Chapter 3
Water Systems

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I. INTRODUCTION

This Chapter reviews the general arrangement of the water supply infrastructure in Frederick County. It includes discussions of the Community Water Systems (CWS) that exist in the County and related planned improvements to these water systems to ensure adequate capacity and compliance with the Safe Drinking Water Act (SDWA).

A. Community Water Systems

Most Frederick County residents obtain their water from publicly-owned Community Water Systems (CWS); water systems that supply at least 25 people or 15 service connections for at least 60 days per year. In 2013, approximately fifty-nine percent of the County population was served by CWS. These residents receive their water supply from 27 different public water systems located throughout the County. Seven (7) of these CWS are Regional Systems, owned and operated by Frederick County's Division of Utilities and Solid Waste Management (DUSWM). Nine (9) of the CWS are owned and operated by the municipal governments of the Cities and Towns within the County. There is one (1) large Federal CWS that serves Fort Detrick and one (1) large institutional CWS that serves Mount Saint Mary's University. The remaining five publicly-owned Sub-Regional CWS serve individual subdivisions and residential developments throughout the County. In addition, there are several smaller community water systems, some publicly owned and some privately owned, described in Sections V and VI. Tables 3.01 through 3.04 categorize the CWS in Frederick County by ownership.

The twenty-seven (27) CWS in Frederick County supply water to approximately 133,500 people. More than 98% of these residents receive their water from government owned utilities.

Table 3.01 Frederick County/DUSWM Owned Water Systems

Water System	Approximate Population Served	Primary Water Source	Water System ID
Cambridge Farms	950	Ground water	MD0100033
Cloverhill III*	886	Ground Water	MD0100031
Copperfield	338	Ground Water	MD0100037
Fountaindale[2]	2,717	Ground Water	MD0100013
Libertytown Apts.	100	Ground Water	MD0100036
Liberty East	108	Ground Water	MD0100038
New Design[3]	35,811	Surface Water (Potomac River)	MD0100030
Total	**40,910**		

***secondary source after subdivision connected to the City of Frederick water system in 2015**

[2] Includes the Fountaindale North water system (MD0100012) and Braddock Heights

3 Includes Adamstown, Ballenger Creek, Buckeystown, Eastalco, portions of Frederick City, Frederick Southeast, Holly Hills, Linganore, Monrovia, New Market, Point of Rocks, Spring Ridge/Bartonsville, Urbana Community Growth Areas/Service Areas.

Table 3.02 Municipal Owned Community Systems

Water System	Approximate Population Served	Primary Water Source	Water System ID
City of Brunswick	,6,480	Surface Water (Potomac River & Yourtee Springs)	MD0100005
City of Frederick	66,294	Surface Water (Monocacy River, Potomac River, Linganore Creek, Fishing Creek Reservoir)	MD0100015
Town of Emmitsburg	2,814	Surface/Groundwater (two impoundments of Turkey Creek, a tributary of Tom's Creek & wells)	MD0100010
Town of Middletown	4,300	Ground Water	MD0100018
Town of Myersville	1,624	Ground/Surface Water (wells, springs & reservoir)	MD0100020
Town of Thurmont	6,170	Groundwater	MD0100023
Town of Walkersville	5,870	Groundwater	MD0100025
Town of Woodsboro	1,141	Ground water	MD0100027
Town of Mt. Airy (Frederick County portion)	3,785	Ground water	
Total	**98,478**		

Table 3.03 Federal/Institutional Owned Community Systems

Water System	Approximate Population Served	Primary Water Source	Water System ID
Fort Detrick	7,500	Surface Water (Monocacy River and Potomac River)	MD0100011
Mount Saint Mary's	1,900	Ground Water	MD0100019
Total	**9,400**		

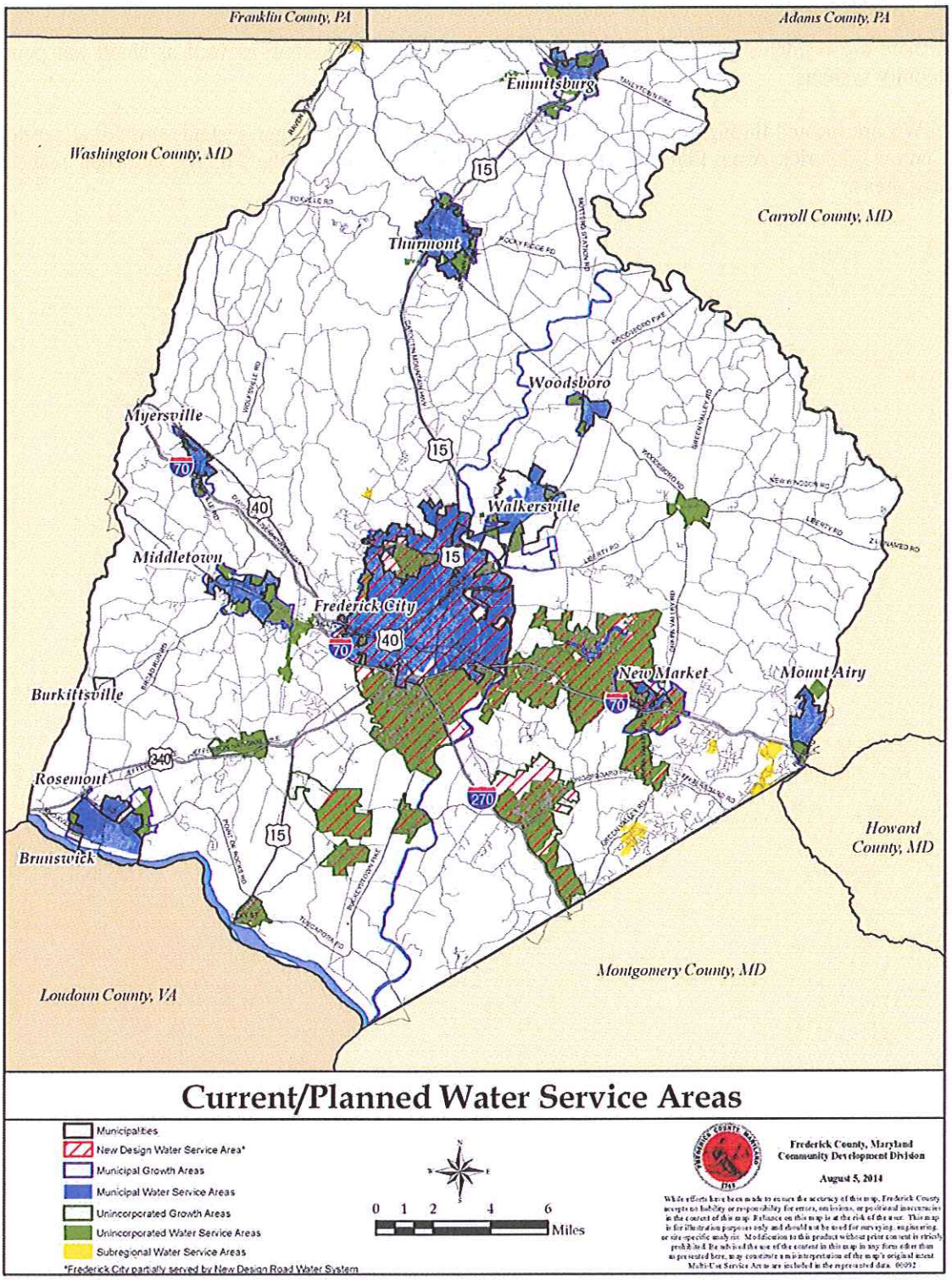
Table 3.04 Frederick County/DUSWM Owned Sub-Regional Water Systems

Water System	Approximate Population Served	Primary Water Source	Water System ID
		Ground Water	MD0100001
White Rock.	260	Ground Water	MD0100004
Samhill.	366	Ground Water	MD0100203
Windsor Knolls	658	Ground Water	MD0100207
Bradford Estates	192	Ground Water	MD0100210
Highfields (*owned and operated by Washington County, MD*).	964	Ground Water	MD0210001
Total	**2,440**		

All of the Regional Water Service Areas are designated by the County Comprehensive Plan as growth areas. Together they encompass 105 sq.mi. or 16% of the County. Within the limits of these service

areas there are residents who are not yet served by a community system as well as small independent community systems.

The CWS are located throughout Frederick County with most of the larger systems providing service to the Central Frederick Area. Figure 3.01 shows the relative location of the 27CWS and their respective services areas.



Water Supply Planning Tools

In 1992, the County completed its first major study for a Water Distribution Plan for the southern two-thirds of Frederick County. Prepared by Boyle Engineering, the study was intended to be a planning

tool to help the Division of Utilities and Solid Waste Management implement water system improvements, as needed, on a cost effective basis. Population projections were used to estimate future demands if all current zoning and Comprehensive Plan designations were built. Since pipeline and treatment plant life is generally 50-100 years, the Distribution Plan recommendations go beyond the 20-year planning period of this Water & Sewerage Plan, which does not necessarily imply that the planned growth will occur within the planning period. In other words, the growth anticipated in a 20-year planning period may in fact take 40, 50 or more years to occur and thus, the infrastructure must be designed to last accordingly. Since 2001, the DUSWM has completed important long- term water supply engineering studies and construction projects that have resulted in significant improvements to the water system. These projects, which in some cases build on the earlier work by Boyle, are intended to provide the necessary water supply infrastructure needed by the DUSWM surface water systems until 2045.

The Boyle study also established a computer model to evaluate DUSWM water system operating characteristics. Whitman Requardt & Associates would later update this study with a focus on the Linganore area. Focus was placed in Linganore due to deficiencies encountered by infrastructure that was designed and built by a developer. Since the Boyle model was created the DUSWM has worked on developing its own water model with more current software. The effort is ongoing to validate the existing model, qualify results via field data and continue to add further detail and capture new infrastructure.

Based on concepts contained in the 1992 Boyle Study and more recent analysis, the County has moved away from small individual ground water supply systems and relies more on its Potomac River Water Supply system. Based on the DUSWM's current water supply program, the County's New Design Road (Potomac River) WTP, will be the primary water supply for the Central Frederick, East County and Point of Rocks water service areas. The County's New Design Road WTP and transmission system has been constructed and programmed for expansion to provide up to 45 MGD (max day demand) of water capacity to these areas by 2045. Smaller existing ground water systems would remain in use until the regional water system is connected. Inter-connection of existing individual systems is a logical step toward a county-wide system that was identified in the original Boyle study. Phasing of this integration will involve analysis of cost to benefit with respect to the capital cost for connection and any mitigated operational fees from taking a smaller water treatment plant off line.

Features of a county-wide system include:

1. The relatively high up-front capital cost of a county-wide system with its oversized distribution pipelines should be viewed as a long-term investment. Planning and design incorporates both short and long term goals to the extent possible.

2. Unregulated development along large water supply lines will not occur. The County can, through the designation of *denied access* lines, restrict development in areas where these cross-county waterlines are located outside of designated growth areas. Development will continue to follow regional zoning and as defined in the County Comprehensive Plan.

3. Although the regional system requires greater capital investment, the County has developed a program of phased improvements that allow the incremental deployment of the water supply infrastructure to compliment land development programmed in the Comprehensive Plan. Since 2001 the County has had a strict policy that requires water system infrastructure necessary for new development to be funded by water system capacity fees-- not by the County's water system users.

4. The County's regional water system relies on the largest water source in the County to provide water to County residences and businesses. The Potomac River, and the reservoirs that augment its flow, is the most reliable source of water in the County.

5. As State and Federal regulators increase the requirements for drinking water quality, more burden is put on water producers to meet these requirements. Increased control over water quality due to

a centralized water system would provide safe water for the users and easier quality control for the County.

6. Several existing water treatment plants would remain in operation to avoid County dependence on a single water source. Water would remain available to users throughout the study area even in the event of a failure or emergency; however, water usage would need to be severely reduced. Maintaining existing water systems allows the useful life of the capital improvements to be utilized fully.

The County has decided to implement some of the recommendations of the Distribution Study as the need arises in the form of amendments to the County Water & Sewerage Plan. Some of the more remote phases or recommendations may never be adopted.

B. Estimating Future Demand

The consumption estimate value used in this Plan is 250 gallon per day per equivalent dwelling unit. In addition to domestic usage, however, there are industrial and commercial demands on a water system and a certain amount of system loss, especially in the older systems. Estimates for commercial and industrial usage contain large variability as each land use, operation or facility will have different demands for water usage and generate different wastewater flows. 2013 average daily water production for the City of Frederick was 6.10MGD. Dividing this number by the 2010 City population of 66,294 equates to 92.0 gpd total.

Estimating water demand for future years includes the expectation that the average household size of 2.72 in 2000 will remain constant. Frederick City's household size was 2.42 in 2000 and assumed to hold constant.

Water demand is not constant throughout the day nor is daily demand consistent throughout the year. The maximum day demand is called the peak flow and for planning purposes can be estimated to be the average factor of 1.7 times the average daily demand. It should be noted that the average factor varies and is affected by a variety of considerations, such as the size of the water system and the diversity within the water system, to name a few. The Frederick County Design Manual for Water and Sewer Facilities details sizing requirements for pipelines and treatment plant capacity.

It should be noted that not all water used is processed through the sewerage system. Lawn watering, car washing, evaporation from cooling systems and water included in processed products are all examples of how water demand can exceed sewage treatment demand. Consequently, sewage treatment demand in Chapter 4 may not identically match water demands reported in Chapter 3.

As Table 3.05 illustrates, the existing water treatment capacity in some systems will have to be increased to meet short-term demands. In most cases, an increase in supply and treatment capacity will be required for ultimate growth to occur.

Table 3.05 Water Supply and Demand by Regional, Sub-Regional or Municipal Service Area

SERVICE AREA	Permitted Withdrawal (avg. MGD)	Permitted Withdrawal (max. MGD)	Existing Treatment Capacity (MGD)	Existing Demand (MGD)	Maximum Demand Monthly Average (MGD)	Projected Demand (MGD) 2020	Projected Demand (MGD) 2030	Projected Demand (MGD) 2040
Frederick City	16.285	25.520	14.89	6.10[1]	9.76[2]	6.85	8.29	9.59
New Design[3]	26.0	45.0	25.0	4.63	6.82			
Fort Detrick	2.0	2.6	4.250	0.900				
Myersville	0.256	0.48068	0.300	0.135	0.200	0.172	0.249	0.267
Mt. Airy[4]	0.927	1.3865	1.00	0.927				1.18
Walkersville	1.00	1.50	1.00	0.473	1.168	0.578	0.601	0.638
Woodsboro	0.128	0.1782	0.128	0.085	1.157	0.120	0.148	0.185
Thurmont [5]	1.006	1.484	1.240	0.467	0.498	0.522	0.549	0.550
Emmitsburg [6]	0.546	0.902	0.423	0.315	0.902	0.312	0.347	
Brunswick/ Rosemont [7]	1.350	2.00	2.00	0.500	1.620	0.575	0.837	0.912
Middletown	0.387	0.504	0.533	0.299	1.229	0.329	0.433	0.538
Fountaindale/ Braddock	0.280	0.420	0.280	0.183	0.205	0.185	0.186	0.186
Knolls of Windsor	0.1068	0.1773	0.1068	0.059	0.083	0.100	0.100	0.100
Copperfield	0.0293	0.0473	0.0293	0.023	0.027	0.045	0.070	0.070
Cloverhill III	0.0843	0.125	0.083	0.064	0.085	0.066	0.066	0.066
Cambridge Farms[8]	0.0620	0.100	0.062	0.050	0.062	0.050	0.050	0.050
Bradford Estates	0.0170	0.0280	0.0170	0.012	0.020	0.012	0.012	0.012
Samhill[9]	0.1556	0.260	0.155	0.079	0.095	0.110	0.113	0.113
Liberty East	0.0157	0.0236	0.016	0.007	0.090	0.009	0.009	0.009
Liberty West[10]	0.0050	0.0075	0.005	0.003	0.006	0.005	0.007	0.007
Whiterock	0.0300	0.0450	0.030	0.011	0.025	0.012	0.014	0.015
Small Systems(public or private)[11]			0.700	0.052	0.344			
TOTALS[12]	**50.67**	**82.78**	**52.24**	**15.37**	**24.39**			

FOOTNOTES ON FOLLOWING PAGE

Projected demand figures for municipal systems supplied the respective municipal government

1 Based on 2013 data from City of Frederick, Annual Drinking Water Quality Report
2 Maximum day factor from City of Frederick (peaking factor = 1.6)
3 Adamstown, Ballenger Creek, Buckeystown, Eastalco, portions of Frederick City, Frederick Southeast, Holly Hills, Linganore, Monrovia, New Market, Point of Rocks, Spring Ridge/Bartonsville, Urbana Community Growth Areas/Service Areas
4 Build-out of Mt. Airy Comprehensive Plan (Carroll and Frederick County)
5 145 gpcd includes industrial and commercial uses
6 100 gpcd to include industrial. In addition 100,000 GPD is available for purchase on demand from Mt. St. Mary's University.
7 Water and Sewer Annexation Plan, Whitman, Requardt Engineers, March 1992; WATEK 2002
8 Includes Briarcrest condominiums
9 Capacity upgrades are currently programmed for the Samhill Estates WTP as part of the Harvest Ridge development
10 Increase in withdrawal permit and treatment capacity is required to support future Libertytown Gardens project
11 Includes the following Mobile Home Parks: Concord, Pohling, Rocky Bend, Highfield, Springview, Rocky Fountain, Gilberts, plus Amelano Manor Subdivision
12 Figures in table not to be used to determine capacity allocations

C. Existing Regional Water Agreements[4]

The Metropolitan Washington Council of Governments has prepared the *Metropolitan Washington Water Supply and Drought Awareness Response Plan: Potomac River*, which provides implementation steps during drought conditions for the purpose of coordinated regional response. The Plan consists of a regional year-round plan emphasizing the wise water use and conservation, and a water supply and drought awareness and response plan. The drought awareness plan contains four stages:

- Normal – wise water use
- Watch – voluntary water conservation measures
- Warning – voluntary water restrictions
- Emergency – mandatory water restrictions

This Plan is primarily designed for those customers who use the Potomac River for their drinking water supply source. Since Frederick County relies on other water supply sources as well, other drought restrictions may apply to those non-Potomac source areas.

Frederick County has the following agreements with neighboring county jurisdictions and municipalities within Frederick County.

1. Frederick County (DUSWM) and Town of New Market – Water Service Area Agreement allows the DUSWM to serve properties within the municipal limits of the Town of New Market.

2. Frederick County, City of Frederick, and Lake Linganore Regional Water System Agreement regarding the withdrawal of water from Lake Linganore.

3. Frederick County (DUSWM) has an agreement with the City of Frederick to provide up to 8.0 MGD of maximum day water capacity (5.0 MGD Annual Average) from its Potomac supply.

4. Frederick County residents in Blue Ridge Summit receive water from Washington County.

5. Frederick County provides water to the Rattlewood Golf Course Clubhouse in Montgomery County.

6. The Town of Walkersville has the right of first refusal to use the Fountain Rock Spring as a public water supply.
7. Frederick County (DUSWM) has an agreement with Fort Detrick to provide water through Frederick City to the Fort.
8. Frederick County and the City of Brunswick – Rosemont Water Supply Agreement recognizes certain commitments where the City provides water capacity for the County's Rosemont Water customers.

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[4] The agreements listed are not all-inclusive and may be amended from time to time and is provided for information purposes only. Inter-jurisdictional agreements are executed to provide operational, capital funding, capacity sharing details, etc., that cannot be adequately captured within the *Water and Sewerage Plan*.

D. Water Conservation

Historically, water conservation has been seen in relation to a particular distribution system. In fact, water withdrawn from a well affects an aquifer which also feeds the streams. Water discharged from a sewage treatment plant is conveyed away from an aquifer faster than it might have been if treated by an on-lot disposal system. Therefore, water conservation should be a universal ethic because of the inter-relatedness of the water cycle and the natural system.

Water consumption in Frederick County is below the national average and reflects the limited nature of the supply serving many of the residents. Water usage could increase in various areas of the County as abundant water supply systems are developed. However, even users on a system with abundant supply must be educated to conserve water due to the costs of treatment and distribution.

The Maryland Water Conservation Plumbing Fixtures Act requires that only water conserving plumbing fixtures be used in new construction or remodeling and that only water conserving fixtures may be sold. The Frederick County Permits & Inspections Office inspects plumbing for compliance with all laws and regulations prior to approval of certificates of occupancy.

Frederick City, Walkersville and the County subdivision of Waterside participated in a water conservation pilot study by offering kits containing low flow shower heads, toilet dams, and faucet aerators. In addition, dye tablets were offered to check for leaky toilets. The tablets were the least expensive item which resulted in the greatest water conservation, once the leaks were repaired. Leak detection has been built into the computer billing systems of both the County and Frederick City. The City of Brunswick initiated a water conservation program in 1989.

Water conservation in community service areas has a sewage treatment reduction benefit which, added to the water treatment cost savings, should encourage the consumer to be careful regardless of the abundance of the supply. Water conservation is especially significant for on-lot disposal systems. It has been reported that current watersaving technology can have up to a 40% reduction in sewage flows. This can alleviate existing overloading problems of small treatment plants or malfunctions of individual on-lot disposal systems.

II. SOURCE WATER PROTECTION AND SUPPLY

A. Impaired Surface Waters

1. Section 303 (d) of the Federal Clean Water Act which became law in 1972, establishes a system of reporting impaired surface waters in a jurisdiction. Usually the impaired water body is a section of a stream, and the 303 (d) list is an annual list of 12 digit watersheds. An impairment is identified when water quality monitoring data suggest that a water body does not meet or is not expected to meet water quality standards. Most of the impairments are biological, although the larger 8 digit watersheds of which they are a part, are listed for sediments, nutrients, and bacteria, as well as biological impairment

2. Total Maximum Daily Loads (TMDLs)

A TMDL establishes the maximum amount of an impairing substance or stressor that a water body can assimilate and still meet water quality standards, and allocates that load among pollution contributors. TMDLs are written for streams or stream segments which are listed on the 303 (d) list. It is possible for a stream segment and its watershed to be removed from the list if it resumes meeting water quality standards, or if further research determines that it meets water quality standards.

3. Chesapeake Bay TMDL

In addition to the nationwide goals for restoring and maintaining water quality, the Federal government has given special recognition to the Chesapeake Bay as a natural resource of major significance. Nineteen eighty-three marked the end of an intensive period of Bay research conducted by the Environmental Protection Agency, and the beginning of a landmark coordinated effort to correct water quality, habitat and resource problems identified by this effort. With the signing of the "Chesapeake Bay Agreement of 1987" by Maryland, Virginia, Pennsylvania, the District of Columbia, and the Environmental Protection Agency, a commitment was made to implement coordinated plans to improve and protect the water quality and living resources of the Bay. To initiate this effort, Federal funds earmarked specifically for Bay implementation actions and long-term resource management became available. This effort was furthered by the subsequent signing of the Chesapeake Bay Agreement of 2000, which established additional goals for the health of the Chesapeake Bay and commitments to adopt restoration measures to return the Bay's ecosystem to a healthy state and to remove it from the federal listing of impaired waters (known as the "303(d)" list from the section of the Clean Water Act) by 2010.

The federal government acknowledged that the 2010 goals for the Chesapeake Bay would not be met. Litigation over the failure to meet Clean Water Act requirements and Presidential Executive Order No. 13508, *Chesapeake Bay Protection and Restoration*, issued May 12, 2009, ushered in a new and aggressive plan of action to improve water quality, aquatic habitat and living resources of the Chesapeake Bay. A Chesapeake Bay Watershed-wide Total Maximum Daily Load (TMDL) was developed by the US EPA that establishes specific nutrient and sediment targets or loads from all sources and land sectors—agriculture, wastewater treatment, developed and developing lands, and septic systems---within the 64,000 square mile Bay Watershed, which includes Frederick County plus portions of six states (New York, Pennsylvania, Delaware, Virginia, West Virginia, Maryland and Washington, DC).

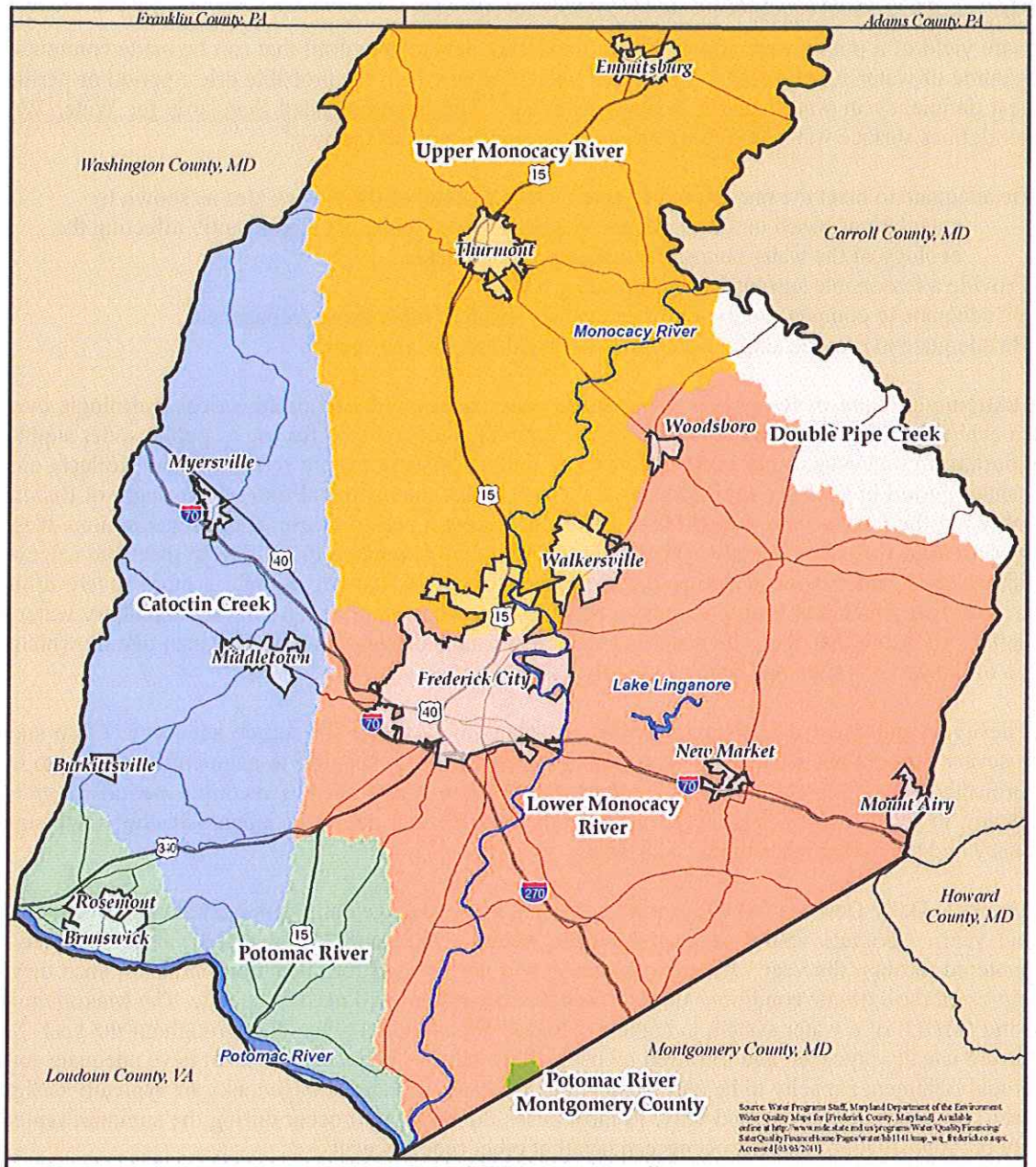
The Chesapeake Bay TMDL, and its pollutant reduction targets, is the largest TMDL ever written and has implications not just for Frederick County, but all states, counties, cities and towns within the Bay drainage area. In general, the Chesapeake Bay TMDL sets pollutant (nitrogen, phosphorus, sediment) pollution limits for all sources and land sectors by dividing or allocating the maximum allowable pollutant loads, among those sources, that waterways can assimilate and still meet water quality standards. Chesapeake Bay Watershed states are required to develop Phase I

Watershed Implementation Plans (WIP) that identifies target loads to be achieved by various pollution source sectors.

Maryland's Phase I WIP was submitted to the US EPA on December 3, 2010 and includes a series of 75 proposed actions and strategies to reduce sediment and nutrient pollution. Maryland pledged to meet its nutrient and sediment reduction goals by 2020, five years earlier than the 2025 end-date established by the EPA to remove the Chesapeake Bay from the Clean Water Act's 303d listing of impaired waterbodies.

A substantial majority of the actions required under the Phase I WIPs will be carried out at the local---County---level, whether they are stormwater program enhancements, wastewater treatment plant upgrades, adoption of agricultural runoff controls, stream restoration, or septic system upgrades. The Bay TMDL is further subdivided into Phase II WIPs, a geographically-refined, local County-based pollution reduction plan. Frederick County and various stakeholders are required to identify and describe the various pollution control actions and practices to be implemented to achieve the necessary pollution reductions. Frederick County submitted its Phase II WIP to the Department on November 18, 2011.

Water quality standards are found at COMAR 26.08.02.03-3.



Impaired Watersheds

Watershed	Bacteria	Biological	Nutrients	Sediment	Toxics
Catoctin Creek		X	X	X	
Double Pipe Creek	X	X	X	X	X
Lower Monocacy River	X	X	X	X	
Upper Monocacy River	X	X	X	X	
Potomac River		X			
Potomac River M.O.Crty		X	X	X	X

0 0.5 1 2 3 Miles

1:250,000

Community Development Division
GIS & Data Services Section

April 14, 2011

While efforts have been made to ensure the accuracy of this map, Frederick County accepts no liability or responsibility for errors, omissions, or positional inaccuracies in the content of this map. Reliance on this map is at the risk of the user. This map is for illustration purposes only, and should not be used for surveying, engineering, or site-specific analysis. Modification to this product without prior consent is strictly prohibited. Be advised the use of the content in this map in any form other than as presented here, may constitute a misinterpretation of the map's original intent.

Source: Water Programs Staff, Maryland Department of the Environment. Water Quality Maps for [Frederick County, Maryland]. Available online at http://www.mde.state.md.us/programs/Water/QualityFinancing/SiteQualityFinanceHomePages/water/bb1141/map_wq_frederick.co.aspx. Accessed [03/03/2011].

B. Public Water Supply Safe Yield Requirements

The safe yield of a public water supply is the maximum dependable draft that can be made continuously on a source of water supply during a period of years during which the probable driest period or period of greatest deficiency in water supply is likely to occur[5]. The Recommended Standards for Water Works further defines surface water source water quantity requirements as follows:[6]

- Be adequate to meet the maximum projected water demand of the service area as shown by calculations based on the extreme drought of record while not significantly affecting the ecology of the water course downstream of the intake,
- Provide a reasonable surplus for anticipated growth,
- Be adequate to compensate for all losses such as silting, evaporation, seepage, etc.,
- Be adequate to provide ample water for other legal users of the source.

The Extreme Drought of Record for a particular water source is based on historical hydrologic events. When evaluating historical data to determine the Safe Yield of a source for use as public water supply, it is important to understand that even 100 years of daily flow data from a river or stream reflects only a very small period in geologic time. One must recognize that the historical Extreme Drought of Record is probably not the most severe drought that will occur during a period of use of the water source. It is for this very reason that water supply systems are planned and developed to be able to meet the calculated maximum daily water demand during the Extreme Drought of Record. Should a more severe drought occur, than that which had been previously recorded, the water supplier can impose mandatory water use restrictions to insure that adequate water is available during a drought more severe than that on which the design of the water system had been previously based.

This design requirement effectively provides a design safety factor for source adequacy. Once such a more severe drought has occurred it is incumbent upon the water supplier to augment its supply to meet the projected maximum daily demand, based on the new (more severe) recorded period of greatest deficiency in water supply. Failure to follow this doctrine can seriously jeopardize the water supply adequacy and the public's health and well-being.

The Average Daily Demand (ADD) of a water system is the average daily demand recorded over a period of one year. Average values do not show the extreme high and low demand values that may be encountered through the year. Average values should not be used for allocation purposes since they do not represent the extreme conditions under which a water system will need to operate. The Maximum Day Demand (MDD) of a water system is highest recorded demand on a given day throughout the year. Such events are usually preceded and followed by near MDD values. Water system must have adequate source water and treatment capacity to be able to meet the MDD since water storage tanks are typically designed to meet maximum hourly demand only. In most cases the MDD will occur during the summer, typically in July or August, although such events can occur at other times as well.

The ratio of the annual Average Daily Demand and the Maximum Day Demand is the Maximum Day Peaking Factor. This value represents the multiplier between the ADD and the MDD. This factor is frequently used to identify the magnitude of the water use when demand is at its highest. When evaluating these water demand relationships it is important to use several years of data and to ensure that unique events, such as periods when water use restrictions are in place, do not suppress the demand values. Conversely, data that arbitrarily inflates the Maximum Day Demand should also be culled from the data used in the analysis. One example would be the rapid filling of a water storage tank immediately following a routine cleaning that coincided with a period of high water demand. In most water systems, routine maintenance that necessitates draining and re-filling of a tank can typically be planned during

[5] Source: Glossary - Water & Wastewater Control Engineering, Prepared jointly by the American Public Health Association, American Society of Civil Engineers, American Water Works Association, Water Environment Federation.

[6] Published by The Great lakes Upper Mississippi River Board of State Public Health & Environmental Mangers

period of average or low demand.

Permitted water withdrawals should complement the water treatment system's MDD capacity. Surface water treatment plants typically do not operate at 100% efficiency. In most WTPs, approximately 5% to 7% of the water withdrawn from the source of supply is needed to sustain the operation of various treatment processes to convey WTP residuals to waste treatment facilities. This includes water used for clarifier blow down and filter backwashing. Other less significant activities, such as continuous monitoring devices, also use water affecting the efficiency of the WTP. This wastewater can be treated and reprocessed through the WTP, or as is the case with the New Design Road WTP, be treated and returned to the Potomac River. When such treated wastewater is returned to the source, the volume of water approved for withdrawal should exceed the WTP design capacity.
The aggregate water supply must be capable of delivering the maximum day demand. Water storage facilities must have adequate volume to meet maximum hourly demands or fire flow demands, whichever is greater.

Potomac River Supply Adequacy

The Potomac River, as a managed water source, is clearly the most abundant water supply available to meet the existing and future needs of Frederick County and the City of Frederick.[7] All of the land in Frederick County drains to the Potomac River, providing significant quantities of water not just for Frederick County but also its downstream neighbors. In addition to surface water contributions, all ground water discharge in Frederick County ultimately flows to the Potomac River, primarily through the Monocacy and Catoctin drainage systems.

According to the Maryland Geologic Survey (MGS) Frederick County's large land area represents a major source of water for the Potomac River. Using the hydrologic budget concept identified by the MGS for Frederick County, the aggregate volume of water resulting from average precipitation, in the various drainage basins that ultimately flow to the Potomac, in inches and Billions of Gallons per Year is estimated to be approximately 708 billion gallons per year. The MGS estimates that total annual runoff associated with Frederick County's land area is approximately 419 billion gallons per year.[8] This represents an average daily volume of water of approximately 1.15 Billion Gallons per Day (BGD).

Frederick County and the City of Frederick's combined water supplies, compared to many of the large downstream users of this water resource, have no significant consumptive impact on the Potomac River.

The combined return flow to the Potomac River from the County and City WWTPs and the volume of watershed by the large land area associated with Frederick County ensures that the overall use of the water is efficient and large quantities of water will be subsequently available for current and future downstream users of the Potomac River.

The ICPRB, through its Section for Cooperative Water Supply Operations on the Potomac, coordinates the operations of the three major metropolitan area water suppliers during times of drought and recommends releases of stored water. These operations ensure adequate water supplies for the Washington metropolitan area during droughts. The Jennings Randolph Reservoir in western Maryland, and Little Seneca Reservoir in Montgomery County, MD, is used as a system to ensure adequate river flows. The larger Jennings Randolph Reservoir, in conjunction with the Savage Reservoir, ensures that adequate water is available to the Washington metropolitan area.

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[7] The MDE does not provide flow-by requirements in WAUP for the Potomac River. Minimum flow requirements at Little Falls are used to trigger releases from upstream reservoirs.
[8] A very small number of acres flows to the Patuxent River.
Source: Maryland Geological Survey, Bulletin 33, 1987, Water Resources of Frederick County, Maryland, Hydrologic Budgets and Water Availability.

Since the DUSWM's Potomac River intake is located between the reservoirs and the Washington metropolitan area, and the DUSWM's use is basically non-consumptive, the safe yield of the River is the regulated flow of the River.

III. COUNTY COMMUNITY SYSTEMS

A. FREDERICK COUNTY (DUSWM) WATER SYSTEMS

Frederick County, through its Division of Utilities and Solid Waste Management (DUSWM), operates 14 separate water systems located throughout Frederick County. The County water systems serve approximately 43,000 people located in several defined services areas. Currently, the County's ground water supply systems serve approximately 18% of this population.

1. Frederick County Surface Water Supplies

The DUSWM's largest water supply system, the New Design Road Water Treatment Plant (WTP), which withdrawals water from the Potomac River, has the greatest source capacity of all the water supplies in Frederick County. The New Design Road WTP Potomac River intake is located 2.5 miles upstream of the confluence of the Potomac and Monocacy Rivers. The New Design Water System serves the following Community Growth Areas:

- Adamstown
- Ballenger Creek
- Buckeystown
- Eastalco (although this facility is not in operation, the agreement to supply this property with 2MGD is still in effect)
- Frederick Southeast
- Holly Hills
- Linganore
- Monrovia
- New Market
- Point of Rocks
- Spring Ridge/Bartonsville
- Urbana
- City of Frederick (via PRWSA)
- Fort Detrick (via agreement)

The Potomac River is the most abundant water supply in Frederick County. All of the land in Frederick County drains to the Potomac River, providing significant quantities of water not just for Frederick County but also its downstream neighbors. Additionally Frederick County's large land area represents a major source of water for the Potomac River. The Maryland Geologic Survey (MGS) estimates that total annual runoff associated with Frederick County's land area is approximately 419 billion gallons per year. This represents an average daily volume of water of approximately 1.15 Billion Gallons per Day (BGD). The DUSWM's use of the Potomac River as a water supply is basically non-consumptive. Water withdrawal and wastewater return flow data, during the two most recent drought years (1999 and 2002); reflect relatively low consumptive use during drought, compared to that of other large (downstream) users of the Potomac.

The DUSWM's Facility Plan for the New Design Road WTP is based on providing an ultimate 45 MGD maximum day capacity. Based on the Facility Plan, the first major increase in treatment capacity provides 25 MGD of maximum daily treatment capacity. The DUSWM's Water Appropriation and Use Permit (WAUP) for the Potomac River supply currently allows the withdrawal of up to 26 MGD, providing the New Design Road WTP with a permitted treatment capacity of 25 MGD to meet maximum day demands. Substantial completion for the WTP upgrade project occurred in April 2011. Completion of the plant upgrade allowed the County to fulfill its 8 MGD (max day) supply obligation to the City of Frederick per the Potomac River Water Supply Agreement (PRWSA).

In conjunction with this project the New Design Transmission Main (Phases 1 thru 5) was completed in 2010. The 42" transmission main conveys water from the New Design WTP to Frederick City via two different points of interconnection and also supplies the eastern part of Frederick County via the East County Water Storage Tank and Booster Station.
The DUSWM has completed a major expansion and upgrade to its Potomac River water treatment and transmission system to accommodate programmed growth in the County and to supplement the City of Frederick's water supply.

The DUSWM also has a 2.0 MGD surface water treatment facility located at Lake Linganore. This permanent facility was constructed in 1991 after the County deployed several smaller temporary surface water treatment systems that relied on the Lake as a source of supply. Presently this water appropriation allows the DUSWM to withdraw 0.30 MGD on an average annual basis and 2.0 MGD maximum monthly daily basis. A package filtration plant provides complete treatment of the lake water. Screened intakes located at various depths in the lake provide the WTP with multiple points of withdrawal. Although this area is now served by the New Design treatment plant via the East County pumping station, the Linganore water treatment plant remains in a "ready" state for potential use.

In December 2000, Frederick County, the City of Frederick and the Lake Linganore Association executed a Regional Water System Agreement. This agreement addressed several long-standing issues associated with the use of Lake Linganore as a water supply. In addition to providing public funds to make repairs to the aging private dam and spillway, the agreement also addressed conflicting permit flow-by requirements that are contained in the City of Frederick's Linganore Creek WAUP and the Lake Linganore Association (LLA) obstruction permit. The agreement requires the LLA to release enough water from the lake to ensure that the City of Frederick can withdraw up to 6.0 MGD and also meet its WAUP permit flow-by requirement of 4.46 MGD. The agreement also requires the County, once it has completed the construction of its Potomac River Water Supply system, including a direct connection to the Linganore Service Area, to cease all water withdrawal from the Lake whenever its pool level (in the lake) is below elevation 308 AMSL (the crest of the dam's spillway). This requirement effectively prevents the County from continuously relying on Lake Linganore as a source of supply. Once the Potomac River water supply projects are completed, the County's Lake Linganore water supply will become an un-allocable secondary source, used only to supplement the Potomac River supply, when excess water resources are available in the Linganore basin or if necessary during certain emergencies.

The County's combined surface water appropriation associated with the New Design Road and Lake Linganore sources allows for the average daily withdrawal of up to 16.03 MGD with a combined maximum daily withdrawal of 28 MGD. However, the provisions of December 2000 agreement regarding the use of Lake Linganore limit the allocation of this surface water to the permitted values provided in the New Design Road WAUP. Table 3.06 Summarizes the County's current surface water appropriations.

Table 3.06 Frederick County/DUSWM Surface Water Appropriations

Water Supply System	Current Water Appropriation and Use Permits		
	Permit Number	*Daily Average*	*Max Daily Use*
Lake Linganore (impoundment of Linganore Creek) (secondary source)	FR 85S002 (09)	1.20	2.00
New Design Road (Potomac River)	FR 68S005 (06)	16.00	26.00
Total (MGD)		**17.20**	**28.00**

Water treatment requirements for the DUSWM's surface water supplies are not unlike those of other systems with similar source water quality. The DUSWM's New Design Road WTP, which withdrawals water from the Potomac River, provides complete conventional surface water treatment, including pre-settling, flocculation, sedimentation and filtration. Turbidity levels in source water from the Potomac River can exceed 1,500 NTU necessitating more substantial (conventional) treatment.

Table 3.07 summarizes the type of treatment provided at these surface water WTPs.

Table 3.07 Frederick County/DUSWM Surface Water Treatment Requirements

Surface Water Systems														
Water System	Screening		Pre-Settling	Flash Mix	Pre-Chlorination	Activated Carbon	Flocculation	Sedimentation	Rapid Sand Filtration	Disinfection		Corrosion Control		Fluoridation
	Course	Fine								Post Chlorination	Ultra-Violet Light	PH Adjustment	Orthophosphate	
New Design	●	●	●	●	■	■	●	●	●	●	●	●	■	■
Lake Linganore (secondary source)		●		●	■	■	●	●	●	●		●	■	■

● Necessary treatment process, used continuously.

■ Optional treatment process, available but used only if needed.

2. Frederick County DUSWM Ground Water Supply Systems

The DUSWM also owns and operates several ground water supply systems that supply water to the County's small individual Community Water Systems (CWS) or are available to supplement the surface water supplies. These small systems range in size from 0.01 MGD to 1.0 MGD.

As Frederick County grows, its water distribution network expands, allowing the interconnection of small ground water based systems to larger water systems that rely on the more abundant surface water supplies. These interconnections frequently result in the partial idling of the smaller ground water supply and treatment systems. In most cases, when distribution system interconnections occur, the surface water supply subsequently becomes the CWS primary source of water, with the ground water system maintained as a secondary supplemental system only. These consolidations of the DUSWM's ground water systems with larger surface water supplies, creates a supplemental relationship between several of the ground and surface water appropriations.

A series of New Design Water Transmission Main projects and Linganore waterline loop projects have facilitated the interconnection of Lake Linganore, New Market and Monrovia to the DUSWM's New Design Road System Potomac River water supply. This has resulted in idling the Linganore WTP and decommissioning the New Market West and Woodspring systems. Water supply to the City is provided by two 24" waterlines. The County began "wheeling" water through the City of Frederick's water distribution system to supply the County's Waterside development water system. One more interconnection was provided to the City.

The DUSWM's water system consolidations continue. In 2004 a 20-inch water transmission line was constructed along MD 28 from New Design Road to Point of Rocks. This allowed the DUSWM's Point of Rocks CWS to be connected to its New Design Road WTP supply. The original Point of Rock's CWS wells have been idled, but can be used if needed.

Treatment requirements for the ground water supplies vary depending on the source of supply. These small ground water supply systems require various levels of treatment to ensure SDWA compliance or to meet reasonable aesthetic expectations of the customer. Table 3.08 provides a basic summary of the treatment requirements for the DUSWM's ground water based CWS.

Table 3.08 DUSWM Ground Water CWS Treatment Requirements

DUSWM Ground Water Regional and Sub-Regional CWS Treatment Requirements									
Active (Primary) Ground Water Systems									
Water System	Radon Removal (Aeration)	Nitrate Removal	Fe/Mg Removal	Cartridge Filtration	Corrosion Control		Disinfection		Fluoridation
					pH Adjustment	Orthophosphate	Chlorination	Ultra-Violet Light	
Bradford Estates		●		□	●		●	□	●
Cambridge Farms					●	■	●		●
Cloverhill III[9]		●			●	●	●		●
Copperfield			●		●	■	●		○
Fountaindale[9]	●	■		●	●		●		○
Knolls of Windsor		■		●	●		●	●	●
Libertytown Apts.					●		●		○
Libertytown East			■		●		●		●
Mill Bottom (Samhill)	■	●			●		●		●
White Rock					●		●		○
Reserve Ground Water Systems									
Francis Scott Key				●	●		●	●	●
New Market West			■		●		●		○
Point of Rocks	●			●	●	●	●		○
Waterside[10]						●	●		●
Urbana WTP	●				●		●		○
Woodspring					■		●		●

●Necessary treatment process, used continuously.
■Optional treatment process, available but used only if needed.
□Treatment process provided through programmed WTP expansion.
○ The County's goal is to provide Fluoride prophylaxis for all of its customers including those on small ground water supplies. However, these particular CWS (WTP) are not yet fluoridated.

[9] Includes the Fountaindale North water system (MD0100012) and Braddock Heights
[9] Intended to be connected to the City of Frederick system in late 2014
[10] No longer in use; Waterside community connected with City of Frederick and County water supplies

Table 3.09 Summary of DUSWM's Ground Water Appropriations

Frederick County Groundwater Supplies			
Water Supply System Name	**Current Water Appropriation and Use Permits (MGD)**		
	Permit Number	*Daily Average*	*Month of Max. Use*
Bradford Estates	FR 88G002 (03)	0.0170	0.0280
Cambridge Farms	FR 70G014 (05)	0.0620	0.1000
Cloverhill III*	FR 86G026 (05)	0.0843	0.1250
Copperfield	FR 87G034 (03)	0.0293	0.0473
Fountaindale	FR 66G012 (10)	0.2800	0.4200
Fountain Rock	FR 85G027 (03)	0.0015	0.0050
FSK (Arcadia Wells)*	FR 77G008 (05)	0.0420	0.5000
FSK (Ballenger Wells)*	FR 77G108 (03)	0.0420	0.5000
Knolls of Windsor	FR 90G031 (05)	0.1068	0.1773
Libertytown Apartments	FR 85G001 (05)	0.0050	0.0075
Libertytown East	FR 89G024 (03)	0.0157	0.0236
New Market West*	FR 84G005 (04)	0.0070	0.0276
New Market West*	FR 84G105 (02)	0.0160	0.0643
Urbana High School*	FR 93G015 (02)	0.0110	0.0410
Point of Rocks *	FR 68G001 (06)	0.1010	0.1690
Samhill Estates	FR 90G013 (05)	0.1556	0.2600
Waterside[1]	FR 83G013 (03)	0.1250	0.1750
White Rock	FR 54G007 (04)	0.0300	0.0450
Woodspring*	FR 85G021 (04)	0.1370	0.2190
***secondary/reserve sources** **[1] not in use**			
Total		**1.268**	**2.935**

The County has 21 separate WAUPs associated with its various ground water supplies. These WAUP identify the daily average water withdrawals that are permitted on annual basis and during the month of maximum use. The DUSWM's ground water appropriations allow for 1.268 MGD of ground water to be used on an annual average basis with up to 2.935 MGD available during the month of maximum use. The individual WAUP are shown in Table 3.09.

3. Frederick County DUSWM Water System Pressure Zones

The DUSWM's water supply systems have six (6) categorized pressure zones. These pressure zones establish the minimum and maximum water pressure available for the water service areas. By using categorized pressure zones, water storage and booster pumping facilities can be planned in a uniform way, insuring that ultimate interconnection of water systems is possible. The DUSWM also has several small water systems that operate outside of the categorized pressure zones. These systems were developed before uniform design standards for water storage facilities and defined pressure zones were established. When feasible the DUSWM is converting these water systems so that they operate in one of the categorized pressure zones. For example a new 1.0 MG Zone 1 elevated tank is replacing an existing standpipe in Point of Rocks that was built with an overflow elevation of 452 as opposed to the required Zone 1 overflow elevation of 473. The ground elevations that can be served by each pressure zone are shown on Table 3.10. Multi-story structures exceeding these elevations require specific considerations consistent with adopted design criteria by DUSWM.

Table 3.10 DUSWM Water System Pressure Zones

DUSWM Water System Pressure Zones

Pressure Zone	Tank Overflow Ele.	Service Area	
		Min. Elevation	Max. Elevation
1	473	242	373
2	610	373	510
3 East	700	469	600
3 West	737	506	637
4	870	639	770
5	1021	790	921

The DUSWM's water systems rely on a combination of water storage systems to maintain an adequate, reliable hydraulic gradient across the water distribution system. The DUSWM's water systems pressure zones are established by the overflow elevation of its reservoirs (tanks), standpipes and elevated tanks. Reservoirs and standpipes constructed at defined elevations and or elevated water tanks are used on most DUSWM distribution systems to provide gravity water storage. Only the DUSWM's smallest water systems rely on pump storage supply with either ground tanks or standpipes used for supply. The only exception to this would be those homes served by the Jordan Tank in the area west of New Market.

Frederick County's topographic relief (1695 feet) necessitates the need for multiple pressure zones. To the extent possible categorized pressure zones have been established to facilitate coordination and connection of the DUSWM's water storage tanks.

The DUSWM currently has 18 gravity water storage tanks operating in the 6 active DUSWM categorized pressure zones. These tanks and their particular pressure zones and configurations are shown in Table 3.11.

Table 3.11 DUSWM Pressure Zones/Gravity Water Storage Tanks

Frederick County DUSWM Pressure Zones/Gravity Water Storage Tanks						
Tank Name	Overflow (Ft AMSL)	Dimensions		Construction Type	Capacity (MG)	Note
		Height	Diameter			
Pressure Zone 1						
Ballenger 1 (MD RT 85)	473.0	144	50	Steel/Elevated	0.50	
Ballenger 2 (Reich's Ford)	473.0	44	112	PSC/Tank	2.5	(1)
Ballenger 3 (Hannover)	473.0	69	70	PSC/Tank	2.0	(2)
Point of Rocks	473.0	122	75	Steel/Elevated	1.0	(3)
Pressure Zone 2						
Ballenger 4	610.0	TBD	TBD	Comp./Elevated	1.0	(4)
Linganore 1	610.0	50	47	Steel/Tank	0.70	
Linganore 2	610.0	48	90	PSC/Tank	2.5	(6)
Urbana 1	610.0	125	40	Steel/Elevated	0.15	(7)
Urbana 2	610.0			Comp./Elevated	1.5	(7)
White Rock 1	610.0	14	47		0.054	
White Rock 2	610.0	14	47	Steel/Standpipe	0.054	
Pressure Zone 3 (East County)						
Bradford Estates	700.0	25	47	Steel/Standpipe	0.17	(8)
Monrovia	700.0	150	90	Comp./Elevated	2.0	(9)
Pressure Zone 3 (West County)						
Cambridge Farms	737.0	98	25	Steel/Standpipe	0.35	
Pressure Zone 4						
Fountaindale	870.0	39	70	Steel/Standpipe	0.625	(10)
Mill Bottom (Samhill)	870.0	15	62	Steel/Tank	0.309	
Pressure Zone 5						
Braddock Hts.	1021	46	61	Steel/Standpipe	0.75	

(1) Constructed in 2005 as a part of the Potomac River Water Transmission System, placed in operation 2006.
(2) Booster pump station located at this reservoir supplies Ballenger 4 located in Pressure Zone 2.
(3) This tank replaces existing non-categorized zone tank in Point of Rocks.
(4) Project is on hold.
(5) This reservoir also supplies booster pump system, which can (in the future) supply Pressure Zone 3.
(6) This reservoir also supplies booster pump system, which supplies Pressure Zone 3.
(7) Supplied from Pressure Zone 1 by Ball Road Booster pump station.
(8) Pumped storage supply system for Bradford Estates Subdivision.
(9) Supplied from Pressure Zone 2 by Jordan booster Pump station located at Linganore Tank 2.
(10) This standpipe also supplies booster pump system, which supplies Braddock Tank in Pressure Zone 5.
(11) This reservoir also supplies booster pump system, which supplies Samhill Pressure Zone 5.

In addition to these water storage facilities the County also has several water storage tanks that do not operate by gravity. Some of these tanks are located at WTPs, which in conjunction with pumping systems, supply water to the various pressure zones. In some cases such as the Bradford Estates, Knolls of Windsor and Samhill water systems, these tanks were designed to complement their categorized pressure zones and the tanks can provide both gravity and pumped storage supply. These tanks do not supply water to the distribution systems by gravity, they rely on pumping systems located at the WTP to convey water, at the appropriate gradient, into the distribution system, which may or may not have gravity storage on the distribution system. These tanks are shown on Table 3.13.

Table 3.12 DUSWM WTP Ground Storage Tanks

Frederick County DUSWM WTP Ground Storage Tanks						
Tank Name	Overflow (Ft AMSL)	Dimensions		Construction Type	Nominal Cap. (MG)	
		Height	Diameter			
Pumping to Pressure Zone 1 – OF 473						
New Design WTP 1	300.0	44	65	PSC/Reservoir	0.90	
New Design WTP 2	310.0	51	77	PSC/ Reservoir	1.30	
FSK WTP	311.0	69	70	RC/ Reservoir	0.15	
Pumping to Pressure Zone 2—OF 610						
Knolls of Windsor	610.0	38	42	Steel/ Reservoir	0.40	
New Market West*	601.0	65	25	Steel/Standpipe	0.24	
Pumping to Pressure Zone 3 – OF 700						
Fountaindale ETP 1	665.0	47	25	Steel/Standpipe	0.17	
Bradford Estates	700.0			Steel/ Reservoir	0.30	
Pumping to Pressure Zone 4 – OF 870						
Mill Bottom (Samhill)	870.0	15	62	Steel/Reservoir	0.310	
Fountaindale Standpipe	870.0	70	39	Steel/Standpipe	0.625	

*Tank no longer in service

When it is necessary to convey water from a lower pressure zone to a higher-pressure zone the DUSWM generally deploys booster pump stations at water storage facilities to facilitate a controlled increase in system pressure and flow. Therefore some water storage facilities provide both gravity storage pressure in a lower zone and pumped storage supply for the next higher zone. These configurations increase the reliability of both pressure zones since flow can be easily controlled (in either direction) between pressure zones.

B. FOUNTAINDALE/BRADDOCK HEIGHTS WATER SYSTEM

The Fountaindale/Braddock Heights Water System (MD0100012) (MD0100013) is owned by Frederick County (DUSWM). Raw water is conveyed at seven active wells and centrally treated then distributed to the community through 6, 8, and 12-inch mains. The Braddock Heights water system is now combined with Fountaindale. In response to an Order issued by the Maryland Department of the Environment to provide water service to the Braddock Heights community, the County constructed new lines and facilities to serve the properties previously served by the private Braddock Water Company. Additional information can be found earlier in this chapter under Frederick County (DUSWM) Ground Water Supply Systems.

The Fountaindale/Braddock Heights Water System has approximately 1105 equivalent dwelling units (pop. 2717) connected to the system. There are few taps available and only a small undeveloped acreage. The Braddock Heights water system service area has a few large undeveloped properties, which may be developed in the future but only to the extent that the existing groundwater appropriations and supply could support same.

The Fountaindale Water Treatment Plant is currently under design for upgrade with respect to controls, treatment and additional capacity. One additional well will be added to the raw water well system along with updated plant controls for the entire process.

C. JEFFERSON WATER SERVICE AREA

The Jefferson Water Service Area covers 1.79 square miles including and surrounding the unincorporated community of Jefferson. A portion of the area is currently served by two County (DUSWM) water systems and one private water system, which are planned to become part of one community water system in the future. The majority of the service area population is currently served by individual wells including the Valley Elementary School.

1. Existing Facilities

Copperfield Water System (MD0100037) is owned and operated by the County (DUSWM) and serves the 125 lot Copperfield subdivision on the west end of Jefferson. Water from two wells is chlorinated, pH adjusted and filtered for iron. The system will be fluoridated in the future. Additional information can be found earlier in this chapter under Frederick County (DUSWM) Ground Water Supply Systems.

Briercrest Apartment Water System (MD0100004). is privately owned and operated and is served by one well with a yield of 47 gpm. Water from the well is chlorinated by use of hypochlorinators. Water is distributed to the 24 unit apartment complex from an underground 10,000 gallon pressurized tank.

The **Cambridge Farms Water System (MD0100033)** is owned and operated by the County (DUSWM) and serves the Cambridge Farms subdivision of single-family lots at the east end of Jefferson. The water is chlorinated, pH adjusted and eventually will be fluoridated. Water is stored in a 364,000 gallon standpipe. Additional information can be found earlier in this chapter under Frederick County (DUSWM) Ground Water Supply Systems.

2. Existing & Future Demand

The appropriation permit for Cambridge Farms and Briarcrest Apartments is combined. The water systems serve a total population of 950 and have 352 service connections. The average daily use in 2013 was 51,987 gpd. The Copperfield system serves 125 single-family dwellings and an estimated population of 335 persons. The 2013 average daily use was 22,518 gpd. The Jefferson Growth Area has an estimated population of 2,212.

The Smith Farm (Woodbourne Manor subdivision) has been approved for 197 residential lots and will be combined with the Copperfield water system, which includes an increase in the Water Appropriation and Use Permit, construction of a water storage tank and additional treatment/pumping capacity. Water Appropriate and Use Permit FR2004G003(02) was approved for the Woodbourne Manor Subdivision for 33,100 gpd (avg.) and 45,700 gpd (max.), utilizing 4 wells and permit FR2004G103(02) (1 well) for 12,600 gpd (avg.) and 30,700 gpd (max). The estimated population served is 1,816.

Table 3.13 Jefferson Area Ground Water Sources

Aquifer/location	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Permit Number
Granodiorite & Biotite Granite Gneiss Copperfield	29,300	47,000	FR1987G034
Catoctin Metabasalt Cambridge Farms & Briercrest Apts.	62,000	100,000	FR1970G014
Granodiorite & Biotite Granite Gneiss Valley Elementary	6,700	10,000	FR1968G008
Biotite Granite Gneiss Woodbourne Manor	33,100	45,700	FR2004G003(02)
Biotite Series Woodbourne Manor	12,600	30,700	FR2004G103(02)

3. Planned Improvements

It is anticipated that the separate water systems will be joined to provide a Jefferson regional system and depends entirely on the collective availability of groundwater and the ability to appropriate same from the Maryland Department of the Environment. An alternative to groundwater supply in the future suggested by the Boyle Water Distribution Study includes a connection from the County distribution network from the Ballenger system west along MD 180. However, the capital cost for such a system, relative to the number of users, would be extremely high.

4. Wellhead Protection

The Wellhead Protection Areas (WHPAs) delineated in the Jefferson Area, overlap in some instances. The Copperfield WHPA is approximately 160 acres and extends to the east side of Broad Run Road, and includes part of the Valley Elementary School site. The Elementary School's WHPA, is a standard 1000 ft. radius around the well, which is standard for public Water supplies which yield less than 10,000 gpd. The Cambridge Farms WHPA, follows topographic divides and covers an area of approximately 191 acres. The Briarcrest WHPA is the standard 1000 ft. radius from the well, and includes the Briarcrest Subdivision lots, as well as existing dwellings along Old Middletown Road and along Jefferson Pike, which are served by individual wells.

D. LIBERTYTOWN SERVICE AREA

The Libertytown Service Area is approximately 0.5 square miles in size encompassing the unincorporated community of Libertytown, which is designated as a community growth area. Most of the 1,141 persons in the community are served by individual wells. However, the County (DUSWM) has a water system serving the convenience store and a condomimium complex on the west end, and another serving the Liberty East development on the east end of the community. Proposed developments south and north of the existing community would provide additional supply and the impetus to connect the entire service area into one system.

The area is underlain with a relatively low yielding aquifer with scattered intrusions of high yielding Wakefield Marble. It has been suggested that a community system could take advantage of locating production wells, where these high water yielding rocks occur, to the benefit of the entire community.

1. Existing Facilities

The **Liberty East Subdivision Water System (MD0100038)** serves a population of 86 people and has 42 service connections. It obtains its water supply from two wells. Additional wells have been drilled in the Liberty Village community on the south side of MD 26, but water quality issues precluded the use of those wells. The water is treated with chlorination and pH for corrosion control at a small WTP on-site in the Liberty East subdivision. Fluoride treatment was added to the finished water in the WTP. Additional information can be found earlier in this chapter under Frederick County (DUSWM) Ground Water Supply Systems.

The **Libertytown Apartments water system (MD0100036)** Additional information can be found earlier in this chapter under Frederick County (DUSWM) Ground Water Supply Systems.

The **Liberty Elementary School (MD1100016)** is a Multi-Use system served by two wells with an appropriation permit to withdraw 4000 gpd.

Table 3.14 Libertytown Area Ground Water Sources

Aquifer/location	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Permit Number
Wakefield Marble & Ijamsville Formation Liberty East & Liberty Village	15,700	23,600	FR89G024(4)
Libertytown Metarhyolite Libertytown Apts.	5,000	7500	FR1985G001(5)
Libertytown Metarhyolite Liberty Elem.	4,000		1973G017

2. Existing & Future Demand

The current estimated population of the Libertytown community is 770 persons. The twenty year population projection is 4220 persons. This would result in a water demand of 379,800 gpd. Additional water supply is needed to serve the commercial and institutional uses in the community. The Libertytown water system will be combined as part of planned improvements with future development. There will be additional wells added to the system and an elevated water storage tank.

3. Planned Improvements

Future plans call for the independent water systems to be connected and service extended to the existing community. A future water storage tank site has been identified on the north side of the community at MD 550 next to the Mayne's property. Potential land development south of MD 26 would connect to this shared system and participate in ensuring shared infrastructure is adequate to support the entire system.

4. Wellhead Protection

The WHPA for the Liberty East Water System was delineated to include the extent of the fracture traces intersecting near the wells, the outcrop of Wakefield Marble and the watershed boundaries of the small creek that passes near the wells. The area was then modified to approximate a recharge area. An area of approximately 98 acres is delineated.

The WHPAs for the Libertytown Apartments and the Liberty Elementary School, are the standard 1000 ft. radius around the wells, which is standard for water systems producing less than 10,000 gpd. These WHPAs overlap somewhat. The Elementary School wells showed a detection of MTBE, but the Libertytown Apartment wells did not.

IV. MUNICIPAL COMMUNITY SYSTEMS

A. CITY OF BRUNSWICK/ROSEMONT/KNOXVILLE

The Brunswick Area Water System (MD0100005) serves the City of Brunswick, most of the Village of Rosemont, some of the unincorporated community of Knoxville, and the subdivision known as New Addition. The service area also includes customers in Washington County adjacent to the Yourtee Springs.

1. Existing Facilities

The Brunswick Water Treatment Plant was built in 1968 to supplement the spring supply. In 1990, the plant was upgraded and expanded to 1 MGD and the Potomac became the major water source. The City has a withdrawal permit for a daily average withdrawal of 1.0 mgd with a maximum daily withdrawal of 1.5 MGD. The treatment plant has coagulation, clarification, filtration, and disinfection.. A clear well at the treatment plant has a capacity of 130,000 gallons and an overflow elevation of 260 ft. In 2012, the treatment plant was expanded to an ultimate capacity of 2.0 MGD.

The Yourtee Springs are located in Washington County, Maryland, 3 miles west and 7 miles north of the Town at elevation 588. Yourtee Springs is permitted for 0.35 MGD (daily average) and 0.50 MGD (max. day demand) The supply is chlorinated at the intake of an 8-inch gravity main, which carries water along MD 67 to Weverton, thence, easterly along US 340 to Knoxville when the main increases to 10 inches. The 10-inch main travels easterly along MD 478 into Brunswick a total of 7 miles.

Three Loudoun County, Virginia springs at elevations of 585-653 had previously flowed by gravity through 2 1/2 miles of 4 - 8 inch mains under the Potomac River to join the northern springs transmission main at Knoxville. However, these springs are currently not being utilized to supply the Brunswick system due to leaks in the transmission main and reported minor surface water contamination problems. If needed in the future, the Virginia Springs have a capacity of 120,000 gpd with a safe yield of 60,000 gpd. Two wells located inside the corporate limits of Brunswick are rated at 30 - 50 gpm but are out of service and not planned to be utilized as a future municipal source.

Water storage includes a 3 million gallon capacity concrete lined reservoir located in the northern part of Brunswick at an elevation of 509 ft. The reservoir serves lower areas and controls service from 246 to 440 ft. elevation. There are two elevated storage tanks located at the reservoir site with a combined capacity of 1,250,000 gallons. Two 650- gpm pumps with chlorination equipment is provided at the reservoir site to pump water to the elevated tank. The tank provides increased pressure for elevations 370 to 550 ft. The tank's overflow elevation is 608 ft. The City has installed a 200 KW generator to provide a backup power source for the reservoir pumping station. The Brunswick water distribution system consists of approximately 16 miles of 4, 6, 8, 12, and 16-inch mains.

Table 3.15 City of Brunswick Surface Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Potomac River	1,000,000	1,500,000	373,000	FR1979S013(05)
Yourtee Springs	350,000	500,000	124,000	WA1983G012(03)
Totals	**1,350,000**	**2,000,000**	**497,00**	

2. Existing & Future Demand

The Brunswick water system currently serves an estimated population of 6,480 (2,400 services) including the City of Brunswick, portions of the Town of Rosemont and Knoxville, New Addition, Brownsville and towards Burkittsville. The present demand on the system is reported at 0.50 MGD. The total capacity of the system currently is 1.5-2.0 MGD. The City estimates that drinking water demand will reach 2.00 mgd by 2030. To accommodate the projected population, additional appropriations will be required.

In the spring of 2002, the City of Brunswick annexed the Hope and Enfield farms located to the south of Burkittsville Road and to the east of Jefferson Pike. The annexation agreement sets forth that these properties, together with the Long farm, shall be developed with 1,505 residential dwelling units in conjunction with the commercial and office uses as set forth in the City Master Plan and County Comprehensive Plan ("Brunswick Crossing"). The average daily water demand for Brunswick Crossing will be 0.45 MGD. Therefore, the City of Brunswick's water system will have a total average daily demand of 0.99 MGD with a 1.62 MGD maximum day demand. The annexation agreement sets forth the various City infrastructure improvements required to meet this increased demand. In 2012 the WTP was upgraded to treat an approximate capacity of 2.0 MGD. In addition to the expanded capacity, a 300,000 gallon pre-sedimentation tank was added to allow the plant to operate more efficiently.

In 2013, the Rosemont Water Supply Agreement was executed between the City of Brunswick and the Frederick County Board of Commissioners. The agreement states that the City will set aside and provide to the County, capacity to serve a maximum of 150 equivalent dwelling units (EDUs), based on 250 GPD (average daily demand) with a maximum daily demand capacity of 400 GPD per EDU exclusive of fire protection.

3. Planned Improvements

The following improvements are planned to increase the efficienty of the plant to meet water demand:

- Installation of valves and system modifications to pump sediment collected in the pre-sedimentationbasin to the WWTP digester tank.
- Installation of new stainless steel screens on the water intake in the Potomac River.

B. CITY OF FREDERICK (MD0100015)

The City of Frederick encompasses 22.1 square miles. The City's 2013 population was66,647. The City utilizes four sources for treated water supply: The Monocacy River, Linganore Creek, Fishing Creek Reservoir, and the Potomac River. Although the safe yield of the Monocacy source has been reduced to zero (MDE Consent Order, 2002), the City has gained the use of up to 8 mgd (maximum day) from the County's Potomac River New Design Water Treatment Plant. The combined safe yield of the sources listed above is 14.89 mgd.

The City's water service area consists of two pressure zones (462 and 595). There are two elevated and one ground level storage tanks floating off the 462 zone with a combined storage of 4 million gallons. A fourth elevated tank, with a volume of 1.0 million gallons, located near the Amber Meadows development, is currently under design. There are two ground storage tanks and one elevated storage tank in the western high zone (595) with combined storage of 2.750 million gallons. A 4 mgd booster pumping station located at Rt. 40 and Baughman's Lane and a 2 mgd booster pumping station is located at Christopher's Crossing and Whittier Drive serve the 595 pressure zone.

Existing Facilities

The use of the four water sources listed above is regulated by the Maryland Department of the Environment (MDE) through the issuance of Water Appropriation and Use Permits pursuant to Title 5 of the Environmental Article, Annotated Code of Maryland.

The Linganore Creek Water Treatment Plant (WTP), originally constructed in 1932, was upgraded in 1993 and has a current design capacity of 7.1 MGD. This WTP relies on Linganore Creek for its source water. The safe yield of this Source water was increased by the 1971 construction of an 883 million gallon privately owned lake, Lake Linganore. The County, City and Lake Linganore Regional Water System Agreement, dated December 14, 2000 ("the 2000 agreement"), confirms and clarifies the lake owners—Lake Linganore Association—obligation to release enough water from the lake to satisfy the flow-by requirement of the City's Linganore Creek appropriation and use permit and also to provide the City with a 6.0 mgd allocation of water. This system provides a safe yield of 6.0 mgd.

In developing this agreement with the City and Lake Linganore Association, the County evaluated the safe yield of Lake Linganore based on the combined withdrawals associated with the County's WTP and the previously mentioned releases. The result of this analysis indicated that Lake Linganore could provide a safe yield of 2.4 MGD for the County while maintaining the previously mentioned releases. (This is modified by other provisions of the County – Lake Linganore Agreement.)

The City's Monocacy WTP was constructed in 1960 with an initial design capacity of 2.0 MGD. The treatment facilities capacity was increased to 3.0 MDG in 1988. The City's Monocacy River appropriation permit also has a flow-by requirement. Again quoting the Malcolm Pirnie, Inc. August 5, 2004 Water Resources Development & Optimization Final Report, "The historical flow-by rule did not allow any Monocacy River withdrawals by the City when flows immediately downstream of its intake dropped below 40.5 cfs (equates to 50 cfs at downstream Jug Bridge gage). The June 2002 Consent Order between MDE and Frederick City, limits withdrawals to 3mgd, but allows withdrawals to continue when flows at Jug Bridge drop below 50 cfs, as long as such withdrawals do not exceed 20 percent of the river flow. In effect, this allows the City to withdraw 3 mgd at all times until flow at Jug Bridge drops below 29 cfs. Historically, flows below 29 cfs at Jug Bridge have been a rare occurrence, recorded on only 27 days of the 1929-2003 historical record (all occurrences in 1966 or 2002).

Further, even at the lowest recorded flow rate at Jug Bridge (19cfs), the City can still withdraw up to 2mgd under the Consent Order since that would represent 20 percent of the estimated flow at the City's intake." Both the City's Linganore Creek and Monocacy River supplies have the following treatment: corrosion control, coagulation, fluoridation, flocculation, sedimentation, filtration, and disinfection.

In addition to the Linganore Creek and Monocacy River supply, the City also has a 50 million gallon reservoir that supplies the Lester Dingle WTP, which has a current treatment capacity of 3.2 MGD. The primary tributary of this reservoir is Fishing Creek and the City's appropriation permit for this source also has specific flow-by requirements. Based on the low-flow release in the City permit, the yield of this supply appears to be limited to the storage capacity of the reservoir, which is 50 million gallons. This system, in combination with operating procedures for all of the City's water supplies, provides, according to MDE, an annualized sustained safe yield of 0.89 mgd. The Lester Dingle WTP at the Fishing Creek source has corrosion control and uses fluoridation, filtration and disinfection.

The City has two production well fields. Well #4 located in the Monocacy Village Park, has a current appropriation of 365,000 gpd average daily demand., and 420,000 gpd for the month of maximum use. Well # 7 and Well #3, located in Riverwalk and Fredericktowne Village Parks were permitted for a total of 200,000 gpd average daily demand and 260,000 gpd for the month of maximum use. These groundwater sources are not currently being pursued for use by the City for water supply. From 2002 until 2004, water from the well source was treated by a portable ultrafiltration system which was decommissioned in 2007 and removed in 2009.

Table 3.16 Frederick City Surface Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Fishing Creek Reservoir	1,910,000	3,800,000	768,000	FR1924S001
Tuscarora Receiver	800,000	1,000,000	0	FR30S001
Linganore Creek	6,000,000	9,000,000	2,586,400	FR1940S001
Monocacy River	2,000,000	3,000,000	1,744,600	FR1961S001
Potomac River	5,000,000	8,000,000	1,000,400	Frederick County
Totals	**15,710,000**	**24,800,000**	**5,199,400**	

As per Consent Order Agreement, the safe yield of the Monocacy has been reduced to zero (0). The City continues to maintain and utilize this source under the permitted withdrawal limits (as shown above) as water is available.

Table 3.17 Frederick City Ground Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Golf Course (Frederick Limestone)	10,000	40,000	0	FR1990G07
Well No. P-W-4 (Frederick Limestone)	365,000	420,000	0	FR2002G022
Well No. 3 & 7	200,000	260,000	0	FR2003G016
Totals	**575,000**	**720,000**		

Through the Potomac River Water Service Agreement, signed in 2006, Frederick County has agreed to supply treated water to the City of Frederick from its recently expanded new Design WTP. The City has funded a share of the expansion of the County's WTP and has the capability to use and pay for up to 5.0 mgd average daily (8.0 mgd maximum day) of treated water through two metered connections to the County distribution system. The City may ultimately procure up to 8.0 mgd average daily (12.0 mgd maximum day) of treated water as may be needed for future demand when the agreement is revisited in 2015.

1. Existing & Future Water Demand

In 2009, the City received the final version of the 2006 Water Master Plan prepared by Dayton & Knight. The report indicates that the City's water demand (and corresponding production) has seen a significant decrease from an average high in 2001-2002 of 6.8 mgd to 5.8 mgd average daily in 2005. Much of the reduction is attributable to an aggressive leak detection and repair program for the distribution system initiated by the City. The amount of water unaccounted for (leakage) has been reduced from an estimated 24% in the 1980's and 1990's to an acceptable level of 9%.

The 2006 Water Master Plan further pointed out that the per capita water demand has also decreased from an average high of over 130 gpd per capita to about 100 gpd per capita. Using this average demand and population projections within the PRWSA area, Dayton-Knight predicted maximum day water needs of over 19.0 MGD in the year 2030 and 25.0 MGD in the year 2040. The analysis indicated that, given the predicted rate of growth, the City's current supply of 14.89 MGD (safe yield= max. day) and the anticipated additional 4.0 MGD from Frederick County in 2015 will be surpassed by demand in or about the year 2030.

2. Planned Improvements

Currently planned City CIP water projects include:
Monocacy WTP upgrade
Northern (Amber) Water Storage Tank, 1.0 MG and transmission main
Kemp Road/Bowers Road transmission main
Additional source procurement from Frederick County New Design Road WTP
Gas House Pike transmission main replacement
Dingle/Yellow Springs transmission main
Amber Tank/Route 26 transmission main

Walter Martz Road transmission main
Homewood Water Storage Tank, 1.0 mg and transmission main
Zone 595 Water Storage Tank, 0.75 mg and transmission main

C. FORT DETRICK (MD0100011)

The primary missions of the US Army Garrison (USAG) Fort Detrick are biomedical research and development, medical logistics, material management, and global Department of Defense telecommunications. Ft. Detrick encompasses approximately 1,212 acres, located in the midst of Frederick City, west of US 15 and north of US 40. The USAG Ft. Detrick has command and control of approximately 1,143 acres and the National Cancer Institute at Frederick (NCI-Frederick) has command and control of approximately 69 acres. Ft. Detrick is comprised of four non-contiguous parcels: Area A (728 ac.), Area B (399 ac.), Area C Water Treatment Plant (7 ac.) and Area C Wastewater Treatment Plant (9 ac.). Ft. Detrick supports over 40 mission partners.

Fort Detrick obtains drinking water from two separate sources, Monocacy River and Potomac River. The MDE Water Management Administration has authorized Fort Detrick to obtain a daily average of 2.0 MGD annually from the Monocacy River with a maximum daily withdrawal of 2.6 MGD. Fort Detrick owns, operates, and maintains the Installation water treatment plant (WTP) and distribution system. The WTP has a maximum processing capacity of 4.25 MGD. Source water is withdrawn from the Monocacy River and is processed through the Ft. Detrick WTP utilizing Water Appropriation and Use Permit No. FR1943S001(03). This water allocation permit expires in 2015. Ft. Detrick also has a groundwater appropriation, FR1943G101(07), for a daily average of 8,000 gallons on a yearly basis and a daily average of 12,000 gallons for the month of maximum use. Water associated with this permit is used solely for aquatic research.

Fort Detrick maintains a water supply agreement with Frederick County to allow for the purchase and supply of drinking water from the Potomac River. Fort Detrick's permit allows for the cumulative allocation of a daily average of 2.0 MGD with a maximum daily withdrawal of 2.6 MGD from the combination of Frederick County's Water Appropriation and Use Permit FR1968S005(08) [Potomac River] and Fort Detrick Permit No. FR1943S001(03) [Monocacy River]. Fort Detrick began obtaining supplemental drinking water from Frederick County in September 2012. Water obtained in accordance with Permit No. FR1943S001(03) and FR1968S005(08) it utilized as potable water, process water, fire protection, and for sanitary facilities at Ft. Detrick..

Treated water exits from the system through four pipes, which merge into two 12-inch pipes. Subsequently, the water flows into one 16-inch pipe to the lime building where the water is chlorinated and lime is added to adjust pH. . Finished water flows into the two clearwells with a 500,000 gallon capacity. The clearwells allow for sufficient contact time for disinfection during chlorination.

Disinfected water is pumped into the water distribution system. Ft. Detrick has a Cross Connection Control Plan in place. There are no known incidences of contamination of the Ft. Detrick potable water supply. Certified technicians ensure that backflow prevention devices are installed and functioning properly at all appropriate locations throughout the water distribution system.

The Ft. Detrick WTP was shut down in March 2013 for upgrades and is purchasing all potable water from Frederick County. It is anticipated that Ft. Detrick upgrade construction will be completed by the end of calendar year 2014.

Table 3.18 Fort Detrick Water Production (2010-2013)

Drinking Water Demand	CY 2010	CY 2011	CY 2012	CY 2013
Daily Average (MGD)	1.237	1.118	0.998	0.899
Annual Total (gallons)	451,405,000	408,107,000	365,521,000	328,097,000

1 Data includes sanitary and laboratory wastewater .

Table 3.19, Ft. Detrick Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Monocacy River (Ft. Detrick WTP) Potomac River (Frederick County New Design Road WTP)	2.0 MGD	2.6 MGD	0.90 MGD (2013 average)	FR1943S001(03) (Ft. Detrick WTP) FR1968S005(08) (Frederick County New Design Road WTP)

D. TOWN OF EMMITSBURG WATER SERVICE AREA

The Emmitsburg Water Service Area consists of the Town of Emmitsburg and Mt. St. Mary's University which are served by independent water systems which are inter-connected for emergency purposes.

1. Existing Facilities

The Emmitsburg Water System (MD0100010) currently serves an estimated population of 2,814 (2010 US Census) Town residents, plus a limited number of County residents and facilities. There are currently 1,019 service connections. The present Emmitsburg Water Treatment facility has been on-line since 2003. The treatment system - located on College Mountain near the intersection of Hampton Valley Road-Crystal Fountain Road - consists of a 432,000 gallon per day treatment plant, a 500,000 gallon steel storage tank, and a 140,000 gallon glass-lined tank. The water treatment system has the capability of treating up to 600,000 gallons per day, if needed. Once it is treated, the water is stored in the two tanks until distributed via mains of various sizes, as described below. The entire system is gravity fed.

The Emmitsburg water system utilizes both surface and groundwater sources. The primary source of raw water supply is 33 million gallon Rainbow Lake, a 13-acre impoundment located along Hampton Valley Road, approximately one mile west of the water treatment facility. Rainbow Lake, at elevation 870.0

(msl), forms the headwaters of Turkey Creek. As of 2010, the town owns 700 acres of land within the Rainbow Lake watershed. It also owns 610 acres of land adjoining the watershed, south and east of the lake, e that are held under a conservation easement and serve as wellhead protection areas for wells along Turkey Creek. One emergency reservoir on College Mountain- Reservoir No. 3- impounds three million gallons of water. It is situated 3,100 feet east of Rainbow Lake at elevation 740 (msl) and is fed by a diversion dam across Turkey Creek. A six-inch transmission line from Rainbow Lake increases to an eight-inch line at Reservoir No. 3 before continuing the remaining 2,300 feet to the treatment facility.

In addition to surface water, the active water supply system includes five wells. Wells No. 1 and No. 2 pump directly to the treatment facility where they require only pH adjustment and chlorination. Water from Wells No. 3, 4, and 5 is injected into the main raw water transmission line from Rainbow Lake to the treatment plant, where it is filtered, ph adjusted, and chlorinated. . These wells are capable of outputs ranging from 28 gallons per minute up to 100 gallons per minute for wells No. 2 and 3. Once the water is treated, it is stored in the two storage tanks adjacent to the treatment plant.

Table 3.20 Emmitsburg Ground/Surface Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Permit Number
Turkey Creek Rainbow Lake Reservoir #3	168,000	350,000	FR1976S014
Catoctin Metabasalt Wells #1 & #2	168,000	252,000	FR1975G011
Catoctin Metabasalt Wells #3 &# 5	87,000	131,000	FR1976G114
Catoctin Metabasalt Well #4	40,000	60,000	FR1997G032
Gettysburg Shale Well # 7	83,000	109,000	FR2002G020
Totals	**546,000**	**902,000**	

The Town has two wells that are not presently in use. Both are situated in the Gettysburg Shale formation:

- Well 7, Permit FR2002G020(1) has a Permit Average GPD of 83,000 and a Permit Maximum GPD of 109,000.
- Well "J" (proposed permit FR2007G014) has not yet been granted an allocation acceptable to the Town.

These wells will be utilized when the demand warrants. The water treatment plant to be located in Emmit Gardens has been designed for the treatment of these 2 (two) wells.

From the treatment and storage facilities located at College Mountain, the distribution system begins as a ten-inch transmission main, then splits into a ten-inch and an eight- inch transmission main. These two water mains continue down the mountain, the ten-inch along Hampton Valley Road, the eight-inch along Turkey Creek. The ten-inch line continues into Emmitsburg where it once again splits into two ten-inch

waterlines which serve as the Town's primary distribution lines. One branch of these two ten-inch lines goes down Main Street. The eight-inch line along Turkey Creek joins one of the 10-inch lines just west of Town to augment the system and to provide a backup system during emergencies. Additionally, a six-inch line connects Mt. St. Mary's University to the Town's system to act as an emergency water supply in case of problems with the University's own system.

The "downtown" distribution systems consist of a network of 4 in., 6 in., 8 in. and 10-inch waterlines. As of2014, an eight-inch line extends the Town's system east of US 15 to serve the wastewater treatment facility and a portion of the zoned undeveloped land along the US. 15 corridor. There is a provision, via sleeves under US 15, to allow future water connections for the remainder of the town-zoned undeveloped lands on the east side of US 15.

Fewer than 100 County households are served off the Emmitsburg system in addition to Town residents. Some are served off the eight- and ten-inch transmission mains while others along Mt. View Road, Waynesboro Road and Gettysburg Road are served by branches off the "downtown" distribution network. A major ten-inch branch extends south along South Seton Avenue to serve the Town's two major water users - St. Joseph's Provincial House/Daughters of Charity and the National Emergency Training Center. With only a few exceptions, all distribution lines are looped to eliminate dead ends.

The Town has a contract extending until 2040 with Mt. St. Mary's University, to purchase on demand up to 100,000 gallons of water per day.

The **Mount St. Mary's University Water System (MD0100019)** is a large institutional Community System adjacent to the Town of Emmitsburg. Water for the University is obtained from three deep wells. The system serves a population of approximately 2,000 during the academic year.

Well #5 is located 0.3 miles west of the junction of US 15 and Annandale Road, just behind the Physical Plant. This well is situated in the Weverton Quartzite formation. Well #3 is located).4 miles east of the junction of US 15 and Motter Station Road (MD Route 76), and draws from the Grove limestone, and is overlain by Gettysburg Shale. Well #5 produces 30 gallons per minute, while Well #3 produces 130 gallons per minute. Both wells form the central water supply for the university.

Well #6 is located 0.1 mile north of College Lane, 0.3 miles east of the junction of US 15 and College Lane. The well draws from the Frederick Limestone and is overlain by the Gettysburg Shale formation. Well #6 produces from 120 gallons per minute, and is connected to the central water supply system. Water from Well #6 is used as an emergency reserve supply.

Groundwater from the wells east of US 15 is conveyed through a 4-inch pipe under US 15 to a booster pump station located behind the McGowan Center, and then is transmitted up to a 300,000 gallon concrete storage tank behind the main campus, at an elevation of 762 feet. The water is run through a sand filter and chlorinated in a 50,000 gallon treatment tank before entering the storage tank.

The distribution system begins with a 12-inch line, from which 6-inch and 8-inch lines split off to service the facilities on the main campus (west of US 15). The 12-inch primary distribution line runs beneath University Way and under US 15, then splits into a 6-inch line and an 8-inch line to service facilities on the east campus.

Water is also available from Roddy Quarry, located approximately 0.1 mile south of the college east of Motter Station Road (MD 76), but this water is reserved for emergency purposes. This quarry has a storage capacity of approximately 10 million gallons and forms the headwaters of Stoney Branch. A spring located 0.4 miles north of the junction of Grotto Road and Saint Anthony Road (formerly MD 806), supplies water for a fountain at the National Shrine Grotto of Lourdes, located west of the main campus and just south of the 300,000 gallon water storage tank.

Table 3.21 Mt. St. Mary's Ground Water Sources

Water Source Description	Permitted Withdrawal (average GPD)s	Permitted Maximum Withdrawal (GPD in month of maximum use)	Permit Number
Well #5 and #3. Weverton Quartzite/ Grove Limestone	110,000	165,000	FR1975G013
Well #6. Frederick Limestone	70,000	210,000	FR1975G413

2. Existing & Future Demand

The Emmitsburg water system currently has 1,279 service connections. Users include an estimated population of 2,814 town residents (2010 US Census), fewer than 100 out-of-town residents, and commercial uses. The Town serves the Federal Emergency Management Academy (300-500 students) as well as St. Joseph's Provincial House/Daughters of Charity in addition to the typical residential and commercial uses.

Within the Town boundaries, on the east side of US 15, there are large areas of potential commercial and office/industrial land which are presently undeveloped. Potential future water needs for these areas was addressed in the Water Capacity Management Plan within the Town's 2009 Comprehensive Plan. Rezoning efforts subsequent to the adoption of the Comprehensive Plan coordinated water supply and land use types.

Existing water demand of 315,000 gpd is below the existing plant capacity of 423,000 gpd. However, projections for the year 2030 are that there will be some industrial/commercial growth along with population growth to create a demand of 430,000 gpd. Emmitsburg will require additional water supply in the near future.

3. Planned Improvements

Proposed improvements to the Emmitsburg water system are the ongoing maintenance and replacement of existing lines as needed. An additional water plant, proposed for an Emmit Garden location, has been designated but has not yet been approved for construction by the Town Board. The first phase of the plant could provide an additional 468 taps and the second phase could provide 240 taps. Construction of this plant would enable the use of two wells that exist but are not yet active—Well "J" and Well No. 7—located in the Gettysburg Shale aquifer. An in-town storage tank would also be constructed as part of the system improvements.

4. Wellhead Protection

The Wellhead Protection Area (WHPA) for the Town of Emmitsburg consists of the 600- acre watershed of Rainbow Lake, and for the Town wells, the Turkey Creek watershed upstream of the wells plus1000 ft. downstream of the wells.

The Wellhead Protection Area for Mount St. Mary's University is the watershed that contributes ground water to the supply wells. The area was modified to account for topography, ground water drainage divides including the down-gradient stagnation points, significant land features, estimating the underlying Frederick Limestone cavernous layer for Wells 3 and 6 by overlaying available geologic maps, and by

using a conservative calculation of total ground water recharge during a drought. The WHPA is irregularly shaped and has an area of 624 acres. The entire campus and the small residential community of St. Anthony is included.

E. TOWN OF MIDDLETOWN WATER SERVICE AREA

The Middletown Water System area includes the Town of Middletown and its municipal growth area. The municiapality centers on an established commercial district along US 40A, a full K-12 complement of schools, and a regional park surrounded by low density residential uses. This system is separate from the adjoining Fountaindale/Braddock system, which is operated by the County though discussions have been held about connecting the two systems for emergency use only.

1. Existing Facilities

The Middletown Water System (MD0100018) presently has 23 municipal wells, one of which is only being used as a peaking well (well #17). These wells have yields ranging from 30-90 gallons per minute (gpm). The community also utilizes four springs with a total yield of 100-150 gpm. The total water supply has a production capacity of 0.533 million gallons per day (mgd). In 1999, the Town completed a Surface Water Treatment Rule Testing program with the cooperation of MDE, and received ground water certification of all the spring sets currently in use by the Town. This testing may be required in the future to maintain ground water certification of the Town Springs.

The Town completed construction of a 400,000 gallon water storage tank and distribution line improvements in 1997.

Middletown has been divided into three (3) pressure zones, utilizing four (4) Master PRV vaults, located at East Green Street, Summers Drive, the booster station, and North Pointe Terrace, to reduce pressure in the distribution system prior to entering lower elevations in Town. The water treatment plant was relocated to the reservoir under the 1997 project.

Table 3.22 Town of Middletown Ground Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Springs, plus Wells 1—13, 15, 18, 19 (Catoctin Metabasalt, Hollow Creek Watershed)	308, 000	390,800		FR1974G025(07)
Wells 14, 16, 17 (Catoctin Metabasalt, Cone Branch Watershed)	53,500	80,000		FR1974G225(06)
Wells 20, 21, 22 (Catoctin Metabasalt, Catoctin Creek Watershed)	25,500	33,200		FR1974G125(01)
Totals	**387,000**	**504,000**	**296,000**	

Raw water is chlorinated, pH adjusted with caustic soda, and fluoride is added at the reservoir via the new water treatment plant and is conveyed to the Town through a 12 inch main to the booster pump station prior to entering the distribution system. In 2013, the system had an average daily demand of approximately 296,000 GPD. The average usage in Town has decreased consistently over the past five years due to the Town's Water Conservation Program, implemented in 2004. In 1982, approximately 40% of the mains in Town were upgraded with plastic pipe. In 1993, the Town required developers of new developments to satisfy Frederick County Department of Public Works design criteria which required ductile iron pipe. Frederick County requires the ductile iron pipe since it is a more impervious material.

2. Existing & Future Water Demands

The Middletown Water System serves a population of approximately 4,300 with a current demand of about 0.296 MGD. The projected 2030 population is 5,667 persons and an associated drinking water demand of .742 MGD. The Middletown Water System has 1,603 services connected to the system as of April 2014.

The Town of Middletown has its own Water Conservation Public Alert System and accompanying ordinances, which allow the Town to impose reasonable restrictions on the use of water from the municipal water system during periods of short supply, protracted drought, excessive demand or other scarcity of water.

3. Planned Improvements

The Town of Middletown continues to investigate water sources to increase its water supply. The Town's primary focus over the past ten (10) years has been conservation.

4. Wellhead Protection

The Town of Middletown has adopted a Wellhead Protection Ordinance. Hyder North America, Inc. conducted a delineation of the Wellhead Protection Area in 2001. Much of the 576 acre WHPA extends beyond the boundaries of the municipality.

F. TOWN OF MOUNT AIRY WATER SERVICE AREA

Mt. Airy is divided between two counties, Frederick and Carroll. The Mt. Airy water service area includes land in both counties, utilizing groundwater from the unconfined, fractured rock aquifer within the Ijamsville Formation and Marburg Schist. The Town of Mt. Airy owns and operates the community water system which provides water to Town residents only. Development currently located outside the Town limits uses individual wells. Information about the Mt. Airy Water system is obtained from the Carroll County Water & Sewerage Plan.

1. Existing Facilities

The Town of Mt. Airy's Water System consists of ten (10) wells in three separate watersheds (Linganore Creek, Bush Creek, and Patapsco River). The Town of Mt. Airy is located on Parrs Ridge, which is a major hydrogeologic boundary in this area.

The Town entered into a Consent Agreement with the Maryland Department of the Environment in 2005 and 2007 due to drinking water permit approvals that exceeded allowable appropriation. In September of 2009, the Town's daily average water appropriation was increased from 865,000 GPD to 910,000 GPD by bringing well no. 11 on-line, plus a reappropriation of well no. 6.

The Town uses five (5) 'treatment stations' to treat all well water. Liquid chlorine is added for disinfection, caustic soda (sodium hydroxide NaOH) is used for pH regulation, with fluoride added for public dental health. Water from well #8 and #10, treated at station no. 4, employs nitrate removal via an ion exchange system.

The Town has three elevated and one underground storage tanks capable of holding 1,705,000 gallons in reserve. The water system is 100% metered.

Table 3.23 Town of Mount Airy Ground Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Well Nos. 1--4 (Frederick County)	255,000	347,000	255,000	FR1976G007(06)
Well No. 5 (Carroll County)	43,000	80,000	192,000 (well no. 5 + well no. 6)	CL1987G076(06)
Well No. 6 (Carroll County)	149,000	180,000	192,000 (well no. 5 + well no. 6)	CL1987G176(06)
Well No. 7 (Frederick County)	99,000	139,000	174,000 (well no. 7 + well no. 11)	FR1976G107(02)
Well No. 8 (Frederick County)	150,000	210,000	227,000 (well no. 8 +well no. 10)	FR1995G020(03)
Well No. 9 (Frederick County)	79,000	204,000	79,000	FR2001G022(02)
Well No. 10 (Carroll County	77,000	144,000	227,000 (well no. 8 + well no. 10)	FR2000G022(03)
Well No. 11 Carroll County)	75,000	82,500	174,000 (well no. 11 + well no. 70	CL2009G001(02)
Totals	**927,000**	**1,386,500**	**927,000**	

2. Existing & Future Demand

The 2014 population of Mt. Airy is 9,686. The Frederick County portion of Mt. Airy has a population of approximately3,785. The Town's water service area serves 3,160 equivalent dwelling units (EDU). Full build-out within the Town's growth boundary (both Carroll and Frederick County) is estimated to result in a future water demand of 1.18 MGD. .

3. Planned Improvements

Currently, the Town is seeking MDE approval for new or re-appropriations to four (4) wells on the Harrison/Leisher properties in Carroll County (well nos. 1, 3, 12, and 18). Based upon the Town's testing, the wells have an anticipated combined appropriation of 152,000 GPD. Considerations for long-term water supply needs include additional groundwater wells plus a possible 100 million gallon surface water impoundment in the Gills Falls area which could yield up to 850,000 MGD.

Infrastructure improvements to the Town's water system include new well connections and waterlines, upgraded water mains, and upgrades to Water Plant No. 2, at the northwest corner of MD 27 and Watersville Road in Caroll County. The Town is also instituting a Supervisory Control and Data

Acquisition (SCADA) program for all of its water withdrawal, treatment and distribution systems.

4. Wellhead Protection

Mt. Airy adopted a Wellhead Protection Ordinance in 1997. The Wellhead Protection Areas (WHPA) extend beyond the boundaries of the municipality. Mt. Airy's WHPA consists of five smaller WHPAs. These WHPAs are based on the five subwatersheds in which the wells are located. Wells 1-4 are all in the Woodville Branch subwatershed of the Linganore Creek Watershed. Each of the other wells has its own WHPA. . Residential and commercial land within the WHPA is sewered or in planned service areas. Nitrate levels in the water supply are the biggest concern. Well 8 has an ion exchange system for nitrate removal. Well 5 has had detection of Tetrachloroethene above the MCL two times.

G. TOWN OF MYERSVILLE WATER SERVICE AREA

The Town of Myersville is located in the western portion of Frederick County, situated approximately 700 feet above sea level within the Catoctin Creek Watershed. The mainstem of Catoctin creek and its tributary, Grindstone Run, flow within the Town's boundary.

1. Existing Facilities

The Myersville Water System (MD0100020), operated by the Maryland Environmental Service (MES), obtains its drinking water from a combination of groundwater, spring water, and surface water sources. All of the wells are located in the Catoctin Metabasalt bedrock. The springs are located on South Mountain and were developed as part of the original public water supply in 1937. The water from the springs flow by gravity through a 3-inch cast iron raw water line into the Town's smaller reservoir north of US 40. A 6-inch force main delivers the water to the Town's larger reservoir water treatment plant south of US 40. The surface water plant uses conventional filtration. The well houses are disinfected with a sodium hypochlorite solution. All but one well in Town is filtered.

The total water supply is permitted for 0.267 mgd. The water treatment plant has a design capacity of 0.300 mgd and current water demand is 0.135 mgd. The Town currently maintains approximately 1 million gallons of storage in the existing reservoir.

Additional water sources have been added to the Town system in the last 11 years through developer contribution of groundwater wells. These groundwater wells are located in the Ashley, Canada Hill, Deerwoods, Quail Run, and Saber Ridge subdivisions, and in the Doubs Meadow Park ('Meadow Wells'). One of these wells, known as the Catoctin Meadow well, is located outside of the Town boundary, north of US 40,east of Easterday Road. All sources of water are treated in three (3) existing water treatment plants and incorporated into the water conveyance system. The water lines are generally 6, 8 or 12-inch lines with a few older lines with a smaller diameter. Water lines are generally extended to serve new development within the Town at the expense of the developer.

Table 3.24 Town of Myersville Ground/Surface Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Appropriation (Taps)	Average System Demand (GPD)	Permit Number
Little Catoctin Creek	35,000	150,000	140		FR1964S003
Treatment Plant Well	15,000	25,000	60		FR1987G004
Ashley Wells (3)	22,500	37,600	90	17,945	FR1987G104
Deerwoods Well	18,000	20,700	72	31,199	FR1987G204
Canada Hill Wells (2)	38,000	46,800	152		FR1988G035
Meadow Wells (2)	27,000	57,000	108		FR1995G022
Reservoir (Creek) Well	12,500	15,000	50		FR1997G034
Quail Run Wells (future) (3)	27,000	38,500	110		FR2004G001(03)
Saber Ridge/Catoctin Meadow Wells (2)	20,500	30,080	82		FR2009G001
Spring Supply	40,000	60,000	160		FR1987G020
Totals	**256,000**	**480,680**		**135,089**[1]	

[1] Excludes finished water from the Quail Run WTP. Excerpted from May 2013 *Source Water Protection Plan for Myersville, MD*, prepared for MDE by S.S. Papadopulous, Associates and Chesapeake Environmental Management, Inc.

Three Year (2012-2014) WTP Daily Average Finished Distribution

	Daily Avg. Distribution (gpd)	Daily Avg. Distribution (Taps)
TOTAL	**135,129 gpd**	**541 Taps**

Water Tap = 250 gpd

Total Water Allocation

Water Allocated To	Water Allocation (gpd)	Water Allocation (Taps)
Existing Average Allocation	135,129	541
Residential Lots of Record	11,250	45
Commercial Lots of Record	4,000	16
Town Lots of Record	2,500	10
TOTAL	**152,879 gpd**	**612 Taps**

Non-Commercial Lot of Record = 250 gpd = 1 Water Tap
Commercial Lot of Record = 1,000 gpd = 4 Water Taps

Water Summary
Permitted Water Allocation = 256,000 gpd = 1,024 Water Taps
Current Water Allocation = 152,879 gpd = 612 Water Taps
Remaining Water Allocation = 103,121 gpd = 412 Water Taps

2. Existing and Future Demand

There are approximately 1,624residents within the Town. The town expects a 2030 population of 2,440. State figures used to estimate average water usage per household is 250 gpd, indicating that the Town should consider an estimate of approximately 135,500 gallons for residential water usage. However, the Town requires through their Adequate Public Facilities Ordinance, that new development produce for the Town, 500 gpd for each new unit that is connected to the system.

3. Planned Improvements

The Town will be accepting wells from new development in the future. A new water treatment plant was approved in 2013 to treat raw water from the public wells in the Quail Run subdivision off Monument Road.

4. Source Water Protection

In 1996, the Maryland Department of the Environment (MDE) developed a Wellhead Protection Plan for the Town, followed in 2002 by a Source Water Assessment, which included recommendations for protection of Myersville's groundwater supplies. These included:

- Continued water quality monitoring
- Engaging in public outreach and education
- Land acquisition/easements for protecting sources
- Development of a contamination contingency plan for the public water supply
- Incorporating Wellhead Protection Area zoning considerations in land use planning and development review
- Periodic updates to the contaminant source inventory and land use changes

Since completion of the Myersville Source Water Assessment Area report in 2002, the Town has added new sources of groundwater to its public water system. In 2013, the MDE completed and published an update to the 2002 Source Water Assessment report for the Town of Myersville.

A wellhead protection area (WHPA) was originally delineated in 1996 for the wells and springs based on long term aquifer tests and inferred fracture trace interpretations from the groundwater appropriation permits together with topographic features and drainage divides.

To date, according to MDE, groundwater and surface water quality have been good, but two locations—the Springs intake and the Meadow wells—have been categorized by MDE as groundwater under the direct influence of surface water (GUDI). This designation requires additional monitoring, and is an indication of greater susceptibility to surface water impacts than most groundwater sources.

The Town owns a small portion of land in the watershed of Little Catoctin Creek and Seven Springs: two acres along the creek and 12 acres at the springs. The Town has also purchased approximately 63 acres (6 properties) since 2009 to augment the 12 acres at the Seven Springs area for the purposes of well head protection. These purchases have yielded an uninterrupted, contiguous protection area between Pleasant Walk Road and South Mountain of approximately 75 acres.

H. TOWN OF THURMONT SERVICE AREA

The Town of Thurmont's Public Water System (MD 0100023) provides water service within its boundaries to 6,170 Town residents (2010 US Census), with 2,300 connections. The Town is located at the foothills of the Catoctin Mountains, 10 miles south of the Mason-Dixon Line and encompasses 3 square miles. The majority of the Town is located within the Hunting Creek Watershed, and the northeast portion of the Town within the Owens Creek Watershed, both of which have drainage into the Monocacy River.

1. Existing Facilities

Thurmont's water source is ground water, which consist of eight (8) wells, located within the Frederick Limestone and Gettysburg Shale bedrock. Only six (6) of the wells are currently active, with well #2 and #5 no longer utilized (there was never a Well #6). The Town also has a surface water appropriation (FR1974S013) from High Run, a tributary of Hunting Creek, but is not used. The safe combined yield of all these wells is 1,230,000 gallons per day.

Table 3.25 Thurmont Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Well No. 2 (not in use)	89,000	149,000		FR1969G121
Well Nos. 3, 4, 5 (well No. 5 not in use)	275,000	460,000		FR1969G021
Well No. 7	93,000	156,000		FR1988G004
Well No. 8	234,000	300,000		FR1993G036
Well No. 9	204,000	318,000		FR2003G001
Jermae Well	200,000	275,000		FR2002G030
High Run (surface) (not in use)	89,000	500,000		FR1974S013
Totals	**1,184,000**	**2,158,000**	**606,000**[1]	

[1] Excerpted from November 2013 *Source Water Protection Plan for Thurmont, MD Public Water System*, prepared for MDE by S.S. Papadopulous, Associates and Chesapeake Environmental Management, Inc.

The six (6) wells currently in use share three (3) treatment plants where the raw water received hypochlorite treatment. Well Nos. 7 and 9 also receive air stripping treatment for Volatile Organic Compounds (VOCs). The water system includes three (3) elevated storage tanks and a covered concrete storage basin which have a combined total capacity of 580,000 gallons.

2. Existing & Future Demand

The Thurmont Water System serves a 2010 population of 6,170 people. Average water consumption is 0.606 MGD. Maximum (peak) daily production has been reported at 0.85 MGD. There are 50 services located outside of the existing corporate boundaries. . Industrial demand is approximately .05 MGD. This rate is expected to continue into the future. Projected population for the Thurmont PWS and service area by the year 2030 is 7,700 persons.

3. Planned Improvements

Extensions of water lines are expected to occur as annexation occurs.

One of the wells, Well No. 3, was found to be under the influence of surface water. Diatomaceous earth pressure filters, and more chlorine detention time have been added to the treatment of this well. Also, Wells No. 7 and No. 8 are treated for VOCs by the use of stripping towers.

4. Source Water Protection

In 1995, the Maryland Department of the Environment (MDE) developed a Wellhead Protection Plan for the Town, which addressed potential contaminant sources and defined wellhead protection areas, utilizing zones based upon travel time of contaminants to the wells. This was followed in 2000 by a Source Water Assessment, which included recommendations for protection of Thurmont's groundwater supplies. These included:

- Continued water quality monitoring
- Engaging in public outreach and education
- Implementation of a Contingency Plan for emergency spill response
- Adoption of a Municipal Wellhead Protection Ordinance
- Physical protections/buffers for the Town's wells
- Periodic updates to the contaminant source inventory and land use changes

In 2013, the MDE completed and published an update to the 2000 Source Water Assessment report for the Town of Thurmont. Well No. 3 has been categorized by MDE as groundwater under the direct influence of surface water (GUDI). This designation requires additional monitoring and is an indication of greater susceptibility to surface water impacts than most groundwater sources.

I. TOWN OF WALKERSVILLE SERVICE AREA

The Walkersville service area consists of the Town of Walkersville and the adjacent County subdivisions of Glade Manor I, Discovery and Spring Garden Estates. The County's Fountain Rock Park which adjoins the Town is served by its own multi-use system. The total area of the service area is 10.76 sq.mi.

1. Existing Facilities

The Town of Walkersville (MD0100025) treats water from 3 high yield production wells with softening, chlorination and fluoridation. The wells have a combined capacity of 550 GPM, 575 GPM & 500 GPM. All of the wells are located in the Grove Limestone formation. A 1993 study found that Glade Creek contributes approximately 25% of the water pumped from the Town wells. In 1990 the use of springs and

a reservoir east of Town was discontinued.

Treatment facilities have a capacity of 1.2 MGD. Backwash from the filtration and softening processes discharged into the public sewer at a controlled rate. In 1989, a 100,000 gallon clearwell was constructed at the treatment plant to provide longer chlorine contact time. Treatment for nitrate removal was installed in 1955. A filtration system enables the town to provide treated water that meets the turbidity standards.

Storage is provided by three elevated storage tanks. The Crum Road tank has a reported overflow elevation of 450 ft. which is 12 ft. lower than the Frederick City Low Zone tanks and, therefore, presents a barrier to inter-connection of the systems. The Discovery tank provides storage for the Discovery and Spring Garden Estates Subdivisions (725 units). This tank is connected to the rest of the system by a 12 inch main along one side of the MD 194 by-pass to Crum Road and an 8 inch main along the other side of MD 194 and Frederick Street. The third tank is located on the north side of Devilbiss Bridge Road west of the Maryland Midland Railroad Tracks. It is connected to the system by a 12 inch main through the Fountain Rock Manor Subdivision. The existing distribution system includes approximately 140,000 ft. of mains. There are approximately 300 fire hydrants in the system.

Table 3.26 Walkersville Ground/Surface Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Well #1	400,000	600,000	189,438	FR720037
Well #2	233,000	349,500	110,347	FR810307
Well #3	367,000	550,500	173,809	FR815107
Totals	**1,000,000**	**1,500,000**	**473,594**[1]	FR1987G017

[1] Data supplied by the Town of Walkersville, 2013

2. Existing & Future Demand

The Walkersville water system is reported to have 2,863 connections all of which are metered. Average water use is 473,594 GPD. The residential population of the service area is estimated at 8,130. There are large industrial, commercial and institutional users also served by the water system as follows:

	Gallons Per Day
Lonza	36,424
Glade Valley Nursing and Rehabilitation Center	9,762
Walkersville High School	6,019
Elementary Schools (2)	2,897
FCPS Staff Development Center	347
Walkersville Middle School	1,795
Walkers Village Shopping Center	3,184

HCI	294
Safeway	1,433
Discovery Shopping Center	2,159

Population projections for the Walkersville service area estimate 9,160 residents by the year 2030.

The Rotorex Company, which manufactured air conditioner compressors and employed 500 persons, had an appropriation permit for their wells of 125,000 GPD. There are 4 wells drilled in Frederick Limestone with yields of 20 gpm, 20 gpm, 55 gpm and 81 gpm. The business closed in 2004. Several of the previous production wells have been contaminated with chromium over time and abandoned. Remediation is being studied.

3. Planned Improvements

Fountain Rock Spring, which is owned by the County as part of the Fountain Rock Park, is a perennial spring located just outside the western boundary of the Town. The spring discharges to a pond of approximately 5,000 sq. ft. It has a reported average yield of between 1.5 and 3 MGD. The spring is available to Walkersville by agreement as a water source for the future. Analysis of the spring's water quality indicates that is it likely from the same limestone formation as the Town's production wells.

Development of Fountain Rock Spring is an additional source of public water that would necessitate construction of an intake structure and pumping to the treatment plant approximately 2,500 linear feet to the north.

Fountain Rock Spring system is operated by Frederick County and serves one house and a park facility. Water from the spring is chlorinated and stored in a 100 gallon pressure tank. The capacity of the water system is reported at 10,000 GPD and average water use is 150 GPD. Also on the 22.5 acres property is a water filled quarry containing an estimated 10 million gallons of water.

Using the Fountain Rock Spring supply, the Town of Walkersville could become a water exporter into the City or the County's Waterside systems or at least provide backup or emergency supply.

As a result of water contamination incidents in 1999 and 2008, a temporary water interconnection of Walkersville with the City of Frederick was built and used for several months. This led to plans for a permanent interconnection with Frederick City and Frederick County for emergency use.

The Town is on a five-year timetable to build a new, more technically advanced water treatment plant (WTP) using microfiltration (membrane) filter with reverse osmosis for nitrate removal. The new plant will be constructed on the same property as the existing plant at 77 West Frederick Street. The capacity of the new WTP will be 1.0 MGD, which is the same as the existing WTP, in accordance with MDE permit approvals. The capacity is determined to be adequate for projected growth in the Town over the next 30 years according to the Town's 2011 Comprehensive Plan. The existing WTP will be reused as a storage facility or demolished.

4. Wellhead Protection.

As a result of a wellhead tracer study, the Town of Walkersville has delineated a Wellhead Protection Area which extends to the north beyond the Town boundaries, to the Town of Woodsboro. The Town of Walkersville has adopted a wellhead protection ordinance. Multiple sinkholes have been mapped in the Wellhead Protection Area. Much of the Town's water supply has a greater susceptibility to contamination because the Karst terrain (limestone geology) present in this area creates conditions where the groundwater is under the direct influence of surface water (GWUDI. Potential contaminants can travel quickly to the Town wells. Travel times encountered during dye tracing ranged from a few hours to a few days. This was unfortunately illustrated in 1999 when a construction accident ruptured a sewer line, and the contamination reached the Town wellfield in a matter of days. In that incidence, thousands of feet of water line were laid by the County to connect the Town system to City of Frederick water, until the wells could be restored to use. In 2008, a significant manure spill upstream of the Town's wells resulted in contamination of groundwater, whereby the installation of the temporary water line interconnection with the City of Frederick was repeated.

J. TOWN OF WOODSBORO SERVICE AREA

The Woodsboro Service Area consists of the Town of Woodsboro, plus 5 properties that are served by 1,000 linear ft. of waterline along Gravel Hill Road and MD 550. Although there are small areas of industrial growth designated on the County's Comprehensive Plan west and south of the Town, the Town's policy is not to extend water and sewer service to areas outside the corporate limits. The Town is located wholly within the Israel Creek Watershed at the northern edge of the larger Lower Monocacy River Watershed.

The Town of Woodsboro is located within the limestone lowland section of the Piedmont Physiographic Province in Maryland. The limestone lowlands region consists of valley regions floored by limestone bedrock, exhibiting many sinkholes, but few caves. [1]

1. Existing Facilities

The Town of Woodsboro water system (MD0100027) is supplied by groundwater delivered by five wells and are located within limestone of either the Frederick or Grove Formations, according to MDE.

Table 3.27 Woodsboro Ground Water Sources

Water Source Description	Permitted Withdrawal (average GPD)	Permitted Maximum Withdrawal (GPD in month of maximum use)	Average System Demand (GPD)	Permit Number
Well #1 (standby)				FR01-0039
Well #2				FR03-4608
Well #2A				FR88-1545
Well #3				FR81-0518
Well #7				FR88-1607
Well #14				FR88-1833
Totals	**128,000**	**178,200**	**85,000**	FR1979G010 All Town wells operate under one (1) WA&U permit.

Well 1 has been found to be under the direct influence of surface water (GWUDI) and is currently not used for primary production. MDE states that well #1 is susceptible to contamination by microbiological contaminants and, lacking treatment, should be abandoned and sealed. Well #1 is not used for water supply, but kept in standby status in case of the need for water in a firefighting emergency.

The five (5) wells currently in use share two (2) treatment plants where the raw water receives hypochlorite treatment. Storage capacity in the system includes a 50,000 gallon elevated storage tank which has an overflow elevation of 520.5 ft. A 200,000 gallon ground storage tank is located in the Copper Oaks development on the east side of Town. The distribution system consists of 6 and 8 inch mains.

In 1994, a booster pump station was built to provide adequate pressure for the residential lots of Copper Oaks at the highest elevations. In addition, the 2 inch line located along Gravel Hill Road and MD 550 west of Town was replaced with an 8 inch line.

2. Existing and Future Demand

The Woodsboro system serves 456 residences serving a population of 1,141 (2010 US Census). Permitted withdrawal is 128,000 gpd. Data provided by MDE indicate that from 2002 to 2011, the Woodsboro PWS has appropriated an average of 31 million gallons of groundwater each year, or about 85,000 gallons per day. Included in the service area is an elementary school and a number of commercial establishments. The Woodsboro Industrial Park is served by a well that is not connected to the Town system. Some of the properties in the industrial park are connected to 2 inch lines coming from Barricks Lane to the south and MD 550 to the north. Fire protection is not available via hydrants in the industrial park.

Population projections for the Town of Woodsboro indicate a potential water demand by the year 2030 of 133,200 gpd. The Town cannot meet this demand without establishing new wells and the water loss via leaks is corrected.

3. Planned Improvements

Woodsboro has an ongoing program of leak detection and correction.

4. Source Water Protection

In 1997, the MDE's Public Drinking Water Program developed a Wellhead Protection Plan for the Town. The 1997 Plan found that Woodsboro's wells were highly susceptible to contamination due to the limestone bedrock, and made recommendations on strategies for well head protection. The MDE also completed a Source Water Assessment for the Town in 2002, which included identifying potential sources of contaminants, designating a formal source water assessment area, and completing a susceptibility analysis for each public groundwater source of water.

The Town's unique geology includes a diabase dike of Jurassic age that bisects the Town in a north/south fashion. The dyke serves as a boundary between the LeGore and Barrick limestone quarries, and subsequent wellhead protection areas. The MDE established a zone of dewatering influence around the Barrick and LeGore quarries in the late 1990's. This zone is based on topography, watershed boundaries, geologic structure and composition. According to the MDE, dye tracer tests indicate that dye sourced in the quarry locations and sinkholes can be detected in Town wells within a short time span. Another key finding from the State is that Israel Creek contains a losing reach north of the Town (water discharging from the stream into the ground), which further emphasizes the connection between surface and groundwater in this limestone system.

In 2010, the Town's Source Water Protection Committee issued a Source Water Protection Plan, as an extension to the 2002 MDE Assessment, although the Town's Plan was not formally adopted. The Town's 2010 Source Water Protection Plan contained a number of recommendations including BMP implementation for water management, public outreach and education, contingency planning, aquifer protection through zoning, and Committee review of relevant ordinances to better manage and protect the Town's water supply. Currently, the Town does not have an adopted Wellhead Protection Ordinance.

The MDE published in 2013 an update to the 2005 Source Water Assessment report, which included an update to the source water assessment area with expanded data and recommendations.

V. SMALL COMMUNITY WATER SYSTEMS

Small Community Water Systems have a ground water appropriation permit of less than 10,000 gallons average daily use and typically serve a single subdivision. Small systems in Frederick County obtain their water supply from unconfined fractured rock aquifers, for which a one thousand foot radius source water assessment area is defined in Maryland's Sourcewater Assessment Plan (SWAP).

A. Public Systems

The publicly-owned, Waterside community water system (MD0100029) no longer has its own water treatment and storage and is now tied to the County's and the City of Frederick's water supply. A design for connecting the publicly-owned, Clover Hill III community water system (MD 0100031) to the City of Frederick water system has recently been completed. Once operational, water will not be actively treated and stored at the Clover Hill III WTP.

The five (5) Sub-Regional water systems-White Rock, Samhill, Windsor Knolls, Bradford Estates, Highfields are publicly-owned systems and serve existing developed areas, not within Community Growth Areas. The Highfields Water System is operated by Washington County under Appropriation Permit WA1988G032, with a permitted daily average of 100,000 GPD and a maximum average of 150,000 GPD. The reported daily average pumpage in 2007 was 71,663 GPD. The system currently serves 964 people in both Frederick and Washington Counties.

B. Private Systems

The **Briercrest Apartment Water System (MD0100004)** is privately owned and operated and is served by one well with a yield of 13 gpm. Water from the well is chlorinated by use of hypochlorinators. Water is distributed to the 24 apartment complex from an underground 10,000 gallon pressurized tank.

The Amelano Manor Water System (MD0100001) is privately owned and presently serves 11 residences and 36 persons. Daily consumption is reported at 800 GPD. The system includes a well rated at 40 GPM, a 20 GPM pump and a 4,000 gallon pressure tank. Treatment is chlorination. The distribution system is a 6-inch main along Amelano Drive. The County has no plans to purchase or improve this system. Hook-up to Frederick City's system may be possible in the future as development extends to this area, if the subdivision is annexed into the City.

Several mobile home parks in the County have their own private water systems and are listed under Multi-Use Water Systems.

VI. MULTI-USE WATER SYSTEMS

The Federal system of classification of water systems defines a Public Water System as a system that served 25 or more people 60 days per year. Community, non-transient non-community and transient non-community are sub-categories of Public Water Systems. The Maryland definition of a Public Water System (PWS) is generally consistent with the Federal definition above.

The Water & Sewerage Plan objective is to develop the water and sewerage systems in a way consistent with county comprehensive planning. Therefore, the useful distinction for that purpose among PWS is between a system serving two or more individual lots (community system) and a system which serves a group of people on a single lot or under the same ownership (multi-use system).

A multi-use water system is one which produces over 5,000 GPD and serves a group of individuals on a single lot or under the same ownership. Uses that typically employ multi-use water systems include churches, schools, campgrounds, highway rest areas, and commercial or industrial sites. These systems are distinct from community systems which also serve many people but serve multiple lots or connections and are, by policy, not permitted to be privately owned and operated unless "grandfathered". Multi-use systems in the County include both private and public systems. While some are found within regional water system service areas and may be absorbed as regional service reaches them, most are located outside regional water service areas.

Identification and tracking of Multi-Use systems provide the County information on the location of on-site Multi-Use systems and will allow the County to identify areas where Multi-Use systems may create cumulative impacts on ground and surface waters, and facilitate a more comprehensive review of future proposal for Multi-Use systems which are to be located in areas where the provision of community water and sewer service is not anticipated.

In order to ensure the protection of natural resources, the Community Development Division may, in consultation with the Health Department and the Maryland Department of the Environment, require hydrogeologic studies of the potential effects of the proposed Multi-Use system on ground and surface water resources, if warranted.

Table 3.28 Multi-Use Water Systems

WATER SYSTEM	ID (MD)	GROUNDWATER APPROPRIATION PERMIT	OWNERSHIP	APPROPRIATION GPD	
				AVE.	MAX
ATT Switching Station, Fingerboard Rd (MD 80)			Private		
Baltimore Brick Co., Rocky Ridge			Private		
Briarcrest Apartments, Jefferson	0100004	FR72-0448	Private	5,000	8,000
Camp Airy	1101030	FR1958G003	Private	7,000	25,000

Catoctin Mountain Park	1101033	FR1955G002	Federal	40,000	50,000
Concord Mobile Home Park	0100203	FR1970G010	Private	13,100	21,800
Cunningham Falls State Park Houck Area	1101279	FR1971S006	State	15,000	60,000
Cunningham Falls State Park Manor Area-Day Use	1101043	FR1957G003	State	Exempt	Exempt
Cunningham Falls State Park Manor Area-Campground	1101278	FR1957G103	State	Exempt	Exempt
Fountain Rock Park	1101280	FR2001G015	County	2,000,000	3,000,000
Foxville Naval Quarters			Federal	45,000	
Gambrill State Park High Knob	1101232	FR1963G004	State	Exempt	Exempt
Gambrill State Park Rock Run	1101262	FR1963G004	State	Exempt	Exempt
Gilbert's Mobile Home Park	0100207	FR1997G038	Private	3,000	4,000
Green Valley Shopping Center	110058	FR1975G005	Private	Exempt	Exempt
I-70 Rest Area, Myersville	1101162	FR1966G013	State	35,000	50,000
Kemptown Elementary School	1100013	FR1978G010(03)	County	2,000	3,000
Lewistown Elementary School & Fire Dept.	1100015	FR1973G018(03)	County	3,000	5,000
Liberty Elementary School, Libertytown	1100016	FR1973G017(04)	County	4.000	6,000
Life in Jesus Retreat Center (Sacred Monastery of St. Nina)	1101291	FR2001G026	Private	12,000	20,000
Mar-Lu-Ridge Conference Center	1101130	FR1959G001	Private	9,000	15,000
New Life Foursquare Church & School	1100052	FR1979G005	Private	Exempt	Exempt
Pollings Mobile Home Estates	0100210	FR1970G005	Private	8,500	10,000
Rocky Fountain Mobile Home Park			Private	3,000	20,000
Saint John's Catholic Preparatory School	1100066	FR2008G002	Private	9,800	15,000

Sheppard Pratt Treatment Center/ Jefferson School	1100054	FR1994G012	Private	7,500	10,000
Spring View Mobile Home Park	01000212	FR1963G013	Private	6,800	13,600
Summit Lake Bible Conference	1101183	FR1962G008	Private	9,200	20,000
T.E.C. Building Partnership, Hyatt Industrial Park	1100011	FR1986G011	Private	5,500	9,000
Valley Elementary School, Jefferson	1100033	FR1968G008	County	6,700	10,000
Victor Cullen residential school			State		

Table 3.29 Ground Water Permits - Frederick County Public Schools

PERMIT NUMBER (FR)	AQUIFER NAME	SCHOOL	EFFECTIVE DATE	PERMIT AVERAGE GPD	PERMIT MAX GPD
FR71G008(03)	Ijamsville Formation	Green Valley Elementary School	5/01/97	4,000	6,000
FR1078G010 (03)	Ijamsville-Marburg Formation	Kemptown Elementary School	5/01/01	2,000	3,000
FR73G018(03)	New Oxford Formation	Lewistown Elementary School	5/01/97	3,000	5,000
FR73G017 (04)	Libertytown Metarhyolite	Liberty Elementary School	3/01/96	4,000	6,000
FR73G016 (04)	Libertytown Metarhyolite	Linganore High School	5/01/97	13,000	19,500
FR1989G005 (03)	Libertytown Metarhyolite	Linganore High School Stadium	2/01/03	2,500	8,000
FR73G019 (03)	New Oxford Formation	New Midway Elementary School	5/01/97	1,800	2,500
FR1965G004 (05)	Catoctin Metabasalt	Sabillasville Elementary School	6/01/05	2,000	3,000
FR73G022 (03)	Urbana Formation	Urbana Elementary School	5/01/97	4,000	6,000
(FR)1993G015	Urbana Formation	Urbana High School	Connected to Co. water supply	27,000	41,000
FR1968G008 (05)	Granodiorite and Biotite Gneiss	Valley Elementary School	6/01/05	6,700	10,000
FR73G020 (03)	Catoctin Metabasalt	Wolfsville Elementary School	5/01/97	1,700	2,500
FR97G028 (01)	Mountain Wash	Yellow Springs Elementary School	8/01/97	2,500	6,000

VII. GROUND & SURFACE WATER PERMITS

Table 3.30 Ground and Surface Water Permits - Frederick County

PERMIT NUMBER (FR)	STREAM/ AQUIFER NAME	OWNER'S NAME	REMARKS	EFFECTIVE DATE	PERMIT AVERAGE GPD	PERMIT MAX GPD
1901G001	Grove Limestone	Laurel Sand & Gravel, Inc. T/A S.W. Barr Grove Limestone		09/2002	360,000	864,000
1909S012	Glade Creek	Burgess and Commissioners of Walkersville	Municipal Water Supply	07/1999	83,000	1,000,000
1923S001	Unnamed Tributary	S.W. Barrick & Sons	Legore Quarry	03/2002	300,000	2,000,000
1924S001	Fishing Creek	Frederick, City of	Fishing Creek Reservoir	11/1998	1,910,000	3,800,000
1929G006	Araby Formation	Lehigh Cement Company	Laurel Hill Quarry	02/2002	1,500,000	2,500,000
1930S001	Tuscarora Creek	Frederick, City of	Tuscarora Creek	11/1998	810,000	1,000,000
1939G048	Wakefield Marble	Lehigh Cement Company		02/2002	3,200,000	4,100,000
1939S048	Sams Creek	Lehigh Cement Company	Sam's Creek Diversion	02/2002	100,000	1,100,000
1939G049	Wakefield Marble	Lehigh Cement Company	Quarry Dewatering	02/2002	4,000,000	8,500,000
1940S001	Linganore Creek	Frederick, City of	Linganore Creek Intake	12/2003	6,000,000	9,000,000
1943S001	Monocacy River	U.S. Army Garrison	Ft. Detrick - Monocacy River	03/2000	2,000,000	2,500,000
1943G101	Frederick Limestone	U.S. Army Garrison		02/2005	9,000	9,500
1954G007	Harpers Formation	Solid Waste Management, Frederick County	White Rock Subdivision - Community Water Supply	04/2001	30,000	45,000
1955G002	Catoctin Metabasalt	U.S. National Park Service	Catoctin National Park	05/2003	40,000	50,000
1955G003	Frederick Limestone	Division of Utilities & Solid Waste Mgt., Frederick County	Pinecliff Subdivision - Supplemental Supply for Lake Linganore	04/2004	29,000	50,000
1956G005	Grove Limestone	ESSROC Cement Corp.	Quarry & Cement Plant	05/2005	1,600,000	2,600,000
1958G003	Loudoun Formation	Camp Airy & Camp Louise Foundation, Inc.	Camp Airy	07/2005	7,000	25,000
1959G001	Harpers Formation	Mar-Lu-Ridge Conf. & Education, Center, Inc.	Mar-Lu-Ridge Camp	10/2005	9,000	15,000
1961S001	Monocacy River	Frederick, City of	Monocacy River Intake	09/2006	2,000,000	3,000,000
1962G008	Catoctin Metabasalt	Summit Lake Bible Conference, Inc.	Camp & Retreat Center	02/1991	9,200	20,000

1963G013	New Oxford Formation	Wu, John	Spring View Mobile Home Estates	11/1993	6,800	13,600
1964S003	Little Catoctin Creek	Myersville, Mayor and Council of	Myersville (Little Catoctin Creek) Municipal Water Supply	03/1998	40,000	150,000
1966G012	Catoctin Metabasalt	Division of Utilities & Solid Waste Mgt., Frederick County	Fountaindale/Braddock Heights Subdivisions	01/2004	330,000	500,000
1966G013	Metarhyolit & Assoc. Pyroclas Sediments	Maryland State Highway Administration	I-70 Rest Areas at South Mountain	09/1998	35,000	50,000
1967G005	Ijamsville Form. - Marburg Schist	Jesse Smith LLP	Hope Valley Golf Course - Irrigation Well	10/2004	22,000	84,000
1968G001	Tomstown Dolomite	Department of Public Works, Frederick County	Point of Rocks Central Water Supply	08/1997	101,000	169,000
1968S005	Potomac River	Frederick County Commissioners	Municipal Water Supply - Potomac River	07/2003	16,000,000	26,000,000
1968G008	Granodiorit & Biotit Granit Geniss	Frederick County Board of Education	Valley Elementary School	06/2005	6,700	10,000
1968G011	Grove Limestone	Genstar Stone Products Company	Frederick Quarry	10/1998	42,000	63,000
1969G021	Frederick Limestone	Commissioners of Thurmont	Wells #3 & #4 - Well #2 now permitted under 69G121	09/2000	275,000	460,000
1969G023	Sams Creek Metabasalt	Division of Utilities & Solid Waste Mgt., Frederick County	Lake Linganore - "Weller Well"	04/2004	15,000	20,000
1969G024	Urbana Formation	Peter Pal Limited Partnership	Restaurant, Offices, Retail, Bank	06/2000	8,000	15,000
1969G121	Frederick Limestone	Commissioners of Thurmont	Thurmont - Well #2	09/2000	89,000	149,000
1970G005	Loudoun Formation	Polings Mobile Homes	Mobile Home Park - 39 homes	08/2002	8,500	10,000
1970G010	Harpers Formation	Concord Mobile Home Park, LC	Concord Mobile Home Park	04/2003	13,100	21,800
1970G014	Catoctin Metabasalt	County Bureau of Water & Sewer, Frederick	Cambridge Farms & Briercrest Apts.	01/2001	62,000	100,000
1970S026	Linganore Creek	Westwinds Golf Club, LLC	Westwinds Golf Club - Irrigation	10/2000	65,000	250,000
1970G035	Grove Limestone	Redland Genstar, Inc. DBA Lafarge	Frederick Quarry - Dewatering	10/1998	4,000,000	5,000,000
1971S006	Hunting Creek	Maryland Department of Natural Resources	Cunningham Falls State Park Water	03/2005	15,000	60,000
1972G015	New Oxford Formation	Eaves, Sr., Glenn, E.	Farm Irrigation	05/2003	9,000	53,000
1972G016	Frederick Limestone	Rotorex Company	Process Water - Manufacturer of Air Compressors	10/1995	68,000	110,000
1973G016	Libertytown Metarhyolite	Frederick County Board of Education	Linganore High School	05/1997	13,000	19,500
1974S013	High Run	Commissioners of Thurmont	Reservoirs on High Run	09/2000	43,000	500,000

1974G019	Antietam Formation	Meadow Farms, Inc.	Nursery Irrigation	09/2005	24,000	71,000
1974G025	Catoctin Metabasalt	Middletown, Burgess and Commissioners	Middletown Municipal Water Supply	09/2008	308,000	375,000
1974G030	Sams Creek Metabasalt	HHCC, L.L.C.	HHCC Club House	08/2005	6,900	14,000
1974S030	Long Branch	HHCC, L.L.C.	GC Irrigation	07/1995	52,000	500,000
1974G131	Sams Creek Metabasalt	Holy Hills County Club	Holly Hills Irrigation Wells	11/2001	33,000	165,000
1974G225	Catoctin Metabasalt	Middletown, Burgess and Commissioners	Middletown Wells (Cone Branch Wells 14, 16 & 17)	07/2005	94,400	113,800
1975G011	Catoctin Metabasalt	Emmitsburg, Town of	Turkey Creek Watershed Wells 1 & 2	07/1999	168,000	252,000
1975G013	Grove Limestone	Mount Saint Mary's College	Mt. St. Mary/s College (Wells 3&5)	03/1998	110,000	165,000
1975G016	Catoctin Metabasalt	Moser Concrete Inc.	Ready Mix Concrete Use	02/1994	8,000	15,000
1975G113	Harpers Formation	Mount Saint Mary's College (Roddy Quarry)	Mount Saint Mary's College (Roddy Quarry)	03/1998	15,000	50,000
1975G413	Frederick Limestone	Mount Saint Mary's College	Mount Saint Mary's College (Well #6)	03/1998	70,000	210,000
1976G007	Ijamsville Form - Marburg Schist	Mount Airy, The Town of	Mt. Airy Wells 1-4, Temp Increase	08/2005	307,000	347,000
1976S014	Turkey Creek	Emmitsburg, Town of	Emmitsburg-Rainbow Lake & Well #3	07/1999	168,000	350,000
1976G107	Marburg Schist	Mount Airy, The Town of	Mount Airy Well #7 (Twin Ridge SBDN)	08/2005	112,000	139,000
1976G114	Catoctin Metabasalt	Emmitsburg, Town of	Emmitsburg Wells #3 & #5	07/2001	87,000	131,000
1976G214	Catoctin Metabasalt	Emmitsburg, Town of	Emergency Supply Emmitsburg	04/2005	10,000	29,000
1977G008	Grove Limestone	Frederick County Bureau of Water & Sewer	FSK Water Treatment Plant for Ballenger Creek System	07/1998	42,000	500,000
1977S041	Little Hunting Creek	Hunting Creek Fisheries, Inc.	Goldfish Farm	09/1992	1,500,000	3,000,000
1977S043	Fishing Creek	Hunting Creek Fisheries, Inc.	Goldfish Farm	09/1992	1,000,000	2,000,000
1977G108	Frederick Limestone	Frederick County Bureau of Water & Sewer	FSK Water Treatment Plant for Ballenger Creek System	07/1998	42,000	500,000
1978G017	Grove Limestone	Burgess and Commissioners of Walkersville	Municipal Water Supply	07/1999	1,000,000	1,500,000
1978G019	New Oxford Formation	Canam Steel Corporation	Standard Building Systems-Steel Fabrication	12/2001	6,000	9,000
1979G008	Catoctin Metabasalt	Baptist Convention of Maryland/Delaware	Skycroft Baptist Conf./Retreat Center - Added 3 wells	01/2002	8,600	20,100
1979G010	Frederick Limestone	Corporation of Woodsboro	Municipality	10/2005	128,000	178,200
1979S013	Potomac River	Brunswick, Town of	Potomac River Intake	05/2005	1,000,000	1,500,000

1980G005	Gettysburg Shale	Hunting Creek Fisheries, Inc.	Aquaculture	10/1998	200,000	464,000
1980G009	Frederick Limestone	Lilypons Water Gardens, Inc.	Lilypons Water Gardens	07/1992	40,000	80,000
1981G006	Sams Creek Metabasalt	Division of Utilities & Solid Waste Mgt., Frederick County	Lake Linganore - "Pool Well"	04/2004	25,000	30,000
1981G016	Ijamsville Formation	Yee, Kwang, Woo	GWHP - Foxpass II Lot 2A	12/1994	9,200	18,400
1981G105	Frederick Limestone	John R. Webb Post 3285, Veterans of Foreign Wars	Irrigation of 9-hole G.C.	12/2003	15,000	60,000
1983G013	Frederick Limestone	Frederick County Bureau of Water & Sewer	Waterside Subdivision	04/1997	125,000	175,000
1984G005	Urbana Formation	Frederick County	New Market West SBDN - Well 12 & 14	03/2005	27,600	27,600
1984G105	Urbana Formation	Frederick County	New Market West Sbdn - Two Wells	03/2005	27,400	64,300
1985S002	Linganore Creek	Frederick County Division of Utilities	Lake Linganore Intake	09/2003	1,200,000	2,000,000
1985G021	Wakefield Marble	Department of Public Works, Frederick County	Fr Co DPW - Woodspring & Environs	04/2001	137,000	219,000
1986G011	Ijamsville Formation	TBC Building Partnership, LLP	Hyatt Park, Lot 2B-East	06/2004	5,500	9,000
1986G023	Frederick Limestone	Kirkpatrick, Richard F.	Car Wash & Laundromat	10/1986	6,500	8,000
1986G026	New Oxford Formation	Utilities & Solid Waste Management, Frederick County Division	Cloverhill III SBDN	03/2005	84,300	125,000
1987G004	Catoctin Metabasalt	Myersville Municipal Supply (WTP Well)	Myersville Municipal Supply (WTP Well)	03/1998	13,000	26,000
1987G034	Granodiorit & Biotit Granit Geniss	Bureau of Water & Sewer, Frederick County	Fr Co. Water & Sewer Dept. Copperfield Subdivision	06/1998	28,300	47,300
1987G104	Catoctin Metabasalt	Myersville, Mayor and Council of	Myersville Municipal Supply (Ashley Hills Wells)	03/1998	22,500	37,600
1987G204	Catoctin Metabasalt	Myersville, The Town of	Myersville - Deer Woods Water Supply	11/1994	15,600	17,300
1988G002	Ijamsville Form - Marburg Schist	Utilities & Solid Waste Management, Frederick County Division	Bradford Estates Sbdn	09/2003	17,000	28,000
1988G004	Gettysburg Shale	Commissioners of Thurmont	Well #7 - Separate System - Not connected to Towns Central Sys.	09/2000	93,000	156,000
1988G035	Catoctin Metabasalt	Myersville, The Town of	Myersville - Canada Hill Water Supply	11/1994	42,000	46,800
1988S039	Monocacy River	Dearbought Limited Partnership	Pond Fill-Up	11/1988	7,000	9,500
1989G007	Sams Creek Metabasalt	Ritchie, Jr., M. Robert	Holly Hill Farm - Irrigation and Potable Supply	02/2003	10,000	30,000

1989S007	Long Branch	Ritchie, Jr., M. Robert	Holly Hill Farm - Irrigation and Potable Supply	02/2003	10,000	50,000
1989G024	Ijamsville Formation	Milrey, Inc.	Liberty East & Liberty Village Subd/Shopping Center	03/1997	15,700	23,600
1989G032	Grove Limestone	Glade Valley Golf Club, LLC	Irrigation (Clubhouse under FR89G132)	08/2000	55,000	214,000
1989G036	Sams Creek Metabasalt	Adel Development Company, LLC	Festival at Green Valley Shopping,	10/2001	18,000	25,000
1989G039		Utilities & Solid Waste Management, Frederick County Division	Intercoastal Industrial Center	01/2003	70,000	157,000
1990G007	Frederick Limestone	City of Frederick	Municipal Golf Course	12/2003	10,000	40,000
1990G013	Ijamsville Form.- Marburg Schist	Division of Utilities and Solid Waste Management, Frederick County Div.	Samhill WTP - Samhill, Penn Shop Estates & Harvest Ridge Sbdns	09/2004	155,600	260,000
1990G026	New Oxford Formation	Stadler, Peter	Stadler Nursery - Stock Irrigation	03/2003	26,000	76,000
1990G031	Ijamsville Formation	Dept. of Public Works, Frederick County	Fr. Co. DPW, Bureau of Water & Sewer - Knolls of Windsor Water Supply	09/2000	106,800	177,300
1991G008	Gettysburg Shale	E&H Golf Property, LLC, Russell L.	Maple Run Golf Course	05/2005	43,000	170,000
1991S008	Hunting Creek	E&H Golf Property, LLC	Maple Run Golf Course	05/2005	9,000	20,000
1992S001	Monocacy River	Zimmerman, Jurgen-Harald	Farm Irrigation - 50 acres	08/2005	51,000	225,000
1992S002	Bennett Creek	Lilypons Water Gardens, Inc.	Lilypons Water Gardens	07/1992	12,000,000	90,000,000
1992G009	Urbana Formation	New Market, Town of	Town of new Market Municipal Supply	11/1995	75,000	125,000
1993G002	Loudoun Formation	Bollinger, Jr. Eugene, Sterling	Farm Irrigation	02/1993	6,600	40,000
1993S002	Unnamed Tributary	Bollinger, Jr. Eugene, Sterling	Farm Irrigation	02/1993	6,600	40,000
1993G007	Grove Limestone	Mayne etal, Mehrl F.	Farm Irrigation	05/2005	180,000	1,089,000
1993S011	Tuscarora Creek	Phillips, Jean K.	Farm Irrigation	06/2005	46,000	1,389,000
1993S012	Tuscarora Creek	Automobile Insurance Co., State Farm Mutual	Landscape Irrigation	03/2006	35,000	120,000
1993G015	Ijamsville Formation	Utilities & Solid Waste Management, Frederick County Division	Urbana High School	03/2005	27,000	41,000
1993G018	Mountain Wash	Catoctin Mountain Orchard, Inc.	Irrigation	09/2005	75,000	130,000
1993G021	Catoctin Metabasalt	Connie Masser & Richard Calimer	Connie Masser & Richard Calimer	10/2005	34,000	204,000
1993G026	Urbana Formation	Brightwell, Matthew, P.	Waiting for Zoning Change to Convert to Machine Shop	10/2005	9,700	25,000

1993G036	Gettysburg Shale	Commissioners of Thurmont	Thurmont - Well #8 - Apples Church Rd.	09/2000	234,000	300,000
1994G002	New Oxford Formation	Kenel, Greg & Steve	Landscape Nursery	03/2005	5,700	23,000
1994G004	New Oxford Formation	Milligan, Michael, R.	Irrigation and Potable Supply	09/1994	8,000	31,000
1994S008	Chesapeake Bay	Treeland Nurseries, Inc.	Hydroseeding	06/1994	5,300	13,500
1994G012	Granodiorit & Biotit Granit Gneiss	Sheppard and Enoch Pratt Hospital, Inc.	Western Maryland Residential School	09/1994	7,500	10,000
1994G013	Grove Limestone	Eastalco Aluminum Company	Lower Water Table Beneath Bake Ovens	08/1998	375,000	400,000
1994G022	Grove Limestone	McDermit, Inc.	Concrete Plant	02/1995	6,000	9,000
1995G008	Mt. Wash	Exxon Company, U.S.A.	Replaces FR876825	05/1995	18,000	29,000
1995SO12	Israel Creek	Thomas, Bennett & Hunter, Inc.	Ready-Mix Concrete Plant	07/2002		
1995G020	Ijamsville Form. – Marburg Schist	Mount Airy, The Town of	Mount Airy Municipal Supply Well #8 (Summit Ridge)	08/2005		
1995G021	Urbana Formation	St. Luke Evangelical Lutheran Church	St. Luke Church Pond Supply	07/1995	8,000	43,200
1995G022	Catoctin Metabasalt	Myersville, Town of	Community Water Supply (Myersville Town Park Site)	07/1996	38,000	57,000
1996G005	Sams Creek Metabasalt	Whiskey Creek Golf Course, LLC	Whiskey Creek GC Irrigation Well	06/2000	23,000	72,000
1996S005	Bush Creek	Whiskey Creek Golf Course, LLC	Adjusted use to make supplemental to FR96G005	06/2000	71,000	328,000
1996G008	Urbana Formation	Robert Sturges	Hopeland Golf Course	12/1996	51,000	202,000
1996G014	Frederick Limestone	Eastalco Aluminum Company	GWCU	07/2002	9,000	10,000
1997S013	Little Catoctin Creek	Maryland National Golf, L.P.	Maryland National Golf Club	04/2003	15,000	250,000
1997G017	Urbana Formation	P.B. Dye Golf Club	P.B. Dye Golf Club Irrigation - 8 Wells	06/2001	83,000	288,000
1997S021	Bennett Creek	Dansam International, Inc.	Golf Course and Country Club	09/1997	9,800	480,000
1997G032	Catoctin Metabasalt	Emmitsburg, Town of	Town of Emmitsburg - Well #4 (Turkey Creek Watershed)	07/1999	40,000	60,000
1997G034	Catoctin Metabasalt	Mayor and Council of Myersville	Myersville's Reservoir Well	11/2001	10,000	15,000
1997G043	Catoctin Metabasalt	Klein Golf Associates, LLC	Glenbrook Golf Course (Irrigation Wells)	09/2002	Permit 5/2006	inactivated
1997S043	Hollow Road Creek	Klein Golf Associates, LLC	Glenbrook Golf Course (Irrigation Pond)	05/2006	10,000	450,000
1998G005	Harpers Formation	North Market Street LLC	Potomac Hills 30-Lot Subdivision	02/1998	6,500	10,800
1998S007	Monocacy River	Toms, David	Irrigation	07/1998	231,000	1,405,000
1998G008	New Oxford Formation	Tabbara, Kamel	Aguaculture Project	11/1998	67,500	74,300

1998G010	Harpers Formation	North Market Street LLC	Potomac Hills 30 Lot SBDN	03/1998	6,500	10,800
1998G014	Catoctin Metabasalt	Ausherman, Dale, E.	30 Lot Legends Subd	04/1998	6,500	1,100
1998G018	Frederick Limestone	Eastalco Aluminum Company	Lowering Water Table Beneath Primary Aluminum Smelter	12/2001	48,000	49,000
1998G022	Catoctin Metabasalt	Musket Ridge Development Co., LLC	Musket Ridge Golf Club	05/2001	102,000	400,000
1998S022	Catoctin Creek	Musket Ridge Golf Course, LLC	GC Irrigation - SW Ponds	09/2004	20,000	288,000
1998G031	Frederick Limestone	Waverly Farm, LC	Waverly Farm Irrigation	02/1999	65,000	200,000
1998G038	Catoctin Metabasalt	Rudy, Richard A.	Rudy Spring Water Co.	11/2003	9,900	10,000
1998G039	Granodiorit & Biotit Granit Gneiss	Lewis, Jr., George E.	Catoctin Station Farm - Stocker Beef Cattle on Pasture Only	01/1999	9,700	18,000
1999G002	Ijamsville Formation	M.E. Burton, LLC	Nursery	05/1999	7,500	10,000
1999SO23	Linganore Creek	Frey, Joshua, N.	Farm irrigation (100 acres)	10/1999	69,000	252,000
1999GO37	New Oxford Formation	Lynch, William and France	Lynfield Fairgrounds	10/1999	7,000	14,000
1999GO39	Grove Limestone	Teabow, Inc.	Dairy Farm	03/2000	75,000	110,000
1999S042	Weldon Creek	Skoczelak, Joseph M.	Orchard & Pond	12/1999	5,100	31,000
2000G023	New Oxford Formation	Eaves, Glenn E.	Dairy Farm Use	12/2000	96,300	124,000
2000G027	New Oxford Formation	Windridge Farm, LLC	Windridge Farm, LLC	04/2000	9,600	10,600
2000S030	Monocacy River	Jorgensen Family Foundation, Inc.	Farm Irrigation	08/2000	88,000	533,000
2001G001	Catoctin Metabasalt	Springdale II, LLC	40-Lot Subdivision Springdale II, LLC	01/2001	8,600	14,400
2001S004	Monocacy River	Glade-Link Farms, LLC	Berry Irrigation P24B	03/2001	9,000	47,500
2001G006	New Oxford Formation	Glade-Link Farms, LLC	Berry Irrigation P11	02/2001	10,000	60,000
2001G007	New Oxford Formation	Glade-Link Farms, LLC	Berry Irrigation P-110	02/2001	8,000	42,000
2001G012	Sams Creek Metabasalt	Linthicum, James, M.	Turnpike Center - Lot 1 Proposed Restaurant - 125 seats	04/2001	9,400	15,000
2001G014	Ijamsville Formation	Roy E. Stanley	Central Supply Sbdn.	03/2002	27,800	46,400
2001G015	Grove Limestone	Fountain Rock Park Fish Hatchery	Fountain Rock Park	08/2001	2,000,000	3,000,000
2001G020	Ijamsville Formation	Knowledge Farms Partners, LLC	Office Park Development	02/2005	9,000	15,000
2001G021	Catoctin Metabasalt	Ganley, Joseph, H.	Ganley Property - 2 Heat Pumps	06/2001	6,000	12,000
2001G022	Ijamsville Form. - Marburg Schist	Mount Airy, Town of	Mt. Airy New Well (#9 - Abells Knoll)	08/2005	79,000	204,000

2001G026	Libertytown Metarhyolite	Life in Jesus, Inc.	Religious Community	08/2005	12,000	20,000
2001G027	Catoctin Metabasalt	Maryland National Golf, L.P.	Maryland National Golf, L.P.	04/2003	42,000	226,000
2002G014	Frederick Limestone	BP Solar International LLC	Process Water	04/2003	12,200	21,600
2002G020	Gettysburg Shale	Emmitsburg, Town of	Town of Emmitsburg Well #7	10/2002	83,000	109,000
2002G022	Frederick Limestone	Frederick, City of	Frederick City Municipal Well PW-4 (Monocacy Village Park)	05/2003	365,000	420,000
2002G029	Frederick Limestone	103-29 Limited Partnership	Farm Irrigation Well	11/2004	15,000	87,000
2002G030	Gettysburg Shale	Jer Mae Development, LLC	Jer Mae LLC - Thurmont Municipal Well	07/2004	200,000	275,000
2002G001	Gettysburg Shale	Thurmont, Commissioners of	Thurmont - New Well (#9)	07/2003	204,000	318,000
2003G016	Frederick Limestone	Frederick, City of	Frederick City Municipal Wells 3 and 7	03/2005	200,000	260,000
2003G043	Catoctin Metabasalt	MAF Myersville, LC	Saber Ridge Sbdn.	01/2005	20,500	30,800
2003G045	Harpers Formation	Millennium Development Group, LLC	Millennium Development Group	10/2003	5,500	9,100
2004G001	Catoctin Metabasalt	Buckeye Development, L.L.C.	Quail Run Sbdn Municipal Water Supply	03/2005	22,000	30,800
2004G002	Frederick Limestone	Adams, Joseph	Nursery Stock irrigation	08/2004	100,000	300,000
2004S002	Tuscarora Creek	Adams, Joseph	Adams Property Nursery	08/2004	50,000	300,000
2004G004	Sams Creek Metabasalt	Hickory Plains, LLC	Baldwin Road Greenhouse & Four Apartments	06/2004	5,800	25,000
2004G009	Grove Limestone	Bardon, Inc.	Bardon, Inc. Concrete Plant	01/2005	20,000	25,000

Source: Maryland Department of the Environment – Water Management Administration