~~Water Resources Element~~ Overview

The ~~City of Frederick's 2010 Comprehensive Plan over-arching goals includes:~~

- ~~Promote the redevelopment of lands with existing infrastructure and public services while supporting the maintenance and rehabilitation of existing residential, commercial, and industrial structures~~

~~Encourage land uses, densities and regulations that promote efficient development patterns and relatively low municipal, state governmental and utility costs.~~

- ~~Ensure that~~ ~~existing infrastructure (water, sewer, parks, roads, etc.) and services (police, code enforcement, recreation, etc.) are properly maintained and utilized to maximize the cost benefit of the service.~~

~~More specific the~~ goals of the Water Resource ~~Element~~Chapter are listed below:

- ~~Protect water supply from pollution and encroachment.~~
- ~~Provide an adequate and safe drinking water supply to serve the existing and future residents of the City of Frederick.~~
- ~~Provide an adequate capacity of wastewater treatment with effluent meeting all necessary regulatory requirements for existing and future residents of the City.~~
- ~~Take steps to restore and protect water quality and contribute toward meeting the water quality regulatory requirements. This will require addressing current water quality impacts as well as future impacts from land development and population growth.~~
- ~~Protect the habitat value of the County's rivers and streams.~~

- PROTECT THE WATER SUPPLY FROM POLLUTION AND ENCROACHMENT.
- PROVIDE AN ADEQUATE AND SAFE DRINKING WATER SUPPLY TO SERVE THE EXISTING AND FUTURE RESIDENTS OF THE CITY OF FREDERICK.
- PROVIDE AN ADEQUATE CAPACITY OF WASTEWATER TREATMENT WITH EFFLUENT MEETING ALL NECESSARY REGULATORY REQUIREMENTS FOR EXISTING AND FUTURE RESIDENTS OF THE CITY.
- TAKE STEPS TO RESTORE AND PROTECT WATER QUALITY AND CONTRIBUTE TOWARD MEETING THE WATER QUALITY REGULATORY REQUIREMENTS. THIS WILL REQUIRE ADDRESSING CURRENT WATER QUALITY IMPACTS AS WELL AS FUTURE IMPACTS FROM LAND DEVELOPMENT AND POPULATION GROWTH.
- PROTECT THE HABITAT VALUE OF THE LOCAL AND REGIONAL RIVERS AND STREAMS.
- EFFICIENTLY USE PUBLIC DOLLARS FOR INFRASTRUCTURE THAT ENSURES SUSTAINABLE, SAFE AND ADEQUATE SUPPLY OF WATER FOR ALL RESIDENTS.

[insert language above as bumpout]

The City is committed to ensuring water and wastewater (sewer) capacity for both existing and new developments~~. The~~ and minimizing the negative impacts of stormwater runoff. In 2002, the City established ~~in 2002~~ the Water and Sewer Allocation System ~~(Section 742 of the Land Management Code)~~ to make certain that adequate treatment capacity for potable water and wastewater is in place for new growth prior to approval ~~of same.~~ . In 2012, Ordinance G-12-13 was adopted which updated the allocation process and combined with it the Impact Fees payable for water and sewer service.

The City adopted an Adequate Public Facilities Ordinance (APFO) ~~which~~in 2007 that allows development to proceed only after it has been demonstrated that sufficient infrastructure exists or will be created in the water and wastewater systems. ~~Section 602~~In addition, Chapter 4 of the ~~LMC~~City Code establishes the criteria and process for the City's APFO, which not only regulates water and wastewater~~,~~ but also roads and schools.

In 2019, after 10 years of implementation, the City began reviewing the APFO process to ensure its intent to consistently manage development is intact. Among the revisions, the capacity of water and wastewater treatment facilities has been removed to the time of allocation at building permit approval. The reason was to allow capacity management review later in the process so that it was easier to predict.

With an allocation process in place, the City has a reliable and ~~predicable~~predictable growth rate, which ~~is expected to increase by 700~~historically has been 440 dwelling units each year. The City currently has about ~~4,000~~7,700 dwelling units in the pipeline. ~~-~~These units have some type of approval (~~PND, Preliminary Subdivision~~master plan, preliminary plat or site plan) from the Planning Commission. ~~The~~Historically, the majority of ~~the~~ growth ~~is expected to occur~~has occurred in newly annexed areas; however a goal of this plan is to encourage development in strategic areas within the City's current jurisdictional boundary.

~~-~~The ~~City of Frederick prepared a municipal growth element (MGE) that compared~~Municipal Growth Chapter compares population and housing projections against the ability to provide adequate and safe services such as sources of water supply and wastewater treatment.

To decide upon an appropriate land use plan, the City ~~of Frederick~~ used a growth model to conduct a series of analyses based on the tenets mentioned above, historical growth trends, and natural resource limitations, and focused on the ~~eight~~ Maryland Planning Visions Law of ~~the State Planning Act of 1992.~~ 2009.

The City ~~of Frederick~~ has historically been the growth center for Frederick County and it is anticipated that this trend will continue. ~~-~~The land~~-~~use policy of the City supports this trend by concentrating capital improvement projects and maximizing the use of ~~the~~ existing infrastructure.

Land Use Pattern

Growth within the City ~~of Frederick~~, as detailed ~~in the land use & economic development elements~~throughout this plan, is expected to occur through development or redevelopment

within the current City boundary and the Potomac River Water Service Agreement (PRWSA) area. ~~The~~Per Washington Council of Governments, the City's population is projected to increase by ~~22,000 with 9,185~~17,454 new residents and 8,213 new households~~, being constructed~~ between ~~2009~~2018 and 2030~~.~~, an average annual population growth rate of 1.8%. Looking to 2045, it is expected that the City's population growth rate will slow to 0.3%, adding just 3,500 new residents and 1,500 new households between 2030 and 2045. The emphasis ~~in~~of the land use plan is on creating community spaces appropriate to the desired character of an area or neighborhood. ~~-~~This is coupled with efforts to improve environmental conditions with a variety of environmentally~~-~~-friendly policies for site and building design as noted in the environmental ~~element~~chapter of this comprehensive plan.

Inter-jurisdictional Cooperation

~~The City of Frederick's Public Works, Engineering and Planning Departments completed Frederick County's Municipal Survey and Municipal Data Spreadsheets. The City and County have had several joint meetings to work through the complex issues of water supply and wastewater treatment in the community.~~

~~The~~ ~~top three issues facing the City of Frederick as related to the County's Municipal Survey include:~~

- ~~Reliable quantities of water supply and wastewater treatment.~~
- ~~Lack of available public water supply and wastewater services.~~
- ~~Potential expansion of public water supply and wastewater services.~~

In 2006, the City entered into the Potomac River Water Supply Agreement (PRWSA) with Frederick County~~,~~ to secure additional potable water supply ~~(see discussion below).~~ . This is one of the fundamental documents that will help determine the amount of water that will be available to the City in the future. The quantitative attachment to the agreement, Exhibit 4, is updated annually to ensure current and future demands do not exceed capacity levels.

It is important to note that the assumptions that are used to calculate the available water supply is conservative to ensure demands to do not exceed the capacity levels. With improvements to technology, such as low flow devises, leak detection and education, water usage has not been as significant as anticipated nationwide.

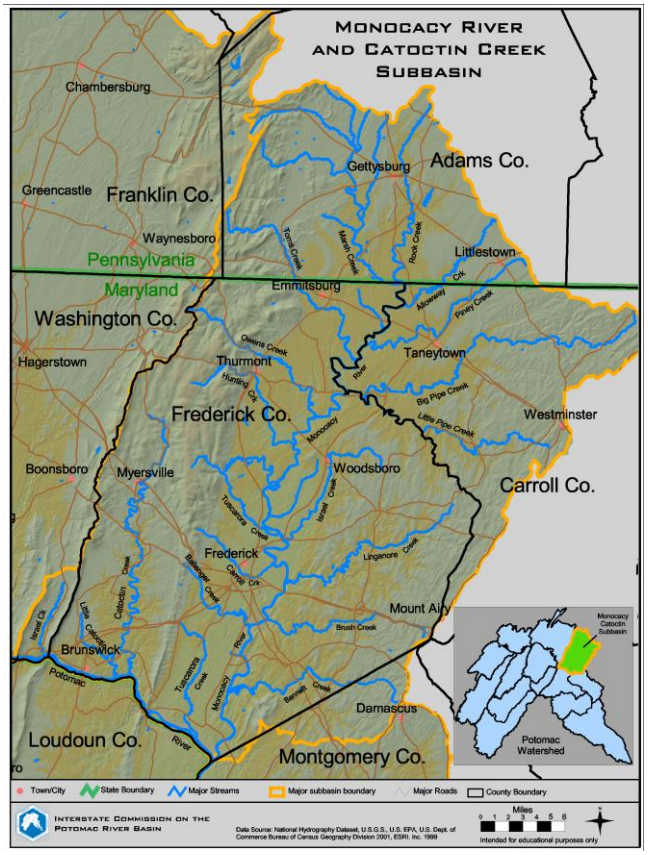
In 2010 the City and County had several meetings to work through the complex issues of water supply and wastewater treatment in the community. At that time, the top three issues identified as facing the City, as related to the County's Municipal Survey, were:

- Reliable quantities of water supply and wastewater treatment.

- Lack of available public water supply and wastewater services.
- Potential expansion of public water supply and wastewater services.

The City and County also have a joint capacity sharing agreement for wastewater treatment. With the Central Frederick Service Area Agreement (CFSSAA 2014), the City has procured 1.36 MGD (million gallons per day) of sewer treatment capacity at the County's Ballenger~~/~~ McKinney ~~Waste Water~~Wastewater Treatment Plant~~. With this agreement, the City secured 1.028 MGD of wastewater treatment capacity from the County. Discussions regarding~~ (WWTP) with the option to add 0.51 MGD when the plant is expanded in the future ~~treatment capacity and other wastewater-related issues are currently ongoing between the City and County.~~. The County is in the process of constructing a pumping station and force main to divert the flow of northern sewer customers around the City's WWTP and into the County's Monocacy Interceptor. Once online, this pump station will provide an additional 2.0 MGD of capacity at the City Gas House Pike WWTP.

Watersheds



The City ~~of Frederick is within the Upper Potomac Basin and~~ is comprised of two watersheds~~. The~~, the Lower Monocacy River watershed and the Upper Monocacy River ~~Watersheds~~watershed. The two comprise 350,724 acres~~. The~~ and drain to the Upper Potomac watershed and ultimately, the Chesapeake Bay. The breakdown of the land use in the two Monocacy River watersheds can be reviewed in the table below. ~~All three watersheds drain into the Potomac Basin and ultimately into the Chesapeake Bay.~~

~~The~~Also shown in Table WRE-1 are City sub-watersheds identified in a 2016 study performed by Straughan Environmental: the Tuscarora Creek watershed, which drains to the Upper Monocacy, and the Carroll Creek and Rock Creek watersheds, which drain to the Lower Monocacy.

The Upper and Lower Monocacy River ~~Watersheds~~watersheds extend over 80~~ percent~~% of Frederick County and into Pennsylvania. ~~—~~These combined watersheds extend from Gettysburg to the ~~North,~~north, the Catoctin Mountains to the ~~West,~~west, the Potomac River to the ~~South~~south and Westminster to the ~~East.~~ east. The only area of Frederick County that does not drain into the Monocacy ~~Watershed~~ River watershed is the area to the west that drains into the Catoctin Creek ~~Watershed.~~ watershed.

The City~~ of Frederick~~ is one of many municipalities that are within ~~this watershed.~~ these watersheds. The other municipalities that drain into these watersheds include~~:~~ Lewistown~~,~~;

Thurmont~~,~~; Emmitsburg~~,~~; Taneytown~~,~~; Gettysburg ~~PA~~, Pennsylvania, and Littlestown ~~PA.~~, Pennsylvania.

[INSERT WATERSHED MAP]

[INSERT TABLE WRE-1]

Table WRE-1
Watershed Characteristics

~~**Table WRE – 1 Watershed Characteristics**~~

Watershed	**Sub-watersheds***	**Urban Acres**	**Agricultural Acres**	**Forest Acres**	**~~Wetlands~~Wetland Acres**	**Barren Acres**	**~~Totals~~ Total Acres**	**Impe**
Upper Monocacy		9,500	89,910	56,917	0	0	156,327	-
	Tuscarora Creek	36.49%	43.36%	19.53%	-	-	12,000	11%
Lower Monocacy		28,746	115,420	~~50,060~~106,977	33	138	194,397	-
	Carroll Creek	63.49%	26.92%	7.67%	-	-	15,000	26%
	Rock Creek	60.09%	12.77%	24.57%	-	-	2,900	24%
Totals		38,246	205,330	106,977	33	138	350,~~724~~24	

~~Source: Maryland Department of Natural Resources~~

~~These combined watersheds have seen a reduction of 0.20 acres of wetlands from 1991 to 1994. This reduction has been due in large part to wetlands mitigation.~~

*Sub-watersheds as identified in the Baseline Conditions Assessment Report for the Rock Creek, Carroll Creek and Tuscarora Creek prepared by Straughan Environmental, June, 2016.

The Monocacy watershed has a high prevalence of karst formations, which is concerning when planning for future growth and development. These karst formations are prone to developing sinkholes due to both natural causes and urban development activities and can provide a source for groundwater pollution from stormwater runoff in addition to other damaging effects.

As part of its watershed protection strategy, the City owns what is known as the Frederick Municipal Watershed outside of the municipal boundary to the northwest. This 7,000+ acre tract of land, which is the largest tract of public land in Frederick County, is jointly maintained with the Maryland Department of Natural Resources and serves as protection for the Fishing Creek Reservoir watershed.

[INSERT MUNICIPAL FOREST MAP]

As with any other basin, the Monocacy River ~~Basin~~basin is subject not only to the discharge from the City ~~of Frederick~~ and Frederick County, but also from ~~source~~sources upstream. While the City, County, and State work to improve water quality, it will take a regional effort to improve the Monocacy River, Potomac River and the Chesapeake Bay.

Water Treatment Capacity

The City ~~of Frederick~~ receives ~~it~~its raw water from ~~5~~four available sources: Lake Linganore, the Monocacy River, the Fishing Creek Reservoir, ~~3 wells~~ and the Potomac River.

~~**Table WRE – 2 Potable Water Capacity**~~

~~Source/Plant~~	~~Treated Water Capacity, MGD[1]~~	~~Safe Yield, MGD~~
~~Linganore~~	~~6.00~~	~~6.00~~
~~Monocacy~~	~~3.00~~	~~2.00[2]~~
~~Lester Dingle~~	~~1.70~~	~~0.89~~
~~Wells # 3, 4, & 7~~	~~0.68~~	~~0.68~~
~~Potomac River (2008)~~	~~1.50~~	~~2.40[3]~~
~~SUBTOTAL~~	~~12.88~~	~~11.97~~
~~Potomac River (by 2015)~~	~~3.50~~	~~5.60[3]~~ ~~(less 2.0 Monocacy)[2]~~
~~Potomac River (after 2015)~~	~~2.50~~	~~4.0~~
~~TOTAL~~	~~18.88~~	~~19.57~~

~~[1] Capacity values shown are for Average Daily Demand (ADD).~~
~~[2] Permitted under MDE Consent Order until PRWSA amount gained. Safe yield will then = 0.~~
~~[3] Potomac River Safe Yield value = Max Day delivered amount.~~

[INSERT TABLE WRE-2]

Table WRE-2

Potable Water Capacity

Source/Plant	Treated Water Capacity, MGD[1]	Safe Yield, MGD
Linganore	6.00	6.00
Monocacy	3.00	0
Lester Dingle	1.70	0.89
Potomac River , Current	5.00	8.0[2]
Subtotal	15.70	14.89
Potomac River, Future	2.50	4.00
Total	18.20	18.89

[1]Capacity values shown are for Average Daily Demand (ADD)

[2] Potomac River Safe Yield value equals Max Day dilvered amount

The City operates three ~~(3)~~ water treatment plants ~~which~~that provide potable drinking water for residents of the City. The Linganore and the L.R. Dingle (Fishing Creek) treatment plants have a combined allocable capacity of 6.89 MGD. The Monocacy River Water Treatment Plant can produce up to 3.0 MGD, but has a flow-by requirement and therefore, cannot be ~~a~~ guaranteed as a reliable source of water supply~~.~~ and, as such, is not allocable.

The water capacity for the City was further enhanced with the ~~Potomac River Water Service Agreement (PRWSA)~~PRWSA, which was signed March 16, 2006. ~~-~~Through the PRWSA, the County provides to the City, and the City pays for, 5.0 MGD ADD[1] ~~(~~ (Average Daily Demand) and 8.0 MGD MDD[2] (Maximum Daily Demand, equal to 1.6 times the ADD) of potable water for projected needs ~~through~~. In the ~~year 2015. After 2015~~future, the agreement may be ~~re-evaluated~~reevaluated for an additional amount of potable water ~~3~~of up to 2.5 MGD ADD (4.0 MGD MDD). The additional amount of water required from the Potomac River will be ~~dependant~~dependent upon projected build-out needs ~~beyond 2015~~ and available capacity at the time of re-evaluation. At that time, the City will have ~~an available safe yield~~a potential capacity of ~~12.23~~11.806 MGD ADD (~~19.57~~18.89 MGD MDD).

~~-~~Since the adoption of the PRWSA, the City has been taking steps to decommission wells that once contributed to the available water capacity. As the City moves through the permitting process to cancel withdrawal from the wells, the current Wellhead Protection Overlay (WHO) should be reviewed to streamline appropriate development proposals while ensuring surface and groundwater protection as well as stormwater management is accomplished through the proper regulatory measures.

Wastewater Treatment Capacity

~~[1] ADD is the Average Daily Demand~~

~~[2] MDD is the Maximum Daily Demand = 1.6 times the ADD~~

The City ~~of Frederick~~ operates a wastewater treatment plant (WWTP) with a rated capacity of 8.0 MGD on Gas House Pike (GHP) at the confluence of Carroll Creek and the Monocacy River. The plant presently serves an estimated population of ~~62,000~~72,146 people and receives an average of ~~8.5~~9.0 MGD at the ~~"~~headworks~~", that is~~, the point of receiving ~~water supply~~wastewater flow.

Through an agreement ~~struck~~reached in 1990 with Frederick County, the City provides preliminary treatment for approximately 2.3 MGD of wastewater that is collected within the County's sewer system to the north and transfers it to the County's Ballenger/McKinney WWTP via the Monocacy Interceptor ~~(MI).~~. This basin includes ~~City-resident~~ County sewer customers within the City and other County customers. ~~The City also uses up to 300,000 gpd of treated wastewater for irrigation at the municipal golf course from March 1 through November 30 (no flow is allowed from Dec 1 – Feb 28).~~ The remainder, approximately 6.~~5~~9 MGD, is treated and discharged into the Monocacy River south of Carroll Creek as permitted by the Maryland Department of the Environment (MDE~~.~~).

~~The City is currently evaluating the average plant flows, peak flows and future demands, as well as the feasibility of expanding the capacity of the GHP WWTP versus investing in capacity through the County's Ballenger/McKinney plant (B/M). An upgrade is planned~~An upgrade has been completed for treatment improvements for GHP to meet the requirements of the Enhanced Nutrient Removal (ENR) regulations as mandated by the ~~Maryland Department of the Environment (MDE). Construction of this project is anticipated to begin in early 2010 and be completed by the end of 2011 or early 2012.~~ MDE. The treatment capacity, however, will remain at 8.0 MGD.

~~In conjunction with the improvements, the City is studying the feasibility of upsizing certain components of the plant and the interceptor to handle peak flows and future demands. In specific, the headworks and the County transfer infrastructure, along with the sizing and configuration of the interceptor (versus a parallel interceptor) is under consideration. The City must also work to control peak flows by the reduction of inflow and infiltration (I&I) into the sewer piping system, thereby reducing the need for treatment capacity.~~

~~One option being discussed is~~As mentioned above, the recent CFSSAA has provided for the transfer of all present and future City-resident customers in the sewer basin to the north over to the jurisdiction of Frederick County's Department of Utilities and Solid Waste Management (DUSWM) for service, conveyance, and treatment at ~~B/M~~the Ballenger/McKinney WWTP. ~~If~~When the conveyance of the wastewater ~~could be made~~becomes independent of ~~the~~ GHP ~~WWTP~~, the City ~~would~~will realize an immediate increase in available capacity at the headworks, thereby avoiding costly upgrades. ~~The Monocacy Interceptor, however, would still require sizing and configuration changes and most likely an independent pumping station will be required.~~ The City must continue to work to control peak flows by the reduction of inflow and infiltration (I&I) into the sewer piping system, thereby reducing the need for treatment capacity.

~~A possible, although somewhat dubious, alternative is for the City to construct a new wastewater treatment plant upstream of the pipeline in question to provide for the anticipated capacity needs. This alternative, which could be located near Biggs Ford~~

~~Road and service the projected growth area north of the City along US 15, would provide for an incremental increase in river flow-by rates six miles downstream at the water treatment plants of both the City and Fort Detrick. However, construction and on-going operation and maintenance costs would likely be high and permitting and land acquisition may be very difficult.~~

Stormwater Management ~~Assessment~~

FACILITIES~~:~~

The City is served by storm sewers for the collection of ~~increases in~~ stormwater runoff from impervious surfaces. The urban ~~areas~~areas' stormwater runoff discharges into buffers, streams, creeks, and rivers. ~~–~~Retention~~/~~ and detention facilities are integrated with the City's drainage system. ~~Facilities are~~ This infrastructure is required to be maintained~~, after large storm events~~ by the private property owner and inspected ~~biannually~~by the City triennially per a schedule and after large storm events.

~~Development~~The development of impervious ~~(ie. rooftops and parking lots)~~surfaces increases the amount of pollutants discharged to the environment. This occurs through the buildup of these pollutants on urban surface that is collected with runoff. In addition, the decrease of impervious areas reduces the opportunities for pollutants to be filtered prior to entering rivers and streams. Ideally, these pollutants are reduced by stormwater management (SWM) practices implemented at the time of site development. ~~-~~These SWM practices are designed and constructed in accordance with Best Management Practices (BMP) recommended and required by MDE and in accordance with the City's stormwater management ordinance.

~~The City participates~~However, many of the BMPs in the City were installed prior to current regulations and do not provide stormwater runoff water quality treatment, but instead focus solely on flood control.

As an operator of a small municipal separate storm sewer system (MS4), the City's stormwater discharge is permitted through the National Pollutant Discharge Elimination System (NPDES) phase II ~~permitting).~~ general permit. Small ~~municipalities~~MS4s are regulated under this permit ~~for coverage by~~ by the federal Environmental Protection Agency (EPA ~~or the~~) in order to comply with the Clean Water Act. Permits for small MS4s in Maryland ~~Department of the Environment,~~are facilitated by MDE's Water Management Administration (WMA). The City is required to implement the following ~~five~~six minimum control measures:

1. Public education and outreach;
2. Public participation and involvement;
3. Illicit discharge detection and elimination;

~~Construct~~4. Construction site runoff control; ~~post-construction runoff control; and~~

5. Post-construction runoff control; and
6. Provide pollution prevention/good housekeeping.

Implementation of these minimum control measures ~~foster's~~fosters the improvement of the quality of Maryland's streams, rivers, and the Chesapeake Bay through the continued improvement of stormwater management and erosion and sediment control programs; the ~~removal~~reduction of illicit discharges; and increased public education and outreach.

FLOOD RESILIENCY

Property owners within the City have experienced substantial flooding during larger storm events, such as the event that occurred in May 2018, when extensive damages occurred as a result of inadequate stormwater infrastructure. Much of the development within the areas of the City that were flooded occurred prior to the enactment of modern stormwater management regulations. Runoff generated from impervious surfaces during intense storm events has the potential to overwhelm existing infrastructure causing flooding resulting in loss of property and injury or death. In addition, during the May 2018 flood, several primary roadways were inaccessible due to flooding, which caused significant issues for first responders trying to assist those in need.

The City entered into an agreement in September 2018 with the United States Army Corps of Engineers (USACE) to provide assistance in completing a flood resiliency study for areas prone to stormwater and urban riverine flooding. This study will provide the City with a plan for reducing the risk of flooding to property owners and critical roadways. The four areas of study included Motter Avenue, Kline Avenue, Detrick Branch at North Market Street, and Tributary No. 6 to Carroll Creek at West Patrick Street.

[insert area maps and flood forecast diagrams]

As of the adoption of this Comprehensive Plan, the USACE has completed data gathering and modeling development and calibration for each area and have begun to identify likely causes of the flooding experienced during these major types of storm events. The City has not received the ultimate recommendations from the USACE and so has not been able to prioritize or estimate the funding to address these problems. Policies of this Plan promote using the data and recommendations of the study to strategically invest in the infrastructure and public outreach to prevent devastating damage in the future.

EROSION AND SEDIMENT CONTROL~~:~~

The Stormwater Management Act of 2007 was approved by the State of Maryland and became effective on October 1, 2007, and subsequent ~~Revisions~~revisions to the state law were adopted on May 4, 2009, in the Code of Maryland Regulations (COMR) for stormwater management. These changes apply to all new development and redevelopment projects that do not have final approval for erosion and sediment control and stormwater management plans by May 4, 2010. These newly revised sections require ~~environmental~~Environmental Site Design (ESD) to the maximum extent practicable. ESD practices generally collect and treat stormwater runoff in multiple localized BMPs, ~~preferable~~preferably non-structural practices, and treat for water quality prior to bypassing flows through downstream conveyance systems. More emphasis has

been placed on the treatment of runoff in smaller on-site BMPs and a reduction in post- development runoff characteristics to as closely as possible mimic predevelopment runoff characteristics. as closely as possible. Previously, facilities were designed for multiple sitessites' regional flood protection and quality management. These larger facilities incorporated a larger volume of water to be released at a rate equivalent to pre-developed rates. The larger facilities provided effective flood protection but more frequently washed pollutants downstream bypassing the water quality treatment. ThisFor that reason, the method of combining water quality facilities in flood protection facilities is now discouraged by MDE in exchange for smaller multiple non-structural BMPs.

[Insert bumpout: nonstructural BMP definition]

POINT AND NONPOINT SOURCE LOADING STATUS AND REMEDIATION:

The City of Frederick is workingcontinually works with Frederick County, the Maryland Department of Planning (MDP), and the Maryland Department of the Environment (MDE) to assess nonpoint source loading impacts of designated land uses and their associated land covers. That is Nonpoint source pollution that occursis created when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground watergroundwater.

Introduction

The introduction of sediment, nutrients, chemicals, and fertilizers into storm sewers and waterways is destructive to the biological balance of receiving streams and rivers. Stormwater management and Erosion Control Best Management Practices required by the City's ordinances address pollutants from new and redeveloped sites. There are several policies in this elementchapter that address the manormanner of reducing the impact of storm water run-offstormwater runoff on the environment.

In an effort to regulate pollutants with stormwater BMPs, the MDE requires afacilities to provide water quality volume for the treatment of stormwater runoff. The water quality volume is sized for the drainage area and the percent of impervious on the a site. covered by impervious surfaces. A functional best management practiceBMP is designed to remove 80% of the total suspended solids (TSS) and 40% of the total phosphorousphosphorus (TP) collected from stormwater runoff. These are small solid particles and minerals which remain in suspensionsuspension in water as a due to the motion of the water. This is a principleprincipal indicator of water quality.water quality. MDE also recognizes that a BMP facility must have longevity of service in order to be effective.

The quality of a watershedswatershed's streams and rivers deteriorate as impervious surfaces are built. The City isCurrently, approximately 45%35% of the City is covered by impervious todaysurfaces, according to a study performed by Dewberry in 2016, with additional impervious surfaces planned as in-fill, re-infill development, redevelopment, and expansiongreenfield development occur. While new development is required to meet stringent stormwater management requirements whichthat reduce or negate the potential harmful effects of impervious area on the environment to the maximum extent possible, existing development, which accounts for the majority of the impervious area in the City., is not. As part of the conditions of coverage under the NPDES Phase II permit, the City is required to provide

treatment for 20% of the currently untreated impervious area through retrofitting existing facilities or creating new facilities. Until the existing impervious areas in the City created prior to the adoption of the current era stormwater management regulations are ~~addressed for storm water management measures~~retrofitted to meet these regulations, the quality of the City's streams and rivers will not improve. In order to gain a better understanding of what areas of the City's watershed have been most impacted by impervious surfaces, the City ~~should make efforts~~has taken steps to ~~perform a complete~~ assess the environmental ~~assessment of its~~impacts on watersheds ~~(all portions which lie inside~~within the City limits~~).~~ . This assessment ~~could then~~will be used to prioritize degraded areas and establish Capital Improvement Projects to improve the City's waterways including stream restoration, buffer plantings, and stormwater management ~~retro-fits.~~ retrofits.

Water and Sewer Land Use Implications

The purpose of this section is to outline the estimated water and sewer service increases in both ~~to~~ capacity and cost~~,~~ due to future growth, including the possible addition of annexation areas.

As the ~~city~~City determines future water and sewer needs, along with ~~whether to annex additional lands~~the potential for annexation, the implications of each scenario need to be considered. These implications are summarized as follows:

TIERED GROWTH

The ~~2030~~ average ~~day~~daily water requirements for the ~~tiered growth area~~PRWSA at build-out will be an estimated 11.~~94~~11 MGD which is ~~19.10~~17.77 MGD for Max Day Demand. The safe yield capacity of ~~19.57~~18.89 MGD provides for this future need, but must be augmented from additional sources shortly thereafter. The most likely source of additional water supply at that time will be the purchase of potable water from the County system. ~~As projected within the~~The 2006 Water Master Plan~~,~~ conservatively projected that the Max Day Demand shortfall would occur in the year 2031. ~~This~~The next update to the WMP may determine that this eventuality ~~should be planned for well in advance of 2031.~~ will occur beyond 2035. The wastewater treatment requirement for the average daily flow ~~in 2030~~ for the ~~tiered growth~~PRWSA area at build-out is estimated to be ~~11.84~~12.05 MGD**.** This figure would exceed the ~~current~~ combined available capacity of the City's GHP WWTP (8.0 MGD~~) and~~), the purchased County WWTP capacity (1.~~028~~36 MGD), and the County's transfer (2.3 MGD) of ~~9.028~~11.66 MGD by ~~2.86 MGD. Additional wastewater~~0.39 MGD. Prior to build-out, an additional amount of sewer treatment capacity (up to 0.51 MGD) will ~~have to~~ be ~~obtained in the near future by one or more of~~ needed from the ~~following: a.) the purchase of more County~~County's WWTP ~~capacity at B/M; b.) separation of the City-County sewer-sheds as noted above with moderate system modifications; c.) expansion of the City GHP WWTP; or, d.) construction of a new WWTP upstream of the GHP WWTP.~~ . A reduction

of the amount of inflow and infiltration (I&I) into the sewer piping network will show a related and corresponding decrease in the need for treatment capacity.
The tiered growth opportunities can be served with the construction of infrastructure improvements found in the 2006 Water Master Plan ~~(currently under review)~~ and the upcoming Sewer Master Plan Update (the sewer portion of the plan is scheduled to be updated in the near future).
The tiered growth opportunity is predominantly within the PRWSA boundary. ~~-~~The tier 3 growth area, which is outside of the City's current Service Area (PRWSA), consists of property located to the north at Biggs Ford Road and to the east of the Monocacy River from Route 26 south to Interstate 70. ~~-~~The geographical location of these properties is such that utility service can most likely be provided with the addition of significant infrastructure improvements and ~~the fact that available~~additional treatment capacity ~~exists. .~~

~~Table WRE – 3 Projected Population and Households~~

	~~*POPULATION~~		~~*HOUSEHOLDS~~		~~Population Change~~	~~Household Change~~
	~~2010~~	~~2030~~	~~2010~~	~~2030~~		
~~City of Frederick~~	~~62,000~~	~~90,000~~	~~27,815~~	~~37,000~~	~~52.1%~~	~~44.3%~~

~~*2009 City Land Use Analysis estimations~~

~~Table WRE – 3 Projected Water Demand~~

	~~WATER DEMAND(1)~~		~~SEWER DEMAND(2)~~	
	~~2010~~	~~2030~~	~~2010~~	~~2030~~
~~City of Frederick~~	~~6.29 MGD~~	~~11.94 MGD~~	~~7.30 MGD~~	~~11.84 MGD~~

~~(1) Estimated. ADD, from 2006 Water Master Plan currently under review.~~
~~(2) Estimated. Includes City Basin and northern City-resident County Basin.~~

~~Capital Improvement Projects~~

~~Major capital improvement projects that address long range planning projections include:~~

- ~~Water Transmission and Distribution Improvements;~~
- ~~Water Storage Tanks~~
- ~~Fishing Creek Pipeline~~
- ~~Frederick County's New Design Water Plant Expansion~~
- ~~Water Loss Reduction Program~~
- ~~Sewer Master Plan Update~~
- ~~Gas House Pike WWTP ENR Upgrade and Improvements~~
- ~~Frederick County's Ballenger/McKinney WWTP~~
- ~~Inflow & Infiltration Reduction Program~~

[INSERT TABLE WRE-3] [INSERT TABLE WRE-4]

Drinking Water ~~Policy~~Policies & Implementation:

POLICY ~~WRE~~WR 1~~–~~

Protect and conserve the existing ~~Drinking Water Supply and Distribution Systems~~drinking water supply and distribution systems.

~~**Implementation**~~

IMPLEMENTATION

1. Increase efforts throughout the water system to promote wise use of water resources such as potable water with conservation efforts through education and systems designed to reward water conservation and wise use practices.

2. Continue to meet requirements for regulated discharge into waterways serving as, or tributary to, the public water supply. Work with Frederick County, the State of Maryland, and the State of Pennsylvania to work on regional issues such as point and non-point pollution, ~~withdraw~~withdrawal agreements, and environmental protection.

3. Control the amount of water unaccounted for in the water distribution system by locating and repairing leaks found in the Water Loss Reduction Program.

POLICY ~~WRE~~WR 2~~–~~

Provide an adequate and safe drinking water supply to serve the existing and future residents of the City ~~of Frederick~~.

~~**Implementation**~~

IMPLEMENTATION

1. Continue to ensure that development adheres to the requirements of the City's APFO and Water/Sewer Allocation program.

2. Continue to collaborate with Frederick County officials to provide for the future water capacity needs through negotiated purchase of drinking water per the re-evaluation of the Potomac River Water Supply Agreement~~.~~ (PRWSA).

~~Upon acceptance by the City Administration, follow~~3. Implement the recommendations contained within the ~~2009~~2006 Water Master Plan for improvements to the water system to serve existing and future customer base. Update the Water Master Plan as necessary.

4. Explore the advantages and disadvantages of creating a regional authority to handle future water capacity issues.

~~1. Explore the merits of creating a new reservoir in the Catoctin Mountains and/or re-commissioning the Tuscarora Reservoir system which has been placed out of service.~~

5. Explore opportunities to provide or credit the use of graywater to businesses that may not require potable water for operations.

POLICY ~~WRE~~WR 3~~–~~

Provide adequate wastewater treatment and conveyance capacity to serve the existing and future residents of the City ~~of Frederick~~.

~~**Implementation**~~

IMPLEMENTATION

1. Continue to ensure that development adheres to the requirements of the City's APFO and Water/Sewer Allocation program.

2. Continue to collaborate with Frederick County officials to provide for ~~the~~ future sewer needs through negotiated purchase of capacity.

3. Study ~~the~~ alternatives for obtaining additional wastewater treatment and conveyance to the respective treatment plants ~~to realize the most practical and feasible means~~.

~~Update~~4. Implement the ~~sewer portion~~recommendations of the ~~2000 Water &~~updated Sewer Master Plan.

5. Explore the advantages and disadvantages of creating a regional authority to handle future sewer capacity issues.

POLICY ~~WRE~~WR 4~~–~~

Enhance the ~~Wastewater Collection and Treatment Systems~~wastewater collection and treatment systems.

~~**Implementation**~~

IMPLEMENTATION

1. Control the amount of excessive inflow and infiltration into the sewer piping system by locating and correcting sources of ~~I&I~~inflow and infiltration.

2. Install and maintain proper metering devices within the sewer piping system to determine peak flow rates and areas of concern.

Stormwater Management ~~Policy~~Policies and Implementation:

POLICY WR 5

Coordinate with the United States Army Corp of Engineers (USACE) to complete the flood resiliency study and implement the findings and recommendations to manage stormwater.

IMPLEMENTATION

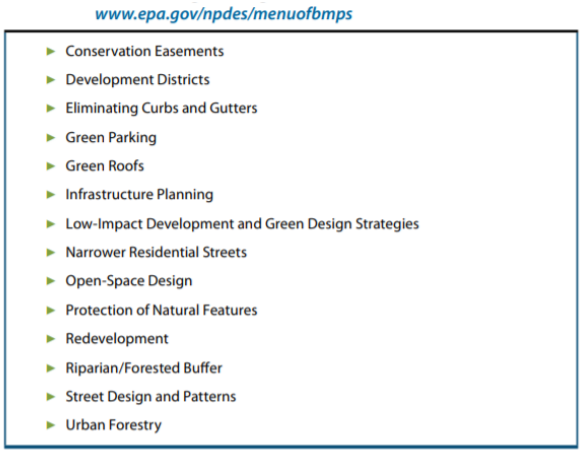
1. Educate the public about the findings of the study and methods to mitigate flooding to personal property with private improvements and best practices

2. Prioritize and fund the improvements necessary to mitigate local flooding to private properties and public roads.

3. In addition to the USACE recommendations, the City should implement the use of best management practices and approaches to manage regional and local stormwater.

    a. Preserve ecologically important land, such as wetlands, buffer zones, riparian corridors and floodplains to reduce, and slow runoff, absorb sediments and serve as flood control.
    b. Reduce additional stormwater runoff by encouraging development in already degraded areas such as infill, brownfield or grayfield sties.
    c. Encourage high density, mixed--use and transit-oriented development to reduce land consumption, the number or parking spaces and vehicle miles traveled.
    d. Include green street design in the Engineering Department's Manual of Standard details for Construction to allow for natural infiltration where possible and reduce impervious surface.
    e. Assess parking requirements to better balance parking demand and supply to reduce impervious surface.
    f. Integrate stormwater management facilities with local parks and amenities to reduce stress on the City infrastructure and allow natural filtration.

[Insert bumpout: EPAs National Menu of Stormwater Best Management Practices: Selected Post Construction BMPS Consistent with Smart Growth and Site Design Strategies]



POLICY ~~WRE 5 -~~ WR 6

Adopt revisions to the ~~LMC Section~~City Code and other regulatory documents where the modification of the 2007 ~~stormwater management act and~~ Stormwater Management Act and Code of Maryland Regulations (COMAR) 26.17.02 are applicable.

~~**Implementation**~~

~~1. Perform citywide watershed environmental assessment to determine condition of watersheds. Use assessment to identify mitigation efforts to address watershed deterioration, to include stream restoration, buffer plantings and storm water management retrofits. Develop Capital Projects to accomplish mitigation as well as ensure that owners/developers are made responsible for restoration efforts to streams and rivers which may cross their properties, through the land planning and development process.~~

IMPLEMENTATION

1. Provide training to City employees on the Stormwater Management Act (Environmental Site Design to the Maximum Extent Practicable).

2. Adopt a City Ordinance to address illicit discharges as required by the NPDES Phase II MS4 General Permit.

~~1.~~3. Update City Codes regulatory requirements are revised.

4. Continue efforts in maintenance and inspection of stormwater facilities within City limits.

POLICY ~~WRE 6 -~~ WR 7

Develop a process for review of site development plans that incorporates Environmental Site Design (ESD) to Maximum Extent Practicable (MEP) and provide outreach and educational opportunities to the community to promote compliance with state and local stormwater management regulations. ~~a whole approach available to the development community in regulating storm water management in compliance with state and local regulations~~

IMPLEMENTATION

1. Use the 2016 citywide watershed environmental assessment to identify mitigation efforts to address watershed deterioration, stream restoration, buffer plantings, and stormwater management retrofits.

2. Develop Capital Projects to accomplish mitigation.

Ensure that ~~**Implementation**~~

~~1. Develop a GIS database of stormwater management facilities.~~

2. ~~Provide training to City employees on implementation of 2007 Storm Water Management Act (Environmental Site Design to the Maximum Extent Practicable).~~

3. owners/developers are made responsible for restoration efforts to streams and rivers which may cross their properties through the land planning and development process.

POLICY ~~**WRE 7 -**~~ WR 8

Ensure that portions of the watershed in critical need of attention are addressed through City, volunteer, and owner/developer efforts.

~~**Implementation**~~

~~Provide~~**IMPLEMENTATION**
Educate the public ~~with information~~ on topics pertaining to maintaining a healthy watershed.

1. Organize voluntary efforts to improve ~~the~~City watersheds ~~of~~ .

2. Investigate incentives for private stormwater management owners to retrofit underperforming facilities.

3. Create and/or retrofit facilities to treat currently untreated impervious surface stormwater runoff in accordance with the ~~City~~NPDES Phase II permit.

POLICY ~~**WRE 8 -**~~ WR 9

Limit impervious ~~cover~~surfaces and suggest alternative surfaces for new development and redevelopment to reduce the ~~over all~~overall runoff discharge and explore new techniques and technologies to reduce development impacts to the watershed.

~~**Implementation**~~
IMPLEMENTATION
Encourage low impact development (LID) where appropriate.

Incorporate the use of non-structural BMPs.

Introduce regulations to limit impervious area in critical or sensitive areas.

POLICY WR 10

Develop a monitoring program for policies 1-9 of the Water Resource Chapter.

IMPLEMENTATION
Develop a GIS database of stormwater management facilities to prioritize projects, provide a holistic stormwater management planning approach, and track progress towards treating currently untreated impervious areas.

Develop a database to track watershed improvement efforts.

~~**Policy WRE 9 –**~~ Develop a monitoring ~~**program for policies 1-8**~~system of ~~**the Water Resource Element**~~local groundwater conditions, aquifer recharge, watersheds, and streams.