in Appendix A of this report.

6. Self-Supplied Nonagricultural User > than 300,000 Gallons

   Information on self-supplied, nonagricultural users that use greater than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70E, 80B6, 80C, and table 70F, 80B6, 80C is included in Appendix A of this report.

7. Self-Supplied Agricultural User > than 300,000 Gallons

   Information on self-supplied, agricultural users that use greater than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70I, 80B7, 80D is included in Appendix A of this report.

8. Self-Supplied User < than 300,000 Gallons

   Information on self-supplied users that use less than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70J, 80B8, 80E is included in Appendix A of this report.

9. Disaggregated Water Use

   The disaggregated water use for each community water system is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 80B9 is included in Appendix A of this report.

10. Other Beneficial In-Stream Uses for Surface Waters with an Intake

    There are two rivers that have surface water intakes; the Dan River, and the Banister River, although the Halifax Water Treatment Plant on the Banister River is not currently in use. These two rivers are large enough to support an array of activities beyond domestic drinking supply, including habitat for wildlife, fishing, boating, and swimming. Additionally, both of these rivers have the designation of State Scenic Rivers.

C. Self-Supplied Nonagricultural Users > than 300,000 Gallons per Month

Information on self-supplied, nonagricultural users that use greater than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70E, 80B6, 80C, and table 70F, 80B6, 80C is included in Appendix A of this report.

D. Self-Supplied Agricultural Users > than 300,000 Gallons per Month

Information on self-supplied, agricultural users that use greater than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70I, 80B7, 80D is included in Appendix A of this report.

E. Self-Supplied Users < than 300,000 Gallons per Month

Information on self-supplied users that use less than 300,000 gallons per month is included in the DEQ "SourceandUseDataSheets.xls" spreadsheet. A printout of table 70J, 80B8, 80E is included in Appendix A of this report.

IV. (9VAC25-780-90) EXISTING RESOURCE INFORMATION

A. Existing Geologic, Hydrologic, and Meteorlogical Conditions

1. Geologic Data

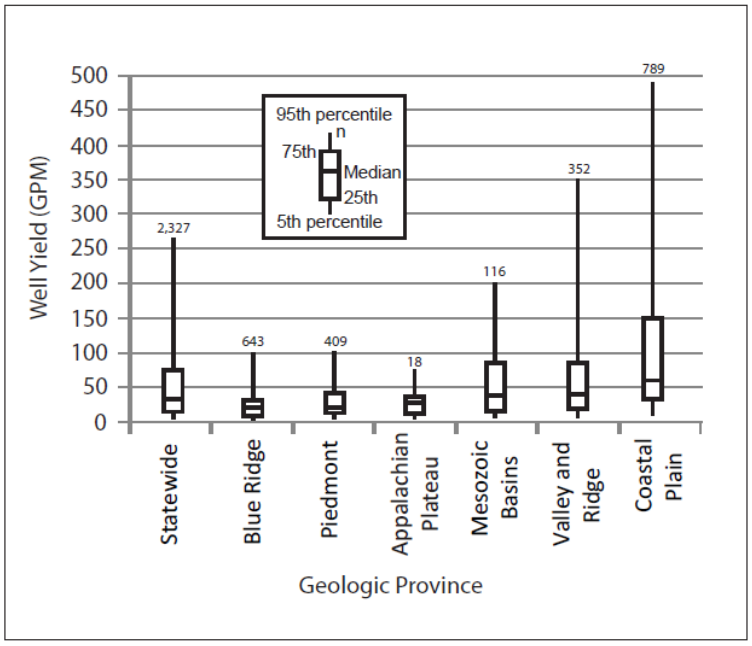
Halifax County is located in the Piedmont province of Virginia. The Piedmont province is the largest physiographic province that exists in Virginia. It is bordered on the east by the Fall Zone, which separates the province from the Coastal Plain province, and on the west by the mountainous Blue Ridge province. The province is characterized by gently rolling topography, deeply weathered bedrock, and few locations of solid rock outcrop. Due to its humid climate, rocks are severely weathered in the Piedmont and bedrock is generally buried under a thick (6-60 ft) layer of saprolite. Outcrops are commonly restricted to stream valleys where saprolite has been removed by erosion. The topography becomes somewhat more rugged with proximity to the Blue Ridge, where local monadnocks of more resistant rock occur.

Hard, crystalline igneous and metamorphic formations dominate this region with some areas of sedimentary rocks which contain saprolite deposits overlying the bedrock. The size and number of fractures and faults in the bedrock which store and transmit ground water decrease with depth, so most significant water supplies are found within a few hundred feet of the surface. In areas such as the Western Piedmont along the base of the Blue Ridge Mountains, localized fracture and fault systems are extensive and large yields of water can be obtained.

The diversity of the subsurface geology of the Piedmont Province produces wide variations in ground water quality and well yields, often resulting in limited water use in many locations. A few areas, for example, have problems with high iron concentrations and acidity. As can be seen in Figure 3, the region's wells yield from nearly zero (gpm) to around 100 (gpm) as well as have a median yield that is nearly the lowest of all seven regions in the state. Because of the range in ground water quality and quantity in this region, as well as the differences in potential for contamination, evaluation and monitoring of well sites is critical in providing clean water in this province. From a wellhead protection standpoint, assumptions about the porosity/permeability of the overlying saprolite may have to be made so that reasonable estimates of wellhead protection areas can be calculated.

Figure 3 – Groundwater Well Yield (GPM) VS Geologic Province

(Provided by Virginia Department of Mines,
Minerals, and Energy's Geology of VA website)



Source: Virginia Department of Mines Minerals and Energy. Online. Available: http://www.dmme.virginia.gov/DMR3/onlinedata.shtml. April 12, 2010.

2. Hydrologic Conditions

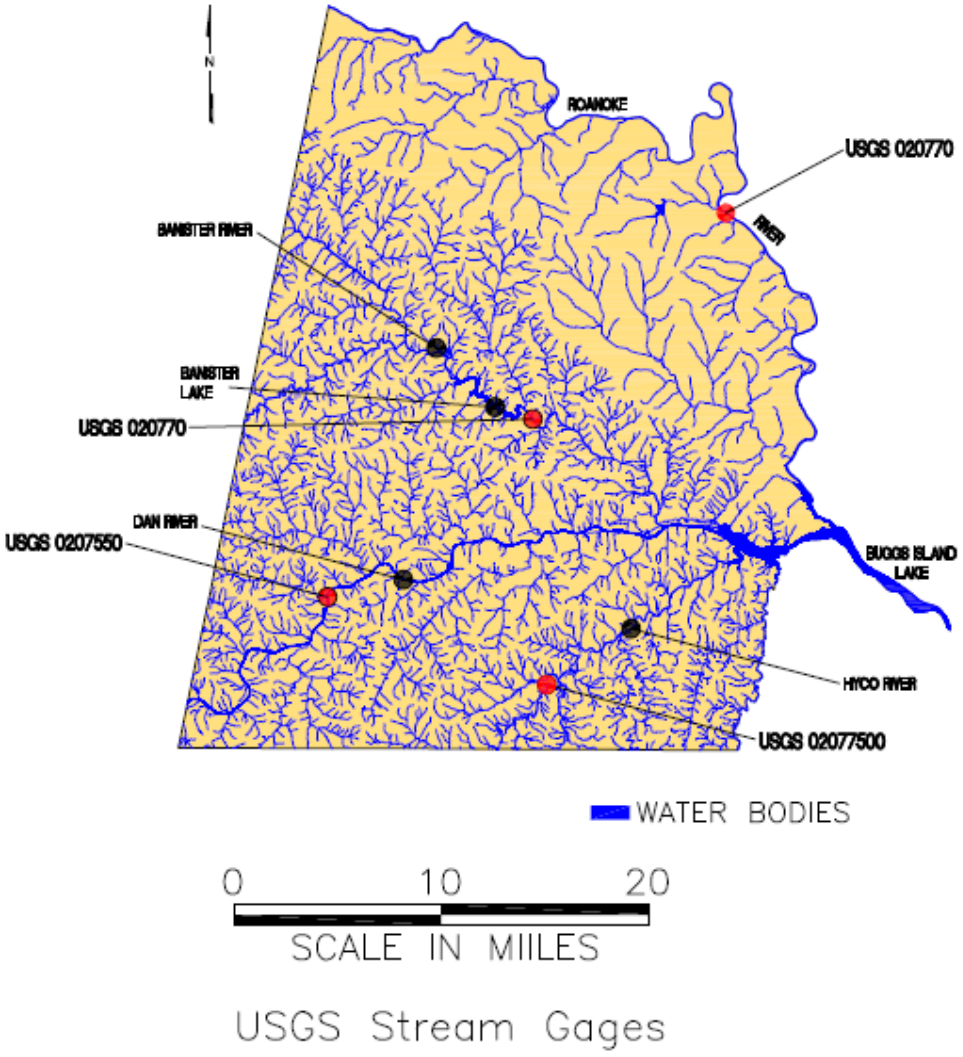
Halifax County lies within the Roanoke watershed and portions of three sub watersheds are within the County. The sub watersheds include the Middle Roanoke (03010102), Lower Dan (03010104), and Banister (03010105). Currently, there are four USGS maintained stream gages within the County's borders, and the statistical data from these sites is presented in the Table 1.

Table 1 – Halifax County, USGS Gauge Stations

USGS Station	02066000		02077000	
Location	Roanoke River at Randolf		Banister River at Halifax	
Hydrologic Unit Code	03010102		03010105	
Latitude (NAD27)	36°54'54"		36°46'35"	
Longitude (NAD27	78°44'28"		78°54'58"	
Drainage Area (Sq. Miles)	2,966		547	
Gage Datum (NGVD29)	307.59		315.54	
Data Range	1877 to Present		1904 to Present	
Annual Mean	2,854	-	500	-
Highest Annual Mean (ft^3/s)	5,152	2002	993	2003
Lowest Annual Mean (ft^3/s)	852	2003	136	2002
Highest Daily Mean (ft^3/s)	78,700	Sep 8, 1996	44,700	Sep 20, 1944
Lowest Daily Mean (ft^3/s)	179	Sep 8, 1965	6.0	Aug 30, 1932
Annual Seven-Day Minimum (ft^3/s)	238	Sep 5, 1965	13	Sep 19, 2007
Maximum Peak Flow (ft^3/s)	89,300	Sep 7, 1996	50,000	Sep 20, 1944
Maximum Peak Stage	34.94	Sep 7, 1996	40.80	Sep 20, 1944
Instantaneous Low Flow (ft^3/s)	176	Sep 8, 1965	6.0	Many Days
Annual Runoff (cfsm)	0.962	-	0.914	-
Annual Runoff (inches)	13.08	-	12.42	-
10 Percent Exceeds (ft^3/s)	5,460	-	937	-
50 Percent Exceeds (ft^3/s)	1,740	-	299	-
90 Percent Exceeds (ft^3/s)	813	-	106	-
USGS Station	02075500		02077500	
Location	Dan River at Paces		Hyco River near Denniston	
Hydrologic Unit Code	03010104		03010104	
Latitude (NAD27)	36°38'32"		36°35'16"	
Longitude (NAD27	79°05'23"		78°53'56"	
Drainage Area (Sq. Miles)	2,587		288	
Gage Datum (NGVD29)	322.48		315.24	
Data Range	1940 to Present		1928 to Present	
Annual Mean	2,708	-	250	-
Highest Annual Mean (ft^3/s)	4,729	2003	776	2003
Lowest Annual Mean (ft^3/s)	872	2002	21.5	2002
Highest Daily Mean (ft^3/s)	63,400	Jun 23, 1972	10,300	Jul 15, 1975
Lowest Daily Mean (ft^3/s)	133	Aug 15, 2002	2.5	Aug 24, 1999
Annual Seven-Day Minimum (ft^3/s)	143	Aug 12, 2002	3.4	Aug 19, 1999
Maximum Peak Flow (ft^3/s)	64,800	Jun 23, 1972	10,800	Jul 15, 1975
Maximum Peak Stage	33.15	Jun 23, 1972	24.27	Jul 15, 1975
Instantaneous Low Flow (ft^3/s)	129	Aug 15, 2002	2.1	Aug 24, 1999
Annual Runoff (cfsm)	1.05	-	0.869	-
Annual Runoff (inches)	14.22	-	11.81	-
10 Percent Exceeds (ft^3/s)	4,860	-	592	-
50 Percent Exceeds (ft^3/s)	1,840	-	66	-
90 Percent Exceeds (ft^3/s)	867	-	19	-

The USGS also maintains a listing of ground water monitoring wells, and according the USGS website, there are no monitoring wells in Halifax County. In addition to the USGS, the DEQ maintains a database of groundwater springs, and groundwater management areas. As of 2008, there were no ground water springs reported and listed on the DEQ's Spring Database, nor were there any ground water management areas listed. A map of all of the USGS Gauge Stations is shown in Figure 4.

Figure 4 - USGS Gauging Stations in Halifax County



3. Meteorological Data

Virginia is broken into five distinctive climate regions that are very similar to its 5 geological regions. Halifax County lies in the Piedmont climate region, which includes much of central Virginia. This region is known to have average January temperatures of 47 (F) as the daily high and 27 (F) as the daily low. The July average daily high temperature is 88 (F) while the average daily low is 68 (F). The climate region has a January average precipitation of 3.24 inches, a July average precipitation of 4.96 inches, and an annual average precipitation of 43.37 inches. More specifically, Halifax has had a total of 7 of its own weather stations, as seen in Table 2, that have allowed weather data to be recorded for different areas of the county since 1929. The data from Halifax 2 SSE has been compiled for the period of record 1971 - 2001 and monthly and annual averages have been calculated as seen in Table 3.

Table 2 – NOAA Weather Stations in Halifax, VA.

Station Name	Period of Record		COOP ID	Type
Halifax 1 N	1-Aug-48	31-Jul-66	443690	Land Surface COOP
Halifax 2 SSE	1-Jan-63	31-May-77	443695	Land Surface COOP
Halifax 5 ENE	1-Jul-55	31-Jan-63	443695	Land Surface COOP
Paces River	1-Oct-92	1-Oct-09	446463	Land Surface COOP
South Boston	1-Feb-29	Present	447925	Land Surface COOP
South Boston River	19-Feb-92	1-Oct-09	447929	Land Surface COOP
Volens	12-Apr-77	30-Nov-09	448751	Land Surface COOP

Table 3 – 1971-2000 Monthly Climate Summary
Station: Halifax 2 SSE, VA.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	48.3	52.6	60.8	69.1	75.6	82.2	85.6	85.2	78.9	69.3	56.8	50.1	68.1
Average Min. Temperature (F)	29.4	31.0	38.1	44.2	53.4	61.8	65.5	64.8	58.8	47.6	35.8	31.5	47.0
Average Total Precipitation (in.)	3.51	2.80	4.09	2.96	4.21	4.10	4.17	4.82	6.17	4.52	3.02	3.81	48.18

Source: The Southeast Regional Climate Center. Online. Available: http://www.sercc.com/cgi-bin/sercc/cliMAIN.pl?va3695. April 12, 2010.

B. Existing Environmental Conditions

1. State or Federal Listed Threatened or Endangered Species or Habitats of Concern

Listings of State and Federal threatened or endangered species and habitats are maintained by the Virginia Department of Conservation and Recreation (DCR) as part of the Natural Heritage Program, and the Virginia Department of Game and Inland Fisheries (DGIF) as part of the Fish and Wildlife Information Service. The DCR and DGIF host these databases on their websites, which are respectively:

http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

http://vafwis.org/fwis/

Results from searching these two databases indicate that there are threatened and endangered species in Halifax County. Species, and habitats indicated in the database are provided in Table 4 and Table 5 on the following pages.

Many of the species that are either threatened or endangered are aquatic or related to aquatic habitats. According to Virginia's Wildlife Action Plan, the main cause of the aquatic degradation is pollution, sedimentation, and nutrient overloads. In order to protect these threatened and endangered species it is of utmost importance that measures are taken to protect groundwater, streams, lakes and all other water bodies. It is easy to discount the importance of some of these species, but as the Action Plan points out, many are dependent on one another. The extinction of one species could cause a complete restructuring of the habitat in which it lived.

The importance of the threatened or endangered species in the context of maintaining a viable water supply, is that these species are a bellwether for the overall health of the habitat. If these species are currently present and disappear from the habitat, it could be an indication that the habitat is not clean enough to support a viable community. Which may mean additional levels of treatment could be needed to clean the water to levels sufficient for public consumption. From a practical standpoint, the presence of threatened and endangered species in an area may also create impedance to access the County's water supply, due to the requirements to identify and mitigate potential conflicts. While this should not be a barrier that cannot be overcome, it will add time and cost to projects.

Table 4 – DCR Endangered and Threatened Species in Halifax County

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	Last Year Observed
BIRDS						
Haliaeetus leucocephalus	Bald Eagle	G5	S2S3B,S3N		LT	2002
BIVALVIA (MUSSELS)						
Elliptio roanokensis	Roanoke Slabshell	G3	S1		SC	2001
Fusconaia masoni	Atlantic Pigtoe	G2	S2	SOC	LT	2007
Lasmigona subviridis	Green Floater	G3	S2		LT	1998
COLEOPTERA (BEETLES)						
Phloeoxena signata	A Ground Beetle	G3?	S1S3			1997
FISH						
Etheostoma collis	Carolina Darter	G3	S2		LT	1987
Fundulus rathbuni	Speckled Killifish	G4	S2		SC	1998
Notropis alborus	Whitemouth Shiner	G4	S1		LT	1987
LEPIDOPTERA (BUTTERFLIES & MOTHS)						
Zale curema	A Noctuid Moth	G3G4	S1S3			1998
REPTILES						
Tantilla coronata	Southeastern Crowned Snake	G5	S2S3			1983
VASCULAR PLANTS						
Anemone berlandieri	Southern Thimble-weed	G4?	S1			2005
Baptisia cinerea	Hairy False-indigo	G3G4	SH			1969
Carex lupuliformis	False Hop Sedge	G4	S2			1998
Carya carolinae-septentrionalis	Southern Shagbark Hickory	G5?	S1			2003
Cirsium carolinianum	Carolina Thistle	G5	S1			2009
Dichanthelium annulum		GNR	S2			2008
Echinacea laevigata	Smooth Coneflower	G2G3	S2	LE	LT	2009
Enemion biternatum	False Rue-anemone	G5	S1			1997
Eryngium yuccifolium var. yuccifolium	Rattlesnake-master	G5T5	S2			2007
Hemicarpha micrantha	Dwarf Bulrush	G5	S1			1998
Hypericum lloydii	Lloyd St. John's-wort	G4?	SH			1967
Isoetes hyemalis	A Quillwort	G2G3	S1?	SOC		1997
Isoetes virginica	Virginia Quillwort	G1	S1?	SOC		1998

Table 4 – DCR Endangered and Threatened Species in Halifax County (Continued)

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	Last Year Observed
VASCULAR PLANTS (CONTINUED)						
Lotus helleri	Carolina Prairie-trefoil	G5T3	S1			1999
Lythrum alatum	Winged-loosestrife	G5	S2			2009
Marshallia obovata var. obovata	Obovate Marshallia	G4G5T3T5	S2			2009
Marshallia sp. 1	Oak Barrens Barbara's-buttons	G1	S1	SOC		2009
Nestronia umbellula	Nestronia	G4	S1		LE	1990
Paspalum dissectum	Walter Paspalum	G4?	S2			1998
Phacelia covillei	Buttercup scorpionweed	G3	S1			1997
Porteranthus stipulatus	American Ipecac	G5	S1			2009
Pseudognaphalium helleri	Catfoot	G4G5	S1			1997
Rhynchospora harveyi	Harvey Beakrush	G4	S1			2008
Rorippa sessiliflora	Stalkless Yellowcress	G5	S1			1998
Sagittaria calycina var. calycina	Long-lobe Arrowhead	G5T5?	S1			1998
Scutellaria parvula var. parvula	Small Skullcap	G4T4	S1			1973
Solidago patula var. strictula	Round-leaved Goldenrod	G5T5	S1			1986
Stachys sp. 1	Yadkin Hedgenettle	GNR	S1			2008
Triadenum tubulosum	Large Marsh St. John's-wort	G4?	S1			1998
Trifolium reflexum	Buffalo Clover	G3G4	S1			1997
COMMUNITIES						
Natural Community	Basic Mesic Forest	G4G5	SNR			2002
Natural Community	Basic Oak - Hickory Forest	G3G4	SNR			2000
Natural Community	Coastal Plain / Piedmont Swamp Forest	G3?	SNR			1998
Natural Community	Low-Elevation Basic Outcrop Barren	G2	SNR			2002
Natural Community	Piedmont / Coastal Plain Oak - Beech / Heath Forest	G2G3	SNR			1998
Natural Community	Piedmont / Mountain Floodplain Forest	G3	SNR			1998
Natural Community	Piedmont / Mountain Swamp Forest	G4	SNR			1998
Natural Community	Piedmont Hardpan Forest	G2G3	SNR			2003
Natural Community	Sand / Gravel / Mud Bar/Shore	G3	SNR			1998
Natural Community	Semipermanent Impoundment	G5	SNR			1998

Global Rank: G1: Critically Imperiled, G2: Imperiled, G3: Vulnerable, G4: Apparently Secure, G5: Secure, GX: Presumed Extinct, Q or ?: Inexact or Uncertain, T: Status is for subspecies

State Rank: S1: Critically Imperiled, S2: Imperiled, S3: Vulnerable, S4: Apparently Secure, S5: Secure, S#B: Breeding Status, S#?: Inexact or Uncertain, SH Possibly Extirpated, SNR: Unranked

Federal Status: LE: Listed Endangered, LT: Listed Threatened, PE: Proposed Endangered, PT: Proposed Threatened, C: Candidate, E(S/A): Treat as Endangered, T(S/A): Treat as Threatened, SOC: Species of Concern

State Legal Status: LE: Listed Endangered, LT: Listed Threatened, PE: Proposed Endangered, PT: Proposed Threatened, C: Candidate, SOC: Species of Concern

Table 5 – DGIF Endangered and Threatened Species in Halifax County

BOVA Code	Status*	Tier**	Common Name	Scientific Name
040129	ST	I	Sandpiper, upland	*Bartramia longicauda*
040293	ST	I	Shrike, loggerhead	*Lanius ludovicianus*
040379	ST	I	Sparrow, Henslow's	*Ammodramus henslowii*
010353	ST	II	Darter, Carolina	*Etheostoma collis*
040093	FSST	II	Eagle, bald	*Haliaeetus leucocephalus*
010070	ST	IV	Shiner, whitemouth	*Notropis alborus*
040292	ST		Shrike, migrant loggerhead	*Lanius ludovicianus migrans*
010110	FS	III	Jumprock, bigeye	*Moxostoma ariommum*
060029	FSSS	III	Lance, yellow	*Elliptio lanceolata*
010174	SS	II	Bass, Roanoke	*Ambloplites cavifrons*
040266	SS	II	Wren, winter	*Troglodytes troglodytes*
040094	SS	III	Harrier, northern	*Circus cyaneus*
040034	SS	III	Heron, tricolored	*Egretta tricolor*
040036	SS	III	Night-heron, yellow-crowned	*Nyctanassa violacea violacea*
040204	SS	III	Owl, barn	*Tyto alba pratincola*
040270	SS	III	Wren, sedge	*Cistothorus platensis*
010394	SS	IV	Killifish, speckled	*Fundulus rathbuni*
040264	SS	IV	Creeper, brown	*Certhia americana*
040180	SS	IV	Tern, Forster's	*Sterna forsteri*
040364	SS		Dickcissel	*Spiza americana*
040032	SS		Egret, great	*Ardea alba egretta*
040366	SS		Finch, purple	*Carpodacus purpureus*
040285	SS		Kinglet, golden-crowned	*Regulus satrapa*
040112	SS		Moorhen, common	*Gallinula chloropus cachinnans*
040262	SS		Nuthatch, red-breasted	*Sitta canadensis*
040189	SS		Tern, Caspian	*Sterna caspia*
040278	SS		Thrush, hermit	*Catharus guttatus*
040314	SS		Warbler, magnolia	*Dendroica magnolia*
050045	SS		Otter, northern river	*Lontra canadensis lataxina*
040225		I	Sapsucker, yellow-bellied	*Sphyrapicus varius*
040319		I	Warbler, black-throated green	*Dendroica virens*

Status: FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FS=Federal Species of Concern; SS=State Special Concern

Tier: I=Critical Conservation Need; II=Very High Conservation Need; III=High Conservation Need; IV=Moderate Conservation Need

2. Anadromous, Trout and Other Significant Fisheries

The Virginia Department of Game and Inland Fisheries, Geographic Information System, contains data sets for “Anadromous Fish Use Areas”, and “Cold Water Streams Survey (CWSS) – trout streams”. A review of these data sets on February 17, 2010 indicates that there are no anadromous fish areas, or trout streams in Halifax County.

However, there are other known fish species in the County. From the DGIF, Fish and Wildlife Information Service, there are 66 species, which are listed in Table 6.

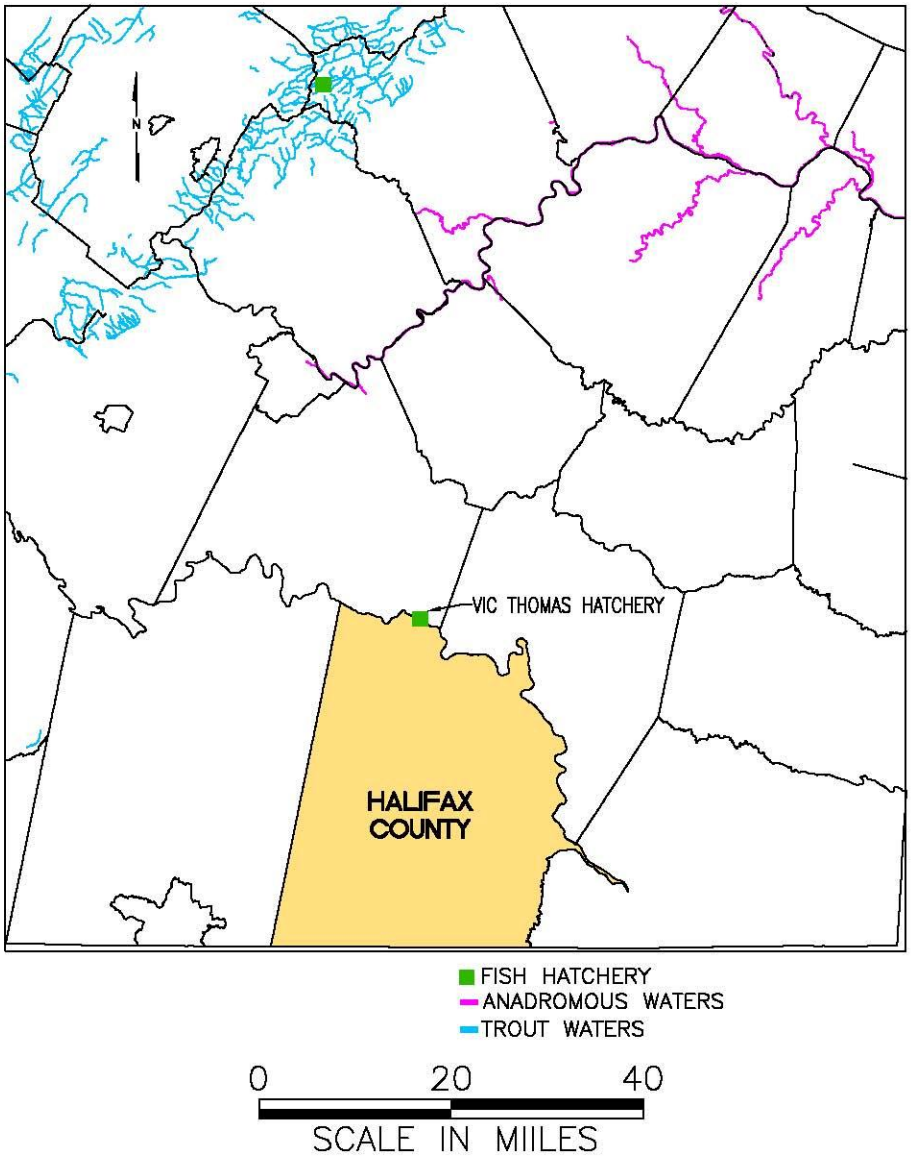
Table 6 – DGIF Listed Fish Species of Halifax County

Species Code	Common Name	Scientific Name
010353	Darter, Carolina	*Etheostoma collis*
010070	Shiner, whitemouth	*Notropis alborus*
010110	Jumprock, bigeye	*Moxostoma ariommum*
010174	Bass, Roanoke	*Ambloplites cavifrons*
010394	Killifish, speckled	*Fundulus rathbuni*
010038	Alewife	*Alosa pseudoharengus*
010389	Bullhead, snail	*Ameiurus brunneus*
010200	Darter, riverweed	*Etheostoma podostemone*
010131	Eel, American	*Anguilla rostrata*
010040	Shad, American	*Alosa sapidissima*
010109	Sucker, Roanoke hog	*Hypentelium roanokense*
010188	Bass, largemouth	*Micropterus salmoides*
010186	Bass, smallmouth	*Micropterus dolomieu*
010187	Bass, spotted	*Micropterus punctulatus*
010168	Bass, striped	*Morone saxatilis*
010183	Bluegill	*Lepomis macrochirus*
010123	Bullhead, brown	*Ameiurus nebulosus*
010124	Bullhead, flat	*Ameiurus platycephalus*
010122	Bullhead, yellow	*Ameiurus natalis*
010062	Carp, common	*Cyprinus carpio*
010125	Catfish, channel	*Ictalurus punctatus*
010130	Catfish, flathead	*Pylodictis olivaris*
010120	Catfish, white	*Ameiurus catus*
010066	Chub, bluehead	*Nocomis leptocephalus*
010103	Chub, creek	*Semotilus atromaculatus*
010106	Chubsucker, creek	*Erimyzon oblongus*
010190	Crappie, black	*Pomoxis nigromaculatus*
010189	Crappie, white	*Pomoxis annularis*
010060	Dace, mountain redbelly	*Phoxinus oreas*
010193	Darter, fantail	*Etheostoma flabellare*
010204	Darter, glassy	*Etheostoma vitreum*
010198	Darter, johnny	*Etheostoma nigrum*
010213	Darter, shield	*Percina peltata*

Species Code	Common Name	Scientific Name
010033	Gar, longnose	*Lepisosteus osseus*
010045	Herring, blueback	*Alosa aestivalis*
010112	Jumprock, black	*Moxostoma cervinum*
010129	Madtom, margined	*Noturus insignis*
010148	Mosquitofish, eastern	*Gambusia holbrooki*
010206	Perch, yellow	*Perca flavescens*
010056	Pickerel, chain	*Esox niger*
010055	Pickerel, redfin	*Esox americanus americanus*
010182	Pumpkinseed	*Lepomis gibbosus*
010374	Quillback	*Carpiodes cyprinus*
010114	Redhorse, golden	*Moxostoma erythrurum*
010116	Redhorse, shorthead	*Moxostoma macrolepidotum*
010387	Redhorse, silver	*Moxostoma anisurum*
010113	Redhorse, v-lip	*Moxostoma pappillosum*
010041	Shad, gizzard	*Dorosoma cepedianum*
010042	Shad, threadfin	*Dorosoma petenense*
010072	Shiner, comely	*Notropis amoenus*
010078	Shiner, crescent	*Luxilus cerasinus*
010068	Shiner, golden	*Notemigonus crysoleucas*
010071	Shiner, highfin	*Notropis altipinnis*
010074	Shiner, rosefin	*Lythrurus ardens*
010073	Shiner, satinfin	*Cyprinella analostana*
010082	Shiner, spottail	*Notropis hudsonius*
010086	Shiner, swallowtail	*Notropis procne*
010069	Shiner, white	*Luxilus albeolus*
010058	Stoneroller, central	*Campostoma anomalum*
010108	Sucker, northern hog	*Hypentelium nigricans*
010105	Sucker, white	*Catostomus commersoni*
010181	Sunfish, green	*Lepomis cyanellus*
010180	Sunfish, redbreast	*Lepomis auritus*
010185	Sunfish, redear	*Lepomis microlophus*
010216	Walleye	*Sander vitreus vitreus*
010177	Warmouth	*Lepomis gulosus*

In addition to the fish species located in Halifax County, the DGIF operates the Vic Thomas fish hatchery in Campbell County. Although the hatchery is outside of the Halifax County boundary, the hatchery is located along the Roanoke River, which is a shared County line. Figure 5, shows the location of the Vic Thomas fish hatchery, anadromous fish waters and trout streams. As seen in the figure, there are no anadromous fish waters, or trout streams in the County.

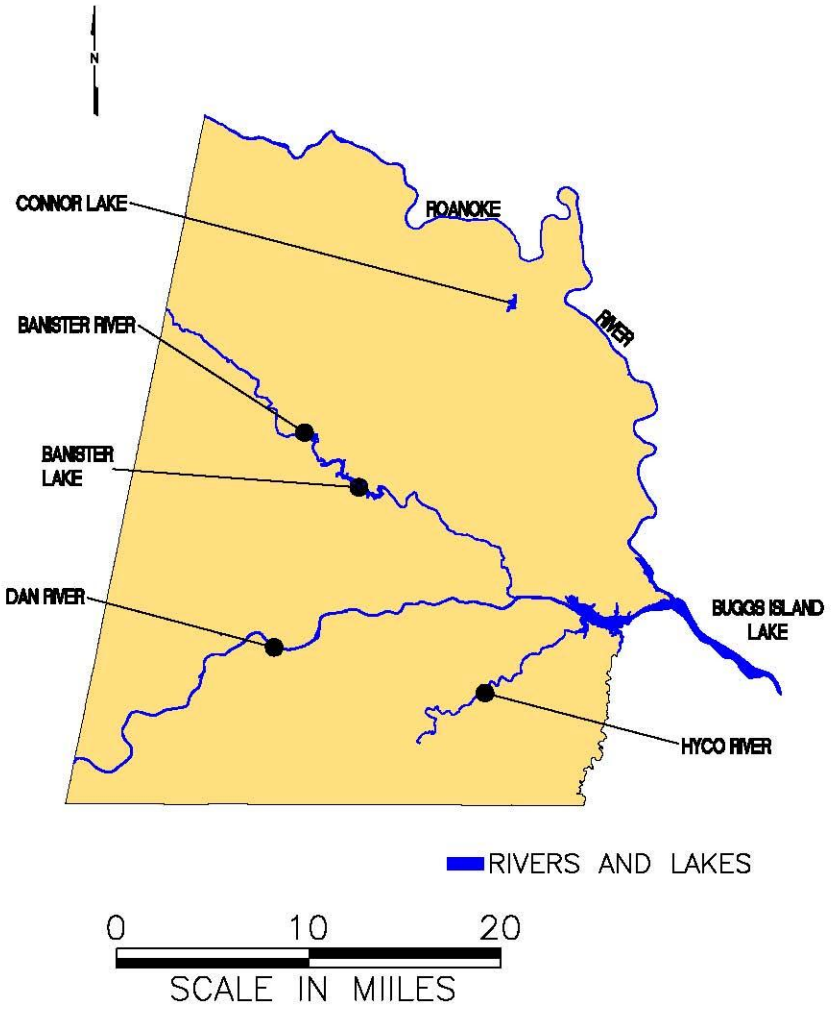
Figure 5 – Fisheries of Halifax County



3. River Segments that have Recreational Significance Including State Scenic River Status

There are four river segments in the County with recreational significance. These segments include the Roanoke River, which is also known as the Staunton River, the Banister River, the Dan River, and the Hyco River. There are also 3 lakes in the County with recreational significance. These lakes include, Buggs Island Lake, which is also known as Kerr Reservoir, Banister Lake, and Connor Lake. These significant river segments can be seen in Figure 6.

Figure 6 – Recreational Significant Water of Halifax County



a. Scenic Rivers

The Virginia Scenic Rivers Program administered by the Department of Conservation and Recreation, is a management tool used to encourage protection and preservation of scenic rivers inside the Commonwealth of Virginia. Currently there is one river segment in the County that has been designated as a scenic river, the Roanoke River (Staunton River) between the crossing of Route 761, and the crossing of Route 360. In addition, there are three other river segments under review. These are the Roanoke River between the intersection of Route 360 to the Staunton River State Park which has been evaluated, and determined to be worthy of designation, but has not yet been accepted into the program, and both the Banister River the Dan River, which have been identified as worthy of additional study.

b. Fishing

The opportunity for fishing is available in all waters of the County. However, public access is limited to many waterways. The most readily accessible waters for fishing include the Dan River, Staunton River, Lake Conner, and Buggs Island Lake.

c. Boating

Recreational boating is dependent on access to water. Both the DGIF and DCR maintain boat ramps within the County. Ramps with direct access to rivers can be found on the Dan River in South Boston, on the Hyco River in Hyco, on the Staunton River in Clover, and Watkins Bridge. Ramps with access to lakes can be found at Conner Lake, and Buggs island Lake at the Staunton River State Park.

4. Sites of Historic or Archaeological Significance

The Virginia Department of Historic Resources (DHR) maintains listings of significant historical landmarks in the State as part of the Virginia Landmarks Register. The register was last updated on December 17, 2009 by DHR, and January 21, 2010 by NPS and the register indicates that there are 29 sites within the County. These historic places are listed in Table 7.

Table 7 – Virginia Landmarks Register for Halifax County

PROPERTY	File #
Bowling Eldridge House	009-5283
Cat Rock Sluice of the Roanoke Navigation (See Campbell County)	015-0217
Berry Hill	041-0004
Black Walnut	041-0006
Brooklyn Store	041-0007
Carter's Tavern	041-0008
Wiley's Tavern Archaeological Site (44HA36)	041-0039
Redfield (and kitchen)	041-0047
Seaton	041-0050
Tarover	041-0053
DeJarnette's Tavern	041-0067
Fourqurean House (Little Plantation)	041-0073
Staunton River State Park (see also MPS 134-5088)	041-0100
Glennmary	041-0104
Indian Jim's Cave Site (44HA18)	041-0106
Buckshoal Farm	041-0108
Old Providence Presbyterian Church	041-0113
Brandon Plantation	041-0157
Brooklyn Tobacco Factory	041-0259
Pleasant Grove	041-5033
Carlbrook	041-5034
The Cove	041-5086
Staunton River Bridge Fortification at Fort Hill (44HA0096)	041-5276
Reedy Creek Site (44HA22)	130-0003
South Boston Historic District	130-0006
E. L. Evans House	130-0006-0407
Halifax County Courthouse	230-0077
Mountain Road Historic District	230-0078
Town of Halifax Court House Historic District	230-5001

5. Unusual Geologic Formations or Special Soil Types

The United States Department of Agriculture, Natural Resources Conservation Service (NRCS) published a Soil Survey of Halifax County and South Boston in 2009, which is an update to the 1938 Soil Survey. According to the NRCS, the County is completely within the Piedmont physiographic province, and the land features are typical of a moderately high plateau. Elevations in the County range between 600 and 320 feet above sea level.

The NRCS lists 87 soil classifications in Halifax County. Of the 87 soil types, 11 soil types dominate the landscape, and by area cover 60% of the County's total land. Figure 7, shows the soil type distribution within the County, and Table 8 lists the 11 largest soil type components. There is no one soil type that could be called the predominant soil for the whole county.

The soil with largest percentage by area in the county is Clifford sandy loam and it covers only 8.3 percent of the county. This soil type normally exists in ridges that have a general convex shape from summit of the ridge to the foot of the ridge and is normally on a slope from 2 to 8 percent. On average, there is at least 80 inches of soil before a restrictive feature is present. Therefore, roots and water can freely move through the soil for 80 or more inches of depth before hitting a layer of bedrock, cemented soil layers or dense soil layers that will significantly impede their movement. The typical profile for this soil type consists of sandy loam from 0 to 6 inches, clay from 6 to 55 inches, and loam from 55 to 65 inches. The soil is a well drained soil with the water table more than 80 inches deep. This soil is also considered prime farmland by the USDA Soil Survey.

It is not anticipated that any of the geologic formations or soil types in the County would present any direct impacts to the quality of water. However, large portions of the County are considered prime farmland, and the act of farming can reduce the quality of surface water. This may come from soil erosion, due to tilling the soil or from grazing animals, and excess runoff from fertilizer.

Figure 7 – Soil of Halifax County

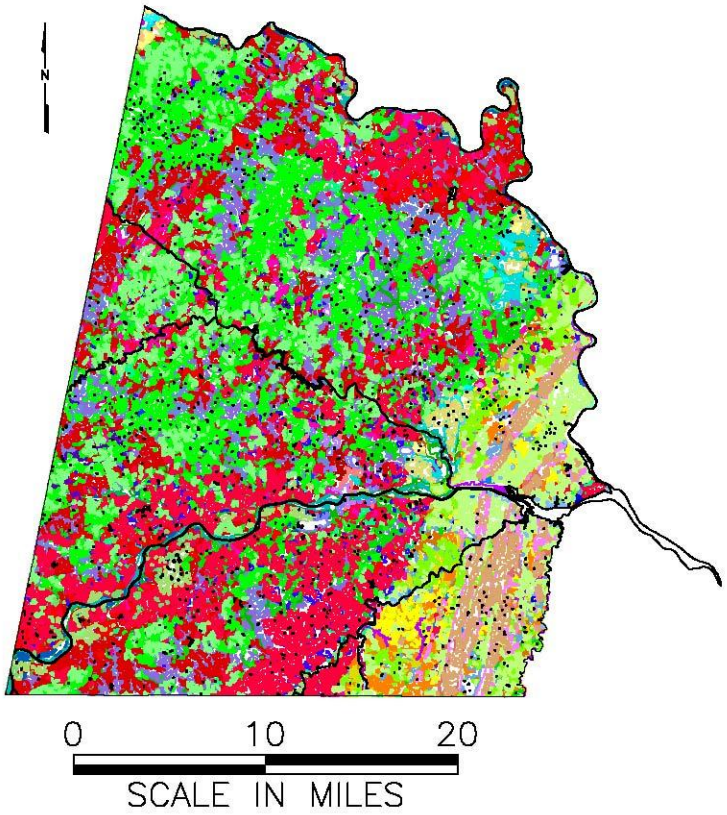


Table 8 – Halifax County's Largest Soil Type by Area

Type	Name	Acres	Percent of County
8B	Clifford sandy loam, 2 to 8 percent slopes	44,186	8.3
8C	Clifford sandy loam, 8 to 15 percent slopes	37,993	7.2
9B3	Clifford clay loam, 2 to 8 percent slopes, severely eroded	31,798	6.0
9BC	Clifford clay loam, 8 to 15 percent slopes, severely eroded	23,314	4.4
14A	Codorus and Hatboro soils, 0 to 2 percent slopes, frequently flooded	22,831	4.3
21D	Fairview sandy loam, 15 to 25 percent slopes	36,450	6.9
24B	Halifax sandy loam, 2 to 8 percent slopes	12,109	2.3
36B	Nathalie sandy loam, 2 to 8 percent slopes	28,105	5.3
36C	Nathalie sandy loam, 8 to 15 percent slopes	42,563	8.0
40B	Rasalo-Orange complex, 2 to 8 percent slopes	12,055	2.3
43C	Spriggs-Rasalo complex, 8 to 15 percent slopes	26,631	5.0

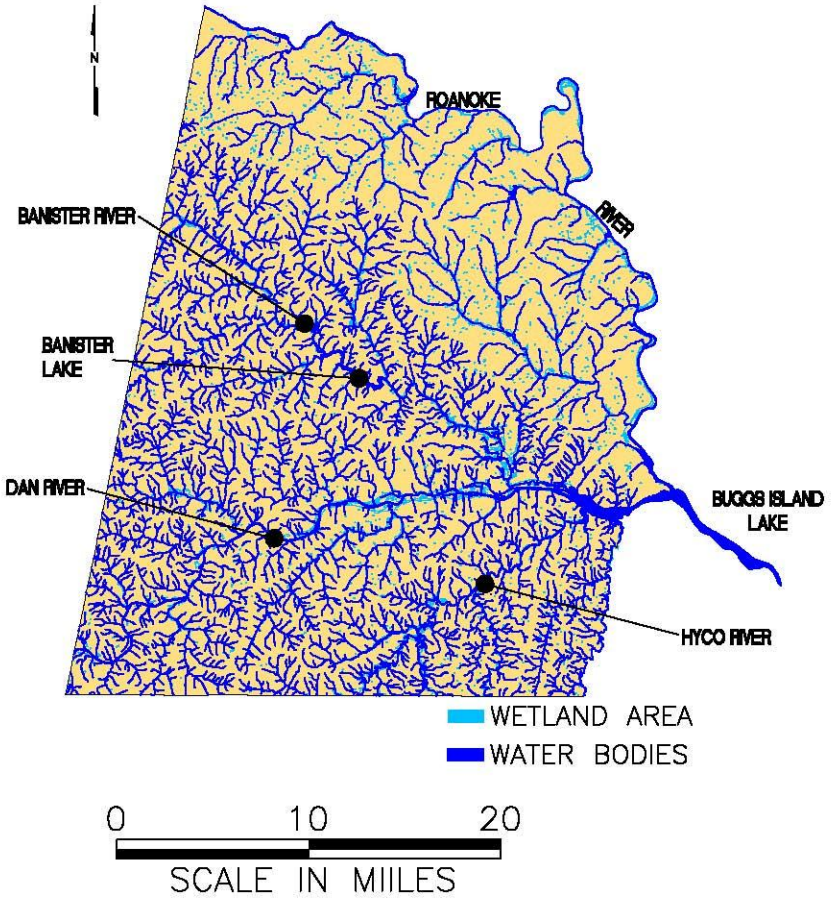
6. Wetlands

The Virginia Department of Environmental Quality (DEQ), Office of Wetlands and Water Protection (OWWP), is tasked with protecting wetlands and streams in the State of Virginia. The DEQ OWWP defines a wetland as an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

The United States Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory (NWI), which is a geospatial listing of areas where wetlands may exist. The NWI wetland data has been downloaded, and mapped for the County in Figure 8. However, wetlands are site specific, and sites must be field verified for the presence of wetland hydrology, hydric soils, and a prevalence of wetland vegetation to determine a classification as a wetland.

County wetlands provide a significant benefit to the County's water supply. Water that enters the wetland from ground runoff slows down and allows suspended particles to settle, while at the same time the plants and microbes that live in the wetland feed off nutrients suspended in the water, which removes the contaminants from the water. Wetland plants take in nitrogen, phosphorous, and other heavy metals, which become deposited in the mud. Wetlands reduce the impacts of flooding by slowing runoff and detaining rain waters. Additionally, wetlands provide groundwater recharge, and are potential habitats for a number of species.

Figure 8 – Wetlands of Halifax County



7. Riparian Buffers, and Conservation Easements

Virginia's Wildlife Action Plan identified 925 species of wildlife in the state as rare or at-risk. Over half of those species are aquatic or have direct aquatic influence in some stage of their life. The most abundant habitat for these species is Virginia's rivers, creeks, and streams. To protect and restore the much important biological diversity that exists in the Commonwealth, the Virginia Department of Game and Inland Fisheries (VDGIF) is providing financial and technical assistance to qualifying landowners through the Landowner Incentive Program (LIP).

VDGIF's primary focus is stream restoration within selected watersheds in central and western Virginia where most of the rare, aquatic species occur. However, rare species can be found in other parts of Virginia in numerous habitats including caves, wetlands, dunes, and other unique places. Landowners with these habitats existing on their property are also part of Virginia's LIP plan. VDGIF offers payment for 75% of the total project cost on a reimbursement basis. Engineering assistance along with help in acquisition of needed permits are both benefits of the LIP program. Landowners are responsible for 25% of the project cost, but in-kind services can be used as match. As can be seen in Figure 9, parts of the Roanoke River Basin in Halifax County are eligible to participate in the LIP program.

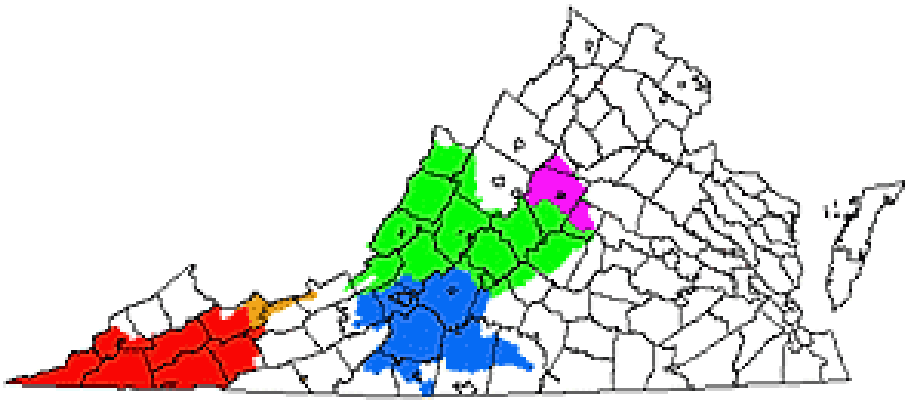
One of the main focuses of the LIP program is the use of Riparian Forrest Buffers. Through case studies and thorough research, VDGIF has proven the many benefits of Riparian Forrest Buffers. Due to their proximity to water, riparian forest buffers support a greater diversity of wildlife than nearly all non-aquatic areas or upland forests. Forested riparian corridors function as connectors between isolated blocks of forested habitat. Riparian forests are often surrounded by low-quality wildlife habitats and therefore support higher densities and diversities of migratory birds. In agricultural areas where extensive forests are not present, riparian forests provide critical habitat and may be the only edge cover available.

Not only do riparian forested buffers have wildlife related benefits, but they are also very beneficial in improving water quality. Studies have shown that riparian forests as narrow as 50 feet in width can completely remove excess nitrogen in runoff as it moves from fertilized fields through the buffer to the adjacent stream. These forested areas limit nutrient inputs into streams by filtering out eroded sediments and phosphorus. Tree roots help stabilize stream banks by holding soil in place. Riparian forests also lower flow velocities, causing sediment to settle out. The most important role of the riparian forest is what it does with the filtered out sediments that would be deemed waste material in most manmade filters. The woody plants naturally uptake most of the sediments and store them in their woody structure.

Another viable key to Virginia’s efforts in land conservation are the conservation easement programs that are currently available to land

owners. By providing tax incentives as well as other financial benefits, Virginia has created a very attractive way for landowners to make a lasting effect on conserving the states landscapes. Table 9 (below) lists the conservation land, both state and private, that currently exists in Halifax County.

Figure 9 – VDGIF LIP Regions



- The **Upper Tennessee River Basin** including the Powell, Clinch, and Forks of the Holston Rivers and all tributaries
- The **New River Basin** including the Bluestone & New Rivers and Wolf Creek and all tributaries
- The **Roanoke River Basin** including the Dan, Smith, Pigg and Roanoke Rivers and all tributaries
- The **Upper James River Basin** including the James River and all tributaries upstream of the Rivanna River
- The **Rivanna River Basin** including the Forks of Rivanna Rivers and all tributaries

Source: VDGIF, Landowner Incentive Program. Online. Available: http://www.dgif.virginia.gov/habitat/lip/#where. April 14, 2010.

Table 9 – Halifax County Conservation Lands

Name	Type	Agency	Acres
CREP Easement	Conservation Easement	VA DCR	170
CREP Easement	Conservation Easement	VA DCR	34
CREP Easement	Conservation Easement	VA DCR	101
CREP Easement	Conservation Easement	VA DCR	124
CREP Easement	Conservation Easement	VA DCR	4
CREP Easement	Conservation Easement	VA DCR	48
CREP Easement	Conservation Easement	VA DCR	4
CREP Easement	Conservation Easement	VA DCR	5
DOF Easement	Conservation Easement	VA Dept of Forestry	1,137
HAL-VOF-1057	Conservation Easement	VA Outdoors Foundation	1,023
HAL-VOF-2510	Conservation Easement	VA Outdoors Foundation	432
HAL-VOF-2530	Conservation Easement	VA Outdoors Foundation	322
HAL-VOF-2549	Conservation Easement	VA Outdoors Foundation	131
HAL-VOF-2557	Conservation Easement	VA Outdoors Foundation	110
HAL-VOF-2558	Conservation Easement	VA Outdoors Foundation	249
HAL-VOF-2750	Conservation Easement	VA Outdoors Foundation	401
HAL-VOF-2753	Conservation Easement	VA Outdoors Foundation	300
VA DHR Conservation Easement	Conservation Easement	VA Dept of Historic Resources	3
WBWF Easement	Conservation Easement	Ward Burton Wildlife Foundation	357
WBWF Preserve	Conservation Easement	Ward Burton Wildlife Foundation	105
DOF Easement	DOF Easement	VA Dept of Forestry	200
Banister River North Unit	Federal Wildlife Management Area	US Army Corps of Engineers	534
Banister River South Unit	Federal Wildlife Management Area	US Army Corps of Engineers	760
Buffalo on the Staunton	Federal Wildlife Management Area	US Army Corps of Engineers	430
Clover	Federal Wildlife Management Area	US Army Corps of Engineers	283
Dan River WMA	Federal Wildlife Management Area	US Army Corps of Engineers	832
Lawsons Creek WMA	Federal Wildlife Management Area	US Army Corps of Engineers	375
Perrin Creek	Federal Wildlife Management Area	US Army Corps of Engineers	533
Wolf Trap WMA	Federal Wildlife Management Area	US Army Corps of Engineers	913
Buggs Island Lake	Reservoir	US Army Corps of Engineers	33,976
John H. Kerr Reservoir	Reservoir	US Army Corps of Engineers	46,383
Difficult Creek	State Natural Area Preserve	VA DCR	819
Staunton River Battlefield State Park	State Park	VA DCR	345
Staunton River State Park	State Park	VA DCR	2,340
		Total Acres	93,783

NOTE: Acreage amounts reflect the total acreage values for all lands that intersect Halifax County; therefore, some acreage totals may appear inflated. Acreage does include water bodies.

Source: DCR, Land Conservation Data Explorer. Online Available: http://www.vaconservedlands.org/gis.aspx. April 13, 2010.

8. Land Use, and Land Coverage including items such as percentage of impervious cover within a watershed and areas where new development may impact water quality of the source

According to the National Land Cover Data hosted by the University of Virginia Library website, 23.5% of the land cover in Halifax is agricultural, 69.7% of the land cover is forested or recently harvested forest land, 5.4% of the land cover is open water or wetland, and less than 1% is urban and residential land uses. Locations of various land cover types can be seen in Figure 10. Impervious surfaces in communities vary greatly depending on land use, however, in 2005 the United States Environmental Protection Agency published a document titled “Estimating and projecting Impervious Cover in the Southeastern United States”. Although the document is specific to the Southeastern states, which excludes Virginia, the methodology to calculate a percent imperviousness was developed for areas outside of the Southeast, and will be applied to Halifax County. Equations are provided that calculate the percent imperviousness dependant on the population density per square mile. Using the population of 35,412 for Halifax County as taken from the US Census estimated for 2008, and a land area of 819.3 square miles provides 45.6 persons per square mile.

$$\%TIA = 95 - 94\exp(-0.0001094 * P)$$

$$\%TIA = 95 - 94\exp(-0.0001094 * 45.6)$$

$$\%TIA = 95 - 94\exp(-0.00498864)$$

$$\%TIA = 95 - 94 * 1.005001$$

$$\%TIA = 95 - 94.470103$$

$$\%TIA = 0.52989$$

Therefore the impervious area for the County is approximately 4.3414 square miles or 2,778 acres.

Additionally, the Virginia Department of Health (VDH), as the Commonwealth's agency regulating public drinking water, was required by the 1996 Amendments to the Safe Drinking Water Act (SDWA) to create a Source Water Assessment Program (SWAP). The goal of this program is to establish procedures and provide a foundation of support for protecting the Commonwealth's drinking water resources from degradation. The SWAP includes delineating assessment boundaries of a drinking water source, inventorying land use activities, and determining the susceptibility of the drinking water source to the land use activities. In order to better protect water sources from the impacts of future land development the USGS has worked through the SWAP to determine the relative sensitivity of the ground water throughout the Commonwealth of Virginia. Determining these sensitivities involved collecting ground water

samples from wells throughout the Commonwealth. The data for samples collected from wells in Halifax, Table 10, show that every well tested was determined to have a high susceptibility to impact from the surrounding land use activities.

Figure 10 – Virginia Gazetteer Land Cover Data

Land Cover Legend and Statistics for HALIFAX COUNTY
(Percent Landcover > .5% only)

Land Cover Type	Percent	Color Shade
Pasture/Hay	18.9	
Row Crops	4.6	
Woody Wetlands	4.4	
Open Water	1.0	
Low Intensity Residential	0.6	
Transitional	2.3	
Deciduous Forest	34.2	
Evergreen Forest	16.2	
Mixed Forest	17.0	

Source: Geospatial and Statistical Data, Alderman Library, 20020330, Halifax County - Land Cover.

Table 10 – Source Water Assessment Program
(Waterworks Susceptibility Rankings)

PWSID	CNYCTY	NAME	SourceName	Susceptibility	SWADate
5083525	HALIFAX	ALTON DINER	WELL	High	11/1/2002
5083270	HALIFAX	CARLBROOK SCHOOL	WELL		6/4/2004
5083370	HALIFAX	CLAYS MILL ELEMENTARY SCHOOL	WELL	High	8/17/2001
5083480	HALIFAX	CLOVER, COMMUNITY OF	WELL NO. 1	High	1/24/2002
5083480	HALIFAX	CLOVER, COMMUNITY OF	WELL NO.2	High	1/24/2002
5083410	HALIFAX	CLUSTER SPRINGS ELEMENTARY SCHOOL	WELL	High	11/13/2001
5083500	HALIFAX	CRESCENT RESTAURANT	DRILLED WELL	High	11/2/2002
5083522	HALIFAX	DAN RIVER BAPTIST CHURCH	CLASS III DRILLED WELL		6/4/2004
5083970	HALIFAX	DEBBIE'S BAR & GRILL	DRILLED WELL	High	1/3/2003
5083531	HALIFAX	FALKLAND FARMS	WELL NO.1	High	1/3/2003
5083531	HALIFAX	FALKLAND FARMS	WELL NO.2	High	1/3/2003
5083531	HALIFAX	FALKLAND FARMS	WELL NO.3	High	1/3/2003
5083550	HALIFAX	HALIFAX, TOWN OF	BANISTER RIVER INTAKE	High	3/26/2002
5083578	HALIFAX	HUBER PLANT	WELL NO. 1		1/23/2002
5083578	HALIFAX	HUBER PLANT	WELL NO.2		1/23/2002
5083567	HALIFAX	INDIAN CAVE YOUTH CAMP	WELL NO.1	High	8/25/2005
5083567	HALIFAX	INDIAN CAVE YOUTH CAMP	WELL NO.2	High	8/25/2005
5083567	HALIFAX	INDIAN CAVE YOUTH CAMP	WELL NO.3	High	8/25/2005
5083567	HALIFAX	INDIAN CAVE YOUTH CAMP	WELL NO.4	High	8/25/2005
5083580	HALIFAX	LAKEWOOD TRAILER COURT	WELL NO. 1	High	7/3/2002
5083580	HALIFAX	LAKEWOOD TRAILER COURT	WELL NO. 2	High	7/3/2002
5083620	HALIFAX	MEADVILLE ELEMENTARY SCHOOL	WELL NO. 2	High	8/23/2001
5083620	HALIFAX	MEADVILLE ELEMENTARY SCHOOL	WELL NO.1	High	8/23/2001
5083628	HALIFAX	ODEC / VIRGINIA POWER PLANT	WELL NO. 1		1/23/2002
5083628	HALIFAX	ODEC / VIRGINIA POWER PLANT	WELL NO. 2		1/23/2002
5083200	HALIFAX	PLAIN AND FANCY CAFE	DRILLED WELL	High	1/3/2003
5083690	HALIFAX	SCOTTSBURG , TOWN OF	WELL NO. 2	High	1/24/2002
5083690	HALIFAX	SCOTTSBURG , TOWN OF	WELL NO. 3	High	1/24/2002
5083690	HALIFAX	SCOTTSBURG , TOWN OF	WELL NO. 4	High	1/24/2002
5083690	HALIFAX	SCOTTSBURG , TOWN OF	WELL NO. 5	High	1/24/2002
5083693	HALIFAX	SINAI ELEMENTARY SCHOOL	WELL		8/17/2001
5780600	HALIFAX	SOUTH BOSTON, TOWN OF	RAW WATER INTAKE	High	3/15/2002
5083710	HALIFAX	SOUTH OF DAN ELEMENTARY SCHOOL	WELL		8/23/2001
5083330	HALIFAX	STAUNTON MEADOWS CAMP	DRILLED WELL	High	11/1/2002
5083534	HALIFAX	STAUNTON RIVER BATTLEFIELD STATE PARK	WELL NO.1		9/6/2001
5083760	HALIFAX	SYDNOR JENNINGS ELEMENTARY SCHOOL	WELL NO.1	High	4/21/2005
5083760	HALIFAX	SYDNOR JENNINGS ELEMENTARY SCHOOL	WELL NO.2	High	4/21/2005
5083760	HALIFAX	SYDNOR JENNINGS ELEMENTARY SCHOOL	WELL NO.3	High	4/21/2005
5083870	HALIFAX	TURBEVILLE ELEMENTARY SCHOOL	WELL	High	11/13/2001
5083940	HALIFAX	VIRGILINA, TOWN OF	WELL NO. 2	High	11/14/2001
5083940	HALIFAX	VIRGILINA, TOWN OF	WELL NO. 3	High	11/14/2001
5083940	HALIFAX	VIRGILINA, TOWN OF	WELL NO. 4	High	11/14/2001
5083940	HALIFAX	VIRGILINA, TOWN OF	WELL NO. 5	High	11/14/2001
5083940	HALIFAX	VIRGILINA, TOWN OF	WELL Q		11/14/2001
5083810	HALIFAX	VIRGINIA INTERNATIONAL RACEWAY	WELL NO.1		8/26/2004
5083810	HALIFAX	VIRGINIA INTERNATIONAL RACEWAY	WELL NO.2		8/26/2004
5083810	HALIFAX	VIRGINIA INTERNATIONAL RACEWAY	WELL NO.3		8/26/2004
5083810	HALIFAX	VIRGINIA INTERNATIONAL RACEWAY	WELL NO.4		8/26/2004
5083810	HALIFAX	VIRGINIA INTERNATIONAL RACEWAY	WELL NO.5		8/26/2004
5083965	HALIFAX	VOLENS MEDICAL CENTER	DRILLED WELL	High	1/3/2003
5083985	HALIFAX	WILSON MEMORIAL ELEMENTARY SCHOOL	WELL		9/6/2001

Source: Virginia Department of Health, Source Water Assessment Program. Online Available: http://www.vdh.state.va.us/drinkingwater/source/. April 13, 2010.

9. The Presence of Impaired Streams, and the Type of Impairment

The DEQ, Virginia Environmental Geographic Information Systems (VEGIS), maintains listings of various impaired waters. The most recent dataset is the 2008 update. Review of this data indicates that many of the rivers, and lakes within the County are either considered impaired, or need further study as enough data has not been collected to make a determination. Figure 11, shows all of the rivers in the County, and water bodies that are considered category 2, 3, 4, or 5 as defined by the United States Environmental Protection Agency (EPA), are highlighted. The EPA categorical descriptions have the following descriptions:

- **EPA Category 1 -** Attaining all associated designated uses and no designated use is threatened.
- **EPA Category 2 -** Available data and/or other information indicate that some, but not all of the designated uses are supported.
- **EPA Category 3 -** Insufficient data and/or information to determine whether any designated uses are met
- **EPA Category 4A -** water is impaired or threatened for one or more designated uses but does not require a Total Maximum Daily Load (TMDL). A new TMDL is not necessary to address the newly identified impaired tributaries if TMDL modeling, source identification and reductions cover the entire watershed and the TMDL has been approved by EPA. These waters are primarily related to shellfish and/or recreational bacteria impairments but could include benthic impairments.
- **EPA Category 4B -** water is impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements (such as VPDES limits under a compliance schedule) are reasonably expected to result in attainment of the Water Quality Standard by the next reporting period or permit cycle.
- **EPA Category 4C -** water is impaired or threatened for one or more designated uses but does not require a TMDL because the impairment is not caused by a pollutant and/or is determined to be caused by natural conditions.
- **EPA Category 5 -** Waters are impaired or threatened and a TMDL is needed.
- **EPA Category 5M -** the Water Quality Standard is not attained for mercury primarily due to atmospheric deposition.

Table 11, contains a listing of category 4 and category 5 impaired streams in Halifax as provided on DEQ's "Impaired Water Fact Sheet" website.

Figure 11 – Impaired Waters of Halifax County

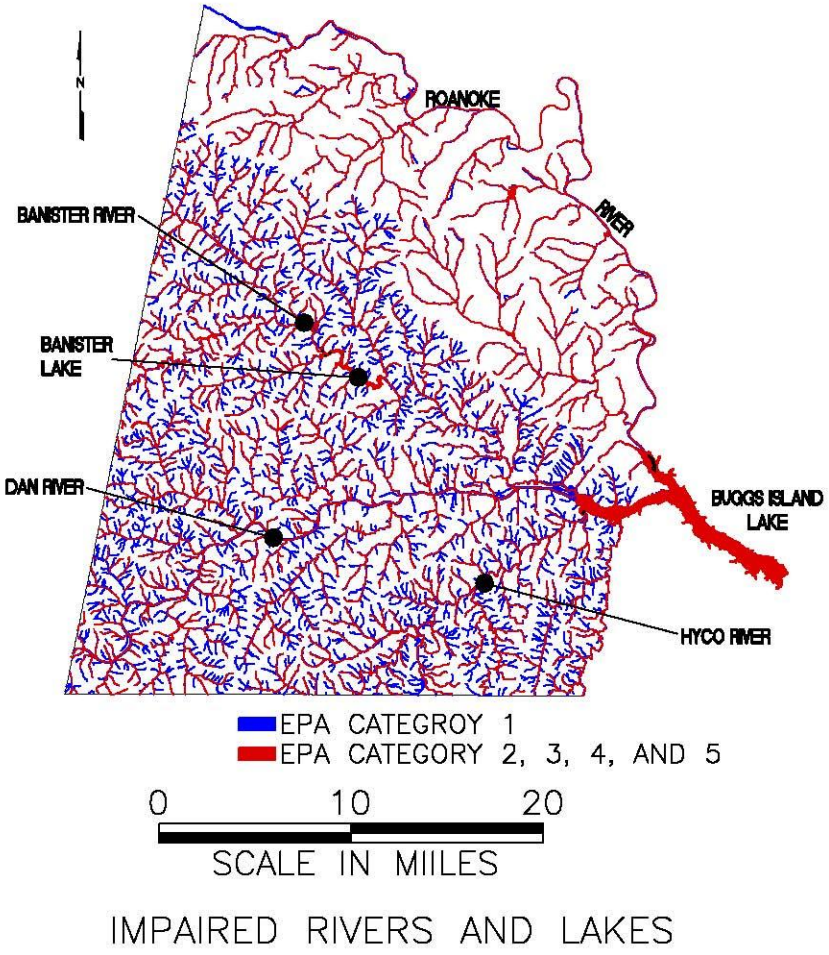


Table 11 – Impaired Waters of Halifax County

2008 Impaired Waters					
Water Body	**Location**	**City/County**	**Use(s)**	**Cause**	**VA Category**
Aarons Creek	Aarons Creek from the VA/NC state line to its mouth on the Dan River	Halifax Co., Mecklenburg Co.	Recreation	Fecal Coliform	5A
Banister Lake	From its impounding structure to its backwaters on the Banister River	Halifax Co.	Aquatic Life	Oxygen, Dissolved	5A
Banister River	Banister River from its confluence with Elkhorn Creek to the backwaters of Banister Lake	Halifax Co.	Recreation	Escherichia coli	5A
Banister River	Banister River from its confluence with Wolf Trap Creek to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Big Bluewing Creek	Big Bluewing Creek from the VA/NC state line to its mouth on the Hyco River	Halifax Co.	Recreation	Escherichia coli	5A
Big Bluewing Creek	Big Bluewing Creek from the VA/NC state line to its mouth on the Hyco River	Halifax Co.	Aquatic Life	Oxygen, Dissolved	5A
Big Toby Creek	Big Toby Creek from its headwaters to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Birch Creek	Birch Creek from its headwaters to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	4A
Birch Creek, Unnamed Tributary	Birch Creek, Unnamed Tributary from its headwaters to its mouth on Birch Creek	Halifax Co.	Recreation	Escherichia coli	5A
Bowes Branch	Bowes Branch from the VA/NC state line to its confluence with the Hyco River	Halifax Co.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	5A
Buckskin Creek	Buckskin Creek from its headwaters to its mouth on the Roanoke (Staunton) River	Halifax Co.	Recreation	Escherichia coli	5A
Buffalo Creek	Buffalo Creek from its headwaters to its mouth on the Roanoke (Staunton) River	Halifax Co., Pittsylvania Co.	Recreation	Escherichia coli	5A
Byrds Branch	Byrds Branch from its headwaters to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Catawba Creek	Catawba Creek from its headwaters to its mouth on the Roanoke (Staunton) River	Halifax Co.	Recreation	Escherichia coli	5A
Childrey Creek	Childrey Creek from its headwaters to its mouth on the Roanoke (Staunton) River.	Halifax Co.	Recreation	Escherichia coli	5A
Coleman Creek	Coleman Creek from its headwaters to its mouth on the Hyco River	Halifax Co.	Recreation	Escherichia coli	5A
Coleman Creek	Coleman Creek from its headwaters to its mouth on the Hyco River	Halifax Co.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	5A
Dan River	Dan River from its confluence with Mineral Springs Branch to its confluence with Peters Creek (Kerr Reservoir).	Halifax Co.	Recreation	Escherichia coli	5A
Dan River	Dan River from the Town of South Boston raw water intake location to the Peter Creek confluence (Kerr Reservoir)	Halifax Co.	Fish Consumption	DDE	5A
Dan River	Dan River from the Town of South Boston raw water intake location to the Peter Creek confluence (Kerr Reservoir)	Halifax Co.	Fish Consumption	DDT	5A
Dan River	The Dan River from the Peter Creek confluence to its confluence with the Roanoke (Staunton) River (Kerr Reservoir).	Halifax Co.	Recreation	Escherichia coli	5A
Dan River, Hyco River, Banister River	Dan River within the state of Virginia from the Brantley Steam Plant Dam in Danville downstream to the confluence with Roanoke River on John. H. Kerr Reservoir, including its tributaries Hyco River up to Rt. 738 bridge and Banister River up to the Banister Dam.	Danville City, Halifax Co., Pittsylvania Co.	Fish Consumption	Mercury in Fish Tissue	5A

Table 11 – Impaired Waters of Halifax County (Continued)

Water Body	Location	City/County	Use(s)	Cause	VA Category
Dan River, Hyco River, Banister River	Dan River within the state of Virginia from the Brantley Steam Plant Dam in Danville downstream to the confluence with Roanoke River on John. H. Kerr Reservoir, including its tributaries Hyco River up to Rt. 738 bridge and Banister River up to the Banister Dam.	Danville City, Halifax Co., Pittsylvania Co.	Fish Consumption	PCB in Fish Tissue	5A
Difficult Creek	Difficult Creek from its confluence with East Prong Difficult Creek to its confluence with Ashcake Creek	Halifax Co.	Recreation	Escherichia coli	5A
Double Creek	Double Creek from its headwaters to its mouth on the Dan River	Halifax Co., Pittsylvania Co.	Recreation	Escherichia coli	5A
Gibson Creek	Gibson Creek from its headwaters to its mouth on the Banister River	Halifax Co.	Aquatic Life	Oxygen, Dissolved	5A
Grassy Creek	Grassy Creek from its headwaters to the Route 744 bridge crossing	Halifax Co.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	5A
Hyco River	The Hyco River from the VA/NC state line to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Kerr Reservoir, Bluestone Creek, Buffalo Creek	Kerr Reservoir from the John H. Kerr dam to its backwaters, excluding the Dan River portion, Bluestone Creek and Buffalo Creek.	Halifax Co., Mecklenburg Co.	Aquatic Life	Oxygen, Dissolved	5A
Lawsons Creek	Lawsons Creek from its headwaters to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli, Fecal Coliform	5A
Little Coleman Creek	Little Coleman Creek from its headwaters to its mouth on Coleman Creek	Halifax Co.	Recreation	Escherichia coli	5A
Miry Creek	Miry Creek from the Mikes Creek confluence to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Polecat Creek	Polecat Creek from its headwaters to its mouth on the Banister River.	Halifax Co	Recreation	Fecal Coliform	5A
Powells Creek	Powells Creek from its headwaters to its mouth on the Dan River	Halifax Co.	Recreation	Escherichia coli	5A
Roanoke (Staunton) River	Roanoke (Staunton) River from the former Dan River, Inc. discharge to the backwaters of Kerr Reservoir.	Campbell Co., Charlotte Co., Halifax Co., Mecklenburg Co., Pittsylvania Co.	Recreation	Escherichia coli	4A
Roanoke (Staunton) River, Cub Creek, Kerr Reservoir	Roanoke (Staunton) River from Leesville Dam to the John H. Kerr Dam including Kerr Reservoir, its tributaries Eastland Creek and Nutbush Creek (within the state of Virginia) and Cub Creek from its mouth to the crossing of Rough Creek Road near Rough Creek.	Campbell Co., Charlotte Co., Halifax Co., Mecklenburg Co., Pittsylvania Co.	Fish Consumption	Mercury in Fish Tissue	5A
Roanoke (Staunton) River, Cub Creek, Kerr Reservoir	Roanoke (Staunton) River from Leesville Dam to the John H. Kerr Dam including Kerr Reservoir, its tributaries Eastland Creek and Nutbush Creek (within the state of Virginia) and Cub Creek from its mouth to the crossing of Rough Creek Road near Rough Creek.	Campbell Co., Charlotte Co., Halifax Co., Mecklenburg Co., Pittsylvania Co.	Fish Consumption	PCB in Fish Tissue	5A
Winn Creek	Winn Creek from its headwaters to its mouth on the Banister River	Halifax Co.	Recreation	Escherichia coli	5A
Wolfe Creek	Powells Creek from its headwaters to its mouth on the Dan River	Halifax Co., Pittsylvania Co.	Aquatic Life	Benthic-Macroinvertebrate Bioassessments	5A

Source: DEQ, 2008 Impaired Water Fact Sheets. Online. Available: http://gisweb.deq.virginia.gov/FactSheets2008/FactSheets.aspx?loc=HALIFAX+CO.&style=0. April 13, 2010.

10. The Location of Point Source Discharges

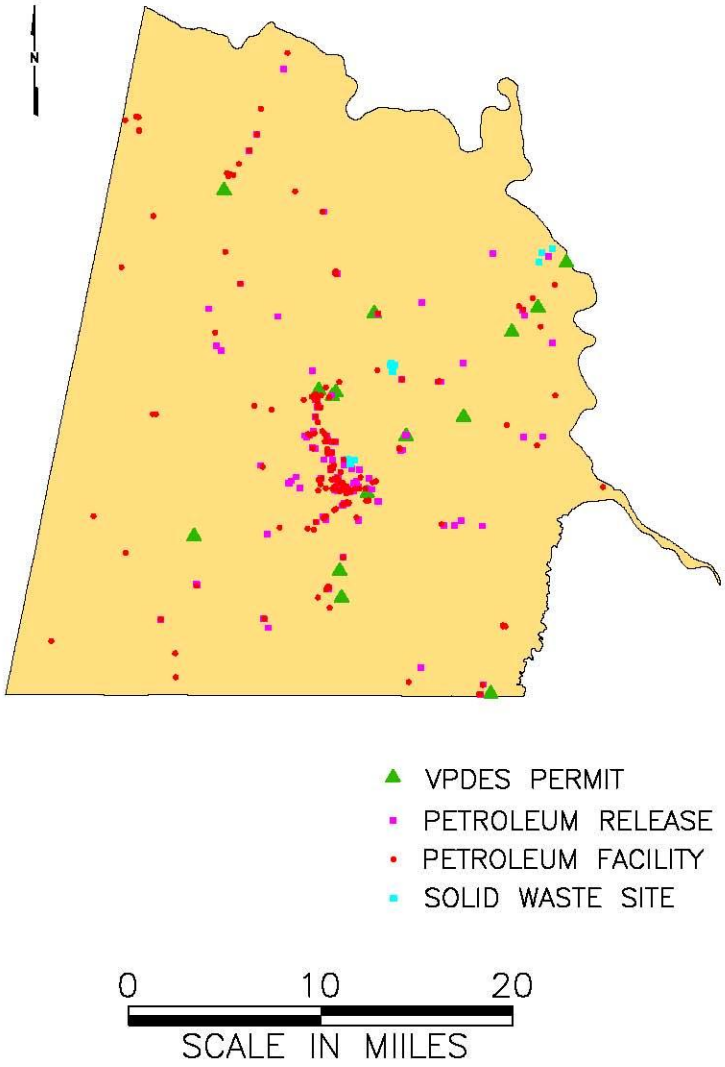
Under the authority of the Federal Clean Water Act, the EPA allows each state to individually monitor point source pollution. In Virginia, the Department of Environmental Quality issues Virginia Pollution Discharge Elimination System (VPDES) permits to monitor and regulate point source pollution. In Halifax County there are 15 registered VPDES permits, as issued by the state. The majority of these permits in Halifax County are for the discharge of treated sewage effluent. The registered permits are listed in Table 12.

Table 12 – Halifax County VPDES permits

VPDES	FACILITY NAME	DESCRIPTION
VAU001579	ASAL TIE AND LUMBER COMPANY INCORPORATED	SAWMILLS AND PLANING MILLS, GENERAL
VA0022748	HALIFAX COUNTY SCHOOLS CLAYS MILL ELEM.	ELEMENTARY AND SECONDARY SCHOOLS
VA0073733	CLOVER WWTP	SEWERAGE SYSTEMS
VA0083097	DOMINION - CLOVER POWER STATION	ELECTRIC SERVICES
VA0022721	HALIFAX COUNTY SCHOOLS MEADVILLE ELEM.	ELEMENTARY AND SECONDARY SCHOOLS
VA0022691	HALIFAX COUNTY SCHOOLS SOUTH OF DAN ELEM.	ELEMENTARY AND SECONDARY SCHOOLS
VA0091804	HALIFAX COUNTY SCHOOLS CLUSTER SPRINGS ELEM.	SEWERAGE SYSTEMS
VA0020320	HALIFAX S T P	SEWERAGE SYSTEMS
VA0089893	LEIGH AVE WTP	WATER SUPPLY
VA0062103	SCOTTSBURG WWTP	SEWERAGE SYSTEMS
VA0020362	SOUTH BOSTON STP	SEWERAGE SYSTEMS
VA0022705	HALIFAX COUNTY SCHOOLS CLUSTER SPRINGS ELEM.	ELEMENTARY AND SECONDARY SCHOOLS
VA0063568	SOUTHERN MOBILE HOME PARK	OPERATORS OF RESIDENTIAL MOBILE HOME SITES
VA0022730	HALIFAX COUNTY SCHOOLS SYDNOR JENNINGS ELEM.	ELEMENTARY AND SECONDARY SCHOOLS
VA0076830	VIRGILINA TOWN OF	SEWERAGE SYSTEMS

In addition to the point source discharges, registered by the VPDES program, the DEQ also maintains records of solid waste facilities, and petroleum facilities. Figure 12, shows all VPDES permit locations, solid waste facilities, petroleum facilities, and petroleum releases within the County, as maintained in the Virginia Environmental Geographic Information system database, as available on February 17, 2010.

Figure 12 – Point Source Discharges of Halifax County



11. Potential Threats to the Existing Water Quantity and Quality, Other Than those From Above

There are multiple potential threats to the water supply in Halifax County. The first threat, is general, and comes from pollution associated with land disposal of solid waste materials, and sewage from septic systems. This concern is presented in the Halifax County 2007 Comprehensive Plan Update.

The second potential threat to the Halifax County water supply comes from uranium mining. A permit to perform uranium exploration mining was issued in the year 2007 to a site in Pittsylvania County. The exploratory site is upstream of Halifax County, within the Banister River watershed. Therefore escaped hazardous particulates including heavy metals, petroleum products, and radioactive elements could reach the water supply of Halifax County. At this time, there are no known releases of hazardous particulates, but the site is considered as a potential threat to Halifax County's water supply. It is also expected that if the site moves beyond exploration into full scale production, there will be an increase in the level of the potential threat.

The third potential threat to the water resources of Halifax County comes from usage of water outside of the drainage basin. Currently the City of Virginia Beach is permitted to withdrawal 60 MGD from Lake Gaston. The water that is obligated to Virginia Beach is removed from the Roanoke drainage basin and taken to the Chowan drainage basin, which prevents the residents of the Roanoke drainage basin from using this amount of water.

V. (9VAC25-780-100) PROJECTED WATER DEMAND INFORMATION

A. Population Projection

The ability to plan for future water needs is dependent on projections of population. There are a number of readily available population projections, which include projections from the Weldon Cooper Center (which are prepared for the Virginia Employment Center) and County-produced projections in the 2007 County Comprehensive Plan. However, the readily available projections are not forecast far enough into the future to meet the needs of this report. Therefore a population projection has been produced specifically for this report.

There are many viable alternative calculation methods to obtain a population projection for a given area, including simple and complex extrapolation, simple and complex ratios, cohort-component methods, and structural models. In all of these methods assumptions are made, and data is extrapolated based on past performance, which creates uncertainty in the projection. In spite of this uncertainty the U.S. Census Bureau uses the cohort-component method to make projections; therefore this report uses the cohort-component method. For consistency in this report, projections are forecast to the year 2050, which is a 40 year forecast. All of The historic population estimates, and projected populations are shown in Table 13.

Table 13 – Halifax County Population Data

Year	Halifax County Population	Growth Rate	Cohort-Component Method Projection	Growth Rate	Weldon Cooper Center Projection	Growth Rate	Halifax County Comprehensive Plan Projection	Growth Rate
1900	37,197	N/A						
1910	40,044	7.65%						
1920	41,374	3.32%						
1930	41,283	-0.22%						
1940	41,271	-0.03%						
1950	41,442	0.41%						
1960*	39,611	-4.42%						
1970*	36,965	-6.68%						
1980*	37,692	1.97%						
1990*	36,030	-4.41%						
2000	37,355	3.68%						
2010			35,257	-5.62%	34,906	-6.56%	39,700	6.28%
2020			34,034	-3.47%	33,836	-3.07%	40,900	3.02%
2030			33,231	-2.36%	33,821	-0.04%		
2040			33,022	-0.63%				
2050			33,654	1.91%				

* During the years 1960, 1970, 1980, and 1990, population counts for Halifax County and South Boston were independent, but for purposes of this report have been combined.

Although the submittal date for this report is after the release of portions of the 2010 census, the work was completed in advance of the census, and projections are based on the 2000 census data. To perform the cohort-component method, the 2000 census data from Halifax County was used to divide the population into small segments by sex, and by 5 year age groups. The estimated populations for each cohort from the 2000 census are shown in Table 14.

Table 14 – Halifax County 2000 Census Cohorts

Cohort	Male	Female	Total
0-4	1149	1054	2203
5-9	1277	1272	2549
10-14	1280	1183	2463
15-19	1187	1126	2313
20-24	898	871	1769
25-29	1021	1032	2053
30-34	1107	1165	2272
35-39	1279	1346	2625
40-44	1441	1466	2907
45-49	1370	1404	2774
50-54	1310	1458	2768
55-59	1083	1180	2263
60-64	944	1079	2023
65-69	755	938	1693
70-74	654	913	1567
75-79	513	857	1370
80-84	301	659	960
85+	213	570	783
Total	17782	19573	37355

To calculate the next generation cohort, each of the current cohorts takes into account fatalities, child births, and the net migration. To accomplish this, each cohort was multiplied by a ratio of existing fatality rates to determine fatalities (or conversely survivorship), existing natality rates (pregnancy of the female population), and a ratio of average age to determine the age of people moving.

The data used to develop the fatality ratio in the population was published by the Centers for Disease Control in the National Vital Statistics Reports, Volume 57, Number 1, Tables 2 and 3. The data used to develop the natality rate for each of the female cohorts was published for the year 2009 in the National Vital Statistics Reports, Volume 59, Number 3, Table 2. Although the natality data used is a national average, the natality rate for Virginia is marginally below the national average and no adjustment was made. All children born are then added into the 0-4 cohort, and the sex is split based on the Halifax County sex distribution from the 2000 census, with 47.6% male, and 52.4% female.

After the natural growth factors of mortality and natality are applied, the net migration factor is applied. The net migration factor is a more uncertain variable, as people in America are free to move, and the reasons people move are varied, but may include the availability of jobs, and affordable housing, both of which change constantly depending on market conditions. However the net migration applied was based on recent historic migrations. In order to determine which population cohort the migration belongs in, the Virginia average cohort, as published in the Virginia: 2000, Census 2000 profile by the U.S. Census Bureau issued in August 2002, was used to develop a ratio. The ratios for mortality, pregnancy, and Virginia average cohort are provided in Table 15.

Table 15 – Multiplication Ratios per Cohort

Cohort	5 Year Mortality Rate		1 Year Pregnancy rate	Virginia Average Cohort Distribution
	Male	Female		
0-4	0.0090	0.0074	0.0000	0.0650
5-9	0.0009	0.0007	0.0000	0.0700
10-14	0.0013	0.0008	0.0005	0.0700
15-19	0.0047	0.0020	0.0391	0.0680
20-24	0.0071	0.0024	0.0963	0.0680
25-29	0.0071	0.0028	0.1105	0.0730
30-34	0.0078	0.0038	0.0977	0.0730
35-39	0.0104	0.0057	0.0466	0.0850
40-44	0.0151	0.0086	0.0101	0.0850
45-49	0.0229	0.0127	0.0007	0.0705
50-54	0.0326	0.0193	0.0000	0.0705
55-59	0.0496	0.0304	0.0000	0.0510
60-64	0.0758	0.0482	0.0000	0.0390
65-69	0.1135	0.0737	0.0000	0.0305
70-74	0.1699	0.1125	0.0000	0.0305
75-79	0.2465	0.1750	0.0000	0.0195
80-84	0.3687	0.2803	0.0000	0.0195
85+	1.0000	1.0000	0.0000	0.0120

Between the years 1995 and 2000, migration occurred both into and out of the County, but on average, the County lost an estimated 66 people per year. Therefore the population projections have been calculated to continue to lose people. However, it is believed that with proximity to the Cities of Danville and Lynchburg, and the available land of Halifax County, the population loss will eventually stop, and possibly reverse direction. The assumed migration pattern for each year is provided in Table 16.

Table 16 – Halifax County Assumed Migration Pattern

Year	Net Migration Per Year
2000-2010	-175
2010-2020	-50
2020-2030	0
2030-2040	50
2040-2050	100

Using the current data for fatality, and natality, the County cannot sustain its population without migration into the County, which is a trend seen across the country. Therefore the net migration into or out of the County has the most influence to change the total population. Any change to the assumed migration numbers in Table 16 will greatly affect the population projections in Table 13.

The County wide population projections have been disaggregated into eight (8) regions. The cohort-component method has been used on each of the disaggregated regions. As the planning regions do not match census blocks, a structure count was performed in each region, and the structure count was converted into a population estimate by applying a factor of 2.29 (16,261 structures / 37,355 population) to each structure. The cohort-component method used on the disaggregated regions is the same as the one used on the County aggregate. It is assumed that the designated planning areas will attract a larger population than the County, and in the cohort-component have been assigned higher net migration values. As the methodology of the cohort-component method is the same in the regions, as it is for the whole County, no further explanation of the regional calculations is presented. Table 17 is provided to show the disaggregated net migrations, Table 18 provides a current estimate of the number of structures in a region, and Table 19 contains the disaggregated population projections.

Table 17 – Halifax County Assumed Disaggregated Net Migrations

Year	Planning Areas						Urban	Rural Areas	County Wide Total
	Clover	Cluster Springs	Four Forks	Scotts-burg	Turbe-ville	Virgilina			
2000-2010	0	0	0	0	0	0	10	-185	-175
2010-2020	0	0	0	0	0	0	15	-65	-50
2020-2030	0	5	0	0	0	0	15	-20	0
2030-2040	5	5	5	5	5	5	20	0	50
2040-2050	5	5	5	5	5	5	50	20	100

Table 18 – Halifax County Structures per Region (year 2000)

	Planning Areas						Urban	Rural Areas	County Wide Total
	Clover	Cluster Springs	Four Forks	Scotts-burg	Turbe-ville	Virgilina			
Structures	227	213	71	151	26	104	5,913	9,556	16,261

Table 19 – Halifax County Disaggregated Population Data

Year	Planning Areas						Urban	Rural Areas	County Wide Total
	Clover	Cluster Springs	Four Forks	Scotts-burg	Turbe-ville	Virgilina			
2010	561	523	165	376	59	303	14,446	18,824	35,257
2020	561	523	165	376	59	303	15,161	16,886	34,034
2030	561	604	165	376	59	303	15,606	15,557	33,231
2040	639	657	241	461	124	391	15,976	14,533	33,022
2050	690	706	320	536	200	470	16,689	14,043	33,654

B. Planning Period

The planning period for the water supply plan is 40 years. The resulting projections in this report end in the year 2050.

C. Projections by Decade

To make the estimated future water use projections more relevant over the 40 year planning period, the estimates are provided in 10 year increments. Although the report is submitted in 2011, significant portions of the work were performed and completed prior to 2010, therefore the first decade listed by year in this report is 2010, and the consequential decades are 2020, 2030, 2040, and 2050.

D. Demand Projection of Community Water Systems

There are many forecasting methods available to make projections of demand. The Water Resources Planning Manual M50 published by the American Water Works Association (AWWA), lists the following demand forecasting model types as acceptable:

- per capita models,
- extrapolation models,
- disaggregate water use model,
- multiple regression (multivariate) models,
- land use models,
- univariate forecasting models and,
- integrated models.

This report uses a per capita calculation to determine the water needs of the County. The AWWA Manual M50 suggests that the appropriate forecasting method does not need to be the most complicated as there is a diminishing rate of return on the effort and increased cost to use more complex forecasting methods. Forecasts also have uncertainty due to assumptions that are made to perform a calculation, and the farther into the future the forecast is made, the more these uncertainties will cause the projection to be in error.

There are five public community water systems in Halifax County. Two of the systems are independently operated by the Towns of Scottsburg, and Virgilina, and three of the systems are operated by the Halifax County Service Authority, which includes the Urban Planning Area (UPA) system, the Clover system, and the Virginia International Raceway (VIR) system. The UPA system is the combined County, Town of Halifax, and Town of South Boston system that was created when the water and sewer systems merged together in 2008.

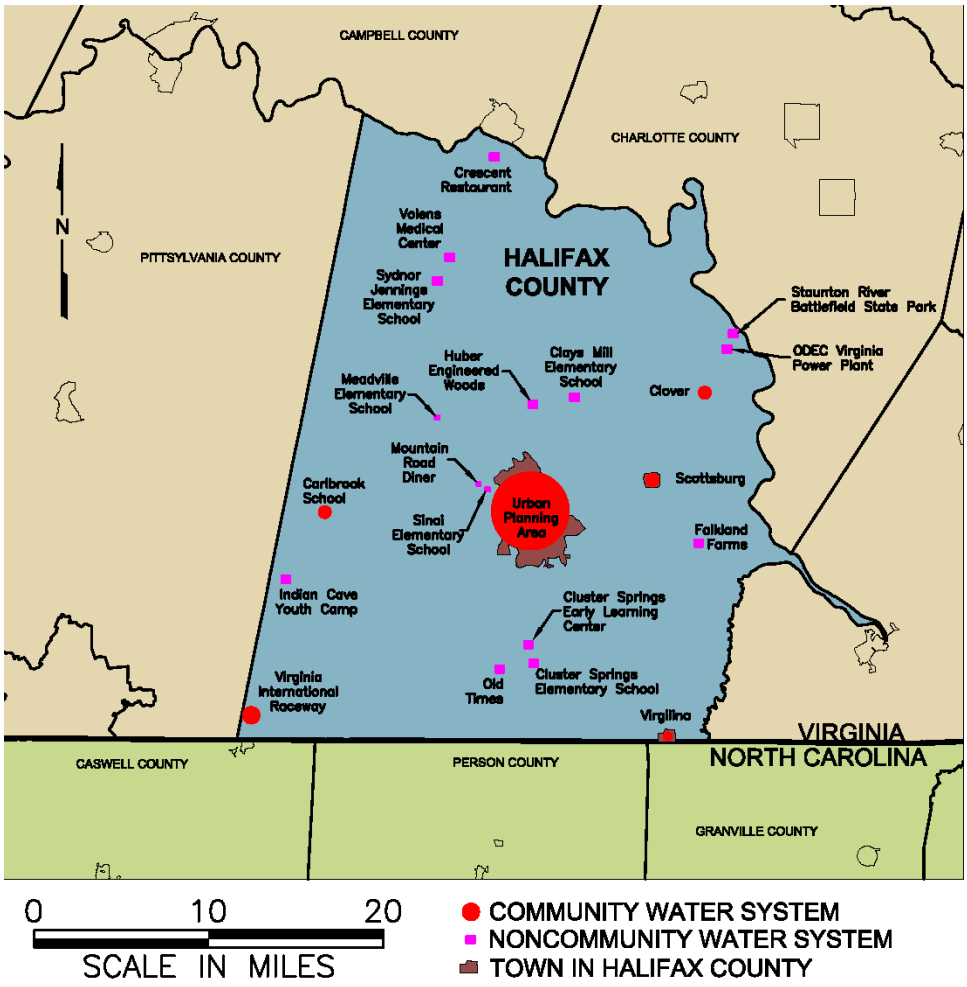
There is one private community water system which serves Carlbrook School, and is run by Carlbrook School, LLC.

Additionally there are fifteen (15) noncommunity water systems in Halifax County with VDH permits. These systems include farms, schools, commercial properties, and industrial properties, and are listed in the community water systems section of this report, to demonstrate that some are forecasted to be removed from service, as the community water systems are expanded. The list of noncommunity water systems incudes:

- Mountain Road Diner,
- Clays Mill Elementary School,
- Cluster Springs Elementary School,
- Cluster Springs Early Learning Center,
- Crescent Restaurant,
- Old Times,
- Falkland Farms,
- Staunton River Battlefield State Park,
- Indian Cave Youth Camp,
- Huber Engineered Woods,
- Meadeville Elementary School,
- ODEC Virginia Power Plant,
- Sinai Elementary School,
- Sydnor Jennings Elelmentary School and,
- Volens Medical Center.

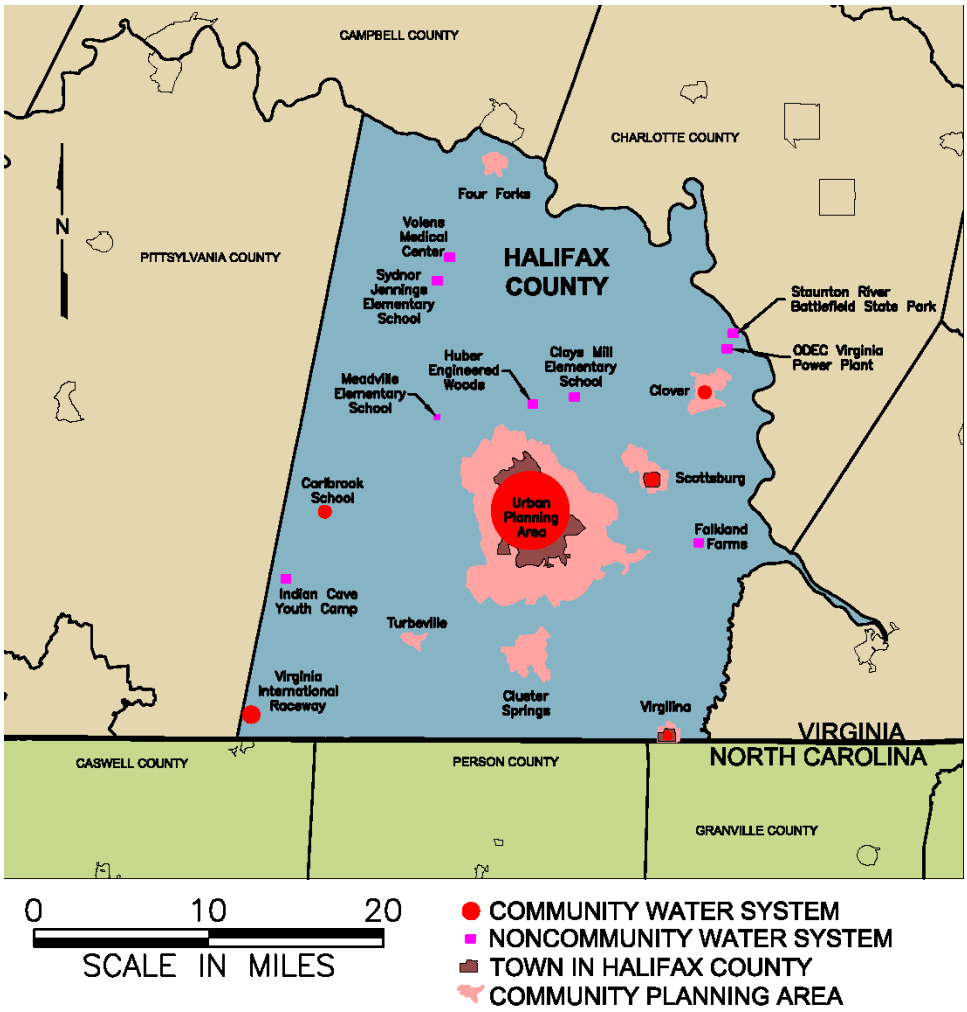
A map of all permitted community and noncommunity water systems in Halifax County is provided in Figure 13.

Figure 13 – Community Water Systems



Although definitive plans for growth and expansion of the community water systems are not known, the County's 2007 Comprehensive Plan provides for planning areas around four of the existing public water systems, and includes three planning areas that do not currently have public water systems. There are no stated plans to provide public water systems to planning areas that do not already have public water, but the County's 2007 Comprehensive Plan supports growth in the planning areas, and as such this report assumes that water will be provided to these communities in the future. A map of the County, and the County's planning areas are provided in Figure 14.

Figure 14 – Community Water Systems, and Planning Areas



To calculate the current and future water demands for each community water system a few assumptions are made.

- All noncommunity systems have a growth rate of 0.0%, and the current production level will remain constant over time.
- The County's planning areas contain populations that are not currently connected to the community systems. However, it is expected that within 50 years all of the population within the planning area will be connected to a community water system. Assuming that 20% of the population that is not connected will be connected during each decade, means that at the end of the 40 year planning period 80% of those not currently served will become connected to a community water system.
- The Cluster Springs, Four Forks, and Turbeville Planning Areas, will have public community water systems built. The Cluster Springs

community system will be built by the year 2030, and the Four Forks and Turbeville community systems will be built by the year 2040.

- Until a population is served by a community water system, the population is made up of self-supplied users of less than 300,000 gallons per month.

Based on the types of demand, and the density in the planning area, each community has its own per capita demand. In the Urban Planning Area, Clover Community Planning Area, Scottsburg Community Planning Area, and Virgilina Community Planning Area, the per capita water demand is calculated based on the most recent production rate, and the most recent customer count. In the County's community planning areas without existing system data, the per capita water demand is set equivalent to the existing demand of an average person in the planning area. Tables 20 through 24 provide the disaggregated community water system demands from the years 2010 through 2050, and provide the demands of the VDH permitted noncommunity water systems, as it is projected that the noncommunity systems will be enveloped as the community water systems grow. Table 25 provides a summary of the community water systems by decade.

Table 20 - Community Water Systems, 2010 Estimate

System	Population		Usage (MG)		Disaggregated Demand (MGD)							
	In Community	Served	Annual Average	Peak Month	Residential	Commercial, Institutional, & Light Industrial	Heavy Industrial	Military	Water Used in Production	Unaccounted Water Losses	Sales to Other Communities	Total
Community Water System												
Halifax County Service Authority												
Urban Planning Area	14,446	10,389	633.28	59.76	0.41	0.40	0.17	0.00	0.41	0.35	0.00	1.73
Clover	560	290	9.39	1.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.03
VIR	430	430	5.13	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cluster Springs *	523	-	-	-	-	-	-	-	-	-	-	-
Four Forks *	165	-	-	-	-	-	-	-	-	-	-	-
Turbeville *	59	-	-	-	-	-	-	-	-	-	-	-
Scottsburg	376	360	16.24	1.46	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.04
Virgilina	303	300	4.12	0.43	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Carlbrook School	100	100	2.79	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Subtotal (CWS)	16,962	11,869	670.95	N/A	0.47	0.40	0.17	0.00	0.41	0.38	0.00	1.83
Noncommunity Water System												
Mountain Road Diner	50	50	0.27	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Clays Mill Elementary School	390	390	1.42	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Cluster Springs Elementary School	750	750	2.74	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Cluster Springs Early Learning Center	150	150	0.55	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Crescent Restaurant	125	125	0.68	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Old Times	50	50	0.27	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Falkland Farms	25	25	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Staunton River Battlefield State Park	150	150	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Indian Cave Youth Camp	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Huber Engineered Woods Plant	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Meadeville Elementary School	280	280	1.02	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
ODEC Virginia Power Plant	150	150	1.83	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Sinai Elementary School	380	380	1.39	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Sydnor Jennings Elementary School	400	400	1.46	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Volens Medical Center	50	50	0.18	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Subtotal (NCWS)	3,150	3,150	11.82	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.03
Total	N/A	N/A	682.77	N/A	0.47	0.40	0.17	0.00	0.41	0.38	0.00	1.87

* Proposed Future Community Water Systems
N/I = No Information Available
N/A = Not Applicable
2008 usage data was provided by the HCSA. The 2008 usage data was estimated to be equal to the 2010 estimate.

Table 21 - Community Water Systems, 2020 Forecast

System	Population		Usage (MG)		Disaggregated Demand (MGD)							
	In Community	Served	Annual Average	Peak Month	Residential	Commercial, Institutional, & Light Industrial	Heavy Industrial	Military	Water Used in Production	Unaccounted Water Losses	Sales to Other Communities	Total
Community Water System												
Halifax County Service Authority												
Urban Planning Area	15,161	12,118	738.67	69.71	0.48	0.46	0.19	0.00	0.48	0.41	0.00	2.02
Clover	561	359	11.62	1.24	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.03
VIR	430	430	5.13	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cluster Springs *	523	-	-	-	-	-	-	-	-	-	-	-
Four Forks *	165	-	-	-	-	-	-	-	-	-	-	-
Turbeville *	59	-	-	-	-	-	-	-	-	-	-	-
Scottsburg	376	364	16.42	1.48	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.04
Virgilina	303	301	4.13	0.43	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Carlbrook School	100	100	2.79	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Subtotal (CWS)	17,678	13,672	778.77	N/A	0.55	0.47	0.19	0.00	0.48	0.44	0.00	2.13
Noncommunity Water System												
Mountain Road Diner	Abandoned											
Clays Mill Elementary School	390	390	1.42	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Cluster Springs Elementary School	750	750	2.74	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Cluster Springs Early Learning Center	150	150	0.55	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Crescent Restaurant	125	125	0.68	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Old Times	50	50	0.27	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Falkland Farms	25	25	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Staunton River Battlefield State Park	150	150	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Indian Cave Youth Camp	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Huber Engineered Woods Plant	100	100	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Meadeville Elementary School	280	280	1.02	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
ODEC Virginia Power Plant	150	150	1.83	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Sinai Elementary School	Abandoned											
Sydnor Jennings Elementary School	400	400	1.46	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Volens Medical Center	50	50	0.18	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Subtotal (NCWS)	2,720	2,720	10.16	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.03
Total	N/A	N/A	788.93	N/A	0.55	0.47	0.19	0.00	0.48	0.44	0.00	2.16

* Proposed Future Community Water Systems
N/I = No Information Available
N/A = Not Applicable

Table 22 - Community Water Systems, 2030 Forecast

System	Population		Usage (MG)		Disaggregated Demand (MGD)							
	In Community	Served	Annual Average	Peak Month	Residential	Commercial, Institutional, & Light Industrial	Heavy Industrial	Military	Water Used in Production	Unaccounted Water Losses	Sales to Other Communities	Total
Community Water System												
Halifax County Service Authority												
Urban Planning Area	15,606	13,578	827.67	78.10	0.54	0.52	0.22	0.00	0.54	0.46	0.00	2.27
Clover	561	426	13.79	1.47	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.04
VIR	430	430	5.13	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cluster Springs *	604	400	9.60	0.93	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.03
Four Forks *	165	-	-	-	-	-	-	-	-	-	-	-
Turbeville *	59	-	-	-	-	-	-	-	-	-	-	-
Scottsburg	376	368	16.60	1.49	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.05
Virgilina	303	302	4.15	0.43	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Carlbrook School	100	100	2.79	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Subtotal (CWS)	18,204	15,604	879.74	N/A	0.62	0.53	0.22	0.00	0.54	0.50	0.00	2.41
Noncommunity Water System												
Mountain Road Diner	Abandoned											
Clays Mill Elementary School	390	390	1.42	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Cluster Springs Elementary School	Abandoned											
Cluster Springs Early Learning Center	Abandoned											
Crescent Restaurant	125	125	0.68	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Old Times	Abandoned											
Falkland Farms	25	25	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Staunton River Battlefield State Park	150	150	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Indian Cave Youth Camp	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Huber Engineered Woods Plant	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Meadeville Elementary School	280	280	1.02	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
ODEC Virginia Power Plant	150	150	1.83	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Sinai Elementary School	Abandoned											
Sydnor Jennings Elementary School	400	400	1.46	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Volens Medical Center	50	50	0.18	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Subtotal (NCWS)	1,770	1,770	6.60	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.02
Total	N/A	N/A	886.34	N/A	0.62	0.53	0.22	0.00	0.54	0.50	0.00	2.43

* Proposed Future Community Water Systems
N/I = No Information Available
N/A = Not Applicable

Table 23 - Community Water Systems, 2040 Forecast

System	Population		Usage (MG)		Disaggregated Demand (MGD)							
	In Community	Served	Annual Average	Peak Month	Residential	Commercial, Institutional, & Light Industrial	Heavy Industrial	Military	Water Used in Production	Unaccounted Water Losses	Sales to Other Communities	Total
Community Water System												
Halifax County Service Authority												
Urban Planning Area	15,976	14,962	912.04	86.06	0.592	0.569	0.239	0.000	0.593	0.504	0.000	2.50
Clover	639	572	18.52	1.97	0.031	0.002	0.000	0.000	0.004	0.017	0.000	0.05
VIR	430	430	5.13	1.08	0.004	0.001	0.000	0.000	0.000	0.003	0.000	0.01
Cluster Springs *	657	555	13.33	1.29	0.023	0.002	0.000	0.000	0.001	0.011	0.000	0.04
Four Forks *	241	175	4.20	0.41	0.007	0.001	0.000	0.000	0.000	0.004	0.000	0.01
Turbeville *	124	90	2.16	0.21	0.004	0.000	0.000	0.000	0.000	0.002	0.000	0.01
Scottsburg	461	457	20.62	1.85	0.036	0.003	0.000	0.000	0.000	0.017	0.000	0.06
Virgilina	391	390	5.36	0.56	0.009	0.002	0.000	0.000	0.000	0.004	0.000	0.01
Carlbrook School	100	100	2.79	0.30	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.01
Subtotal (CWS)	19,019	17,731	984.14	N/A	0.713	0.581	0.239	0.000	0.599	0.563	0.000	2.70
Noncommunity Water System												
Mountain Road Diner	Abandoned											
Clays Mill Elementary School	390	390	1.42	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Cluster Springs Elementary School	Abandoned											
Cluster Springs Early Learning Center	Abandoned											
Crescent Restaurant	Abandoned											
Old Times	Abandoned											
Falkland Farms	25	25	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Staunton River Battlefield State Park	150	150	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Indian Cave Youth Camp	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Huber Engineered Woods Plant	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Meadeville Elementary School	280	280	1.02	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
ODEC Virginia Power Plant	150	150	1.83	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Sinai Elementary School	Abandoned											
Sydnor Jennings Elementary School	400	400	1.46	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Volens Medical Center	50	50	0.18	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Subtotal (NCWS)	1,645	1,645	5.91	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.02
Total	N/A	N/A	990.05	N/A	0.71	0.58	0.24	0.00	0.60	0.56	0.00	2.71

* Proposed Future Community Water Systems
N/I = No Information Available
N/A = Not Applicable

Table 24 - Community Water Systems, 2050 Forecast

System	Population		Usage (MG)		Disaggregated Demand (MGD)							
	In Community	Served	Annual Average	Peak Month	Residential	Commercial, Institutional, & Light Industrial	Heavy Industrial	Military	Water Used in Production	Unaccounted Water Losses	Sales to Other Communities	Total
Community Water System												
Halifax County Service Authority												
Urban Planning Area	16,689	16,689	1017.31	96.00	0.66	0.64	0.27	0.00	0.66	0.56	0.00	2.79
Clover	690	690	22.34	2.38	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.07
VIR	430	430	5.13	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Cluster Springs *	706	706	16.95	1.65	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.05
Four Forks *	320	320	7.68	0.75	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.02
Turbeville *	200	200	4.80	0.47	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Scottsburg	536	536	24.18	2.17	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.07
Virgilina	470	470	6.45	0.67	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.02
Carlbrook School	100	100	2.79	0.30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Subtotal (CWS)	20,141	20,141	1107.64	N/A	0.81	0.65	0.27	0.00	0.67	0.64	0.00	3.04
Noncommunity Water System												
Mountain Road Diner	Abandoned											
Clays Mill Elementary School	390	390	1.42	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Cluster Springs Elementary School	Abandoned											
Cluster Springs Early Learning Center	Abandoned											
Crescent Restaurant	Abandoned											
Old Times	Abandoned											
Falkland Farms	25	25	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Staunton River Battlefield State Park	150	150	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Indian Cave Youth Camp	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Huber Engineered Woods Plant	100	100	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I
Meadeville Elementary School	280	280	1.02	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
ODEC Virginia Power Plant	150	150	1.83	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.01
Sinai Elementary School	Abandoned											
Sydnor Jennings Elementary School	400	400	1.46	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Volens Medical Center	50	50	0.18	N/I	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.00
Subtotal (NCWS)	1,645	1,645	5.91	N/A	N/I	N/I	N/I	N/I	N/I	N/I	N/I	0.02
Total	N/A	N/A	1113.55	N/A	0.81	0.65	0.27	0.00	0.67	0.64	0.00	3.05

* Proposed Future Community Water Systems
N/I = No Information Available
N/A = Not Applicable

Table 25 – Community Water System, Disaggregated Demand

Disaggregated Demand (MGD)	Year				
	2010	2020	2030	2040	2050
Residential	0.474	0.546	0.624	0.713	0.813
Comm., Inst., & Light Ind.	0.402	0.468	0.525	0.581	0.650
Heavy Ind.	0.166	0.194	0.217	0.239	0.267
Military	0.000	0.000	0.000	0.000	0.000
Water Used in Production	0.414	0.483	0.542	0.599	0.669
Unaccounted Water Losses	0.379	0.439	0.499	0.563	0.637
Sales to Other Communities	0.000	0.000	0.000	0.000	0.000
Total CWS Projected Demand	1.835	2.130	2.408	2.696	3.035

E. Self-Supplied Nonagricultural Users > than 300,000 Gallons a Month

In depth data on self-supplied nonagricultural users is not readily available, but there are a few known users in this category. Table 26, provides the disaggregated demand for each user.

Table 26 – Self-Supplied Nonagricultural Users Greater than 300,000 Gallons a Month

System	Usage (MG)		Disaggregated Demand (MGD)							
	Annual Average	Peak Day	Res.	Comm. & Light Ind.	Heavy Ind.	Military	Water Used in Prod.	Water Losses	Sales to Other Comm.	Total
ODEC Power Plant (SW)	4,220	19.44	0.000	0.000	11.562	0.000	N/I	N/I	0.000	11.562
ODEC Power Plant (GW)	1.91	0.007	0.005	0.000	0.000	0.000	N/I	N/I	0.000	0.005
Vulcan Material (GW)	10.96	0.045	0.000	0.000	0.030	0.000	N/I	N/I	0.000	0.030
Total	4,233	N/A	0.005	0.000	11.592	0.000	N/I	N/I	0.000	11.597

Table 26 is based on data from the year 2007.
N/I = No Information Available, N/A = Not Applicable
(GW) = Ground Water, (SW) = Surface Water

There are no known plans for expansion of the existing self-supplied nonagricultural users greater than 300,000 gallons a month, and there are no known projects to establish new users in this category. Therefore, it is assumed that this usage will not increase during the planning period. Table 27 provides the forecasted use for the planning period

Table 27 – Forecasted Self-Supplied Nonagricultural Users Greater than 300,000 Gallons a Month

Self-Supplied Nonagricultural Users Greater than 300,000 Gallons a Month	Year				
	2010	2020	2030	2040	2050
Annual Average Usage (MG)	4,233	4,233	4,233	4,233	4,233

F. Self-Supplied Agricultural Users > than 300,000 Gallons a Month

In depth data on self-supplied agricultural users is not readily available, but there are a few known users in this category. Table 28, provides the disaggregated demand for this category.

Table 28 – Self-Supplied Agricultural Users Greater than 300,000 Gallons a Month

System	Usage (MG)		Disaggregated Demand (MGD)							
	Annual Average	Peak Month	Res.	Comm. & Light Ind.	Heavy Ind.	Military	Water Used in Prod.	Water Losses	Sales to Other Comm.	Total
Howerton Farm (GW)	7.48	N/I	N/I	0.021	N/I	N/I	N/I	N/I	N/I	0.021
Lacy Farm (GW)	1.61	N/I	N/I	0.004	N/I	N/I	N/I	N/I	N/I	0.004
Total	9.09	N/A	N/I	0.021	N/I	N/I	N/I	N/I	N/I	0.025

Table 27 is based on data from the year 2007.
N/I = No Information Available, N/A = Not Applicable
(GW) = Ground Water, (SW) = Surface Water

There are no known plans for expansion of the existing self-supplied agricultural users greater than 300,000 gallons a month, and there are no known projects to establish new users in this category. Additionally, the cost to irrigate has risen over the years, while the value of the crops has not, which makes irrigating farmland financially less attractive. Therefore, it is assumed that this usage will not increase during the planning period. Table 29, provides the disaggregated demand for this category.

Table 29 – Forecasted Self-Supplied Nonagricultural Users Greater than 300,000 Gallons a Month

Self-Supplied Agricultural Users Greater than 300,000 Gallons a Month	Year				
	2010	2020	2030	2040	2050
Annual Average Usage (MG)	9.09	9.09	9.09	9.09	9.09

G. Self-Supplied Users of < than 300,000 Gallons a Month of Ground Water

The population of the County that is not supported by community water systems is assumed to be self-supplied. Areas outside of the Urban Planning Area, and the Community Planning Areas, which do not already receive water from an existing community water system are in agricultural or forested land. As such the majority of the usage is expected to be residential. Table 30, contains the forecasted water needs of the residential self-supplied user population.

Table 30 – Residential Self-Supplied Users of Less than 300,000 Gallons a Month of Ground Water

Year	Population			Usage			
	County Wide	Served by a Community System	Self-Supplied	Gallons per Capita per Day	Daily Ave. (MGD)	Annual Ave. (MG)	Peak Month (1.2*Ave) (MG)
2010	35,257	11,769	23,488	75	1.76	642.98	64.30
2020	34,034	13,572	20,462	75	1.53	560.15	56.01
2030	33,231	15,504	17,727	75	1.33	485.28	48.53
2040	33,022	17,631	15,391	75	1.15	421.33	42.13
2050	33,654	20,041	13,613	75	1.02	372.66	37.27

Although the area outside of the designated planning areas is mostly agricultural and forested, there are a limited number of businesses. It is assumed that this usage will not increase during the planning period. Table 31 provides an estimate on the water demands of businesses as supplied by the County. Table 32 combines the residential and commercial usage during the planning period.

Table 31 – Commercial Self-Supplied Users of Less than 300,000 Gallons a Month of Ground Water

Business	Population	Per Capita Water Use (gpcd)	Annual Ave. (MG)	Daily Ave. (MGD)
General Businesses	50	53	0.967	0.003
Trucking	8	113	0.330	0.001
Contractors	64	71	1.659	0.005
Stores	15	110	0.602	0.002
Garages/ tire sales	26	75	0.712	0.002
Beauty shops	10	95	0.347	0.001
Misc Industrial/machine	5	315	0.575	0.002
Ag business/retail	12	208	0.911	0.002
Recreation	10	98	0.358	0.001
Medical	5	270	0.493	0.001
Food Services	7	225	0.575	0.002
Total	N/A	N/A	7.528	0.021

Note: 2007 Population and Per Capita Use were provided by the HCSA.

Table 32 –Self-Supplied Users of Less than 300,000 Gallons a Month of Ground Water

Year	Residential Daily Ave. (MGD)	Commercial Daily Ave. (MGD)	Total Daily Ave. (MGD)
2010	1.76	0.02	1.78
2020	1.53	0.02	1.55
2030	1.33	0.02	1.35
2040	1.15	0.02	1.17
2050	1.02	0.02	1.04

H. Cumulative Demand, Use Conflict, or In-Stream Flow Information

At this time the State Water Resources Plan is not complete, and therefore such cumulative demand and use conflict information cannot be incorporated into this regional plan.

I. Projected County Water Needs

Paragraphs, D, E, F, and G of Section V cover how the projected needs of domestic consumption, in-stream uses, and economic development have been accounted in the demand projection.

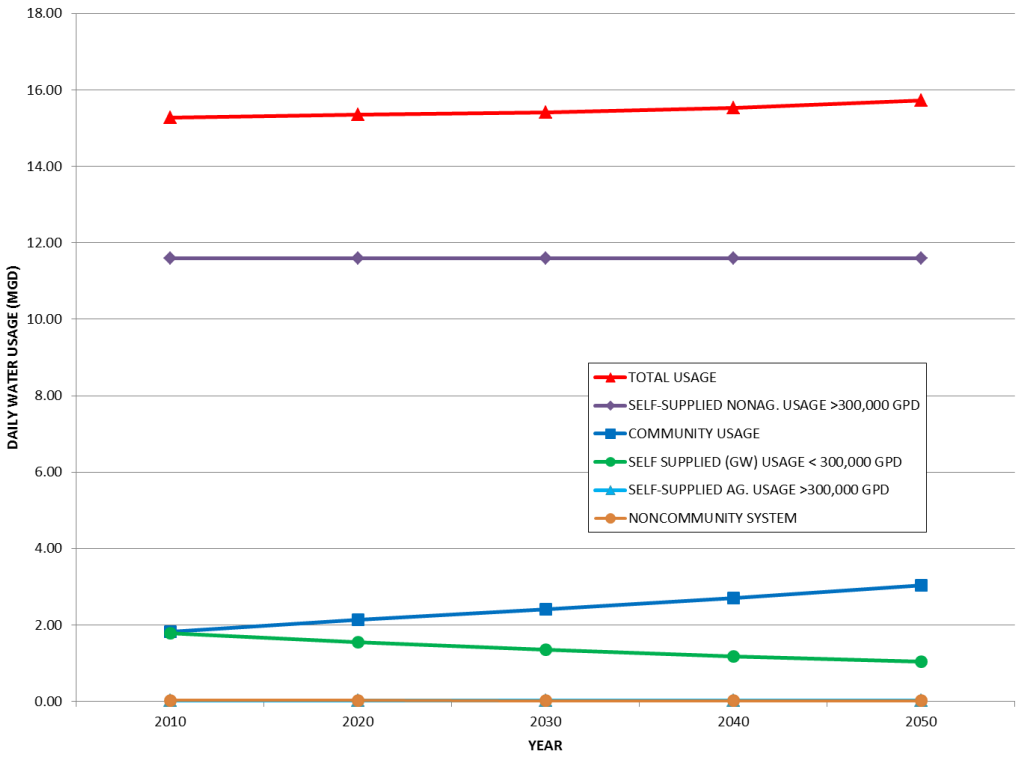
The total forecasted water needs of the County can be obtained by adding together the needs of the community water systems, and those of the self-

supplied users. Table 33 and Figure 15 represent the total water needs that are projected for the County.

Table 33 – Halifax County Average Daily Water Needs

Year	Community Systems (MGD)	Noncommunity Systems (MGD)	Self-supplied Nonag. >300,000 (MGD)	Self-supplied Ag. >300,000 (MGD)	Self-supplied <300,000 of GW (MGD)	Total (MGD)
2010	1.83	0.03	11.60	0.03	1.78	15.27
2020	2.13	0.03	11.60	0.03	1.55	15.34
2030	2.41	0.02	11.60	0.03	1.35	15.41
2040	2.70	0.02	11.60	0.03	1.17	15.52
2050	3.04	0.02	11.60	0.03	1.04	15.73

Figure 15 – Graph of Halifax County Average Daily Water Needs



As demonstrated in Figure 15, it is expected that there will be an increase in County wide water demand during the planning period. The forecasted increase is approximately 3% of the current usage. Based on the projections the increase is due to serving more of the population within the planning areas with public water, and an increased population density inside of the Urban and Community Planning Areas.

VI. (9VAC25-780-110) WATER DEMAND MANAGEMENT INFORMATION

A. Water Demand Management

1. Water Use Efficiency

   Practices and measures to use water more efficiently in the County have been compiled by the HCSA, and are presented in the document "Water Demand Management Information, 9VAC 25-780-110" as developed by the DEQ. Code compliance is enforced by Halifax County, as all building permits and inspections for the County, and Towns are provided by the County. The completed form is included in Appendix B of this report.

2. Water Conservation

   Practices and measures to conserve water in the County have been compiled by the HCSA, and are presented in the document "Water Demand Management Information, 9VAC 25-780-110" as developed by the DEQ. Code compliance is enforced by Halifax County, as all building permits and inspections for the County, and Towns are provided by the County. The completed form is included in Appendix B of this report.

3. Water Loss Reduction

   Practices and measures to reduce water loss in water systems within the County have been compiled by the HCSA, and are presented in the document "Water Demand Management Information, 9VAC 25-780-110" as developed by the DEQ. Code compliance is enforced by Halifax County, as all building permits and inspections for the County, and Towns are provided by the County. The completed form is included in Appendix B of this report.

B. Current Conservation Practices

Current conservation practices, techniques, and technologies have been considered in the water demand projections of Section 9VAC25-780-100. No future water loss technologies have been assumed in the development of water demand projections.

VII. (9VAC25-780-120) DROUGHT RESPONSE AND CONTINGENCY PLANS

A. Introduction and Background

Drought is a complex issue with many definitions, but in general a drought is a period of time in which there is a shortage of moisture within a defined space, which may adversely affect living organisms. At one point or another, most of the United States, including Virginia, has experienced various levels of drought. According to the Virginia Department of Environmental Quality (DEQ), the Commonwealth of Virginia had four major droughts during the last century. These occurred during the years 1930-1932, 1938-1942, 1962-1971, and 1980-1982.

During the summer of 2002 Virginia experienced another significant drought due to precipitation deficits that dated to 1999 in most areas of the Commonwealth. While the drought of 2002 did not reach the same level of water deficit that occurred in the 1930 drought, the population of Virginia increased more than threefold between the two events, and accordingly the demand on water resources within the Commonwealth has increased which resulted in significant impacts to all sectors of Virginia's economy and society.

The intensity of these drought impacts peaked in late August 2002. Wildfire indices were at levels previously unrecorded in Virginia, the vast majority of Virginia agricultural counties had applied for Federal drought disaster designation, stream flows reached period of record lows, and thousands of individual private wells failed.

On August 30, 2002 Governor Warner declared a drought emergency in the majority of the Commonwealth by issuance of Executive Order #33. This executive order required the elimination of some non-essential water uses in large areas of the Commonwealth. In addition, this executive order named the Deputy Secretary of Natural Resources as the Commonwealth Drought Coordinator and charged him with the implementation of the water use restrictions. While these emergency actions were necessary in light of the drought impacts within the Commonwealth, they resulted in significant confusion and consternation among water users who were impacted.

On December 13, 2002 Governor Warner issued Executive Order #39, the Virginia Water Supply Initiative. This executive order requires the Commonwealth's Drought Coordinator to develop a formal drought assessment and response plan. In January 2003, the Deputy Secretary of Natural Resources invited a broad coalition of stakeholders to participate in a Drought Response Technical Advisory Committee chaired by the Virginia DEQ. This technical advisory committee was supported by the existing Virginia Drought Monitoring Task Force, and developed the Virginia Drought Assessment and Response Plan, dated March 28, 2003

To better handle responsibilities of government during droughts, the DEQ has issued the Water Supply Planning Regulations, and specifically 9VAC25-780-120, has been implemented to create Drought Response and Contingency Plans (Plan). If implemented correctly, the Plan should assist the community in

conserving water during drought conditions in an effort to prolong the viable supply of fresh water for human consumption, and public health and safety. According to the regulations, the Plan shall contain at least three graduated response stages, under varying levels of drought.

This Plan has been drafted in response to these Virginia state regulatory actions. It addresses the specific types of impacts and water resource issues that are relevant to Halifax County and outlines appropriate drought response actions

B. Establishment of Drought Task Force

1. Drought Task Force

There are many parties with a vested interest in water usage, and the determination of drought conditions, within Halifax County. In the interest of the public, and to share the responsibility among these parties a Drought Task Force (Task Force) shall be created, and made up of representatives from agencies and organizations within the County with experience in emergency management, and water supply. The Task Force shall have a representative from each of the following organizations:

a. Halifax County, Department of Agricultural Development

b. Halifax County, Emergency Service Coordinator

c. Halifax County Service Authority

d. Town of Halifax

e. Town of Scottsburg

f. Town of South Boston

g. Town of Virgilina

h. Virginia Cooperative Extension

Each of the listed organizations may designate a single representative. The Task Force will have a rotating chair position with each representative organization having a one year term as chair person. Each organization shall hold the chair position once within every eight year period. The Task Force may rely on existing personnel from the supporting organizations to make determinations of drought status.

C. Establishment of Drought Conditions

1. Drought Monitoring

Monitoring of localized drought warnings should be conducted by the Task Force through periodic observation of key drought indicators as described in Appendix C. Along with local indicators, Task Force should pay special attention to drought data that is produced at the state level. A Drought Status Report is produced monthly, using these same indicators, by the Virginia Drought Monitoring Task Force (DMTF), an interagency group of technical representatives from state and federal agencies responsible for monitoring natural resource conditions and the effects of drought on various segments of society.

During periods of normal moisture conditions, the Virginia DEQ will monitor the NOAA U.S. Drought Monitor, and will produce information from this report specific to Virginia on a monthly basis. The Virginia drought map will be produced concurrent with the release of NOAA monthly and seasonal outlooks, which usually are released on the Thursday closest to the middle of the month. The DMTF will be activated with the first occurrence of moderate drought conditions (D1) in the Commonwealth or the occurrence of smaller scale moisture deficits that may fall beneath the level of resolution of the U.S. Drought Monitor.

The DMTF will monitor the advance of drought conditions in the Commonwealth using the drought indicators listed in Appendix C and other indicators such as the Standardized Precipitation Index, Palmer Drought Severity Index, Crop Moisture Index, Keetch-Byrum Drought Index, and NOAA monthly and seasonal precipitation outlooks. In addition, the DMTF will monitor the effect of advancing drought conditions on various sectors of society including agriculture, forestry, and recreation. The DMTF will produce a monthly report of current drought conditions and their effects, and will generally remain active until the NOAA U.S. Drought Monitor indicates that all drought impacts in the Commonwealth have subsided to an *unusually dry* level (D0). The DMTF may remain active after all drought impacts have subsided to an *unusually dry* level when small areas beneath the resolution of the U.S. Drought Monitor continue to experience drought impacts.

2. Drought Indicators

To produce a uniform monitoring of the drought conditions in the state, Virginia has identified four indicators to evaluate drought severity. The Task Force will use the same indicators in their localized drought monitoring. The indicators are based on the amount of precipitation and the effect of the precipitation (or lack of precipitation) on the hydrologic system. These indicators include:

a. Precipitation Deficits

b. Streamflows

c. Ground Water Levels

d. Reservoir Storage

Details of the four drought indicators are provided in Appendix C. The current measurements for these four indicators will be compared to long term averages to determine if current conditions require further attention and possible drought classification. To provide locally applicable data, the State Plan divides the State into thirteen drought evaluation regions. Halifax County falls within the Roanoke River Drought Evaluation Region.

D. Declaration of Drought Stages

All water supplies are unique to the communities that they serve. As such, there is a large diversity in the uses of water, and the degree to which the water source is used within each community. In addition to being a source of potable drinking water, the waters of Halifax County also provide the following benefits:

1. Electrical power is generated at the Kerr Dam on the Roanoke River.

2. Recreational boating and swimming occurs County wide, but in particular occurs most often at Kerr Reservoir, Banister Lake, Conner Lake, Roanoke River, Banister River, Dan River, and Hyco River.

3. Fishing occurs County wide in the major rivers, lakes, and minor tributaries.

4. Fish spawning happens throughout the surface waters of the County, and the Department of Game and inland Fisheries raises fish at the Vic Thomas fish hatchery.

5. Irrigation of crops is dependant on the use of wells, and the quantity of ground water.

6. Wetlands that are scattered throughout the County provide both habitat for plants and animals, and the wetlands also help mitigate pollution from runoff.

7. Kerr Lake provides flood management to areas downstream of the lake.

8. Water supplies provide natural beauty to an area that can be enjoyed by all to see and the Staunton River (Roanoke River) has been granted status as a scenic river.

With water for all of these uses in mind the County needs to be vigilant to monitor the amount of water in the ground and on the surface. Therefore the Task Force will use four drought indicators (precipitation, stream flows, reservoir levels and ground water levels) as the initial indicators to be considered when advising the Board of Supervisors regarding the declaration of a particular drought stage. The drought stages which the Task Force shall have available for determination include:

1. Normal Conditions

2. Drought Watch

3. Drought Warning

4. Drought Emergency

When two indicators exceed the threshold for stage determination, the advisement may be to declare a specific drought stage or may include an explanation of why the particular drought stage should not be declared at that time. The Task Force recommendation to declare a drought stage shall include a summary report that sets out the data utilized in making such determination highlighting the indicator exceedance levels that have been met.

As an example, when two of the four drought indicators indicate drought warning conditions, the Task Force will evaluate all other drought information available and, if the majority of information warrants declaration, advise the declaration of a drought warning. In addition, the Board may declare local drought emergencies, adopt emergency ordinances to address those local emergencies, and implement those ordinances prior to the declaration of a Drought Emergency by the Governor of Virginia. While actions on the State level are important for the purpose of alerting localities and citizens of the advance of drought impacts; actions by local governments, individual water suppliers, and individual citizens are much more important and effective in actually addressing the impacts of drought.

Following the declaration of the drought and its level of severity, the locality will implement appropriate response actions, including but not limited to various conservation measures. The Task Force will continually monitor drought conditions and based on the monitoring evaluation will decide if the drought warning level needs to increase or if conditions have improved to a point where the declaration can be removed.

E. Responses to Drought

The following stages are to be used by the Task Force in advising the Board of Supervisors on making drought declarations. The descriptions given for each stage are not to be used as requirements, but as tools for the Task Force in determining the appropriate drought advisement. Specific response activities can be found in Appendices II & III and should be initiated by the Board alongside declaring a drought stage.

1. Drought Watch

   Drought watch responses are generally responses that are intended to increase awareness, in the public and private sector, to climatic conditions that are likely to precede the occurrence of a significant drought event. During this drought stage the primary activities that are suggested are to prepare for the onset of a drought event. It is unlikely that significant water use reductions will occur at this stage although it is

possible that the increased public awareness of water conservation activities may reduce water use up to 5%.

2. Drought Warning

Drought warning responses are generally responses that are required when the onset of a significant drought event is imminent. Water conservation and contingency plans that have been prepared during a drought watch stage would begin to be implemented. From the perspective of the County, water conservation activities at this stage would generally be voluntary. Voluntary water conservation activities generally result in reductions in water use of 5-10%.

3. Drought Emergency

Drought emergency responses are generally responses that are required during the height of a significant drought event. During these times, it is likely that some water supplies will not provide the amount of water needed by all users and non-essential uses of water should be eliminated. Mandatory water conservation requirements contained in water conservation and contingency plans should be initiated at this stage. Mandatory water conservation activities generally result in water use reductions of 10-15%.

F. Procedure for Implementation

1. Locality Adoption

Each locality within the Halifax County Regional Water Supply Plan area shall adopt an ordinance for the purpose of implementation and enforcement of the drought response.

2. Suggested Ordinance Language

a. Short Title.

This Article shall be known and may be cited as the Drought Response Ordinance.

b. Purpose.

The purpose of this Article is to provide for the voluntary and mandatory restriction of water within the Halifax County Regional Water Supply Plan area during declared water shortages or water emergencies.

c. Scope.

This Article shall apply to all Halifax County residents and businesses, including those served by private water systems and public water systems.

d. Drought Response Plan.

The locality shall adopt by resolution the Halifax County Regional Water Supply Plan, which includes the Drought Response and Contingency Plan.

e. Drought Indicators.

Upon determination that drought indicator(s) exceed the threshold of a drought stage, as set forth in the Drought Response and Contingency Plan as outlined in Parts B and C of Section VII of the Halifax County Regional Water Supply Plan, the Drought Task Force may declare a specific drought stage.

f. Drought Stages.

The drought stages shall be Drought Watch, Drought Warning, and Drought Emergency, as determined by the Drought Task Force, pursuant to the Halifax County Drought Response and Contingency Plan and State Water Control Board regulation 9 VAC 25-780-120.

g. Declaration.

Upon determination of a drought stage as defined by this ordinance, the Drought Task Force may issue a declaration of a drought stage. The Drought Task Force may declare a drought stage in the absence of a declaration by the Commonwealth of Virginia.

h. Drought Stage Responses.

Upon declaration by the Drought Task Force of a Drought Watch or Drought Warning, voluntary conservation measures will be requested of residents and businesses as set forth in the Drought Response and Contingency Plan. Upon declaration of a Drought Emergency, mandatory restrictions shall apply as set forth in the Plan.

i. Waiver of Restrictions.

Upon prior written request by an individual, business, or other water user, the Drought Task Force, or its designee, may permit less than full compliance with any drought restrictions if good cause can be shown, including evidence that the applicant is affected in a substantial manner not common to other businesses or persons generally. No waiver shall be granted by the Drought Task Force or its designee unless the Drought Task Force or its designee determines that the public health, safety, and welfare will not be adversely affected by the waiver. All waivers granted by

the Drought Task Force or its designee shall be reported at the Drought Task Force's next regular or special meeting.

j. Penalties.

Any violation of this ordinance shall constitute a misdemeanor, punishable by a fine of not less than one hundred dollars ($100) and not more than five hundred dollars ($500). Each act or each day's continuation of the violation shall be considered a separate offense.

VIII. (9VAC25-780-130) STATEMENT OF NEED AND ALTERNATIVES

A. Adequacy of Existing Source

Review of Halifax County's existing water sources, indicates that there is capacity to meet the County's current needs, and forecasted needs thru the year 2035. An overview of each of the major water sources is presented to demonstrate the adequacy of the water sources.

1. Staunton River

   Approximately 77% of the County's current water demand is based on a single user, the ODEC Virginia Power Plant. The ODEC Virginia Power Plant uses an average of 11.5 MGD, but can use up to 19.4 MGD, and this water comes from the Staunton River. The USGS Station 02066000 is located approximately 3 miles upstream of the Plant. The lowest recorded flow through this station is 176 ft^3/s, which is equivalent to 78,994 gallons per minute. Over a full day, this low flow volume represents a volume of 113.75 million gallons. Therefore even at the rivers lowest recorded flow, the river has 5.8 times more water than is needed during the power plant's maximum working conditions.

2. Dan River

   Approximately 11% of the County's current water demand is from the HCSA's UPA water system. The UPA water system currently uses approximately 1.73 million gallons of water from the Dan River. The UPA system's Leigh Street Water Treatment Plant has a VDH permitted capacity of 3.0 MGD, which exceeds the 2050 forecasted demand of 2.79 MGD. However, based on the VDH *Waterworks Regulations*, the system must start planning to expand the water treatment plant once the water treatment plant produces 80% of its permitted capacity for a three month period. Using the projections developed in this report, it is expected that demand in the UPA system will reach the 2.4 MGD threshold sometime around 2035.

   The amended September 1986 VDH engineering description sheet does not make a determination of the source water capacity, but says that the design capacity is 3.0 MGD. Therefore, if the system demand reaches the 80% capacity limit, then planning for the expansion of the water treatment plant would be necessary. Using a 1.25 multiplier on the projected 2050 demand to account for the 80% threshold indicates that in the year 2050, the HCSA will need a permitted capacity of 3.5 MGD.

   A review of the Dan River, using the nearest upstream gage shows that the USGS Station 02075500 is approximately 13 miles upstream from the intake, and the lowest recorded flow is 129 ft3/s, which is equivalent to 57,899 gallons per minute. During a complete day, this low flow volume represents 83.37 million gallons. At the rivers lowest flow level, and the water treatment plants forecasted 2050 needed capacity of 3.5 MGD, the river has 23.8 times the needed capacity. However, it is uncertain if the

DEQ would allow an expansion to the raw water intake at this plant, as large amounts of water are already obligated to other users downstream of Halifax County, specifically Virginia Beach is allocated 60 MGD from Lake Gaston.

3. Ground Water

Approximately 12% of the County's current water demand is met by the use of ground water wells. It is estimated that 1.89 MGD is currently taken out of the ground, and by the year 2050 only 1.33 MGD will be taken from the ground. This projected decrease in ground water is based on two trends; first there is a net migration out of the rural areas of the County, and second, waterline extensions of the existing UPA water system will remove the need for existing wells. Currently there are no known problems with the volume of ground water in use in the County, and as the reliance on ground water decreases in the future, ground water shortages are not expected.

B. Analysis of Potential Sources

The projected demand within the Halifax County Service Authority UPA system will reach 2.79 MGD by the end of the 40 year planning period. Although this volume of water is less than the 3.0 MGD currently permitted at this site, the VDH *Waterworks Regulations* will require planning to start for a plant upgrade. Therefore alternatives to this source will be briefly discussed.

1. Water Demand Management Strategies

a. Loss Control Program

A loss control program to perform regular leak detection and repairs can be implemented. If the system leakage can be reduced by 5%, the projected 40 year planning demand of 2.79 MGD can be reduced to 2.65 MGD, which is a savings of 0.14 MGD.

b. Meter Replacement Program

Like any mechanical device, water meters wear and deteriorate as they age, which reduces the accuracy levels of the reading. To combat the reduced accuracy, a meter replacement program can be implemented to switch out all of the meters on a 10 to 20 year rotation, as system conditions warrant. If average meter accuracy starts at 99% and over a 15 year period ends at 95% accuracy than the average savings by switching out the meter would be 2% of metered usage. Although this 2% will not necessarily reduce water consumption, it will improve billing rates, but a cost analysis of the system would need to be conducted to determine the breakeven point of the cost of the meter versus the cost of the lost water. The study "Evaluating domestic water meter accuracy. A case Study", by F.J. Arregui, C.V. Palau, and L. Gascon,

published in Pumps, Electromechanical Devices and Systems Applied to Urban Water Management, Volume 1, in the year 2003 indicates that two brands of meters had been in use in the study location, one brand of meters had a financial breakeven at 13 years, and another brand of meters had such little degradation, that no financial breakeven point was listed for replacement.

c. Increase Water Rates

A common strategy to reduce water consumption is to raise water rates. However, the 2008 census update indicates that 19.5% of Halifax County lives below the poverty line, and it is believed that raising water rates to reduce water usage would not be in the best interest of the community. Therefore this topic is mentioned, but is not considered a viable strategy for the Halifax County planning area.

2. Potential Sources

a. Dan River

The existing UPA system takes water out of the Dan River. The most straight forward method to increase the system water source would be to increase the withdrawal from the Dan River. This will require an increase to the permitted withdrawal capacity, as approved by the DEQ. As the system demand in 2050 is projected to be 2.79 MGD, the new permitted capacity should be at least 3.5 MGD so that the VDH *Waterworks Regulations* 80% design threshold is not reached. This represents an increase of 0.5 MGD above the existing water withdrawal permit.

b. Banister River

Prior to the HCSA merging water systems, the Banister River served as the water source for the Town of Halifax. Although the Halifax Water Treatment Plant is no longer in use, and the infrastructure is not in place to treat water from the Banister River, the longtime use of this river as a source of water provides evidence that the Dan River is a feasible alternate source of water. The former withdrawal permit for the Halifax intake on the Banister River was 0.29 MGD, which does not fully cover the projected 0.5 MGD water needs of the UPA system.

c. Ground Water Wells

Ground water wells could be used as a potential source to supplement the UPA system. A single well with a yield of 627 gpm for 13 hours per day could provide the needed source of 0.5 MGD. However, the County has many wells on record, and depths range from 32 feet to 603 feet, and yields range from less than 1.0 gpm to 150 gpm. With more than half of the known wells

producing less than 10 gpm. Based on yields of the existing wells, it is not considered likely that a single well location or multiple large well locations could provide the supplemental water. Assuming a County average yield of 10 gpm for 13 hours per day 63 wells would be required to be added to the UPA system. The addition of 63 wells would be an additional operational burden to the HCSA, and is not considered a feasible alternate water source.

3. Potential Resource Issues and Impacts

At this time the State Water Resources Plan is not complete, and therefore such potential resource issues and impacts cannot be incorporated into this regional plan.

C. Potential Alternative Submission

It appears that the County has a sufficient water supply to meet the County's short term and long term water demands. However, at this time the County is only permitted to withdrawal 3.0 MGD from the Dan River and in approximately 25 years it is projected that the HCSA will need to increase the source to 3.5 MGD. As all of the water from the Dan River is used within the drainage basin, and much of it is returned through the HCSA's wastewater treatment plants the most straight forward alternative is to increase the permitted withdrawal rate from the Dan River.

APPENDIX A - SOURCE AND USE DATA SHEETS

Community Water Systems: Groundwater Sources

Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List all well information for community water systems using groundwater. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark well locations on associated map.

COMMUNITY WATER SYSTEMS (MUNCIPAL & PRIVATE) USING GROUND WATER (9 VAC 25-780-70 B)

				INDIVIDUAL WELL DATA:									**GROUNDWATER MANAGEMENT AREA WELLS**		
PWSID	Water System Name	VDH Permitted System Capacity (gpd)	Calculated VDH Permitted System Capacity (MGD)	Well Name and ID #	Well Depth (feet)	Casing Depth (feet)	Screen Depth (Top & Bottom) or Water Zones	Well Diameter (inches)	Withdrawal Design Capacity: **AVERAGE DAILY** (gpd)	Withdrawal Design Capacity: **AVERAGE DAILY** (MGD)	Withdrawal Design Capacity: **MAXIMUM DAILY** (gpd)	Withdrawal Design Capacity: **MAXIMUM DAILY** (MGD)	DEQ Permitted **Monthly Withdrawal** (MGD)	DEQ Permitted **Annual Withdrawal** (MGD)	**Notes or Comments** **(This may include references to maps, data sources, data gaps, etc.)**
5083480	Clover	91,200.00	0.09	#1	300	110	80	6	64,000.00	0.06	73,440.00	0.07			Virginia Department of Health Engineering Data
			0.00	#2	300	104	50	6	27,200.00	0.03	48,960.00	0.05			
5083810	VIR	174,240.00	0.17	#1	265	55	11.5	6.25	47,520.00	0.05	47,520.00	0.05			
			0.00	#2	305	90	22.5	6	15,840.00	0.02	15,840.00	0.02			
			0.00	#3	305	85	5	6	25,920.00	0.03	25,920.00	0.03			
			0.00	#4	305	85	72	6	46,080.00	0.05	46,080.00	0.05			
			0.00	#5	325	68	20	6	38,880.00	0.04	38,880.00	0.04			
5083690	Town of Scottsburg	106,400.00	0.11	#2	280	105	29	6	86,400.00	0.09	92,160.00	0.09			
			0.00	#3	405	56	31	6	36,000.00	0.04	37,440.00	0.04			
			0.00	#4	305	64	20	6	21,600.00	0.02	21,600.00	0.02			
			0.00	#5	305	60	11	6	60,480.00	0.06	70,560.00	0.07			
5083940	Town of Virgilina	41,280.00	0.04	#2	640	51		6.25	16,000.00	0.02	30,240.00	0.03			
			0.00	#3	525	55		6	4,800.00	0.00	11,520.00	0.01			
			0.00	#4	606	55	285	6	10,080.00	0.01	11,200.00	0.01			
			0.00	#5	445	55	18	6	11,520.00	0.01	11,520.00	0.01			
			0.00	#6	607	57	50	6	10,400.00	0.01	25,200.00	0.03			
5083270	Carlsbrook School	16,800.00	0.02	Site D	305	52	15	6	30,240.00	0.03	30,240.00	0.03			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
			0.00							0.00		0.00			
Existing Source Totals - for all CWS's using wells (MGD)			0.43							0.55		0.64	0.00	0.00	

Community Water Systems: Reservoir Sources
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List reservoir information for all community water systems using surface water reservoirs. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark reservoirs and intakes on associated map.

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE) USING SURFACE WATER RESERVOIRS (9 VAC 25-780-70 C)

Is your water system comprised of interconnected reservoirs? ☐ **Yes** ☑ **No**

If YES, designate which reservoirs and which intakes constitute a system. Report the drainage area and amount of storage available for water supply from each reservoir independently. Designed maximum daily withdrawal and the safe yield may be reported for the entire system or subsets of the system.

PWSID #	Water System Name	Reservoir Name	Reservoir watershed **Basin/ Sub-basin**	Reservoir watershed **Drainage Area** (square miles)	On-Stream Storage Available for Water Supply (gallons)	On-Stream Storage Available for Water Supply (MG)	**DESIGN CAPACITY:**						Reservoir **Safe Yield** (MGD)	VDH Permitted System Capacity (gpd)	VDH Permitted System Capacity (MGD)	Limitations on Withdrawal Permit	**Notes or Comments** **(This may include references to maps, data sources, data gaps, etc.)**
							Average Daily Withdrawal (gpd)	**Average Daily** Withdrawal (MGD)	**Maximum Daily** Withdrawal (gpd)	**Maximum Daily** Withdrawal (MGD)	Associated **Water Treatment Plant** (gpd)	Associated **Water Treatment Plant** (MGD)					
	HCSA has no reservoirs for its source water					0.00		0.00		0.00		0.00			0.00		Source use being discontinued
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
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						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
						0.00		0.00		0.00		0.00			0.00		
Existing Source Totals - for all CWS's using surface water reservoirs (MG or MGD)					▨	0.00	▨	0.00	▨	0.00	▨	0.00	▨	▨	0.00	▨	▨

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List intake information for all community water systems using stream intakes. Additionally, include a qualitative description of existing in-stream beneficial uses within the planning area or outside the planning area that may be affected by point of stream withdrawal. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark intakes on associated map.

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE) USING STREAM INTAKES* (9 VAC 25-780-70 D, - 80 B10)

* For municipal or private community water system(s) using springs, list applicable information for your spring sources below.

PWSID #	Water System Name	Stream, River, or Spring Name	Basin / Sub-basin	Intake Drainage Area (square miles)	DESIGN CAPACITY: Average Daily Withdrawal (gpd)	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawal (gpd)	Maximum Daily Withdrawal (MGD)	Pump Station (gpd)	Pump Station (MGD)	Water Treatment Plant (gpd)	Water Treatment Plant (MGD)	Safe Yield of Stream (MGD)	Lowest Daily Flow of Record (cfs)	VDH Permitted Capacity (gpd)	VDH Permitted Capacity (MGD)	Limitations on Withdrawal Permit	EXISTING INSTREAM BENEFICIAL USES: Within Planning Area	Outside Planning Area	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
5780600	Leigh Ave. WTP	Dan River	Roanoke/Dan	2,730.00	1,467,800.00	1.47	3,000,000.00	3.00	3,670,000.00	3.67	3,000,000.00	3.00	173.00	218.00	3,000,000.00	3.00	n/a	Fish and Wildlife - Recreation	Fish and Wildlife - Recreation	
5083550	Halifax WTP	Banister River	Roanoke/Dan/ Banister	574.00	139,866.00	0.14	288,000.00	0.29	288,000.00	0.29	288,000.00	0.29	?	6.00	288,000.00	0.29	n/a	Fish and Wildlife - Recreation	Fish and Wildlife - Recreation	Withdrawls ended May 2009
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
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						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
						0.00		0.00		0.00		0.00				0.00				
Existing Source Totals - for all CWS's using stream intakes &/or springs (MGD)						1.61		3.29		3.96		3.29				3.29				

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Water Purchases Outside Planning Area
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List information regarding the amount of ground or surface water to be purchased from water supply systems outside the geographic boundaries of the planning area (9 VAC 25-780-70G). Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map.

AMOUNT OF GROUND OR SURFACE WATER TO BE PURCHASED FROM WATER SUPPLY SYSTEMS OUTSIDE THE GEOGRAPHIC BOUNDARIES OF THE PLANNING AREA (9 VAC 25-780-70G)

	Source:		Amount to be Purchased:				Contract Limitations:				
PWSID#, Community Water System Name	Ground Water Well Name & ID No.	Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	Maximum Daily (gpd)	Maximum Daily (MGD)	Average Annual (gpd)	Average Annual (MGD)	Supplier(s) Name(s) (PWSID #)	Contract or Agreement Terms	Recipient(s) or Area(s) Served	Contract Limits	Other
There are no outside purchases opf Water	N/A	N/A		0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
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				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
Total Amount of Water To Be Purchased Outside the Planning Area (MGD):				0.00		0.00					

List information for the amount of ground or surface water available to be purchased from outside the geographic boundaries of the planning area from water supply systems with the capacity to draw more than 300,000 gallons per month (9 VAC 25-780-70H). Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map.

AMOUNT OF WATER AVAILABLE TO BE PURCHASED, OUTSIDE THE PLANNING AREA, FROM ANY SOURCE WITH CAPACITY TO WITHDRAW MORE THAN 300,000 GALLONS PER MONTH OF SURFACE OR GROUND WATER (9 VAC 25-780-70H)

	Source:		Amount Available to be Purchased:				Contract Limitations:				
PWSID#, Community Water System Name	Ground Water Well Name & ID No.	Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	Maximum Daily (gpd)	Maximum Daily (MGD)	Average Annual (gpd)	Average Annual (MGD)	Supplier(s) Name(s) (PWSID #)	Contract or Agreement Terms	Recipient(s) or Area(s) Served	Contract Limits	Other
N/A	N/A	N/A		0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
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				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
				0.00		0.00					
Total Amount of Water Available for Purchase Outside the Planning Area (MGD):				0.00		0.00					

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Note findings and recommendations from source water assessment plans and/or wellhead protection programs. Reference sources and note any assumptions. If unable to find data or data not applicable, note accordingly. If applicable, mark program/plan areas on associated map.

FINDINGS AND RECOMMENDATIONS FROM APPLICABLE SOURCE WATER ASSESSMENT PLANS OR WELLHEAD PROTECTION PROGRAMS (9 VAC 25-780-70K)

Locality Name	Source Water Assessment Plan(s):		Wellhead Protection Program(s):	
	Date of Plan	Summary of Findings and Recommendations	Date of Program	Summary of Findings and Recommendations
HCSA		HCSA has no SWAP plans		HCSA has no Wellhead protection plans

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Community Water Systems: Withdrawal Information
Your Locality or Region

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 3 and fill out a separate spreadsheet for each data year.**

COMMUNITY WATER SYSTEMS USING GROUND AND SURFACE WATER: *water withdrawal information* (9 VAC 25-780-80 B1-B3)

YEAR: 2008

PWSID	Water System Name	Source Name	Population Served	Number of Connections	WITHDRAWAL: Average Daily (MGD)	WITHDRAWAL: Maximum Daily (MGD)	Notes or Comments (This may include references to maps, data sources, data gaps, etc.)
		Municipal Systems					
5780600	Town of South Boston	Dan River	9,000	3,621	1.706	3	Part of HCSA Consolidated system
5083550	Town of Halifax	Bannister River	1,389	590	0.029	0.36	Part of HCSA Consolidated system
5083480	Clover	Wells	290	155	0.028	0.091	Operated by HCSA
5083810	VIR	Wells	430	40	0.014	0.174	Operated by HCSA
5083690	Scottsburg	Wells	360	175	0.045	0.106	
5083940	Virgilina	Wells	300	110	0.011	0.041	
5083270	Carlsbrook School	wells	100	3	0.008	0.016	
	Municipal Community Water System Totals:		**11,869**	**4,694**	**1.84**		
		Private Systems					
	Private Community Water System Totals:		**0**	**0**	**0.00**		
	Municipal and Private Community Water System Totals:		**11,869**	**4,694**	**1.84**		

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

CWS Annual Average and Average Monthly Water Use
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map.
Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.

Community Water Systems Using Ground and Surface Water: ***annual average and average monthly water use*** **(9 VAC 25-780-80 B4)**

	PWSID # 5780600 Town of South Boston System Name			PWSID # 5083550 Town of Halifax			PWSID # 5083480 Clover			PWSID # 5083810 VIR			PWSID # 5083690 Scottsburg			PWSID # 5083810 Virgilina			PWSID # 5083270 Carlbrook School			Locality or Region Total Water Use (MG/Mo)	Locality or Region Total Average Monthly by Month (MGD)
	SW			SW			GW			GW			GW			GW			GW				
YEAR 2008	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)	Monthly Readings (gallons)	Monthly Readings (MG)	Average Monthly (MGD)		
January	53,205,000.00	53.21	1.716	2,507,000.00	2.51	0.081	1,000,000.00	1.00	0.032	110,000.00	0.11	0.004	1,457,667	1.46	0.047	328,000.00	0.33	0.011	225,940.00	0.23	0.007	58.83	1.90
February	48,427,000.00	48.43	1.730	1,308,000.00	1.31	0.047	647,500.00	0.65	0.023	277,906.00	0.28	0.010	1,457,667	1.46	0.052	311,780.00	0.31	0.011	203,430.00	0.20	0.007	52.63	1.88
March	50,813,000.00	50.81	1.639	793,000.00	0.79	0.026	713,500.00	0.71	0.023	373,056.00	0.37	0.012	1,457,667	1.46	0.047	343,610.00	0.34	0.011	243,080.00	0.24	0.008	54.74	1.77
April	48,323,000.00	48.32	1.611	765,000.00	0.77	0.026	668,100.00	0.67	0.022	403,499.00	0.40	0.013	1,296,333	1.30	0.043	326,120.00	0.33	0.011	236,670.00	0.24	0.008	52.02	1.73
May	52,946,000.00	52.95	1.708	703,000.00	0.70	0.023	784,100.00	0.78	0.025	475,340.00	0.48	0.015	1,296,333	1.30	0.042	363,080.00	0.36	0.012	259,420.00	0.26	0.008	56.83	1.83
June	56,286,000.00	56.29	1.876	904,000.00	0.90	0.030	849,100.00	0.85	0.028	685,430.00	0.69	0.023	1,296,333	1.30	0.043	425,080.00	0.43	0.014	296,670.00	0.30	0.010	60.74	2.02
July	55,352,000.00	55.35	1.786	868,000.00	0.87	0.028	919,000.00	0.92	0.030	373,340.00	0.37	0.012	1,404,400	1.40	0.045	366,588.00	0.37	0.012	285,590.00	0.29	0.009	59.57	1.92
August	57,254,000.00	57.25	1.847	534,000.00	0.53	0.017	758,400.00	0.76	0.024	1,079,740.00	1.08	0.035	1,404,400	1.40	0.045	363,570.00	0.36	0.012	259,510.00	0.26	0.008	61.65	1.99
September	52,370,000.00	52.37	1.746	590,000.00	0.59	0.020	709,700.00	0.71	0.024	708,590.00	0.71	0.024	1,404,400	1.40	0.047	321,580.00	0.32	0.011	192,040.00	0.19	0.006	56.30	1.88
October	51,074,000.00	51.07	1.648	577,000.00	0.58	0.019	802,900.00	0.80	0.026	284,250.00	0.28	0.009	1,255,981	1.26	0.041	307,410.00	0.31	0.010	188,140.00	0.19	0.006	54.49	1.76
November	47,890,000.00	47.89	1.596	545,000.00	0.55	0.018	736,600.00	0.74	0.025	338,230.00	0.34	0.011	1,255,981	1.26	0.042	321,590.00	0.32	0.011	211,310.00	0.21	0.007	51.30	1.71
December	48,487,000.00	48.49	1.564	503,000.00	0.50	0.016	804,600.00	0.80	0.026	20,220.00	0.02	0.001	1,255,981	1.26	0.041	345,460.00	0.35	0.011	186,240.00	0.19	0.006	51.60	1.66
Total Annual (MG)		622.43			10.60			9.39			5.13			16.24			4.12			2.79		670.70	
Average Monthly (MG/Mo)		51.87			0.88			0.78			0.43			1.35			0.34			0.23		55.89	
Average Daily (MGD)		1.705			0.029			0.026			0.014			0.045			0.011			0.008		1.838	
NOTES or COMMENTS:				To be closed in 2009									Data is reported Quarterly										

Worksheet Instructions:

1) Enter the data year and your system name.
2) Enter source code (GW = Ground Water; SW = Surface Water).
3) Enter monthly water use data in gallons.
4) Enter notes or comments (this may include references to maps, data sources, data gaps, etc.) in the approriate cells.
5) If you need additional data entry columns, "unhide" columns V through AU.

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Community Water Systems: Peak Day Use
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Include the following water use information for each community water system within the planning area. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark service areas on associated map. **Note the data reference year in Row 6 and fill out a separate spreadsheet for each data year.**

Community Water Systems Using Ground and Surface Water: *peak day use* (9 VAC 25-780-80 B5)

YEAR 2008	PWSID # 5780600 South Boston System Name SW		PWSID # 5083550 Halifax ` SW		PWSID # 5083480 Clover GW		PWSID # 5083810 VIR GW		PWSID # 5083940 Virgilina GW		PWSID # 5083690 Scottsburg GW		PWSID #5083270 Carlbrook School GW	
	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)	Peak Day Readings (gpd)	Peak Day Readings (MGD)
January	2,289,000	2.289	179,000	0.179	48,387	0.048	5,323	0.005	11,890	0.012		0.000	118,970	0.119
February	2,235,000	2.235	177,000	0.177	33,491	0.033	14,374	0.014	10,600	0.011		0.073	10,600	0.011
March	1,961,000	1.961	88,000	0.088	34,524	0.035	18,051	0.018	32,720	0.033	72,883	#REF!	32,720	0.033
April	1,838,000	1.838	93,000	0.093	33,405	0.033	20,175	0.020	25,040	0.025		0.000	25,040	0.025
May	2,279,000	2.279	94,000	0.094	37,935	0.038	23,000	0.023	15,430	0.015		0.000	15,430	0.015
June	2,255,000	2.255	136,000	0.136	42,455	0.042	34,272	0.034	14,850	0.015	64,104	0.064	14,850	0.015
July	2,031,000	2.031	104,000	0.104	44,468	0.044	18,065	0.018	12,470	0.012		0.000	12,470	0.012
August	2,159,000	2.159	101,000	0.101	36,697	0.037	52,245	0.052	13,300	0.013		0.000	13,300	0.013
September	2,394,000	2.394	98,000	0.098	35,485	0.035	35,430	0.035	8,120	0.008	68,693	0.069	8,120	0.008
October	1,866,000	1.866	90,000	0.090	38,850	0.039	13,754	0.014	7,970	0.008		0.000	7,970	0.008
November	1,809,000	1.809	89,000	0.089	36,830	0.037	16,912	0.017	12,800	0.013		0.000	12,800	0.013
December	1,889,000	1.889	91,000	0.091	38,932	0.039	978	0.001	9,000	0.009	63,064	0.063	9,000	0.009
NOTES or COMMENTS:					Estimated peak		Estimate - usage tends to be seasonal and on weekends				Quarterly reports - estimated peak			

Worksheet Instructions:

1) Enter the data year and your system name.

2) Enter source code (GW = Ground Water; SW = Surface Water).

3) Enter peak day water use for each month in gallons per day (gpd). If you only have peak day data for your peak month (one month), enter that value in the appropriate cell.

4) If you do not have daily data for your system, but know your peak month then estimate your peak day use by using the following equation and enter this information into the applicable month cell above.

Peak Day "Raw" Water Use (gpd) =
Average Daily Withdrawal* (MGD) X 10^6 (g/MG) X 1.5 Peaking Factor
**from worksheet "80 B1-B3 CWS Use"*

5) Enter notes or comments (this may include references to maps, data sources, data gaps, etc.) in the approriate cells.

6) If you need additional data entry columns, "unhide" columns K through AN.

Community Water Systems: Disaggregated Use
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

For each community water system included in the water plan, include an estimate of the disaggregated annual average amount of water used in categories of use appropriate for the system. Reference sources and note any assumptions regarding calculations. **If unable to find data or data not applicable, note accordingly in the Notes/Comments Column and highlight applicable cells. Note the data reference year in Row 4 and fill out a separate spreadsheet for each data year.**

COMMUNITY WATER SYSTEMS (MUNICIPAL & PRIVATE): DISAGGREGATED ANNUAL AVERAGE WATER USE AMOUNTS (9 VAC 25-780-80 B9)

YEAR: 2008

			USAGE CATEGORIES:														Sales to Other CWS's:			Notes or Comments
PWSID	Water System Name	System Total (MGD)	Residential (gpd)	Residential (MGD)	Commercial Institutional Light Industrial C/L (gpd)	Commercial Institutional Light Industrial C/L (MGD)	Heavy Industrial (gpd)	Heavy Industrial (MGD)	Military (gpd)	Military (MGD)	Other (gpd)	Other (MGD)	Production Processes (gpd)	Production Processes (MGD)	Unaccounted for Losses (gpd)	Unaccounted for Losses (MGD)	Amount Sold (gpd)	Amount Sold (MGD)	System Name	(This may include references to maps, data sources, data gaps, etc.)
5780600 5083550	South Boston/ Halifax UPA	1.513	411,154	0.411	395,319	0.395	166,296	0.166	-	0.000	0.00	0.000	190,000	0.190	350,000	0.350	0.00	0.000	0	Production processes include wastewatee treatment plants. Losses are approximately 20%
5083480	Clover	0.028	15,579	0.016	1,238	0.001	0.00	0.000	0.00	0.000	0.00	0.000	2,000.00	0.002	8,848	0.009		0.000		Production losses are at wwtp which has unmetered connection to system.
5083690	Scottsburg	0.044	28,581	0.029	2,485	0.002	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	13,314	0.013		0.000		Estimated 30% ubn accounted for water - no billing data avaialble.
5083940	Virgilina	0.011	6,594	0.007	1,293	0.001	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	3,380	0.003		0.000		Estimated 30% ubn accounted for water - no billing data avaialble.
508310	VIR	0.014	4,297	0.004	3,540	0.004	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000	6,019	0.006		0.000		
5083270	Carlsbrook School	0.008	7,618	0.008		0.000		0.000		0.000		0.000		0.000		0.000		0.000		No billing done or meters to separate buildings.
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		
Total Use By Category in MGD (for All Community Water Systems)		1.618		0.474		0.404		0.166		0.000		0.000		0.192		0.382		0.000		

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Non-Agricultural, Self-Supplied Users of Surface Water
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List non-agricultural surface water source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column I, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF SURFACE WATER (9 VAC 25-780-70 E, - 80 B6, and - 80 C)

Water User Name	Waterbody Source Name	Use Category	DESIGN CAPACITY: Average Daily Withdrawal (gpd)	DESIGN CAPACITY: Average Daily Withdrawal (MGD)	DESIGN CAPACITY: Maximum Daily Withdrawals (gpd)	DESIGN CAPACITY: Maximum Daily Withdrawals (MGD)	Limitations on Withdrawal Permit(s)	WATER USE: Estimated Annual Average (MGD) Year 2007	Notes or Comments (Include service area user falls within and references to any maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas									
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
Within Community Water System Service Area Totals (MGD):				0.000		0.000		0.000	

Office of Water Supply Planning
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Non-Agricultural, Self-Supplied Users of Surface Water
Halifax County Planning Area

List non-agricultural surface water source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column I, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF SURFACE WATER (9 VAC 25-780-70 E, - 80 B6, and - 80 C)

Water User Name	Waterbody Source Name	Use Category	DESIGN CAPACITY: Average Daily Withdrawal (gpd)	Average Daily Withdrawal (MGD)	Maximum Daily Withdrawals (gpd)	Maximum Daily Withdrawals (MGD)	Limitations on Withdrawal Permit(s)	WATER USE: Estimated Annual Average (MGD) Year 2007	Notes or Comments (Include service area user falls within and references to any maps, data sources, data gaps, etc.)
Outside Community Water System (Municipal & Private) Service Areas									
Old Dominion Electric Coop	Roanoke River	Industrial	11,562,520.00	11.563	19,440,000.00	19.440		4,220.320	VPDES permit VA008309
				0.000		0.000			Data from DEQ
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
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				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
				0.000		0.000			
Outside Community Water System Service Area Totals (MGD):				11.563		19.440		4,220	
Self-Supplied Nonagricultural Users of Surface Water Totals (MGD):				11.563		19.440		4,220	

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Non-Agricultural, Self-Supplied Users of Ground Water
Halifax County Planning Area

List non-agricultural groundwater source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column M, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF GROUND WATER (9 VAC 25-780-70 F, - 80 B6, and - 80 C)

		DESIGN CAPACITY:				INDIVIDUAL WELL DATA:						WATER USE:	Notes or Comments
Water User Name	Use Category	Average Daily Withdrawals (gpd)	Average Daily Withdrawals (MGD)	Maximum Daily Withdrawals (gpd)	Maximum Daily Withdrawals (MGD)	Well Name and ID #	Well Depth (feet)	Casing Depth (feet)	Screen Depth (Top & Bottom) or Water Zones	Well Diameter (inches)	Limitations on Withdrawal Permit(s)	Estimated Annual Average (MGD) YEAR 2007	(Include service area user falls within and references to any maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas													
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
Within CWS Service Area Totals (MGD):			0.000		0.000							0.000	
Outside Community Water System (Municipal & Private) Service Areas													
Vulcan Material	Sump	25,964.00	0.026	38,946.00	0.039	N/A						0.026	VPDES permit No.VA0001123
Vulcan Materail		4,071.00	0.004	6,106.50	0.006	N/A						0.004	VPDES permit No.VA0001124
ODEC Clover plant		5,225.00	0.005	7,837.50	0.008	N/A						0.005	PWSID 5083628
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
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			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Non-Agricultural, Self-Supplied Users of Ground Water
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List non-agricultural groundwater source and use information for all self-supplied users of more than 300,000 gallons per month. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark users on associated map. **Note the data reference year in Column M, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, NON-AGRICULTURAL USERS USING MORE THAN 300,000 GAL/MONTH OF GROUND WATER (9 VAC 25-780-70 F, - 80 B6, and - 80 C)

Water User Name	Use Category	DESIGN CAPACITY: Average Daily Withdrawals (gpd)	DESIGN CAPACITY: Average Daily Withdrawals (MGD)	DESIGN CAPACITY: Maximum Daily Withdrawals (gpd)	DESIGN CAPACITY: Maximum Daily Withdrawals (MGD)	INDIVIDUAL WELL DATA: Well Name and ID #	Well Depth (feet)	Casing Depth (feet)	Screen Depth (Top & Bottom) or Water Zones	Well Diameter (inches)	Limitations on Withdrawal Permit(s)	WATER USE: Estimated Annual Average (MGD) YEAR 2007	Notes or Comments (Include service area user falls within and references to any maps, data sources, data gaps, etc.)
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
			0.000		0.000								
Outside CWS Service Area Totals (MGD):			0.035		0.053							0.035	
Self-Supplied Nonagricultural Users of Ground Water Totals (MGD):			0.035		0.053							0.035	
Self-Supplied Nonagricultural Users Totals (surface and groundwater in MGD):			11.598		19.493							4,220.355	

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Agricultural, Self-Supplied Users
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

List data for all agricultural users who utilize more than 300,000 gallons per month of ground or surface water. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. If applicable, mark and label on associated map. **Note the data reference year in Column F, Row 4 and fill out a separate spreadsheet for each data year.**

SELF-SUPPLIED, AGRICULTURAL USERS > 300,000 GAL/MONTH OF GROUND OR SURFACE WATER (9 VAC 25-780-70 I, -80B7, and -80D)

User Name	SOURCE TYPE: Ground Water Well Name & ID No.	SOURCE TYPE: Surface Water Reservoir & Sub-basin or Stream/River Name & Sub-basin	USE TYPE: Irrigation (Place an "X" in appropriate column cell)	USE TYPE: Nonirrigation (Place an "X" in appropriate column cell)	WATER USE: Estimated Annual Average (MGD) Year 2007 — Surface Water (MGD)	WATER USE: Estimated Annual Average (MGD) Year 2007 — Ground Water (MGD)	Notes or Comments (Include service area user falls within and any references to maps, data sources, data gaps, etc.)
Within Community Water System (Municipal & Private) Service Areas							
See "Halifax Agr_Irr" tab of DEQ WWR spreadsheet. The "SOURCE and TYPE" columns on this sheet (columns AT and AU) specify whether its SW or GW sourced. The "CAT_MP" column (column AX) denotes whether the use is irrigation (IRR). The "SUBYEAR" Column (Column BH) tells you the year that a user and source was discontinued. Use best knowledge to determine if these users fall within or outside the SA.							
Within Community Water System Service Area Water Use Totals (MGD):					0.000	0.000	
Outside Community Water System (Municipal & Private) Service Areas							
Dan Lacy - 5625		Farm Pond / RO			0.004		DEQ Data
Owen & Barbara Howerton - 5738		Farm Pond / RO			0.021		DEQ Data
Outside Community Water System Service Area Water Use Totals (MGD):					0.025	0.000	
Estimated Total Agricultural Useage By Source (MGD):					0.025	0.000	

Self-Supplied, Individual Well Users
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Estimate well use information for small, self-supplied users on individual wells. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly. **Note the data reference year in Row 7.**

ESTIMATED NUMBER OF RESIDENCES AND BUSINESSES THAT ARE SELF-SUPPLIED BY INDIVIDUAL WELLS WITHDRAWING LESS THAN 300,000 GALLONS PER MONTH (9 VAC 25-780-70J); ESTIMATED WATER USE BY SELF-SUPPLIED USERS ON INDIVIDUAL WELLS (9 VAC 25-780-80 B8 and -80 E)

ESTIMATING SMALL SELF-SUPPLIED USERS							ESTIMATING SMALL SELF-SUPPLIED WATER USE										
	Step 1: Estimate Total Population of Individual Self-Supplied Well Users			Step 2: Estimate Number of Residences and Businesses on Individual Wells			Step 3: Estimate Total Self-Supplied Water Use OUTSIDE COMMUNITY WATER SYSTEM SERVICE AREA					Step 4: Estimate Total Self-Supplied Water Use INSIDE COMMUNITY WATER SYSTEM SERVICE AREA					
Locality	Locality Population	Total Population Served by Community Water System(s)	Estimated Population Served by Individual Wells	Locality Specific Population Per Household Factor	Estimated Number of **RESIDENCES** on Wells (Column D ÷ Column E)	Estimated Number of **BUSINESSES** on Wells	Estimated Population Served by Individual Wells	Per Capita Water Use Factor (gal/person/day)	Average Annual Residential Use (gpd) (Column H x Column I)	Average Annual Business Use (gpd) (SSU Business Data)	Estimated Average Annual Use (MGD)	# of Self-Supplied Residences Within Service Area	Locality Specific Population Per Household Factor	Per Capita Water Use Factor (gal/person/day)	Average Annual Residential Use (gpd) (Columns M x N x O)	Average Annual Business Use (gpd) (SSU Business Data)	Estimated Annual Average Use (MGD)
	YEAR 2000	YEAR 2000															
Halifax	37,355	12,664	24,691	2.43	10,161	212	24,691	75	1,851,825	20,624	1.872	350	2.43	75	63,788	0	0.064
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
			0		-		0		0		0.000				0		0.000
Planning Area Totals:	37,355	12,664	24,691		10,161	212	24,691		1,851,825	20,624	1.872	350			63,788	0	0.064

Notes or Comments: (This may include references to maps, data sources, data gaps, etc.)	Most of this data is taken from the 2000 census data.

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Self-Supplied, Individual Well Users: Businesses
Halifax County Planning Area

Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Estimate well use information for small, self-supplied business users on individual wells. Reference sources and note any assumptions regarding calculations. If unable to find data or data not applicable, note accordingly.
Record the data reference year, from your data sources, in Row 5. **Fill out a separate sheet for each locality in your region.**

ESTIMATED WATER USE BY SELF-SUPPLIED BUSINESS USERS ON INDIVIDUAL WELLS (9 VAC 25-780-80 B8 and -80 E)

Year:

Use this spreadsheet to fill out columns K and Q on the main "70J, 80B8, 80E SSU" spreadsheet

ESTIMATING SMALL SELF-SUPPLIED BUSINESS WATER USE

Step 3 (*continued from 70J spreadsheet*): Estimated Self-Supplied Business Water Use OUTSIDE COMMUNITY WATER SYSTEM SERVICE AREA					Step 4 (*continued from 70J spreadsheet*): Estimated Self-Supplied Business Water Use INSIDE COMMUNITY WATER SYSTEM SERVICE AREA				
Business Name	Estimated Population Served by Each Business	Per Capita Water Use Factor (gal/person/day)	Estimated Average Annual Business Use (gallons/day) (Column B x Column C)	Estimated Average Annual Business Use (MGD)	Business Name	Estimated Population Served by Each Business	Per Capita Water Use Factor (gal/person/day)	Estimated Average Annual Business Use (gallons/day) (Column G x Column H)	Estimated Average Annual Business Use (MGD)
Business Type			0	0.000	None			0	0.000
general businesses	50	53	2,650	0.003				0	0.000
trucking	8	113	904	0.001				0	0.000
Contractors	64	71	4,544	0.005				0	0.000
Stores	15	110	1,650	0.002				0	0.000
Garages/ tire sales	26	75	1,950	0.002				0	0.000
Beauty shops	10	95	950	0.001				0	0.000
Misc Industrial/machine	5	315	1,575	0.002				0	0.000
Ag business/retail	12	208	2,496	0.002				0	0.000
Recreation	10	98	980	0.001				0	0.000
Medical	5	270	1,350	0.001				0	0.000
Food Services	7	225	1,575	0.002				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
			0	0.000				0	0.000
Locality Name : Outside Service Area Totals	212		20,624	0.021	*Locality Name : Within Service Area Totals*	0		0	0.000

Notes or Comments: (This may include references to maps, data sources, data gaps, etc.)	The business data was obtained by examining the license records for the County of Halifax. Itt was assumed that all business establishements within the service areas of the community systems were connected to the community system. This data is for other County biusinesses that were outside of the community service areas. Actual consumption were based on a "best guess" approach made based upon the size of the business. and the type of business. Few required additioanal water for anything other than normal doemstic uses.

APPENDIX B - WATER DEMAND MANAGEMENT INFORMATION, 9VAC 25-780-110

Local and Regional Water Supply Planning in Virginia
Water Demand Management Information, 9 VAC 25-780-110

Purpose: As part of a long-term strategy, a water plan shall address conservation as part of overall water demand management. Current conservation practices, techniques, and technologies shall be considered in projecting water demand in accordance with 9 VAC 25-780-100D.

This form will help you catalog information to describe water efficiency, water conservation, and water loss reduction practices used within your locality and/or planning area. Use the information from this form to develop the water demand management section of your local or regional water supply plan. *Note: If any of the practices are not applicable or no information is available, note as such in the comment boxes. Additionally, if any practices are not currently implemented but will be by your next water supply program submission deadline, note as such in the relevant comment boxes.*

Name: Halifax County Service Authority	**Date:** August 20, 2009
Locality or Region: Halifax County	

Water Use Efficiency

Describe practices for more efficient use of water within the locality and/or planning area.

When did your locality adopt the Virginia Uniform Statewide Building Code sections that limit maximum flow of water closets, urinals, and appliances?

Year: <2000	Ordinance Number: N/A Is a copy of this ordinance included in your water supply plan? ☐ Yes ☒ No

Describe how your locality implements such building codes: Through code inspectons on new construction and repair and replacemtn permits

Has your locality adopted ordinances and/or developed and implemented a master landscape plan for water-efficient landscaping?

☐Yes ☒No	If Yes, reference the Ordinance Number: If Yes, is a copy of this ordinance or master landscape plan included in your water supply plan? ☐ Yes ☐ No

If Yes, briefly describe these low-water use landscaping practices:

Do any Homeowner's Associations in your locality have policies regarding the use of low-water use landscaping?

☐Yes ☒No	If Yes, are copies of such policies included in your water supply plan? ☐ Yes ☐ No

If Yes, briefly describe these low-water use landscaping practices:

Department of Environmental Quality
Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Water Use Efficiency, continued

Describe practices for more efficient use of water within the locality and/or planning area.

Has your locality adopted ordinances declaring wasteful water use and/or running of water unlawful?

☐Yes ☒No

If Yes, reference the Ordinance Number:

If Yes, is a copy of this ordinance included in your water supply plan? ☐ Yes ☐ No

If Yes, briefly describe such anti-waste water use practices:

Does your locality implement practices to increase irrigation efficiency? Such practices may include, but are not limited to: not offering sewer credits during irrigation months, requiring irrigators to invest in irrigation meters, water recycling, etc.

☐Yes ☒No If Yes, please describe these irrigation efficiency practices: If a customer wants to irrigate and not pay sewer charges, they must installan irrigation meter to record that portion of the flow attributaed to irrigation only

Do water suppliers (municipal and/or private) in your locality implement water use efficiency measures?

☐Yes ☒No If Yes, please describe these measures:

Department of Environmental Quality
Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Water Use Efficiency, continued

Describe practices for more efficient use of water within the locality and/or planning area.

Are water suppliers in your locality WaterSense partners? Partners are listed on EPA's WaterSense website (http://www.epa.gov/watersense/partners/index.htm).

☐Yes ☒No If Yes, please list the partners and their practices under the WaterSense program:

Are landscape irrigation professionals in your locality WaterSense partners? Partners are listed on EPA's WaterSense website (http://www.epa.gov/watersense/partners/index.htm).

☐Yes ☒No If Yes, please list the partners and their practices under the WaterSense program:

Does your locality implement any efficient water use practices in addition to those mentioned above?

☐Yes ☒No If Yes, please describe these measures:

Department of Environmental Quality
Office of Water Supply Planning
629 East Main Street,
P.O. Box 1105, Richmond, VA 23218
URL: http://www.deq.virginia.gov/watersupplyplanning/

Water Conservation

*Describe water conservation measures to reduce water use long-term within the locality and/or planning area. Such measures **do not** include short-term water supply emergency or shortage practices.*

Does your locality have ordinances in place that address water conservation practices through reduction of use?

☐Yes
☒No

If Yes, reference the Ordinance Number:
If Yes, is a copy of this ordinance included in your water supply plan? ☐ Yes ☐ No

If Yes, briefly describe these water conservation practices:

Have water suppliers in your locality adjusted their standard operating procedures to improve water conservation (ex: reducing frequency of filter back wash)?

☐Yes ☒No If Yes, please describe these standard operating procedures:

Have water suppliers in your locality installed low-flow and/or no-flow fixtures (faucets, showers, urinals) in their facility that result in water savings to the locality through reduction of use?

☐Yes ☐No If Yes, please describe these measures:

Have water suppliers in your locality developed and implemented water conservation plans?

☐Yes ☒No If Yes, briefly describe the conservation plan measures:

Water Conservation, continued

*Describe water conservation measures to reduce water use long-term within the locality and/or planning area. Such measures **do not** include short-term water supply emergency or shortage practices.*

Have low-flow and/or no-flow fixtures (faucets, showers, urinals) been installed in local government buildings/facilities to improve water savings to the locality through reduction of use?

☐Yes ☒No If Yes, please describe these fixture upgrades:

Has your locality used Clean Water State Revolving Funds (CWSRF) or Drinking Water State Revolving Funds (DWSRF) to upgrade/retrofit facility fixtures, build new facilities, or purchase efficient landscape irrigation equipment for publicly owned facilities (buildings, parks, golf courses, etc.)?

☐Yes ☒No If Yes, please describe such CWSRF or DWSRF water conservation projects:

Does your locality have a dual pipe distribution system or parallel distribution network to distribute reclaimed water to residential, industrial, business, institutional, or irrigational (ex: golf courses) users for non-potable water use purposes?

☐Yes ☐No If Yes, please describe such practices:

Do water suppliers in your locality offer "yard taps" to customers, so customers can monitor and reduce outdoor water use?

☐Yes ☒No If Yes, please describe this program:

Water Conservation, continued

*Describe water conservation measures to reduce water use long-term within the locality and/or planning area. Such measures **do not** include short-term water supply emergency or shortage practices.*

Has the locality developed and implemented public education programs that address water conservation through water use reduction?

☐Yes ☒No If Yes, please describe these public education practices:

Has your locality used Clean Water State Revolving Funds (CWSRF) or Drinking Water State Revolving Funds (DWSRF) to promote water conservation education through development and implementation of water conservation plans, public education programs, and/or ordinances or regulations to conserve water?

☐Yes ☒No If Yes, please describe such CWSRF or DWSRF water conservation education projects:

Does your locality and/or local water suppliers offer incentive programs to customers to retrofit or replace older fixtures (faucets, shower heads, urinals) and appliances to reduce water use?

☐Yes ☒No If Yes, please describe such incentive programs:

Water Conservation, continued

*Describe water conservation measures to reduce water use long-term within the locality and/or planning area. Such measures **do not** include short-term water supply emergency or shortage practices.*

Does your locality and/or local water suppliers offer funding incentive programs such as, but not limited to, rebates, tax breaks, and/or vouchers to encourage customers to reduce water use?

☐Yes ☒No If Yes, please describe such funding incentive programs:

Does your locality implement a water conservation rate structure that encourages reduction of water use by increasing water rates with increasing water usage?

☐Yes ☒No If Yes, please describe such rate structures:

Does your locality implement any water conservation practices in addition to those mentioned above?

☐Yes ☒No If Yes, please describe these measures:

Water Loss Reduction

Describe practices to address water loss in the maintenance of water systems and reduce unaccounted for water loss within the locality and/or planning area.

Do water systems in your locality have source and service connection meters?

☐Yes – Type: ☐Source ☐Service ☒No	If Yes, how frequently are the meters read? ☐Automatic (AMR) ☐Weekly ☐Monthly ☐Bimonthly ☐Quarterly ☐Other

If Yes, please describe practices for meter inventory, testing, maintenance, and replacement:

Does your locality have an ordinance or policy in place that requires water users to repair leaking fixtures, appliances, or plumbing?

☐Yes ☒No	If Yes, reference the Ordinance Number: If Yes, is a copy of this ordinance included in your water supply plan? ☐ Yes ☐ No

If Yes, briefly describe these water loss reduction practices:

Do local water suppliers implement operating strategies for leak detection and regularly scheduled water audits to reduce water loss?

☐Yes ☒No If Yes, please describe the frequency and specifics of such strategies:

Water Loss Reduction, continued

Describe practices to address water loss in the maintenance of water systems and reduce unaccounted for water loss within the locality and/or planning area.

Has your locality used Clean Water State Revolving Funds (CWSRF) or Drinking Water State Revolving Funds (DWSRF) to install water meters in its distribution system and/or develop and implement water audit and leak detection practices?

☐Yes ☒No If Yes, please describe such CWSRF or DWSRF water loss reduction projects:

Does your locality have practices or policies in place to track unauthorized connections (ex: tapping of fire hydrants)?

☒Yes ☐No If Yes, please describe the practices, policies and enforcement of unauthorized connections: Any use of a fire hydrant requires a permit except for staff and the fire departments

Do local water suppliers implement operating strategies for the repair of water mains, service connections, fire hydrants, valves, etc., to reduce water loss?

☒Yes ☐No If Yes, please describe such repair strategies: major breaks are reapired immediately, minor breaks within 24 hours.

Water Loss Reduction, continued

Describe practices to address water loss in the maintenance of water systems and reduce unaccounted for water loss within the locality and/or planning area.

Do local capital improvement plans (CIP) or master plans include dedicated funds to upgrade existing facility infrastructure, water mains, lines, fire hydrants, valves, etc., to reduce water loss?

☐Yes ☒No If Yes, please describe such CIP or master plan projects:

Has the locality developed and implemented educational programs to reduce customer-side water loss (ex: offer leak detection tablets, conduct customer leak detection audits, etc.)?

☐Yes ☒No If Yes, please describe water loss reduction educational programs:

Does your locality implement any water loss reduction practices in addition to those mentioned above?

☐Yes ☒No If Yes, please describe such practices:

APPENDIX C - DROUGHT INDICATORS

DROUGHT INDICATORS

1. PRECIPITATION DEFICITS

Precipitation deficits will be monitored by comparing current precipitation amounts with historical precipitation values as a percent of normal long-term average values. Comparisons will be made for each drought evaluation region using data compiled by the Office of the State Climatologist. Normal long-term average precipitation is defined as the mean precipitation for a thirty-year period of record for the area and time period being evaluated. Precipitation amounts will be evaluated based on the water year (beginning October 1).

Water years are a natural dividing point for water supply drought, as precipitation that falls in the first six months of a water year is analogous to putting money in the bank. Precipitation that occurs during this six month period has the potential to recharge ground water, which will sustain stream flows and support withdrawals from wells during the following six month period when moisture deficits naturally develop as evaporation and plant transpiration generally exceed precipitation. If a precipitation deficit outside of the normal range exists at the end of a water year, the precipitation records will carry forward until a normal condition is reached (i.e. if a precipitation deficit exists on October 1, precipitation records for the previous twelve months will be evaluated until the twelve month deficit is eliminated).

Because the significance of a precipitation deficit changes as the water year progresses, drought response stages will trigger at different percentages of normal depending upon the date of evaluation. Precipitation information can be found at the website http://www.sercc.com/climateinfo/historical/historical_va.html.

Appendix C Table 1 – Precipitation Deficits

Months Analyzed	(% of Normal Precipitation)			
	Normal	Watch	Warning	Emergency
Oct. – Dec.	>75.0	<75.0	<65.0	<55.0
Oct. – Jan.	>80.0	<80.0	<70.0	<60.0
Oct. – Feb.	>80.0	<80.0	<70.0	<60.0
Oct. – Mar.	>80.0	<80.0	<70.0	<60.0
Oct. – Apr.	>81.5	<81.5	<71.5	<61.5
Oct. – May	>82.5	<82.5	<72.5	<62.5
Oct. – Jun.	>83.5	<83.5	<73.5	<63.5
Oct. – Jul.	>85.0	<85.0	<75.0	<65.0
Oct. – Aug.	>85.0	<85.0	<75.0	<65.0
Oct. – Sep. (and previous 12 months)	>85.0	<85.0	<75.0	<65.0

2. STREAMFLOW

Streamflow gages representing drought evaluation regions will be used to monitor streamflow responses to drought conditions. Representative daily flow values will be compared with historic flow statistics for the period of record, and conditions identified as follows:

Appendix C Table 2 – Streamflow Percentiles

Drought Condition	Daily Streamflow Percentile
Normal	>25th
Watch	>10th and <25th
Warning	>5th and <10th
Emergency	<5th

(A streamflow that represents the 25th percentile of return flow frequencies indicates that, for the period of record, 75% of streamflows have exceeded the current flow.)

Gages were selected on the basis of the availability of real-time data, period of record, and relative location within the drought evaluation region. Typically, gages were selected that monitor moderately large drainage areas on streams without significant regulation. In drought evaluation areas where no appropriate stream gages exist, this indicator will not be utilized. The gage selected by the State to monitor drought severity in the Roanoke River evaluation region is listed below. Although this is the stream gage the states uses to represent the region, the Task Force should also monitor the four local stream gages to get a better snapshot of the local flows (or lack of flow). The stream gauge information can be found at the website http://nwis.waterdata.usgs.gov/va/nwis/sw.

State Specified Gage:

-Roanoke River Drought Evaluation Region:

- Goose Creek near Huddleston, USGS Station 02059500

Local Gages:

-USGS Gauge Stations, Halifax County:

- Roanoke River at Randolf, USGS Station 02066000
- Banister River at Halifax, USGS Station 03010105
- Dan River at Paces, USGS Station 03010104
- Hyco River near Denniston, USGS Station 03010104

3. GROUND WATER LEVELS

Water table ground water monitoring wells representing drought evaluation regions will be used to monitor shallow ground water responses to drought conditions. In areas west of Route 95 it was assumed that wells completed in shallow fractured rock formations are indicative of water table conditions. Measured ground water levels will be compared with historic level statistics for the period of record and conditions identified as follows:

Appendix C Table 3 – Ground Water Percentiles

Drought Condition	Daily Ground Water Percentile
Normal	>25th
Watch	>10th and <25th
Warning	>5th and <10th
Emergency	<5th

Monitoring wells were selected on the basis of period of record and relative location within the drought evaluation region. The monitoring well selected to monitor drought severity in the Roanoke River evaluation region is listed below. The Task Force should also monitor the three local monitoring wells as data becomes available. These are manually monitored wells. In order for the Task Force to better evaluate local water table levels, well drilling permits issued on the basis of replacing an existing well should be monitored with anticipation of increase during local drought conditions. Monitoring well data can be found at the website http://nwis.waterdata.usgs.gov/va/nwis/gw.

Roanoke River Drought Evaluation Region:

- Roanoke-Nelson Observation Well, USGS Local Number 31G 1 SOW 008

Local Monitoring Wells:

- USGS 38C1
- USGS 39C1 SOW 011
- USGS 40B1

4. RESERVOIR STORAGE

Storage in major reservoirs will be used as a fourth drought indicator. Major reservoirs in Virginia support a wide variety of uses that include water supply storage, electric power generation, and flow augmentation to protect water quality. Water supply reservoirs will be evaluated based on the estimated days of available usable storage. Useable storage will be calculated as that storage above the level where advanced water treatment will be required.

Appendix C Table 4 – Days of Water Supply

Drought Condition	Days of Water Supply
Normal	>120
Watch	>90 and <120
Warning	>60 and <90
Emergency	<60

Several large multi-purpose reservoirs will be evaluated as drought indicators. The criteria for consideration of drought stages are listed below for these reservoirs. Pool elevations of these reservoirs will be compared to benchmark elevations in relation to mean sea level (msl) or U.S. Army Corp of Engineers operating guide curves as indicated in the following table. The reservoir that the state uses to monitor drought conditions in the Roanoke River evaluation region is listed below. This reservoir happens to be located in Halifax County; therefore, state data will be very relevant and the Task Force should use this data for local monitoring purposes. Other local reservoirs that can be observed by the Task Force are Bannister Lake and Connor Lake.

Appendix C Table 5 – State Drought Stages for Kerr Reservoir

	NORMAL	DROUGHT WATCH	DROUGHT WARNING	DROUGHT EMERGENCY
Kerr Reservoir	< 3 feet below the guide curve	3 to 6 feet below the guide curve	> 6 feet below the guide curve	< 288 feet msl

APPENDIX D - RESPONSE TO DROUGHT (GOVERNMENT)

RESPONSE TO DROUGHT (GOVERNMENT)

Normal Conditions

Indications

No more than one indicator outside of the normal range:

- Precipitation exceeds the percent of normal precipitation for the time period.
- Stream flows are above the 25th percentile.
- Ground water levels are above the 25th percentile for all historic levels.

Action to be taken

- None

Drought Watch

Indications

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period.
- Stream flows fall between the 10th and 25th percentile.
- Ground water levels fall between the 10th and 25th percentile for all historic levels.

Action to be taken

- The Task Force will advise the Board of Supervisors regarding the declaration of a Drought Watch.
- The Board will issue a press release indicating the reasons for the declaration.
- The Task Force, under advisement from the Board, will inform the Halifax County Service Authority, Towns of Scottsburg, and Virgilina public waterworks departments of Drought Watch status.
- The Task Force will continue to monitor regional moisture conditions and provide monthly reports of drought conditions to the Board.
- The Board will make monthly reports of drought conditions available to media outlets.
- The Board will encourage all public waterworks (public wells) and self supplied water users who withdraw more than 10,000 gallons per day to review existing drought water conservation methods as outlined in this document.
- The County will include water conservation information on its website and will distribute water conservation information as broadly as possible.
- The Task Force will continue monitoring problems incurred by the public, on a monthly basis.

Drought Warning

Indications

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period.
- Stream flows fall below the 10th percentile.
- Measured ground water levels fall below the 25th percentile for all historic levels.

Action to be taken

- The Task Force will advise the Board of Supervisors regarding the declaration of a Drought Warning.
- The Board will issue a press release indicating the reasons for the declaration
- The Task Force, under advisement from the Board will inform the Halifax County Service Authority, and the Towns of Scottsburg, and Virgilina public waterworks departments of Drought Warning status.
- The Task Force will continue to monitor regional moisture conditions and provide monthly reports of drought conditions to the Board. Significant changes in drought conditions will be reported biweekly.
- The Board will make monthly reports of drought conditions available to media outlets.
- All public waterworks (public wells) and self-supplied water users who withdraw more than 10,000 gallons per day will initiate voluntary water conservation requirements as described in this plan.
- All self-supplied users who withdraw less than 10,000 gallons per day, including private well users, will be encouraged to voluntary reduce or eliminate nonessential uses of water.
- The County will include water conservation information on its website and will distribute water conservation information as broadly as possible.
- The Task Force will continue monitoring problems incurred by the public and on a monthly basis.
- All local government offices and institutions will initiate the reduction or elimination of nonessential uses of water with the goal of reducing total water usage by 5-10%.

Drought Emergency

Indications

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period.
- Stream flows fall below the 5^{th} percentile.
- Measured ground water levels fall below the 5^{th} percentile for all historic levels.

Action to be taken

- The Task Force will advise the Board of Supervisors regarding the declaration of a Drought Emergency.
- The Board will issue a press release indicating the reasons for the declaration.
- The Task Force, under advisement from the Board will inform the Halifax County Service Authority and the Towns of Scottsburg, and Virgilina public waterworks departments of Drought Emergency status.
- The Task Force will continue to monitor regional moisture conditions and provide monthly reports of drought conditions to the Board. Significant changes in drought conditions will be reported weekly.
- The Board will encourage media outlets to publicize updates of drought conditions by developing weekly press releases.
- All public waterworks (public wells) and self-supplied water users who withdraw more than 10,000 gallons per day will initiate mandatory water conservation requirements as Mandatory Nonessential Water Use Restrictions in Appendix E.
- The County will include water conservation information on its website and will distribute water conservation information as broadly as possible.

- The Task Force will continue monitoring problems incurred by the public on a monthly basis.
- All public waterworks (public wells) and self-supplied water users who withdraw more than 10,000 gallons per day will initiate mandatory water conservation requirements contained in drought water conservation and contingency plans that include the mandatory nonessential water use restrictions listen in Appendix E.
- Local governments and public waterworks may impose water use restrictions more or less stringent than the mandatory nonessential water use restrictions listed below consistent with local water supply conditions at any time.

APPENDIX E - RESPONSE TO DROUGHT – CONSERVATION EFFORTS AND NON-ESSENTIAL WATER USES (PUBLIC)

RESPONSE TO DROUGHT – CONSERVATION EFFORTS AND NON-ESSENTIAL WATER USES (PUBLIC)

Drought Watch Responses and Conservation Measures

There are no voluntary or mandatory reductions in water use requested from the public at this time; however the public should be made aware that water conservation efforts may be needed in the near future.

Drought Warning Responses and Conservation Measures (Voluntary)

Indoor Residential Use

- Use dishwashers only when they are full.
- Wash only full loads of laundry. Adjust water level if possible.
- Turn off faucets while brushing teeth, shaving, etc. (save about 5 gal. per day).
- Reduce water used per flush by installing toilet tank displacement inserts. A plastic jug may often be used as an alternative. DO NOT USE BRICKS - They disintegrate when soaked and the resulting grit hinders closing the flap valve, causing leakage.
- Do not use the toilet as a trash can (flushing down tissues, etc).
- Keep a bottle of water in the refrigerator, so as not to run the tap to get cold water.
- Find and fix leaks in faucets and water-using appliances. Faucets can usually be fixed cheaply and quickly by replacing washers.
- Adapt plumbing with flow-restricting or other water-saving devices. These are usually inexpensive and easy to install.
- Take shorter showers and shallow baths (save about 25 gallons per shower/bath).
- Do not use a garbage disposal.

Outdoor Use

Lawns

- Water before 10:00 a.m. to prevent evaporation during the hottest part of the day. Morning is better than evening, when the dampness encourages growth of fungus.
- Water twice per week if necessary, before 10:00 AM.
- Water only when lawn shows signs of wilt. Grass that springs back when stepped on does not need water.
- Water thoroughly (Long enough to soak roots); not frequently (a light sprinkling evaporates quickly and encourages shallow root systems).
- Water slowly to avoid runoff.
- Do not let the sprinkler run any longer than necessary (In an hour, 600 gallons can be wasted).
- Allow a maximum of one inch of water per week on your lawn.
- Use automatic shutoff nozzles on hoses to avoid waste when watering flowers and shrubs.
- Aerate lawns by punching holes 6 inches apart. This allows water to reach roots rather than run off.
- Position sprinklers to water the lawn, not the pavement.
- Avoid watering on windy days when the wind not only blows water off target, but also causes excess evaporation.
- Keep sprinkler heads clean to prevent uneven watering.

- Adjust hose to simulate a gentle rain. Sprinklers that produce a fine mist waste water through evaporation.
- Install automatic shut off devices on automatic sprinkler systems.
- Know how to turn off an automatic irrigation system in case of rain.
- Use an alarm clock or stove timer to remind you to shut off sprinklers that do not have timers.
- Allow grass to maintain 4" height - grass will absorb water more efficiently.
- Keep mower blades sharp - will reduce water loss.

Vegetables And Flower Gardens

- Water deeply, slowly, and weekly. Most vegetables require moisture to a depth of 6 to 8 inches.
- Keep soil loose so water can penetrate easily.
- Keep weeds out to reduce competition for water.
- Put the water where you want it and avoid evaporation by using soil-soakers or drip irrigation hoses, not sprinklers.

Trees And Shrubs

- Do not plant new landscaping or grass.
- Water deeply with a soil-soaking or drip-irrigation.
- Water only when needed. Check the depth of soil dryness by digging with a trowel.
- Mulch to reduce evaporation. A 2"-3" layer of wood chips, pine needles, grass clippings, or straw keeps the soil cool in summer.
- Dig troughs around plants to catch and retain water.
- Water trees growing in full sun more often than those in shade.
- Do not use sprinklers. Apply water directly at the base of trees.
- Do not fertilize during the summer. Fertilizing increases a plant's need for water.
- Postpone planting until fall when there is generally less demand for water.
- If you have a water meter, determine the amount of water being used outdoors by comparing water bills for summer and winter.

Livestock

- Consider installation of automatic waterers. These devices spread water use out throughout the day rather than filling troughs ounce per day.

Drought Emergency Non-Essential Uses of Water (Mandatory)

The following non-essential water uses will be prohibited during periods of declared drought emergencies. Please note the exceptions that follow each prohibited use. Water use restrictions shall not apply to the agricultural production of food or fiber, the maintenance of livestock including poultry, nor the commercial production of plant materials so long as best management practices are applied to assure the minimum amount of water is utilized.

Unrestricted irrigation of lawns is prohibited.

- Newly sodded and seeded areas may be irrigated to establish cover on bare ground at the minimum rate necessary for no more than a period of 60 days.
- Irrigation rates may not exceed one inch of applied water in any 7 day period.
- Gardens, bedding plants, trees, shrubs and other landscape materials may be watered with hand held containers, hand held hoses equipped with an automatic shutoff device, sprinklers or other automated watering devices at the minimum rate necessary but in no case more frequently than twice per week. Irrigation shall not occur during the heat of the day.

- All allowed lawn irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
- Irrigation systems may be tested after installation, routine maintenance or repair for no more than ten minutes per zone.

Unrestricted irrigation of golf courses is prohibited.

- Tees and greens may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary.
- Localized dry areas may be irrigated with a hand held container or hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
- Greens may be cooled by syringing or by the application of water with a hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
- Fairways may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary not to exceed one inch of applied water in any ten-day period.
- Fairways, tees and greens may be irrigated during necessary overseeding or resodding operations in September and October at the minimum rate necessary.
- Irrigation rates during this restoration period may not exceed one inch of applied water in any seven-day period.
- Newly constructed fairways, tees and greens and areas that are re-established by sprigging or sodding may be irrigated at the minimum rate necessary not to exceed one inch of applied water in any seven-day period for a total period that does not exceed 60 days.
- Fairways, tees and greens may be irrigated without regard to the restrictions listed above so long as:
    - The only water sources utilized are water features whose primary purpose is stormwater management,
    - Any water features utilized do not impound permanent streams,
    - During declared Drought Emergencies these water features receive no recharge from other water sources such as ground water wells, surface water intakes, or sources of public water supply, and,
    - All irrigation occurs between 9:00 p.m. and 10:00 a.m.
- All allowed golf course irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
- Rough areas may not be irrigated.

Unrestricted irrigation of athletic fields is prohibited.

- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. at a rate not to exceed one inch per application or more than a total of one inch in multiple applications during any ten-day period. All irrigation water must fall on playing surfaces with no outlying areas receiving irrigation water directly from irrigation heads.
- Localized dry areas that show signs of drought stress and wilt (curled leaves, foot-printing, purpling) may be syringed by the application of water for a cumulative time not to exceed fifteen minutes during any twenty four hour period. Syringing may be accomplished with an automated irrigation system or with a hand held hose equipped with an automatic shutoff device at the minimum rate necessary.
- Athletic fields may be irrigated between the hours of 9:00 p.m. and 10:00 a.m. during necessary overseeding, sprigging or resodding operations at the minimum rate necessary for a period that does not exceed 60 days. Irrigation rates during this restoration period may not exceed one inch of applied water in any seven-day period.

Syringing is permitted during signs of drought stress and wilt (curled leaves, foot-printing, purpling).
- All allowed athletic field irrigation must be applied in a manner to assure that no runoff, puddling or excessive watering occurs.
- Irrigation is prohibited on athletic fields that are not scheduled for use within the next 120-day period.
- Water may be used for the daily maintenance of pitching mounds, home plate areas and base areas with the use of hand held containers or hand held hoses equipped with an automatic shutoff device at the minimum rate necessary.
- Skinned infield areas may utilize water to control dust and improve playing surface conditions utilizing hand held containers or hand held hoses equipped with an automatic shutoff device at the minimum rate necessary no earlier than two hours prior to official game time.

Unrestricted washing paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts, and patios is prohibited.
- Driveways and roadways may be pre-washed in preparation for recoating and sealing.
- Tennis courts composed of clay or similar materials may be wetted by means of a hand-held hose equipped with an automatic shutoff device at the minimum rate necessary for maintenance. Automatic wetting systems may be used between the hours of 9:00 p.m. and 10:00 a.m. at the minimum rate necessary.
- Public eating and drinking areas may be washed using the minimum amount of water required to assure sanitation and public health.
- Water may be used at the minimum rate necessary to maintain effective dust control during the construction of highways and roads.

Unrestricted use of water for washing or cleaning of mobile equipment including automobiles, trucks, trailers and boats is prohibited.
- Mobile equipment may be washed using hand held containers or hand held hoses equipped with automatic shutoff devices provided that no mobile equipment is washed more than once per calendar month and the minimum amount of water is utilized.
- Construction, emergency or public transportation vehicles may be washed as necessary to preserve the proper functioning and safe operation of the vehicle.
- Mobile equipment may be washed at car washes that utilize reclaimed water as part of the wash process or reduce water consumption by at least 10% when compared to a similar period when water use restrictions were not in effect.
- Automobile dealers may wash cars that are in inventory no more than once per week utilizing hand held containers and hoses equipped with automatic shutoff devices, automated equipment that utilizes reclaimed water as part of the wash process, or automated equipment where water consumption is reduced by at least 10% when compared to a similar period when water use restrictions were not in effect.
- Automobile rental agencies may wash cars no more than once per week utilizing hand held containers and hoses equipped with automatic shutoff devices, automated equipment that utilizes reclaimed water as part of the wash process, or automated equipment where water consumption is reduced by at least 10% when compared to a similar period when water use restrictions were not in effect.
- Marine engines may be flushed with water for a period that does not exceed 5 minutes after each use.

Unrestricted use of water for the operation of ornamental fountains, artificial waterfalls, misting machines, and reflecting pools is prohibited.

- Fountains and other means of aeration necessary to support aquatic life are permitted.

Unrestricted use of water to fill and top off outdoor swimming pools is prohibited.

- Newly built or repaired pools may be filled to protect their structural integrity.
- Outdoor pools operated by commercial ventures, community associations, recreation associations, and similar institutions open to the public may be refilled as long as:
    - Levels are maintained at mid-skimmer depth or lower.
    - Any visible leaks are immediately repaired.
    - Backwashing occurs only when necessary to assure proper filter operation.
    - Deck areas are washed no more than once per calendar month (except where chemical spills or other health hazards occur).
    - All water features (other than slides) that increase losses due to evaporation are eliminated, and
    - Slides are turned off when the pool is not in operation.
- Swimming pools operated by health care facilities used in relation to patient care and rehabilitation may be filled or topped off.
- Indoor pools may be filled or topped off.
- Residential swimming pools may be filled only to protect structural integrity, public welfare, safety and health and may not be filled to allow the continued operation of such pools.

Water may be served in restaurants, clubs, or eating-places only at the request of customers.

All residential, business and industrial water users; whether supplied by public water supplies, self-supplied sources, or private water wells; who do not normally utilize water for any of the listed prohibited uses are requested to voluntarily reduce water consumption by at least 10%. This reduction may be the result of elimination of other non-essential water uses, application of water conservation practices, or reduction in essential water uses. Drought Watch and Drought Warning Responses and Conservation Practices (listed above) should be used, along with any other known conservation practices, to reduce consumption by 10% as requested.

Water Rationing

In some cases, the mandatory nonessential water use restrictions may not be sufficient to protect the supplies of an individual public waterworks. When water sources are so depleted as to threaten public health and safety, it may become necessary to ration water within that system in order to assure that water is available to support essential uses. Rationing water is a more severe measure than merely banning nonessential uses of water. Under rationing, each water user is allotted a given amount of water, based on a method of allotment developed by the local government. Generally, it will be based on a percentage of previous usage or on a specific daily quantity per household. Rationing is more likely to have some effect on welfare than mandatory nonessential use restrictions, because industrial and commercial water uses may be curtailed or eliminated to assure an adequate supply is available for human consumptive uses. The decision to ration water will typically be made by the Board of Supervisors. The Task Force will work closely with an entity where water rationing is required to assure that all available State resources are effectively used to support these highly stressed water supply systems. The Virginia Department of Emergency Management (VDEM) is the first point of contact for waterworks or local governments who decide to ration water. VDEM will coordinate the Commonwealth's response and assistance to such entities.