Chapter 7 WATER RESOURCES ELEMENT

Purpose

The purpose of this plan element is to coordinate the Town of Middletown's land use and water resources planning efforts. The plan is organized around the following three components: drinking water; wastewater; and stormwater. Included within those components are discussions of the watershed resources of the Town; the quality and quantity of drinking water supplies with respect to planned growth; the treatment capacity of wastewater treatment facilities and disposal of treated effluent; a review of Frederick County's stormwater management and non-point source pollution programs; and recommendations for environmentally sound land and water management practices that contribute towards the health and sustainability of our major watershed system and our residents.

This water resources element was prepared to serve as the Town's Water Resources Element mandated through House Bill 1141 by the Maryland State Legislature in 2006. This plan is required to be submitted to the Maryland Department's of Planning and Environment for review in 2009.

Water Resources Goals

Achieving the Town's water resources goals will take a coordinated effort by its citizens, the town's government, and its businesses. Each has a role to play in protecting the Town's water resources for future generations. The overarching goals for the Town of Middletown's water resources are:

1. Maintain a safe, secure and adequate drinking water supply to accommodate the needs of the current population as well as future generations.
2. Protect and enhance the quality of the Town of Middletown's surface waters, ground water resources, and wetlands, with the goal of exceeding all environmental regulatory requirements.
3. Invest in water and sewer infrastructure that will provide ample treatment capacity for projected demand and reduce total maximum daily loading [TMDL] of pollutants to rivers and streams.
4. Promote coordinated planning with other federal, state and local agencies responsible for drinking water, wastewater, and stormwater management.
5. Engage Middletown's citizens in watershed conservation and promote a stewardship ethic.

Coordination with Frederick County

This Water Resources Element (WRE) is linked to [add date of plans] Frederick County-produced plans such as their Water Resources Plan and the Water and Sewerage Master Plan. The County's Water Resources Plan provides for the County's goals for drinking water supplies, wastewater treatment and stormwater management for all of the County's municipalities.

The Water and Sewer Master Plan provides a detailed description of the County's water and sewer service areas including justification for the various levels of service. The Plan includes background on the physical geography of the County and provides detail on vulnerabilities and limitations to water and sewer service based on environmental factors.

Land Use Planning Analysis

Frederick County projects a population of 331,700 by 2030, which is an increase of approximately 99,000 people. This population increase would result in a need for approximately 37,400 new dwelling units. These new residential dwelling units are targeted to occur in the County's Community Growth Areas which includes the Town of Middletown.

Table 7-1
Town of Middletown
2030 Projected Water Resources Needs

Projected 2030 Population	5092[1]	Projected 2030 Household Size	2.68[2]
Current 2008 Population	4198[3]	Current 2008 Household Size	2.78
Projected Additional Population 2008-2030	894	Current 2008 Annual Average Daily Water Use (gpd)	311,000
Projected Additional Dwellings Needed	334	Projected Annual Average Additional Residential Water Needed (gpd)[4]	100,200
Projected Additional Non-Residential Needs – acres	44[5]	Projected Annual Average Additional Non-Residential Water Needed (gpd)	2,226

The future water resource needs of Middletown can be estimated using the above-referenced population projection; it is assumed that by 2030 an additional 100,200 gallons per day of drinking water supply will be needed to service Middletown residents. It is also assumed that by 2030 an additional 2,226 gallons per day of water supply will be needed to service non-residential users in Middletown.

[1] According to the Maryland Department of Planning
[2] According to the Maryland Department of Planning
[3] According to Frederick County population statistics
[4] Based on Middletown requirement that developers must provide 300 gallons of allocable water per unit (gphd).
[5] Based on General Commercial acreage within town's growth boundary.

Importance of Water Resources Planning

With an additional 99,000 people expected to reside in Frederick County over the next 20 years, population growth and its associated water resources challenges are anticipated in the Town of Middletown. In addition to addressing the competing needs of residential, agricultural, and commercial/industrial development, municipalities like Middletown needs to review its water resource and land use plans to ensure delivery of water and sewer service to a larger customer base.

Middletown's geographic location in the Chesapeake Bay watershed offers another major challenge. The major surface water resource in the Middletown Valley is Catoctin Creek, which meanders south through Frederick County directly into the Potomac River which flows into the Chesapeake Bay. The Potomac River, along with its smaller tributaries, carries stormwater runoff from the land [nonpoint] and wastewater discharge from point sources such as wastewater treatment plants to the Bay. Sediment and topsoil, fertilizers and pesticides, oil, pet waste and emerging contaminants (pharmaceuticals, etc.) are examples of pollutants that enter local water bodies. Once in the Bay, these pollutants disrupt the natural balance of the estuary, depleting fish, crab and oyster populations and posing serious health risks for continued human use and aquatic stability.

The environmental challenges associated with growth are not new or unique to Middletown and Frederick County. This water resources element takes into account the diversity of water resources, limitations and vulnerabilities that the Town of Middletown is facing and offers recommendations for potential solutions. This is the first attempt to develop a water resources element for the Town of Middletown.

Middletown Watersheds

Catoctin Creek flows through the Middletown Valley, an intermountain area characterized by heavily rolling land and narrow streams. The valley is surrounded on three sides by the Catoctin and South Mountain ridgelines. These mountain ranges form the boundary of the Catoctin Creek watershed, which accounts for approximately 25% of Frederick County's total land area. The creek's confluence with the Potomac River is located just east of Brunswick, Maryland. See Figure 7-1, Middletown Watersheds & Drainage Basins.

Section 303(d) of the federal Clean Water Act requires Maryland to: (1) identify waters, known as water quality limited segments (WQLSs), where technology-based effluent limitations and other required controls cannot achieve water quality standards; (2) for each listed water, establish Total Maximum Daily Loads (TMDLs) for pollutants preventing the attainment of water quality standards; and (3) offer an opportunity for public review and comment on the proposed TMDLs.

The Maryland Department of the Environment (MDE) has identified the waters of the Catoctin Creek watershed (basin number 02140305) on the State's 303(d) List as impaired by sediments (1996), nutrients (1996), bacteria (2004), and impacts to

biological communities (2002 and 2006). A data solicitation for sediments was conducted by MDE, and all readily available data from the past five years have been considered. The listings for nutrients, bacteria, and impacts to biological communities will be addressed separately at a future date.

The TMDL sets the maximum load limit for the impairing substance. The TMDL also reflects potential load allocations to point sources, nonpoint sources, and a margin of safety that accounts for uncertainty in the procedures used to estimate the TMDL. Once established by the State, the TMDL will be subject to approval by the EPA. The established TMDL will support measures needed to attain water quality standards in the Catoctin Creek watershed. The Environmental Protection Agency approved on July 31, 2009, a Total Maximum Daily Load (TMDL) for sediment in the Catoctin Creek Watershed to reduce sediment runoff and discharges into Catoctin Creek and its tributaries. This TMDL could have future quantitative sediment loading limits or caps for all land uses in the Catoctin watershed.

Improvements to the health of the Catoctin Creek watershed is needed to meet regulatory requirements and support a diverse ecological environment. Watersheds provide natural functions to communities such as flood control, reduction of carbon dioxide, sources of food and water, and recreational opportunities. Some of the watershed management issues that citizens, farmers, schools, government agencies, and businesses are tackling in the area include:

- Reducing urban stormwater runoff;
- Restoring stream corridors;
- Controlling sediment and erosion during the land conversion process;
- Reducing impervious surfaces in new developments;
- Protecting habitat for birds, mammals, and aquatic life by planting trees, shrubs and herbaceous plants that are native to the area;
- Conserving water and
- Directing development away from sensitive environmental areas.

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DRINKING WATER ASSESSMENT

Healthy watersheds provide a safe and sustainable drinking water supply. With more than 1,400 miles of rivers and streams in Frederick County, water appears abundant. Many of us take for granted a safe and abundant supply of drinking water. Middletown uses ground water sources to obtain their water supplies. The perception of abundance highlights the importance of water resources planning. While water may be plentiful certain days or seasons of the year, levels or supplies may be dramatically lower in others. The drought conditions that occurred in 1999 and 2002 and associated restrictions on nonessential water uses brought home the lesson that our water supplies are not limitless and require good stewardship. Summertime demand, in particular, puts pressure on our water resources when supplies are lowest and demand is high.

This drinking water assessment investigates drinking water supply and availability; drinking water demand and water conservation. Other major issues related to drinking water policies and projects will be reviewed. See Figure 7-2 Water Service Map.

Drinking Water Supply and Availability

In Middletown, the drinking water system is supplied by twenty groundwater wells and four major groups of groundwater springs located on the west side of the Catoctin Mountain, north of town. Water from these springs flow by gravity to two in-ground reservoirs with a combined capacity of two million gallons. These drinking water supplies are obtained from ground water sources, as opposed to surface water. There are no private wells in the Town of Middletown.

Ground water is stored in aquifers and crevices beneath the ground that are recharged by precipitation. In an unconfined aquifer, the most common in the Middletown valley, ground water moves horizontally before it is discharged into a stream or other surface water body, such as a seep, spring, or wetland. Stream flow directly correlates with the rise and fall of the water table; both are impacted by climatic and drought conditions.

Disruptions to the natural hydrologic cycle by land use affects availability of both ground water and surface water supplies. The steady increase in the area's population that is expected over the next twenty years poses a significant impact to the availability of this limited natural resource. Increased development reduces water recharge areas and has the potential for introducing new pollutants and contaminants to watersheds. This section assesses the availability of groundwater and presents its limitations.

Groundwater

The available supply of groundwater in Middletown is dependent upon the underlying geologic conditions. In most areas, the water bearing characteristics of the geology offer low storage capacity and low transmissibility. An extensive stream network and the nature of fine particle soils contribute to these characteristics. The United States Geologic Survey (USGS) and Maryland Geological Survey have generalized the water yielding character of Frederick County's aquifers and organized them by hydrogeomorphic region. Middletown is located in the Piedmont Crystalline region.

The poorest aquifers, in terms of yield and capacity, include fractured rock aquifers which are typical in the Piedmont Crystalline regions. In addition to geology, climatic conditions impact groundwater. Seasonal variation in groundwater table level is a primary limitation to its use as a reliable water supply. In a recent evaluation of the Catoctin Creek watershed, it was concluded that groundwater may be an adequate source during average precipitation years, but under drought conditions, groundwater supplies are not adequate to meet existing demand and support the biological and natural

resources of the watershed[6]. Groundwater supply limitations are typically accentuated during the summer months. Mid-June through mid-September is historically the driest time of the year and groundwater supply declines significantly during the summer months.

Water Balance Methodology

Groundwater availability is difficult to predict; aquifers are not confined to topographic, political or watershed boundaries. Availability is based on the amount of recharge (in the form of precipitation, groundwater and septic system discharge) to the aquifer less the amount of water that is supplied as base flow to surface water streams. This estimation method provides a watershed availability scale estimate, and is not used to estimate availability at a particular well.

This water balance method for groundwater availability has been utilized in the Catoctin Creek watershed by Korsak and Smith (2006). It revealed the potential for major variations in groundwater availability under summertime and drought conditions. Assuming combined summertime and 20-year drought meteorological conditions groundwater supplies would be over-allocated in fifty percent (50%) of the sub-watersheds of Catoctin Creek by 2030[7].

This water balance method is also used by MDE for distribution of groundwater appropriation permits for community water systems. To apply for a permit, a municipality must control or have jurisdiction over, either by ownership or via providing public water to the properties, own sufficient undeveloped land resources to allow for groundwater recharge of the aquifer they intend to withdraw from. This MDE policy particularly affects municipalities who are constrained by a municipal boundary with respect to where their groundwater supply wells are located. There is also a Maryland Department of Planning (MDP) policy that states that municipalities must be developed under the state's Smart Growth policy which prescribes higher densities for growth areas, while also identifying land resources to keep in permanent open space for their groundwater appropriations.

The most limiting factor in the near future will be the difficulty in locating sufficiently high yielding wells necessary for public water supplies, without impacting nearby private wells. As the population increases in Middletown, which relies entirely on groundwater, the town will be forced to identify water supply alternatives that will serve to diversify our current water supply.

[6] 2006. MDE. *An Evaluation of Water Resources in the Catoctin Creek Watershed, Frederick County, Maryland.*

[7] *Water Resources Plan for Frederick County, Maryland – A Functional Element of the Frederick County Comprehensive Plan 2009*

Table 7-2 shows the latest watershed information for Middletown as of December 2008. The Town is limited to what the recharge rate of the aquifer is in the region. Since MDE will not allocate a withdrawal greater than the water rights (based on recharge rates), the Town is interested in acquiring water recharge easements on agricultural preservation parcels outside of the Town to increase the Town's overall water rights in the area thereby giving the Town the rights to pump more water out of the aquifer.

Table 7-2 Middletown Watersheds	WATERSHEDS			
	Catoctin Creek	**Cone Branch**	**Hollow Creek**	**Buzzard Creek**
Gross Acreage By Digital Planimetry	**369**	**527**	**646**	**10**
Net Acreage Available for Allocation (Assumes 10% impervious surface)	**332**	**474**	**581**	**9**
Drought (1-in-10) Ground Water Availability (432 gpd/ac)	**143,467**	**204,898**	**251,165**	**3,888**
Set-Aside for Maintenance of a 7Q10 Base Flow (15 gpd/ac)	**4,982**	**7,115**	**8,721**	**135**
Groundwater Potentially Allocable in the Watershed (gpd)	**138,486**	**197,783**	**242,444**	**3,753**
Groundwater Potentially Allocable in the Watershed (gpm)	**96.71**	**137.35**	**168.36**	**2.61**

Source Water Protection

The quality of drinking water varies by source. Different issues exist for ground and surface water sources. Groundwater quality in the Middletown area can be negatively impacted by naturally occurring radon or iron, but can also be contaminated by fecal coliform, particularly when septic systems are nearby. Common water quality contamination concerns include:

- Sedimentation
- Human pathogens
- Fecal contamination
- Potential spills
- Fecal coliform
- Nitrates
- Natural organic matter
- Algae
- Taste and odor compounds
- Gasoline-related compounds

State and federal water quality standards are in place for community systems using ground and surface water sources. Regular testing of drinking water is a requirement. The federal Safe Drinking Water Act amendments of 1996 require that public systems conduct a Source Water Assessment to better understand the vulnerabilities of their source. MDE has prepared Source Water Assessments for all public systems in the State. These plans list in detail the vulnerabilities of the supply and offer recommendations for continued protection. It is likely that additional in-depth watershed management plans will be conducted to protect the diverse sources of drinking water in Frederick County in the future with TMDLs pending at the federal level for most streams in the County.

Middletown is interested in increased source water protection through wellhead protection ordinances at the County level. With groundwater wells and springs feeding Middletown's water system located outside the town limits, County regulations and ordinances are needed for adequate source water protection of municipal water systems. Middletown adopted a Wellhead Protection Overlay Zoning District ordinance in 1996 to ensure protection of the public health, safety and welfare through the preservation of the groundwater resources of community public water supplies. The designation of the wellhead protection districts, along with careful regulation of development activities within the districts, is intended to reduce the potential for ground and surface water contamination.

Drinking Water Demand

Middletown's water system relies on twenty (20) groundwater wells and four (4) major groups of groundwater springs as stated previously. As of 5/12/2009, Middletown is permitted to withdraw 0.427 million gallons a day (mgd) for the average daily demand and 0.522 mgd for the maximum daily demand. Middletown's system serves a population of approximately 4,150 people with a current (2008) demand of about 0.311 mgd (maximum use of 0.343 mgd). Commercial businesses in Middletown are also supplied drinking water from the town's water system. The Town estimates a 2030 population of 5,092 and an associated drinking water demand of 0.411 mgd. To accommodate this projected population, the town will need to identify additional water sources. The 2001 Water System Facility Update, prepared by ARRO Consulting, identifies specific recommendations for increasing the raw water supply for the Town.

Middletown's wells have yields ranging from 30-60 gallons per minute (gpm), and the springs have an estimated total potential yield of 100-150 gpm. In 1999, the Town completed a Surface Water Treatment Rule testing program, with the cooperation of MDE, and received ground water certification of all of the spring currently in use by the Town. This testing is expected to be required in the future to maintain ground water certification of the Town springs. Middletown has two reservoirs with liners and covers located along Hollow Road between I-70 and US 40-A. The reservoirs are supplied by the wells and springs and have capacities of 1.5 million gallons and 0.5 million gallons. In 1997, the Town completed construction of a 400,000 gallon elevated water storage tank and distribution line improvements. See Figures 8-4 and 8-5 in the Municipal Growth Element of this Plan for additional information from the 2009 Middletown Water Supply Capacity Management Plan.

Middletown's water supply system has been divided in three (3) pressure zones, utilizing four (4) master pressure-reducing valve vaults, located on East Green Street, Summers Drive, the booster station at E. Main Street, 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 construction project.

The Town's water treatment program consists of adding caustic soda for pH adjustment; chlorine as a disinfectant to protect against microbial contaminants; and fluoride to

reduce tooth decay. From the water treatment plant, the water is pumped to the elevated storage tank. In 1982, approximately 40% of the mains in Town were upgraded with high density polyethylene (HDPE) plastic pipe. In 1993, the Middletown Burgess and Commissioners required real estate developers of new residential 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.

Due to new MDE allocation policies, Middletown was placed in a new construction/building moratorium in 2004 until the town could identify groundwater sources outside of the over-allocated Hollow Creek aquifer to meet the demand of additional water service connections. Finding new groundwater sources outside of the Hollow Creek aquifer is challenging. With the addition of the new Brookridge South wells being added to the system in 2010, the expectation is that the moratorium will be removed by MDE. Water requirements in Middletown's Residential Growth Policy will prevent this from occurring in the future.

Middletown's water supply is vulnerable due to its sole dependence upon groundwater. The town has concerns regarding source water protection, drought and seasonal variations, overuse of water resources during summer months, depletion of ground water levels. The town is actively addressing these concerns by purchasing land around the spring and wellheads, conservation methods, conservatively allocating water, and establishing a conservation ring around the town.

Middletown, in particular among Frederick County municipalities, is affected by conflicting state policies regarding smart growth and groundwater allocation. The MDE groundwater balance methodology which is used to determine the limits of groundwater withdrawals requires sufficient open, undeveloped land within a water service area to allow for recharge of the groundwater aquifer. This policy encourages an overall lower population density condition for public water supply service areas utilizing groundwater resources. In contrast, state Smart Growth policy encourages higher population densities in designated growth areas. This policy requires an average density of 3.5 dwelling units per acre to maintain Priority Funding Area (PFA) status.

According to Frederick County's *Water Resources Plan (2009)*, there are at least three alternatives that Middletown may consider to address their drinking water supply limitations. The first is the water recharge easement, where properties in land preservation would sell water rights in addition to development rights. A program has begun in Carroll County where the County purchases water rights from landowners adjacent to growth areas then sells them back to the municipality. This enables a growth area to maintain its PFA status while also having sufficient land protected for recharge. This alternative addresses the conflicting state policies noted above and is currently under review by the Maryland Agricultural and Land Preservation Foundation (MALPF) for implementation statewide.

The second alternative mentioned in the 2009 County *Water Resources Plan* resulted from MDE's evaluation of Catoctin Creek which was done in May of 2006 (*An Evaluation of the Water Resources in the Catoctin Creek Watershed*), which advised that Middletown consider a surface water impoundment to diversify their water supply or interconnection to another reliable water supply system. A final alternative is to review the long-term development potential of the town and consider whether residential growth areas need to be redirected elsewhere.

The Town is very interested in the first alternative and plans to look at the ability to secure water recharge easements on properties outside of the municipal limits, which are under agricultural preservation easements. As can be seen on the Growth Boundary map, Figure 8-1, the Town has designated a Conservation boundary outside of the town's growth boundary. The Town will look at the agricultural preservation properties in the designated conservation area or greenbelt for possible water recharge easements. According to *An Evaluation of the Water Resources in the Catoctin Creek Watershed* study done by MDE in 2006, a recommendation of the study is for planners, local governments, and water suppliers to work with the agricultural community to identify properties where conservation easements could be combined with water resource easements to protect valuable water resources and augment water supplies in terms of water balance.

A surface water impoundment in the Middletown Valley would take countless years of planning, siting, engineering, money, public hearings, and permitting not to mention the political will to approve such a resource in the County. Regarding the final alternative, the Town Board will have to consider this if other avenues turn out not to be feasible. In summary, Middletown's plan in terms of addressing drinking water supply limitations is to first look at recharge easements on agricultural land within the town's conservation boundary, and secondly to look at revising planned growth in the Town. The Town also will consider an interconnection with a county water supply for emergency purposes only.

Water Conservation

While water consumption by individual households in the Town of Middletown is below the national average, opportunities exist for further reductions in daily water use. Households, businesses, and institutions can reduce consumption by installing water efficient landscaping, rain barrels, low flow bathroom fixtures, gray water systems, and plumbing retrofits to older homes. Widespread education and outreach efforts on the benefits of water conservation have proven to reduce water use in a community. Conservation is especially important during the summer months when demand is high and supplies are low.

This is certainly something that has been shown to be effective in Middletown by reviewing historical water usage in the town over the past 10 years. Middletown's Municipal Code includes an ordinance on water use restrictions for water conservation purposes. Under the regulations, watering of lawns or grassy areas of property is

prohibited at any time between the hours of 9:00am and 6:00pm during the least restrictive periods of water use under the water conservation public alert system. The public alert system consists of three levels – red, yellow and blue – for which there are varying water conservation measures. The Town also posts tips to prevent water waste on its website, and sends out water conservation information with the water and sewer bills. Middletown uses a tiered rate billing system for residential water and sewer customers, which was put in place in 2001 as an incentive for customers to reduce their water consumption.

Water conservation measures lower consumer rates and utility bills while placing less pressure on precious resources. Middletown has realized major benefits from conservation measures when its citizens participate. Although conservation provides an alternative to providing additional sources of drinking water supply to the community, the Town still needs to investigate additional alternative sources of reliable water.

Implementation – Drinking Water Assessment

To achieve water resources goals related to the **drinking water assessment**, five policies and eight action items have been identified. Completion of the action items and adherence to the policy statements will be monitored regularly by the Town through review and update of the Water Resources Element, a component of the Middletown Comprehensive Plan.

Drinking Water Policies

1. Diversify sources of public drinking water and explore alternatives in order to meet future demand.
2. Employ demand management strategies and conservation measures (water pricing, recycling and reuse) to maximize use of existing resources.
3. Stage new real estate development projects according to the availability and adequacy of drinking water supply.
4. Include individual well construction on adjacent town limit properties within the growth boundary for future water service connection.
5. Encourage and support research and monitoring of local groundwater conditions, aquifer recharge, watersheds and streams.

Drinking Water Action Items

1. Replace aging water main lines and other aging water-related infrastructure.
2. Establish a water recharge easement program to increase the land area within the town limits for recharge purposes.
3. Coordinate with Frederick County on the feasibility of interconnections with the County distribution system for emergency situations.
4. Enhance its water conservation education program for citizens and businesses in Middletown stressing summertime (peak) demand management and an overall household reduction in water use (in gpd).

5. Develop a water-resources-based GIS database for review of development plans and proposals.
6. Identify and advocate appropriate County protection measures in the Town's wellhead, springhead, and headwater areas that lie outside the town boundaries.
7. Require complete data regarding the availability and reliability of groundwater resources to assist in making land use decisions.
8. Continue coordination with the County to collect and share consistent drinking water data.

WASTEWATER TREATMENT ASSESSMENT

This section of the Water Resources Element addresses wastewater treatment and disposal. It presents the quality of treated effluent and its impact to water resources; the regulatory framework related to water quality; and current and projected demand on the community wastewater systems. The section concludes with a list of major issues and potential solutions related to wastewater treatment and disposal as well as recommendations for future policy direction.

Quality of effluent/impact to water resources

Wastewater treatment plants (WWTPs) are point sources of pollution in the Town of Middletown. They discharge treated effluent directly into streams. The contribution of nutrients (nitrogen and phosphorus) from WWTPs is a major water quality problem facing Frederick County streams and impacts the larger Chesapeake Bay watershed.

Pollutant capacity loadings have already been reached in the Catoctin Creek watershed and permitted pollutant loads from existing WWTPs are unlikely to be raised. Expansion of WWTPs in the County would require a corresponding reduction in pollutant concentration. Existing WWTPs in the Catoctin Creek watershed are located in and near Myersville, Jefferson, and also includes the two WWTPs in Middletown and the County WWTP that serves the Fountaindale subdivision. In the future, the majority of new or expanded wastewater treatment plants in the County will need to employ additional filtration and nitrification/denitrification to meet stricter MDE discharge permits. This requirement protects downstream water users and serves to protect the Chesapeake Bay.

Water Quality Regulatory Framework

As an active participant in implementation of the 2000 Chesapeake Bay Agreement, the State of Maryland has agreed to reduce its nitrogen and phosphorus (nutrient) contributions to the Bay by a specific number of pounds to improve water quality conditions in the Bay. To date, Maryland has made significant progress through upgrades of major wastewater treatment plants. In addition to plant upgrades, Maryland has set nutrient caps on wastewater treatment plants through a point source tributary strategy. New or expanded discharges must meet these permitted limitations.

Point sources are required to obtain a National Pollutant Discharge Elimination System (NPDES) discharge permit from MDE in accordance with federal and state law. The permit specifies the allowable ranges for chemical, physical and biological parameters of discharge. Permits are issued on a five-year planning horizon and set discharge limits for WWTPs.

To meet the rigorous water quality goals of the Chesapeake Bay Agreement, Maryland has set up the Bay Restoration Fund, a dedicated fund financed by individual households and businesses served by community sewerage systems and individuals utilizing septic systems. Funds generated by this fee are used to upgrade wastewater treatment plants in Maryland as well as for cover crop plantings on Maryland farms to absorb excess nutrients.

Wastewater Treatment Capacity and Demand

There are two Town owned and operated waste water treatment plants serving sewer discharges within the Town of Middletown corporate boundaries. There are no grandfathered septic systems located with the town. Irrigation is implemented on the Hollow Creek Golf Course with treated water from the East Wastewater Treatment Plant. See Figure 7-3, Sewer Service Map.

Middletown's East and West treatment plants have a combined treatment capacity of 600,000 gpd. The average flow demand to the systems in 2008 was 0.381 mgd which includes demand caused by Inflow & Infiltration (I&I), and is projected to increase to 0.833[8] mgd by 2030 with ultimate demand at plan build-out at 0.850 mgd. Both treatment plants dispose of treated effluent to the Catoctin Creek watershed; the East WWTP discharges to Hollow Creek south of Town and the West WWTP discharges directly to Catoctin Creek west of Town. The sewerage system also includes three (3) sewage pumping stations and a network of 8 inch to 12 inch. sewer lines. A maximum of 21.1 mgd/year of effluent from the East WWTP can be diverted to the Hollow Creek Golf Course for irrigation via MDE permit #04-DP-3480, with a maximum daily amount not to exceed 200,000 gallons per day.

Table 7-3: Permitted Discharges and Avg/Max Flows

Facility	Receiving Stream	Design Capacity (gpd)	Permit Capacity (gpd)	2008 Avg Flow (gpd)	Net Available Capacity from Avg Flow (gpd)
Town of Middletown (East)	Hollow Creek	350,000	250,000	175,760	74,240
Town of Middletown (West)	Catoctin Creek	250,000	250,000	204,790	45,210

Source: Maryland Department of the Environment and Middletown staff, 2009.

[8] According to the Water Resources Plan for Frederick County, MD 2009.

Approximately one third of the Town's wastewater flows by gravity directly to the West WWTP. From Broad Street east, however, the wastewater flows to the Cone Branch pumping station located on Cone Branch between Old Middletown and Holter Roads which it lifts the wastewater to a manhole on Holter Road and conveys it to either WWTP. Another pump station in Brookridge South conveys all wastewater from the Brookridge South subdivision to the West WWTP. Wastewater from the Foxfield Active Adult community along with Ashky and Ari Court and the lower portion of Layla Drive flow by gravity to the Foxfield pump station and are conveyed back into the Cone Branch drainage basin. All pumping stations have more than enough capacity to serve existing and future development through 2030.

The West WWTP was constructed in 1976 and has a design capacity of 250,000 gpd. Average daily flow in 2008 was 180,000 gpd. The East WWTP was constructed in 2000 and has a design capacity of 350,000 gpd. However it is only permitted to discharge 250,000 gpd. Average daily flow to the plant in 2008 was 160,000 gpd. The additional capacity of 100,000 gpd could accommodate up to 400 edus. The plant was designed so that it can be expanded up to 700,000 gpd, subject to permit requirements. Construction of new aeration tanks and clarifiers would be required. See Figures 8-2 and 8-3 in the Municipal Growth Element of this Plan for additional information from the 2009 Middletown Wastewater Capacity Management Plan.

The estimated 2008 population of Middletown is 4,198 and there are 1,515 sewer service customers. While Middletown is capable of providing wastewater service to its current population, expansion and upgrades will be required to meet its 2030 demand.

Major Wastewater Issues

Inflow and Infiltration

Inflow and infiltration (I & I) to community wastewater systems pose major challenges to local jurisdictions. Inflow of stormwater through sump pumps and into sewer pipes and infiltration of groundwater through leaky pipes introduce large amounts of clean water to the wastewater system causing overflows and an increase in the amount of water to be treated. These conditions can cause overflow where raw sewage bypasses the treatment facility and is discharged directly into a stream. Wastewater system overflows places public health at risk and violates state and federal water quality regulations.

Following an extensive project in 1992-1993, and then again in 1997 and 2002, I & I was substantially reduced in the Town's sewage collection system. The Town conducts I & I studies and corrective construction on a 5-year rotating basis. The Town has identified additional I & I work over the next 10-20 years in the Capital Improvements Program budget.

Water Quality

Frederick County's major streams, including Catoctin Creek, have limited assimilative capacity for pollution. TMDL's are forthcoming, which will set waste load allocations to

meet local water quality standards. Since TMDL's have not yet been set, it is not possible to discuss the suitability of the Catoctin Creek as a receiving water given the lack of information at this time. Permitted point source pollutant load limits (from WWTPs) have been reached on Catoctin Creek and are unlikely to be raised.

Public Investment
Public sewer systems will require major investments in new treatment technologies, such as ENR (enhanced nutrient reduction), and infrastructure in order to meet future demand and nutrient caps on wastewater discharge.

Implementation – Wastewater Assessment

To achieve water resources goals related to the **wastewater assessment**, four policies and two action items have been identified. Completion of the action items and adherence to the policy statements will be monitored regularly by the Town through review and update of the Water Resources Element, a component of the Middletown Comprehensive Plan.

Wastewater Policies

1. Stage new real estate development according to the availability and adequacy of wastewater service.
2. Enhance its residential, commercial and industrial water conservation measures in order to reduce inflow to the wastewater treatment facilities.
3. Reduce inflow and infiltration into the wastewater collection system.
4. Reduce point source pollution that results from wastewater disposal.

Wastewater Action Items

1. Complete additional I & I work over the next 10-20 years in the Capital Improvements Program budget.
2. Develop effective disposal of sludge removal.
3. Apply for increase in permit for East Wastewater Treatment Plant in 2013.

MANAGING STORMWATER AND NON-POINT SOURCE POLLUTION

The use of land for development, industry, transportation and agriculture contributes non-point source pollution to our streams and watersheds. Land disturbance and conversion tend to exacerbate impacts, while forests, ground vegetation and wetlands maintain or improve watershed health and function. The Town's land use plan has an opportunity to mitigate non-point source pollution through concentration of growth in appropriate areas and the use of best management practices.

This section of the Water Resources Element provides a programmatic assessment of the County's Stormwater Management Program and discusses the impact of the Town's land use plan on impervious cover and non-point source loads to local streams and watersheds. It concludes with a list of policies and action items for future implementation.

Non-point Source Pollution

Non-point source pollution is transported to surface and groundwater as a result of storm events. Stormwater transports sediment, nutrients, fertilizers, bacteria, heat, salt, oil, grease and other contaminants to local streams and water bodies. On naturally vegetated (forests, meadows) and agricultural lands, stormwater permeates the soil and many pollutants are captured and filtered. Healthy streamside buffers and forest stands are particularly effective in this function. In developed areas, where much of the landscape is impervious (rooftops, driveways, parking lots, compacted or clay soils, and roads) direct groundwater recharge is impeded and the volume of stormwater runoff to neighboring areas increases.

Non-point source pollution is detrimental to water quality and wildlife habitat and in our region its cumulative impacts are degrading the watershed and Chesapeake Bay. Since land use conditions affect the amount and extent of non-point source pollution, future development patterns must take into account their potential impact in order to protect the Chesapeake Bay watershed resource. The following section includes analyses aimed at connecting land use planning with non-point source pollution. The first is an assessment of Middletown's current levels of impervious cover; the second presents the potential nutrient pollution (a form of non-point source pollution) that could result from ultimate build-out of the County's land use plan. At this time, the Town does not have any numbers on stormwater management in terms of discharges. In subsequent revisions of this Water Resources Element, the Town hopes to provide information directly pertaining to the Town of Middletown.

Impervious Cover

Overall watershed imperviousness has been linked to a wide range of negative impacts to stream hydrology, stream morphology, biological habitat, and water quality. Research reveals that when impervious cover within a watershed exceeds about 10 percent, sensitive stream elements are lost. In cold-water regions supporting native brook trout reproduction, impervious cover of greater than 1 percent results in the loss of brook trout population. Once impervious cover reaches 25 to 30 percent, studies show that most indicators of stream quality shift to a poor condition as a result of severe impacts from erosion, channel instability, severe habitat degradation and decreasing biological integrity.

The County's land use plan map (compiled, 1997-2008) was analyzed to determine which watersheds were reaching or exceeding the 10% and 25% thresholds. For each of the County's twenty watersheds, the total acreage in each land use plan designation was captured and was applied a rate of impervious cover. As an example, the total acres of

Low Density Residential land use were applied a 14% impervious cover rate while 72% impervious cover rate was applied to total acres of General Commercial land use. These rates were provided by MDE.

In the Middletown area, Catoctin Creek had an estimated percent impervious cover of 3.7%. As expected, developed watersheds in the County, such as Carroll Creek and Ballenger Creek, which include the City of Frederick, had the greatest level of impervious cover at 26.5% and 18.3% respectively. More than half of the County's watersheds (11) had imperviousness cover less than 5% and efforts should be made to maintain these low values through the local land use planning process. Within the Middletown town limits, the impervious area percentage is 22% with the greatest impervious surfaces coming from roads and buildings. The impervious areas used for the calculation included sidewalks, buildings, driveways, parking lots and roads.

Nutrient pollution

Excessive amounts of nutrients, particularly nitrogen and phosphorus, are the main cause of the Chesapeake Bay's poor health.[9] Nutrient pollution leads to algal growth and oxygen depletion, which create an uninhabitable environment for most aquatic life. Similar to the impervious cover analysis, the County's land use plan map was evaluated to determine its impact of land use on nitrogen and phosphorous pollution.

The methodology was provided by MDE and incorporated loading rates by land use category derived from the Chesapeake Bay Program Watershed Model (Phase 4.3) for the Potomac River basin. In the comparison of its land use plan data with the MDP land use data for the non-point source loading analysis, only land uses greater than 10 acres in size were identified. Summary results for nitrogen and phosphorus loads are provided in the tables below.

Table 7-4
NITROGEN LOADING SUMMARY

Land Use/Cover	Current (lbs/year)	Future (lbs/year)	Change (lbs/year)
Development	428,918	1,055,798	626,880
Agriculture	2,520,798	2,088,181	-432,616
Forest	292,832	176,298	-116,534
Water	23,433	18,802	-4,631
Other	70,286	188,985	118,699
Total Terrestrial Load	**3,336,267**	**3,528,065**	**191,798**
Residential Septic (edus)	485,802	615,231	129,428
Non-residential Septic (edus)	18,439	21,395	2,956
Total Septic Load	**504,242**	**636,626**	**132,384**
Total NPS Nitrogen Load	**3,840,509**	**4,164,691**	**324,182**

[9] 2008. Chesapeake Bay Program web site. http://www.chesapeakebay.net/nutrients. "Nutrients".

Table 7-5
PHOSPHORUS LOADING SUMMARY

Land Use/Cover	Current (lbs/year)	Future (lbs/year)	Change (lbs/year)
Development	38,062	96,618	58,556
Agriculture	260,301	211,802	-48,499
Forest	3,211	1,933	-1,278
Water	1,625	1,304	-321
Other	6,407	17,319	10,912
Total NPS Phosphorus Load	**309,606**	**328,976**	**19,370**

Frederick County's Stormwater Management Program

Frederick County first adopted stormwater management (SWM) regulations in 1984 and maintains its current program in accordance with Environmental Article, Title 4, Subtitle 2 of the Annotated Code of Maryland. The purpose of the County's program is to protect and maintain the public health, safety, and general welfare by establishing minimum requirements and procedures to control and minimize the impacts associated with increased stormwater runoff. Proper management of stormwater runoff minimizes damage to public and private property, controls stream channel erosion, reduces local flooding, and maintains after development, as nearly as possible, the predevelopment runoff characteristics. The Town adopted the County's Stormwater Management and Sediment and Erosion ordinances and authorizes Frederick County to administer within the Town.

The County implemented the policies, practices, principles, and methods of the *2000 Maryland Stormwater Design Manual* through the County's Stormwater Management Ordinance and its Design Manual in 2001. The Board of County Commissioners adopted the County's *Storm Drainage and Stormwater Management Design Manual* in 2003, which has since been updated in 2009.

The County continues to work with the real estate development community to implement the goals of the *2000 Maryland Stormwater Design Manual*. Enhancements will continue to be made as the manual is updated to comply with the MDE Stormwater Management Act of 2007. The County will also continue to educate both the real estate development community and the general public in ways to determine the proper type of design for site-specific areas, as well as in facility installation timetables and maintenance issues. County staff will continue to work to address stormwater management earlier in the process to achieve the best product at the end of the process.

Watershed Restoration Efforts

Frederick County approaches watershed restoration through new stormwater management ponds, stormwater management pond retrofits, Low Impact Development (LID), stream restoration/bank stabilization, and buffer enhancement. These approaches include a myriad of techniques. For example, LID techniques include rain gardens, bio-filtration swales, and tree boxes.

Here in Middletown, watershed restoration projects have included stream buffer protection, stream bank restoration and rain gardens. For the past three years, Middletown, through a partnership with the Interstate Commission on the Potomac River Basin (ICPRB) and the Chesapeake Bay Trust, has received grants for the purchase of rain barrels at a reduced cost to its residents. The rain barrel program has been very successful and well received by the town's residents.

Many opportunities exist to educate citizens and business owners that water is a limited natural resource fundamental to healthy, sustainable communities, both human and biological. Water conservation, low impact development, water reuse, and the reduction of water use during summer months are examples of tools the Town can promote to maintain the quality and quantity of the resource and ensure it is available for our diverse needs.

Implementation – Managing Stormwater and Non-point Source Pollution

To achieve water resources goals related to **managing stormwater and non-point source pollution,** six policies and seven action items have been identified. Completion of the action items and adherence to the policy statements will be monitored regularly by the Town through review and update of the Water Resources Element, a component of the Town's Comprehensive Plan.

Stormwater Policies

1. Encourage innovative technologies for stormwater management.
2. Promote coordinated planning between agencies responsible for drinking water, wastewater, and stormwater management.
3. Require the protection of groundwater quality in the approval of residential and non-residential development.
4. Minimize impervious cover within residential and non-residential development in order to reduce stormwater runoff.
5. Integrate watershed planning and management in the comprehensive planning process.
6. Encourage and support research on and monitoring of local ground water conditions, aquifer recharge, watersheds and streams.

Stormwater Action Items

1. Incorporate the use of non-structural best management practices (BMPs) (vegetated swales, rain gardens, and bio-retention) with maintenance and monitoring agreements.
2. Reduce regulatory barriers to implementation of low impact development measures and create incentives to facilitate their use where appropriate.
3. Showcase examples of low impact development and environmental site design techniques to increase public awareness of BMPs.
4. Recommend development guidelines and BMPs that minimize development's impact on watersheds and water resources.
5. Build the environmental dataset in the Town's Geographic Information System and utilize during the development review process.
6. Develop a water-resources-based GIS database to review in regard to development plans and proposals.
7. Continue to engage the public in watershed conservation and promote a stewardship ethic.