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City of Gaithersburg

WATER RESOURCES

A Master Plan Element

February 17, 2010

2009
MASTER PLAN

CITY OF GAITHERSBURG
2009 MASTER PLAN

WATER RESOURCES ELEMENT

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Kirk Eby, GIS Planner
Raymond Robinson III, Planner

CITY OF GAITHERSBURG
2009 MASTER PLAN

CHAPTER 2
WATER RESOURCES

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1. Purpose and Intent

In 2006, the Maryland General Assembly enacted House Bill 1141, *Land Use – Local Government Planning*, amending Article 66B, *Land Use* of the Annotated Code of Maryland. Article 66B establishes the requirements of a municipal comprehensive master plan and its required elements, and the procedures for approving said master plan. HB 1141 requires counties and municipalities exercising planning and zoning authority to adopt a Water Resources Element (WRE) in the comprehensive plan. The following document presents a detailed quantitative analysis of the impact of potential growth through 2030 (as depicted in the Municipal Growth Element of the Master Plan) on the City's water supply, wastewater services, and stormwater and nonpoint source pollution and the corresponding impact to area water resources.

The purpose of the Water Resources Element is to test water resource capacity limits, determine the potential implications of water resource issues for future growth, and facilitate the development of management strategies. The preparation of the WRE ensures that future comprehensive plans reflect the opportunities and limitations presented by local and regional water resources.

Please note that the figures, such as the projected number of housing units, jobs, and households; future water and wastewater service demand estimates; future land use acreages; and stormwater runoff generation factors are used in this document for analysis purposes only and are not to be construed as entitlements, suggestions, or recommendations for future development. Any site-specific recommended densities, land uses, and zoning for future projects will be addressed either in the Land Use Element of the Master Plan or during customary Site Plan review in accordance with Chapter 24 (Zoning) of the City Code.

The following document presents an analysis of potential infrastructure impacts on a City-wide scale. Any specific future development project within the City of Gaithersburg must comply with the City's adopted Adequate Public Facilities Ordinance (APFO) in addressing and mitigating any related infrastructure impacts including traffic, school capacity, water and sewer capacity, and fire and rescue services. Future development is subject to additional federal and state regulations and associated requirements found in the City Code, as these relate to stormwater management and the Clean Water Act.

2. Background

2.1 Introduction

The Maryland Economic Growth, Resource Protection, and Planning Act of 1992 (Planning Act), and subsequent recodification of Article 66B in 2000, 2006, and 2009, altered the way citizens of the State of Maryland address land use by focusing planning efforts toward growth management and resource protection. Codified in Article 66B, Section 3.05(a)(4)(vi) of the Annotated Code of Maryland, the Water Resources Element (WRE) requires a detailed and quantitative analysis of the impact of anticipated growth on water resources. This analysis concerns the Citywide perspective of water resources and does not make site-specific recommendations.

According to the Maryland Department of Planning, an additional 1.1 million people are expected to reside in Maryland between 2005 and 2030. In order to meet the future needs of this population growth and protect the water quality of streams and rivers, it is essential that proper land use and water resource planning occur throughout each municipality and county in the State. The adoption of the Water Resources Element in the City's Master Plan ensures that Gaithersburg contributes to the protection and stewardship of State land and water resources; the protection of public health, safety, and welfare; and the promotion of smart growth while meeting local economic, environmental, and land use goals.

Gaithersburg's Water Resources Element evaluates how potential new growth through 2030, as depicted in the Municipal Growth Element of the Master Plan, will impact drinking water supply, wastewater infrastructure, and stormwater and nonpoint source pollution. The WRE addresses the following questions:

- Are *drinking water resources and infrastructure* adequate for the needs of current and future development?
- Are *wastewater treatment processes and infrastructure* adequate for the needs of current and future development?
- Are *stormwater infrastructure and policies* adequate to protect and restore local and regional water resources that have been impacted by current growth or could be impacted by future development?

In order to address these questions, the WRE provides the following analyses with respect to Gaithersburg's 2008 baseline conditions and 2030 potential growth:

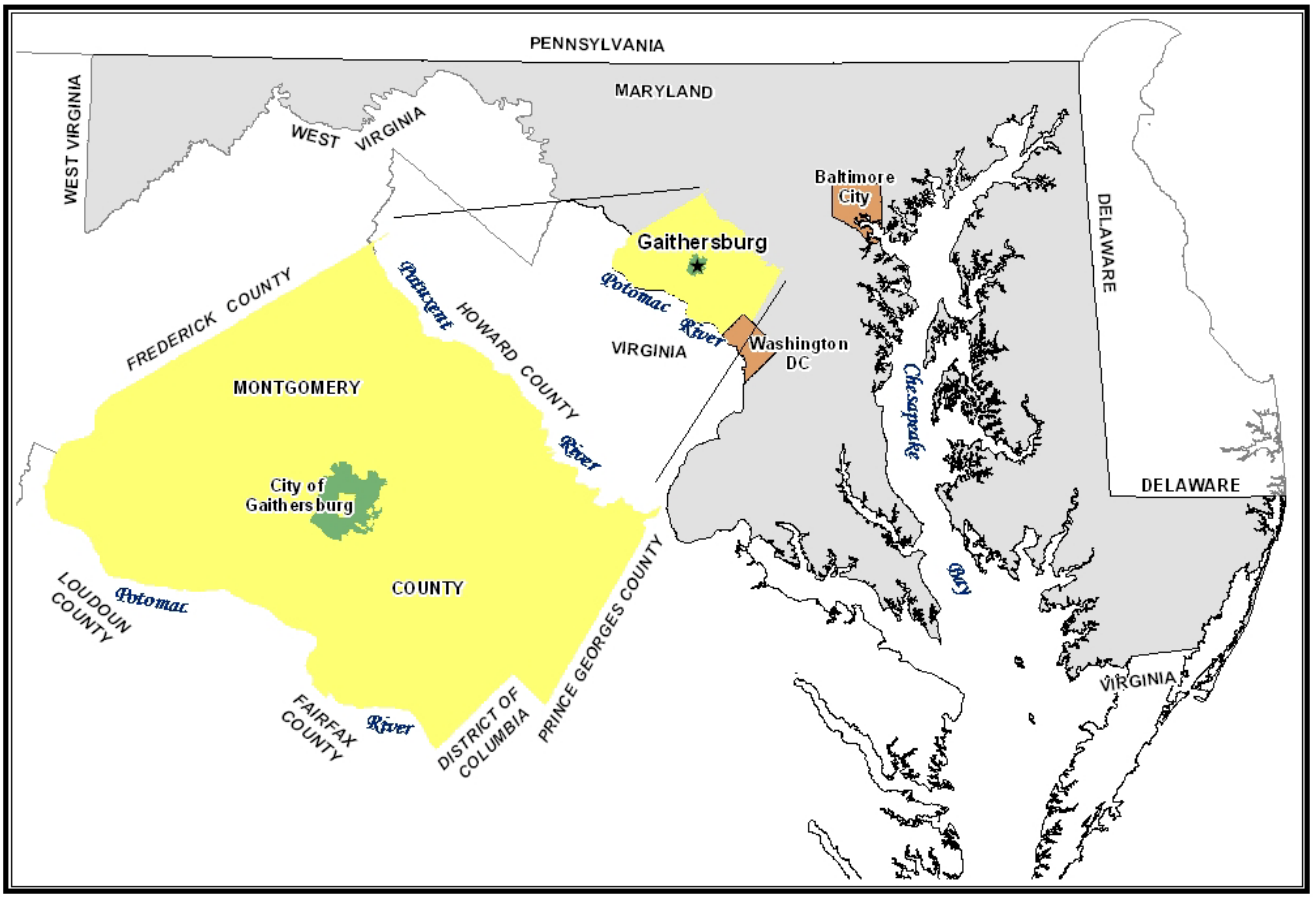
- Identification of watershed resources serving Gaithersburg;
- Assessment of drinking water supplies;
- Assessment of water quality and treatment capacity of wastewater facilities and receiving waters;
- Assessment of stormwater and nonpoint source pollution and stormwater best management practices; and
- Identification of potential water resource concerns and recommendations for sound land use and water management practices to ensure the health and sustainability of our community and water systems.

The Water Resources Element of the City's Master Plan will serve as an informational and policy document to the Mayor and City Council, the Planning Commission, other boards and committees of the City, and the citizens of Gaithersburg. The Element incorporates the City's expected potential growth over the coming decades and analyzes water resource capacity limits, determines the potential implications of water resource issues for future growth, and facilitates the development of management strategies. Ultimately, this Element will support the policies and principles of the City, the framework and visions presented in Process and Overview, and the other Master Plan Elements. This document will evolve as State regulations and guidance, available data, and water resources analysis techniques continue to advance.

2.2 Regional Planning Context

Watersheds intersect jurisdictional boundaries and ultimately affect greater, regional water resources. As illustrated in Map 1, Gaithersburg is located within the Chesapeake Bay watershed, which extends across six states and the District of Columbia and has been the focus of a tremendous restoration effort in recent decades. Since water resources extend well beyond Gaithersburg's boundaries, the City must coordinate watershed management strategies with such regional authorities as the State of Maryland, the Maryland-National Capital Park and Planning Commission (M-NCPPC,) the Washington Suburban Sanitary Commission (WSSC), Maryland Tributary Teams, the Metropolitan Washington Council of Governments (MWCOG), Montgomery County, the National Institute of Standards and Technology (NIST), and the City of Rockville. The WRE is based upon various planning documents created by these regional partners, such as the Montgomery County Comprehensive Water Supply and Sewerage Systems Plan (CWSP), Maryland's Tributary Strategy Statewide Implementation Plan, and Quarterly Available Capacity Reports from WSSC. This regional coordination is necessary to protect and restore water quality in our local streams, lakes, and the Chesapeake Bay, as well as maintain a safe and adequate water supply and wastewater treatment system to serve current and future populations.

Map 1: Regional Locator Map



2.3 Municipal Planning Context

In addition to collaborating with other regional agencies and their plans, the Water Resources Element (WRE) relates to other components of Gaithersburg's Master Plan; including the Municipal Growth Element (MGE), Community Facilities Element, Environment Element, and Land Use Element. Given that the WRE addresses the relationship between planned growth and water resources, the WRE relies primarily on the Municipal Growth Element, adopted by the Mayor and Council on April 6, 2009. The MGE serves as the Master Plan's guide to potential future growth through 2030. The MGE's growth forecasts use a "maximum potential" approach in order to evaluate the maximum possible impact to infrastructure and community services.

The Community Facilities Element, as required by the Planning Act, ensures that local jurisdictions have adequate public and semi-public facilities, services, land, resources, and utilities to support growth. The Community Facilities Elements provides a broad overview of the existing community facilities, resources, and utilities (including water and sewer) within the City of Gaithersburg and identifies potential gaps and recommends improvements and enhancements. The WRE builds on the framework established by the Community Facilities Element and provides a more quantitative assessment of the water and wastewater needs of future growth by 2030.

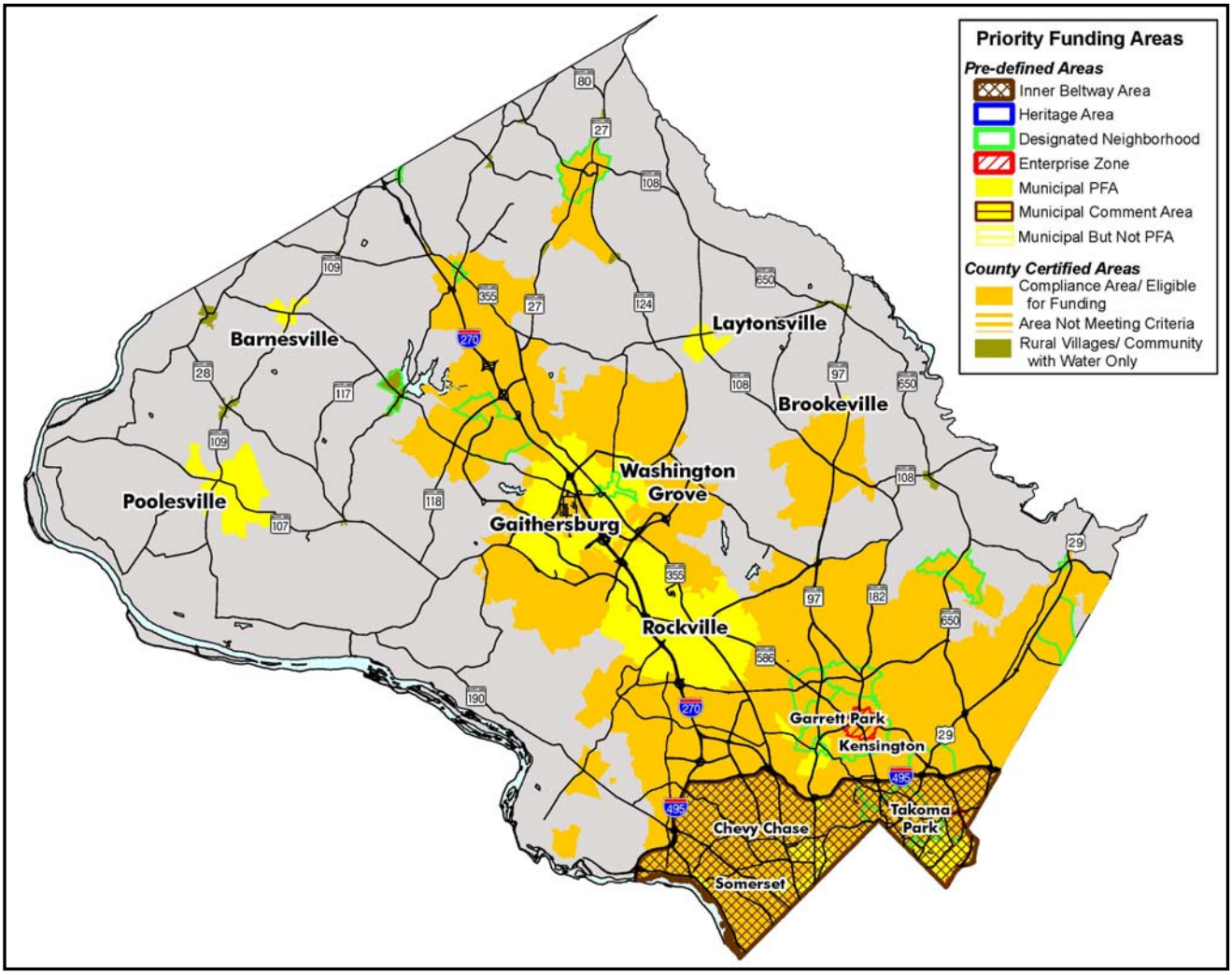
The Environment Element fulfills the sensitive areas requirement of the Planning Act and addresses the health of the urban environment. This element identifies the type and location of important environmentally sensitive areas (e.g., streams, surface water, wetlands, riparian buffers, soils and steep slopes, open space and greenways, forests and landscapes, wildlife, and air quality) and devises management strategies for protection and stewardship of these resources. The Environment Element also addresses the sustainability of the urban environment and the protection of public welfare by presenting management recommendations for smart growth, green building, sustainable redevelopment, noise pollution, light pollution, and solid waste and recycling. The Water Resources Element reinforces the Environment Element and contains similar goals and strategies for the protection and sustainable use of water resources.

The Planning Act also requires jurisdictions to adopt a Land Use Element to address physical development. The Land Use Element is a central element of the Comprehensive Plan because it analyzes the City's existing land use patterns and contains the goals, objectives, and implementation recommendations to guide future land use and the intensity of development. The Land Use Element relies on the other elements of the Comprehensive Plan to develop site specific zoning, use, density, and additional recommendations for individual tracts of land.

2.4 Growth Projections and Scenarios

The Municipal Growth Element's 2008 baseline estimates and 2030 growth forecasts are used to perform the various analyses within the Water Resources Element. The MGE presents a detailed quantitative analysis of the City's potential growth, which includes the identification of potential Growth Areas and forecasts for future housing, population, and jobs under different growth scenarios. Future growth scenarios take into account that Gaithersburg is located within a Maryland Priority Funding Area (PFA) and has a limited amount of undeveloped land available. The 1997 Priority Funding Area Act directs State investment to PFAs to support smart growth in existing communities, as identified in Map 2. The MGE also considers the City's smart growth policy and the presence of such transportation hubs as two MARC train stations, four proposed Corridor Cities Transitway (CCT) stations, the western terminus of the Intercounty Connector (ICC), and a new I-270 full interchange at Watkins Mill Road. Given all of these factors, the MGE assumes that future growth will be predominantly comprised of high-density, mixed use projects with multi-family housing components.

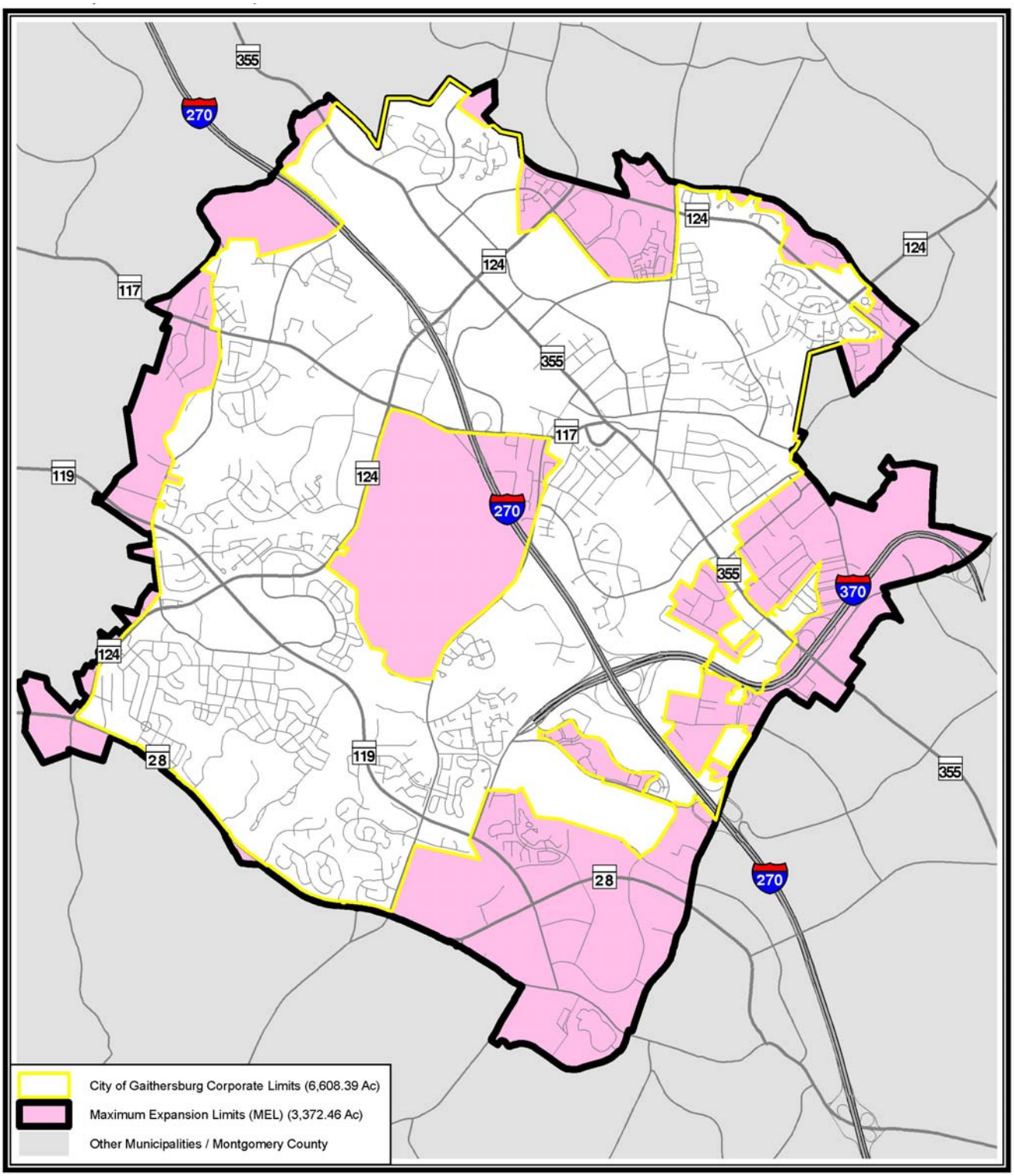
Map 2: Priority Funding Areas (PFA) in Montgomery County, Maryland



Source: Maryland Department of Planning, June 2008.

The MGE includes growth forecasts for areas within Gaithersburg's 2008 corporate limits and Maximum Expansion Limits (MEL). As illustrated in Map 3, the total land area within the 2008 corporate limits encompasses 6,608 acres. The MEL includes properties along the periphery of the City that could request to be annexed into the City. The area of the MEL that could potentially be incorporated into the City is an additional 3,372 acres. The MEL areas are not to be interpreted as areas the City of Gaithersburg is actively pursuing for annexation. The City of Gaithersburg cannot unilaterally annex property. The process for annexation is defined in Article 23A of the Annotated Code of Maryland and must be initiated by the property owner.

Map 3: Maximum Expansion Limits (MEL) for Gaithersburg, Maryland



Source: Gaithersburg Municipal Growth Element (adopted April 2009)

To arrive at Gaithersburg's future housing, population, and jobs forecasts for 2030, the Municipal Growth Element (MGE) combines the Baseline, Pipeline, and Growth Areas estimates, both within the City and the Maximum Expansion Limits (MEL).

- ***Baseline*** generates an estimate of the existing housing, population, and jobs as of July 2008, both within the City and the MEL.
- ***Pipeline*** compiles an estimate of the housing, population, and jobs that are part of the "pipeline development". The pipeline development includes residential "lots of record" and all development approvals that conform to the City's Adequate Public Facilities Ordinance (APFO) for schools, water and sewer, and public safety. The pipeline development generally includes those projects that have received schematic development plan (SDP), preliminary site plan (PSP), or final site plan (FSP) approval.
- ***Growth Areas*** include parcels that have been identified as having the potential for additional housing units and/or jobs by 2030, based on approved master plans, anticipated development proposals, and the City's 2008 Strategic Plan. Growth Areas include "greenfield" and vacant properties, as well as properties that have a strong potential for redevelopment or infill development.

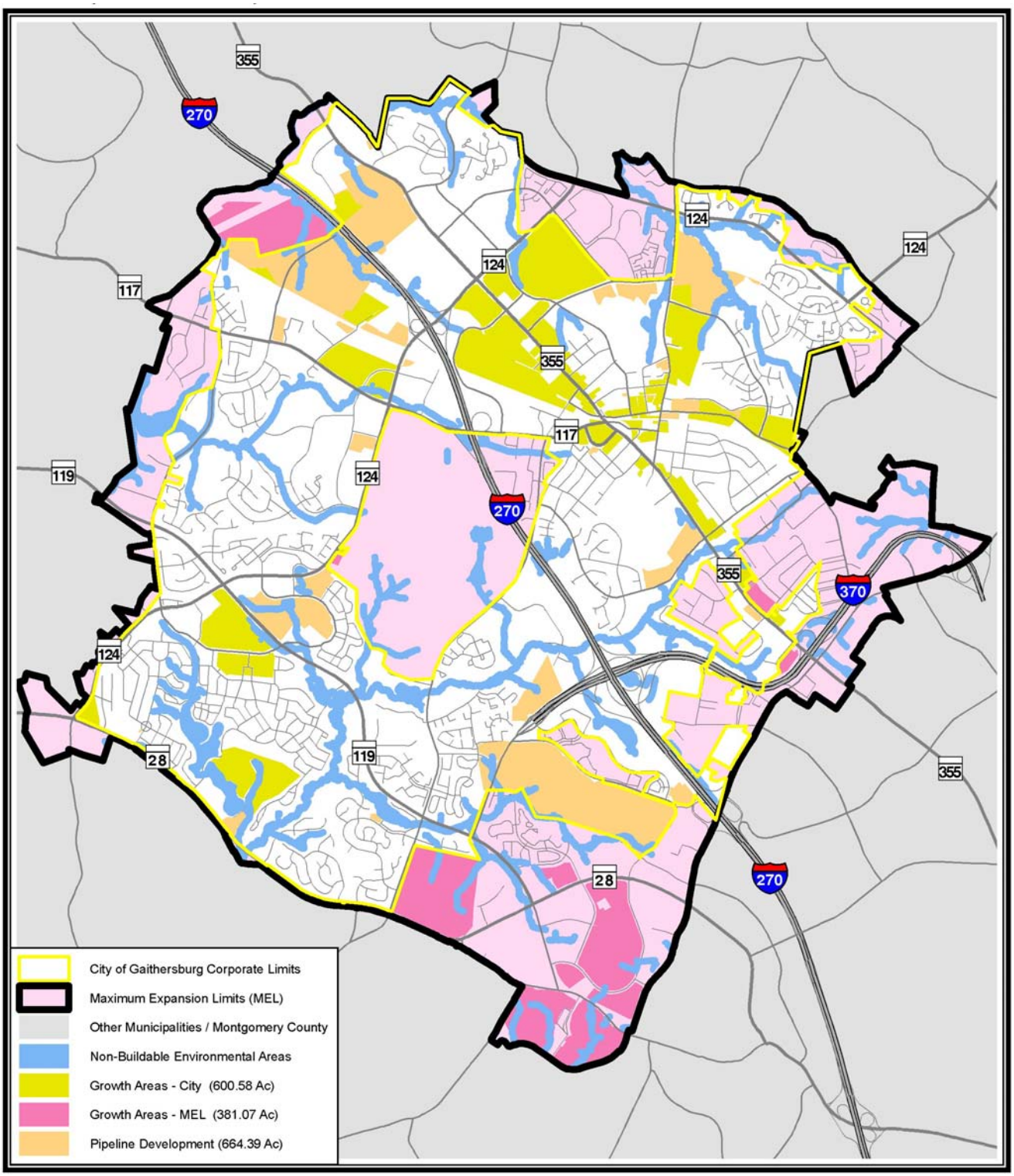
Map 4 illustrates the Pipeline development, approximate non-buildable environmental areas, and potential Growth Areas within the City and the MEL. Within the Growth Areas, environmentally sensitive, non-buildable land is deducted from the total acreage, leaving the potential net developable area, identified as gross land buildable or GLB. The GLB Growth Areas comprise 600 acres within the 2008 City limits and 381 acres within the MEL; for a total of 981 acres. The Pipeline and GLB Growth Areas reflect the potential change in land use/land cover used in the Water Resource Element's stormwater/nonpoint source pollution assessment.

The MGE presents two growth scenarios that utilize different ratios to estimate the density of potential future growth. The ratios are based upon a quantatative review of recent development and redevelopment projects within the City's various floating zones. The growth scenarios are:

- ***Growth Scenario 1***: Growth with an overall average of 20 dwelling units/100 jobs per acre.
- ***Growth Scenario 2***: Growth with an overall average of 32 dwelling units/160 jobs per acre.

Table 1 summarizes the forecast population, household, and job growth that may occur by 2030 for each growth scenario within each watershed in the City and the MEL. This table is the basis for calculating the WRE's existing and future drinking water and wastewater demand. The baseline values calculated for 2008 include both existing development and approved pipeline development. The 2030 forecasts include the two growth scenarios for the City's current boundary, as well as the combined City and MEL area. It should be noted that the housing ratios, densities, and jobs ratios used in the MGE are for analysis purposes only and are not to be construed as entitlements, suggestions, or recommendations for future development. For a more detailed explanation of the baseline estimates, 2030 forecasts, GLB Growth Areas, and associated methodologies, please refer to Sections 4, 5, and 6 of the Municipal Growth Element.

Map 4: Pipeline Development, GLB Growth Areas, and MEL for Gaithersburg



Source: Gaithersburg Municipal Growth Element (adopted April 2009) and City of Gaithersburg development plan approval records

Table 1: 2008 Baseline and 2030 Forecast Population, Households, and Jobs[1]

Watershed Limits	Current City Limits			City Limits and MEL		
		2030 Forecast			2030 Forecast	
	2008 Baseline (Existing and Pipeline)	Scenario 1 (average 20 dwelling units/100 jobs per acre)	Scenario 2 (average 32 dwelling units/ 160 jobs per acre)	2008 Baseline (Existing and Pipeline)	Scenario 1 (average 20 dwelling units/100 jobs per acre)	Scenario 2 (average 32 dwelling units/160 jobs per acre)
Middle Great Seneca						
Households	9,830	14,028	17,377	12,487	17,673	21,616
Single family	3,290	6,073	7,748	4,047	7,323	9,295
Multi-family	6,540	7,955	9,630	8,440	10,350	12,322
Jobs	31,686	50,839	67,585	33,754	57,985	77,701
Population	22,607	32,452	40,406	29,379	42,038	51,402
Lower Great Seneca						
Households	4,601	4,873	5,585	5,333	5,605	6,317
Single family	2,076	2,669	3,025	2,299	2,892	3,248
Multi-family	2,525	2,204	2,560	3,034	2,713	3,069
Jobs	11,859	16,935	20,494	13,453	18,542	22,101
Population	12,116	12,684	14,374	14,052	14,929	16,619
Muddy Branch						
Households						
Single family	7,187	8,299	8,971	7,872	10,613	12,263
Multi-family	6,364	7,228	7,900	9,155	11,649	13,299
Jobs	27,976	35,237	41,958	51,226	71,854	88,355
Population	35,619	40,284	43,476	43,815	56,307	64,144
Watts Branch						
Households	0	0	0	339	1,697	2,576
Single family	0	0	0	0	733	1,173
Multi-family	0	0	0	339	964	1,404
Jobs	0	0	0	7,172	10,526	14,924
Population	0	0	0	675	4,062	6,151
Rock Creek						
Households	0	0	0	9	9	9
Single family	0	0	0	9	9	9
Multi-family	0	0	0	0	0	0
Jobs	0	0	0	2,820	2,820	2,820
Population	0	0	0	28	28	28
TOTAL (all watersheds)						
Households	27,982	34,429	39,834	35,195	47,246	56,081
Single family	12,553	17,041	19,744	14,227	21,570	25,987
Multi-family	15,429	17,387	20,090	20,968	25,676	30,093
Jobs	71,520	103,011	130,037	108,425	161,727	205,901
Population	70,343	85,420	98,256	87,948	117,365	138,344

[1] Watershed locations and boundaries are illustrated in Map 5: *Watersheds in Gaithersburg and the Maximum Expansion Limits (MEL).*

3. Water Resources Overview

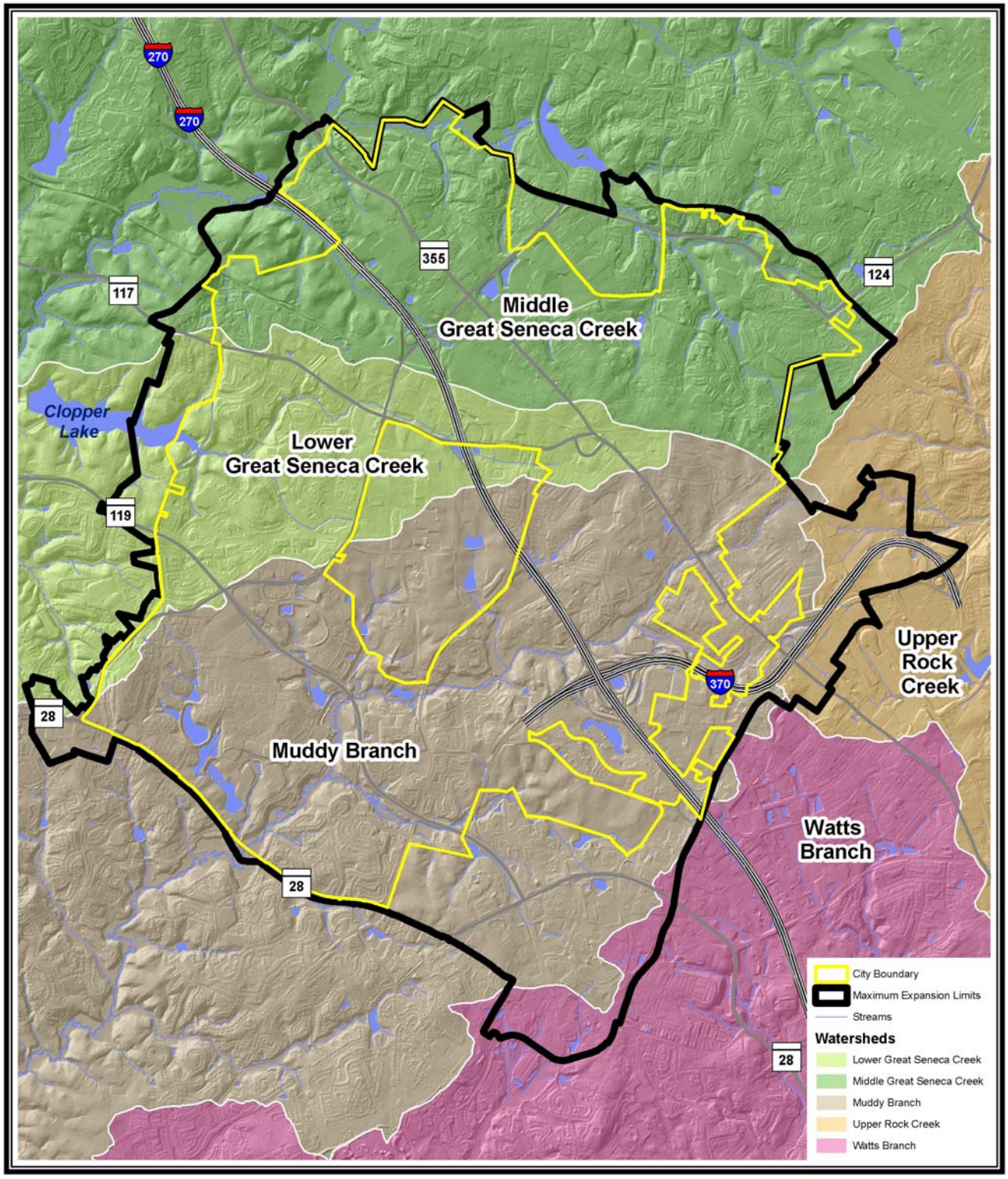
Water resources are typically simplified into surface water and groundwater systems that serve drinking water, industrial, agricultural, recreational, and environmental functions. In nature, groundwater and surface water are not isolated phenomena that occur separate and distinct from each other; instead, they are intrinsically interconnected and affect the quantity and quality of one another. Although the following overview of Gaithersburg's water resources relies on a simplified distinction between surface water and groundwater, the City recognizes that urban water resources are even more wide-ranging, interconnected, and complex. Regional urban water resources actually interconnect the natural environment (integrated surface water and groundwater systems) with the built environment (the water supply, sewer, impervious surfaces, and storm drainage infrastructure) to ultimately impact and shape the hydrologic system. Managing these resources at the watershed level requires the integration of land and water, upstream and downstream, and groundwater and surface water considerations to achieve a sustainable balance. An overview of Gaithersburg's water quality regulatory framework is provided to highlight some of the key regulations influencing water resources management.

3.1 Surface Water

The flow of surface water is generally delineated by topography and analyzed by watershed, defined as the geographic area that drains to a given body of water. On the regional level, Gaithersburg is located within the Chesapeake Bay watershed which stretches across more than 64,000 square miles, encompassing six states and the District of Columbia. On the state level, Gaithersburg is located within the Middle Potomac watershed. According to the Maryland Department of the Environment, the Middle Potomac River basin drains approximately 610 square miles of land, including portions of Montgomery and Prince Georges County. The Potomac River is one of the largest rivers that empty into the Bay, and it is an integral water resource for many jurisdictions. While Gaithersburg relies on the Potomac River as a source for potable water, the City also contributes to pollutant loading to this water body through wastewater treatment plant discharges and stormwater runoff.

Map 5 illustrates the surface water resources and watersheds within Gaithersburg's 2008 corporate limits and Maximum Expansion Limits (MEL). The City spans three subwatersheds: Muddy Branch watershed (3,183 acres), Middle Great Seneca Creek watershed (2,163 acres), and the Lower Great Seneca Creek watershed (1,255 acres). The City contains over 24 miles of predominately first and second order perennial streams. The four major tributaries include the Muddy Branch, Long Draught Branch, Whetstone Run, and Seneca Creek. Non-tidal wetlands are found interspersed along these stream valleys. Additionally, there are numerous lakes and ponds scattered throughout Gaithersburg, many serving as stormwater management facilities. If all of the land within the MEL were to be annexed into the City, the area within the Muddy Branch watershed would increase to 4,952 acres, the area within the Middle Great Seneca Creek watershed would increase to 2,743 acres, and the area within the Lower Great Seneca watershed would increase to 1,736 acres. In addition, the combined City and MEL area includes 217 acres of the Watts Branch watershed and 333 acres of the Upper Rock Creek watershed.

Map 5: Watersheds in Gaithersburg and the Maximum Expansion Limits (MEL)[2]



[2] Additional information regarding local stream, soil, and climate conditions are included in the Environment Element of the Master Plan, Gaithersburg's 2001- 2002 Stream Assessment, and the Soil Survey of Montgomery County, MD.

3.2 Groundwater

Groundwater, contained in formations known as aquifers, affects individual water and sewerage systems in the region and provides the base flow to local streams. Gaithersburg is located in the Maryland Upper Piedmont Plateau physiographic province where groundwater flow is generally unconfined, local, and the water table surface reflects the overlying topography. According to the U.S. Geological Survey, groundwater only constitutes about 13 percent of total water use in Maryland—the majority being in rural areas or areas east of the Chesapeake Bay. Given that Gaithersburg is an urban area located entirely within the WSSC service area, individual drinking water well systems and septic systems are extremely rare in the City, as documented in Appendix C, Septic Systems and Wells Located in Gaithersburg. Therefore, wells and septic systems and their impacts on water availability and quality are not factored into the City's WRE analysis.

Groundwater is still important because it is closely connected with surface water quantity and quality and generally mimics the same watersheds and drainage divides. Within urbanized areas like Gaithersburg, groundwater recharges perennial streams and lakes and is essential to sustain aquatic ecosystems and surface drinking water supplies. Under dry weather conditions, if groundwater is not available to recharge surface waters then a decrease in stream base flow can adversely impact stream water quality and aquatic systems.

3.3 Water Quality Regulatory Framework

The water quality of local and regional water resources can be impaired by excess sediment loading and nutrient runoff. These factors can lead to eutrophication, a condition that occurs in an aquatic ecosystem when high nutrient concentrations (primarily phosphorus, nitrogen, and carbon) stimulate algae blooms that deplete oxygen and result in fish kills. Nutrients from wastewater treatment plants, stormwater, agriculture, and other nonpoint sources are the primary contributors to water quality degradation in the Chesapeake Bay and its tributaries.

There are a number of Federal and State water quality regulations aimed at protecting and improving the quality of local and regional water resources, in particular surface water. Maryland participates in the Chesapeake Bay 2000 Agreement and has developed several policies designed to help restore the Bay. The following summarizes the main Federal and State measures that protect water resources in Gaithersburg.

3.3.1 State Water Use Classification and Anti-degradation Policy

As required by the Federal Clean Water Act (CWA), the Maryland Department of the Environment (MDE) established a State Water Use Classification and Anti-degradation Policy for streams throughout the State. Streams in Gaithersburg are classified as *Use I-P: Water contact recreation, protection of aquatic life, and public water supply*. Streams in this category should be suited for: water contact sports; play and leisure time activities where the human body may come in direct contact with the surface water; fishing; the growth and propagation of fish (other than trout), other aquatic life, and wildlife; agricultural water supply; industrial water supply; and public water supply. As previously discussed, land area within the City's Maximum Expansion Limits could extend Gaithersburg's jurisdictional boundary into the Watts Branch and Upper Rock Creek

watersheds. Streams within the Watts Branch are also classified as *Use I-P*. Streams in the relevant portion of the Upper Rock Creek watershed are classified as *Use IV-P: Recreational trout waters and public water supply*. Streams in this category should be suited for: holding or supporting adult trout for put-and-take fishing; management as a special fishery by periodic stocking and seasonal catching; and use as a public water supply.

3.3.2 Total Maximum Daily Load (TMDL)

In 2008 MDE published its first biennial Integrated Report of Surface Water Quality, fulfilling its reporting requirements under Sections 305(b) and 303(d) of the Clean Water Act. Section 305(b) required annual water quality assessments of jurisdictional waters, and Section 303(d) required states to classify a water body as "impaired" when it is too polluted or otherwise degraded to support its designated and existing uses. When a water body, such as a river or lake, is designated as impaired, a Total Maximum Daily Load (TMDL) is established, defining the maximum amount of pollutant that it can receive without impairing water quality. The TMDL is typically expressed as separate discharge limits from point sources, such as wastewater treatment plants, and from nonpoint sources, such as stormwater or agricultural runoff. MDE's Integrated Report classifies impaired water bodies as Category 4 or Category 5. A Category 4 means that water quality standards are not being met. Category 4 includes three subcategories: Category 4a indicates that a TMDL is already approved or established by the U.S. Environmental Protection Agency; Category 4b indicates that other pollution control requirements (i.e., permits, consent decrees, etc.) are expected to attain water quality standards and therefore a TMDL is not needed; and Category 4c indicates that the impairment is not caused by a pollutant and therefore a TMDL is not required. A Category 5 indicates that a water body is impaired and a TMDL is needed. Several watersheds in Gaithersburg are affected by TMDL programs:

- ***Chesapeake Bay***: The U.S. Environmental Protection Agency is working with state partners to set a Bay TMDL to limit nutrient and sediment pollution to achieve clean water standards for dissolved oxygen, water clarity, and algae. The Bay TMDL will be the largest and most complex TMDL developed, involving six states and the District of Columbia and impacting pollution sources throughout the 64,000 square mile watershed. Phase I Watershed Implementation Plans will require states to specify reductions from such sources as sewage treatment plants, urban stormwater systems, large animal feeding operations, and agricultural runoff. Phase I plans are anticipated in December of 2010. Phase II Watershed Implementation Plans will further divide nonpoint source allocations into smaller geographic areas to help local governments better understand their pollution contributions and responsibilities for reducing loads. Phase II plans are anticipated in November of 2011. Finally, EPA expects that States and the District will work with local partners to submit Phase III Watershed Implementation Plans in 2017 with refined actions and controls that will be implemented between 2018 and 2025 to achieve water quality standards.

- ***Clopper Lake***: Located along Gaithersburg's western border, Clopper Lake is listed as a Category 4a impaired water body and MDE established a TMDL for phosphorus (555 pounds per year) and sediment loading. Municipalities, including Gaithersburg, within Clopper Lake's watershed are required to focus on improving water quality by reducing sediment and nutrient loads. Per MDE's TMDL requirements, future watershed

management efforts for tributaries of Long Draught Branch that drain into Clopper Lake should concentrate on reducing sediment and nutrient loads and increasing opportunities for nutrient uptake.

- ***Seneca Creek***: MDE listed Seneca Creek in Montgomery County as a Category 5 impaired water. The causes of the impairment include total suspended solids (1996), nutrients (1996), and impacts to biological communities (2002). MDE submitted a Water Quality Analysis with the intent of changing the nutrients listing from Category 5 to Category 2, which means surface waters are meeting some standards with insufficient information to determine attainment of other standards. The MDE's Biological Stressor Identification (BSID) analysis indicated that inorganic pollutants, ammonia toxicity, high pH, and flow/sediment related stressors are associated with impacts to biological communities. The BSID analysis did not identify any nutrient stressors present and/or nutrients stressors showing a significant association with degraded biological conditions. EPA agreed with MDE that the results of the BSID study combined with the analysis of recent water quality data indicate that the Seneca Creek watershed is not impaired by nutrients and that a nutrient TMDL is not necessary to achieve water quality standards.

- ***Potomac River***: All of Gaithersburg and its Maximum Expansion Limits ultimately drain to the Potomac River. MDE listed the Potomac River Basin in Montgomery and Frederick Counties as a Category 5 impaired water. The causes of the impairment included total suspended solids (first listed in 1996), total phosphorus (first listed in 1996), a combination benthic/fish bioassessments (first listed in 2006), and polychlorinated biphenyls (PCBs) in fish tissue (first listed in 2008).

- ***Rock Creek***: Gaithersburg's eastern Maximum Expansion Limit extends into the Rock Creek watershed. MDE listed Rock Creek in Montgomery County as a Category 5 impaired water. The causes of the impairment include nutrients (1996), sediments (1996), fecal bacteria (2002), and impacts to biological communities (2002). The USEPA approved a TMDL of fecal bacteria for the non-tidal Rock Creek basin in Montgomery County, Maryland in 2007.

3.3.3 National Pollutant Discharge Elimination System (NPDES) Permit

The Clean Water Act regulates what can be discharged to waterways through National Pollutant Discharge Elimination System permits. Large, medium, and small municipalities have different permits for their stormwater runoff, called Municipal Separate Storm Sewer System (MS4) permits. NPDES Phase I permits require medium cities (where the population is 100,000 to 250,000) and large cities or certain counties (where the population is greater than 250,000) to control stormwater pollution to the maximum extent practicable. NPDES Phase II requires regulated small MS4s (where the population is less than 100,000) to obtain a separate permit for stormwater discharges. With a population currently less than 100,000, Gaithersburg is a Phase II permittee and is required to implement the following six minimum measures:

- Public education and outreach;
- Public participation and involvement;

- Illicit discharge detection and elimination;
- Construction site runoff control;
- Post-construction runoff control; and
- Pollution prevention and good housekeeping.

Should the City's population exceed 100,000, as indicated as a possibility in the Municipal Growth Element, it may become a Phase I medium permittee and would be subject to more stringent permit requirements for monitoring, restoration, and achieving stormwater wasteload allocations.

3.3.4 Maryland Antidegradation Policy and Implementation Procedures

Under this State program, water quality better than the minimum requirements specified by water quality standards shall be maintained. This requires water and sewer planning to take into account the "assimilative capacity" of a receiving body of water when discharging water to a system. This is essentially the mass of nutrients that the stream can receive while still maintaining acceptable water quality. Stormwater runoff also discharges nutrients into a receiving body of water; as a result, stormwater management measures and planning must be implemented to decrease nutrients loads.

3.3.5 Maryland Stormwater Act of 2007

Any development or redevelopment that disturbs greater than five thousand (5,000) square feet of land area is required to address stormwater runoff. Effective on October 1, 2007, the Maryland Stormwater Act of 2007 requires environmental site design (ESD) practices to be implemented to the maximum extent practicable (MEP). ESD is a comprehensive design strategy that integrates small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. Local jurisdictions have until May of 2010 to review and modify local stormwater management ordinances to implement the Act. MDE has established guidelines and design specifications for ESD in the revised 2000 Maryland Stormwater Design Manual, Volumes I and II.

3.3.6 Maryland Tributary Strategies

Revised after signing the Chesapeake 2000 Agreement, tributary strategies are a coordinated effort among local governments, citizens, and other stakeholders within ten river basins in the State. The Implementation Plan published in 2007 defines practices, timelines, and goals to control point and nonpoint source pollution. The following urban stormwater strategies are recommended for the Mid-Potomac River Basin:

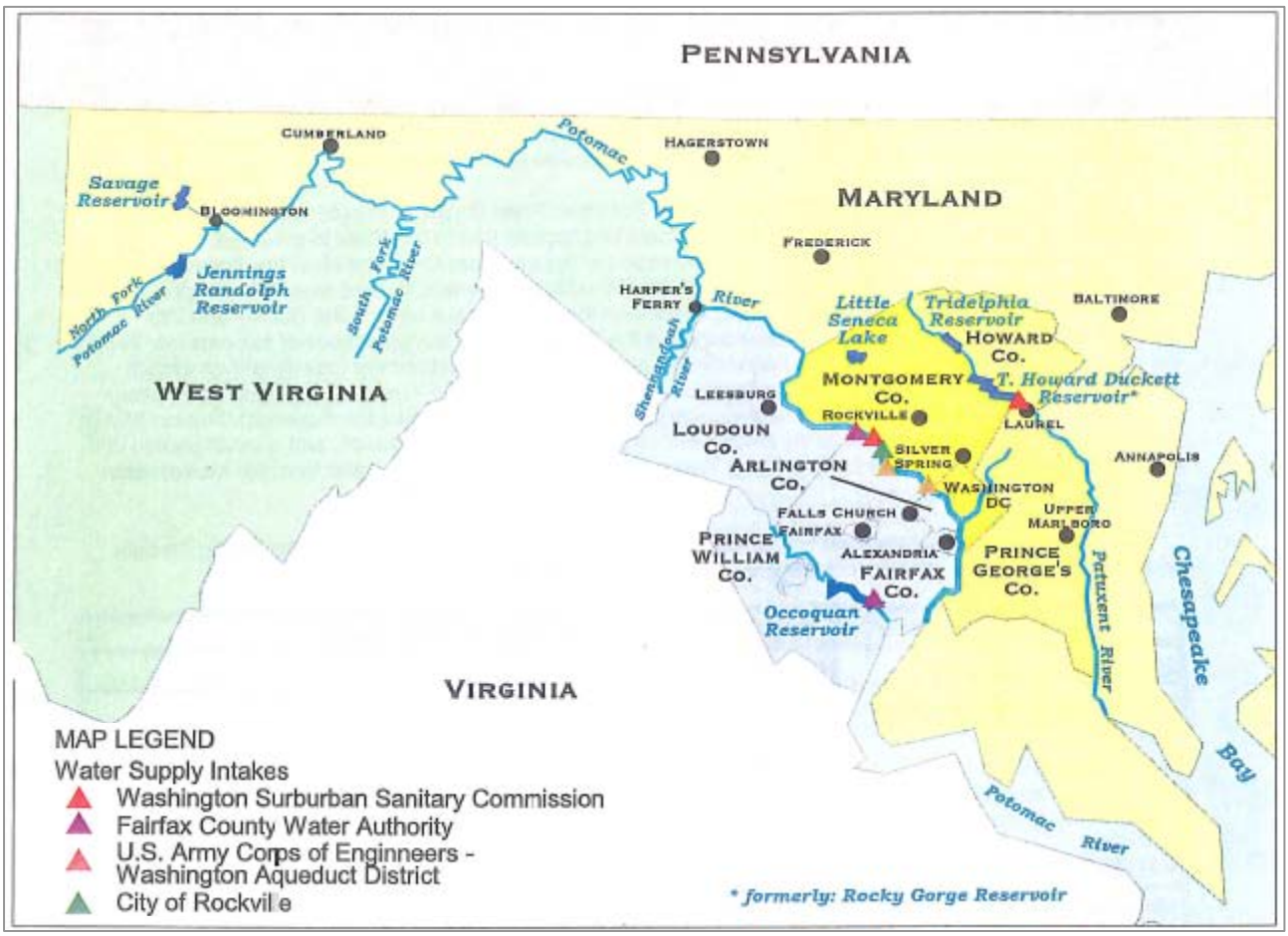
- Requiring all new and redevelopment to use environmental site design (ESD) practices for stormwater management;
- Inspect, maintain, and retrofit development from 1985-2002;
- Retrofit 40 percent of untreated developed land;
- Educate residents to reduce home fertilizer use; and
- Implement sediment and erosion control for all disturbed land.

4. Drinking Water Assessment

4.1 Existing Drinking Water Supply and Infrastructure

The Washington Suburban Sanitary Commission (WSSC) provides drinking water supply, treatment, and distribution services to approximately 1.8 million residents in Montgomery and Princes George's Counties, including Gaithersburg. WSSC relies on surface water from the Potomac River and the Patuxent River reservoir system to supply drinking water. These water resources are also shared between multiple states and counties in the region. In order to ensure sufficient supply, several impoundments located throughout the State have been created to supplement storage and flow. Map 6 highlights the major surface water supplies serving WSSC and the Washington metropolitan region. While the quantity and quality of these water supplies are very important, especially during drought conditions, the drinking water treatment capacity and transmission system are also important factors that may impact future growth.

Map 6: Major Water Supplies Serving the Washington Region



Source: Map excerpted from Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.

4.1.1 Drinking Water Supply and Treatment

WSSC draws surface water from the Potomac and Patuxent Rivers, operates two water filtration plants (WFPs), and distributes water across approximately 1,000 square miles. Map 7 and Table 2 highlight WSSC's main water supply, treatment, and distribution systems, including those that serve Gaithersburg.

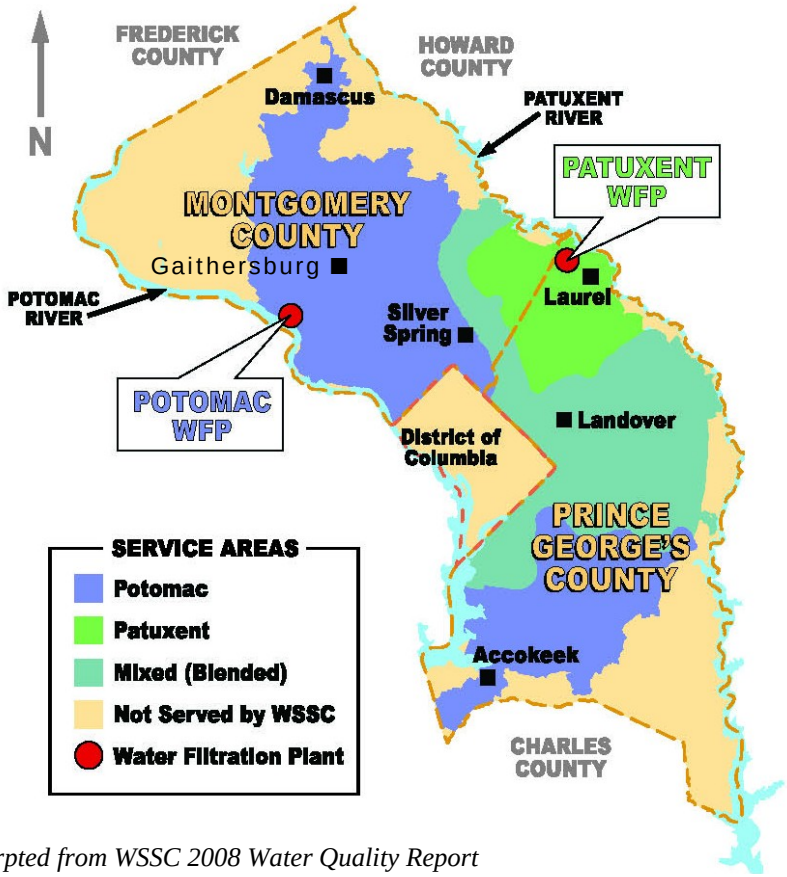
Figure 1: Potomac River near Washington D.C.

Gaithersburg's water supply is drawn from the Potomac River, near Watts Branch, and treated at the Potomac Water Filtration Plant (WFP). According to the Interstate Commission on the Potomac River Basin, the Potomac River meanders over 383 miles, drains 14,670 square miles, and has an average flow in Washington D.C. of about 7 billion gallons per day. A multi-agency study established a Potomac River minimum low-flow or flow-by recommendation of 100 million gallons per day (MGD) at Little Falls and 300 MGD at Great Falls to protect the Potomac River ecosystem. To ensure that flows do not drop below these protective levels, natural flows in the river can be augmented with water releases from several impoundments in the basin.

The Potomac WFP has a permitted withdrawal of 300 MGD and a production capacity of 285 MGD, although typical production is 109.3 MGD[3]. The Potomac WFP produces approximately three-quarters of the water used by WSSC's 1.8 million customers in both Montgomery and Prince George's Counties. The plant intake is located in the Potomac River directly downstream of where the Muddy Branch and Great Seneca creeks discharge into the river. During periods of low flow, impounded water supplies from either the Jennings Randolph Reservoir or Little Seneca Lake can supplement flows directly into the Potomac River. Additionally, the major regional water supply operators can cooperate under extraordinary conditions to share water across the Potomac, Patuxent, and Occoquan (Virginia) basins. Table 2 summarizes the capacity of surface and impounded waters for drinking water use across the WSSC service area.

[3] *Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.*

Map 7: Major Regional Water Filtration Plants and Service Areas



Source: Map excerpted from WSSC 2008 Water Quality Report

Table 2: Washington Suburban Sanitary Commission (WSSC) Water Supply Sources

Water Supply Source	Type	Current Capacity
Primary Sources Serving Gaithersburg		
Potomac River Filtration Plant	Surface	110 MGD* average withdrawal 285 MGD production capacity 300 MGD permitted withdrawal
Jennings Randolph Reservoir	Impounded	13 billion gallons storage
Little Seneca Lake	Impounded	4 billion gallons storage
Sources Serving Other WSSC Service Areas		
Patuxent River Filtration Plant	Surface	42 MGD average withdrawal 56 MGD production capacity (expansion to 72 MGD planned)
Triadelphia Reservoir	Impounded	5.5 billion gallons storage
T. Howard Duckett Reservoir	Impounded	5.2 billion gallons storage

*million gallons per day (MGD)

Source: Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.

In the event that a drought affects water supply, Gaithersburg is a signatory of two Potomac River regional drought agreements: (1) the 1994 Metropolitan Washington Water Supply Emergency Agreement; and (2) the 2002 Metropolitan Washington Water Supply and Drought Awareness Response Plan for the Potomac River System. These agreements outline measures for community level drought awareness and response, establish how the region's utilities will distribute and use water during a drought, and determine how costs associated with a drought will be compensated.

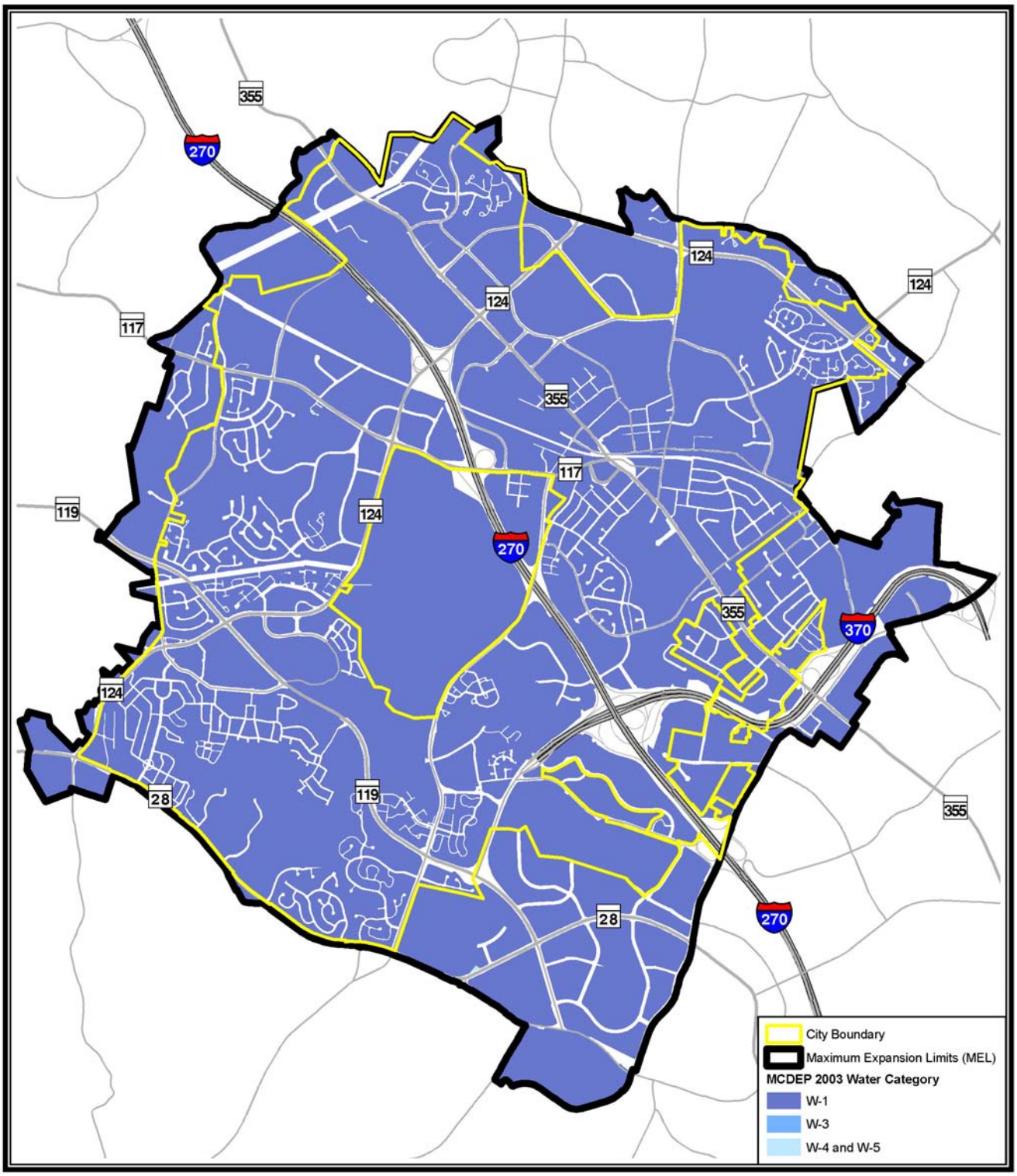
4.1.2 Drinking Water Transmission

Once the water is treated, it must be distributed to the consumer. The Potomac Plant Montgomery County High Zone, where Gaithersburg is located, is served by a pumping station with a pumping capacity of 66 MGD. Additionally, major water transmission mains are needed to move finished water from WSSC's pumping stations into the various pressures zones, to their associated storage facilities, and ultimately to the smaller, local service mains which serve consumers. The entire water service network must be intact for drinking water to reach all residents and businesses.

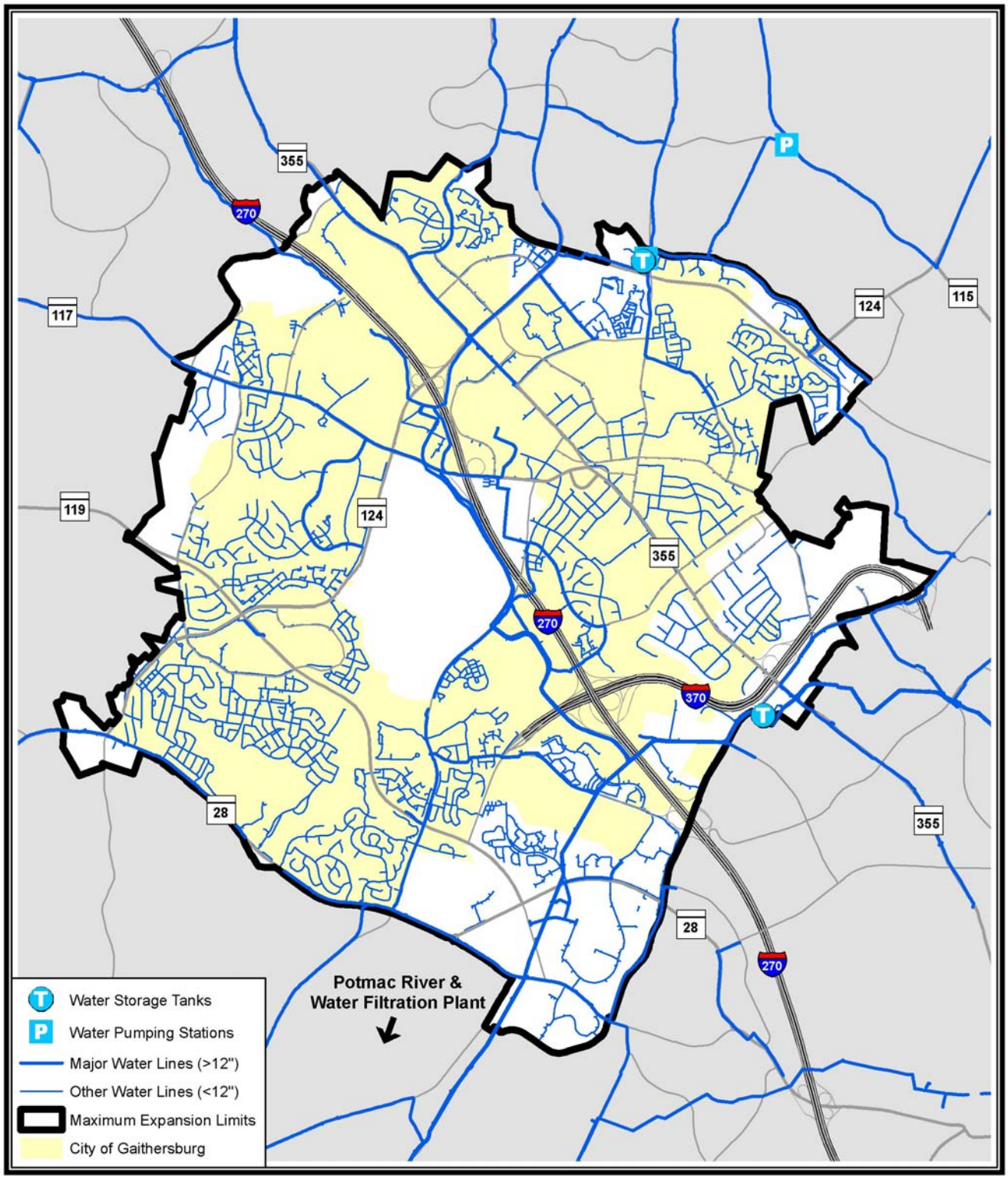
State regulations (COMAR 23.03.01.04) have established category designations for water and sewer service areas to provide for the orderly extension of community water and sewer service. These categories identify those areas approved or proposed for community service and those areas where development will depend on individual systems, including any special service conditions or restrictions. As illustrated in Map 8, according to the service categories as defined in the 2003-2012 CWSP, both the City of Gaithersburg and areas within the MEL have a water service category of W-1, meaning that these areas are either served by water community systems that already exist or are under construction. Map 9 illustrates the existing water supply distribution infrastructure within Gaithersburg, including water storage tanks, water pumping stations, and water lines.

Although the distribution infrastructure is present to serve Gaithersburg and the MEL, the age and quality of the infrastructure are also important. According to WSSC's 30-Year Infrastructure Plan, aging and deteriorating water main pipes and valves present a serious challenge to the integrity of the water transmission system. As the system ages, the occurrence of water main breaks and discolored water events increases. By 2025, it is estimated that approximately 50% of the entire distribution system will reach or exceed its useful life. Importantly, there are approximately 2,000 miles of cast iron pipe in the distribution system and over 85% of this pipe will exceed its useful life by 2025. WSSC is working with officials from Prince George's and Montgomery Counties to develop an infrastructure investment plan to provide a roadmap to refurbish and replace this infrastructure over time.

Map 8: Water Service Area Categories, 2003-2012 CWSP



Map 9: Local Water Supply Infrastructure Serving Gaithersburg



4.2 Drinking Water Projections and Analysis

The Water Resources Element's (WRE) drinking water assessment utilizes the Municipal Growth Element's (MGE) two growth scenarios to estimate average daily water demand in 2030 and compares the estimated demand to the current capacity and planned capacity of the WSSC water supply network. Water demand estimates are calculated by multiplying WSSC's average daily use factors shown in Table 3 by the number of single family dwelling unit (SFDU), multi-family dwelling unit (MFDU), and jobs (from the MGE and Table 1 found earlier in this report). For the purposes of this analysis, it is assumed that exactly one household occupies each single family or multifamily housing unit, so that the 2030 forecast number of households from Table 1 are equivalent to the forecast number of single family and multifamily housing units. Table 4 summarizes the existing and forecast water demand for the area within the City's 2008 corporate limits and for the area within the City and MEL. The 2008 baseline estimates the current water demand for existing and approved (Pipeline) growth. The 2030 forecast demand includes two growth scenarios: 1) an average of 20 dwelling units/100 jobs per acre; and 2) an average of 32 dwelling units/160 jobs per acre.

Table 3: WSSC Average Daily Water Use Factors[4]

Land Use Type	Average Daily Water Use in gallons per day (gpd)
Single-Family Dwelling Unit (SFDU)	231 gpd
Multi-Family Dwelling Unit (MFDU)	209 gpd
Employees (Jobs)	51 gpd

Source: Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.

Table 4: Gaithersburg Existing and Forecast Water Demand

Sector	City Limits (million gallons/day [MGD])			City Limits and MEL (MGD)		
	2008 Demand (existing & approved)	2030 Forecast Demand		2008 Demand (existing & approved)	2030 Forecast Demand	
		Scenario 1 (Average 20 dwelling units/100 jobs per acre)	Scenario 2 (Average 32 dwelling units/160 jobs per acre)		Scenario 1 (Average 20 dwelling units/100 jobs per acre)	Scenario 2 (Average 32 dwelling units/160 jobs per acre)
Single family	2.90	3.94	4.56	3.29	4.98	6.00
Multi-family	3.22	3.63	4.20	4.38	5.37	6.29
Employees	3.65	5.25	6.63	5.53	8.25	10.50
Total	**9.77**	**12.82**	**15.39**	**13.20**	**18.60**	**22.79**

Source: Gaithersburg Municipal Growth Element, April 2009.

[4] The average daily water use factors (Table 3) and wastewater generation factors (Table 4) differ slightly due to data sources. The average daily water use factors were taken from the Montgomery County Comprehensive Water and Sewerage Plan (CWSP). For sewage flows, the CWSP utilizes a model based on existing sewer flows and future growth forecasts that could not be transferred to the City's WRE analysis. Therefore, WSSC provided the *Draft 2006 Wastewater Flow Projection/Demographic Analysis* as a source for wastewater generation factors.

According to the baseline 2008 water demand estimate, the City currently uses approximately 9.77 million gallons of water per day (MGD). If future growth only occurs wthin Gaithersburg's 2008 city limits, the estimated 2030 maximum water demand would be 15.39 MGD. If all of the land within the MEL were to be annexed into the City, the maximum estimated 2030 water demand would be 22.79 MGD, using Growth Scenario 2. The latest Montgomery County Comprehensive Water Supply and Sewerage Systems Plan (CWSP) determined that the average production at the Potomac WFP was 109.3 MGD and peak flow was 161.7 MGD. Overall, the Potomac WFP currently has a daily capacity of 285 MGD and the pumping station serving Gaithersburg can deliver 66 MGD, meeting the current demand for the City and region and the future demand for the City. The 2020 planned daily maximum treatment capacity for both the Potomac and Patuxent WFPs is 357 MGD. WSSC asserts that the planned combined capacity of the Potomac and Patuxent WFPs will accommodate demand for the entire service district; thus, the capacity and infrastructure to accommodate Gaithersburg's future demand should already exist or is planned.

4.3 Drinking Water Discussion and Strategies

While the previous analysis indicates that WSSC's water filtration plants would have the capacity to serve Gaithersburg's highest estimated demand of 22.79 MGD, regional coordination between jurisdictions is required to confirm that the water supply and transmission infrastructure are both adequate to meet *total regional growth demands*. Under State law, Montgomery County has planning authority for the availability and adequacy of water service for land use in the County. Montgomery County is responsible for developing both a Water Resources Element and a Comprehensive Water Supply and Sewerage Systems Plan (CWSP) that incorporate all or part of the subsidiary plans for municipalities, sanitary districts, privately-owned facilities, and other government agencies in the County. Gaithersburg coordinates with Montgomery County and the Maryland-National Capital Park and Planning Commission (M-NCPPC) to ensure that the City's forecasted growth is factored in the County's regional growth plans and capacity analysis. Subsequently, Montgomery County's Water Resource Element will provide a more comprehensive analysis of the *region's total projected drinking water demand* and system capacity.

The responsibilities of planning and providing water service in Montgomery County are multi-jurisdictional and depend on the cooperative efforts of County, bi-county, municipal, State, and regional agencies and authorities. This is especially true with regard to the use of the Potomac River, which is a shared raw water source for several jurisdictions. In order to protect this regional resource, it is important for Gaithersburg to collaborate with these entities to pursue the following drinking water supply management programs and strategies:

- **Drought Awareness and Response Plans**: As a signatory of two Potomac River regional drought agreements, Gaithersburg should continue to support both the regional coordinated year-round plan emphasizing wise water use and conservation and the water supply and drought awareness and response plan.

- **Water Supply Emergency Agreements**: As a signatory of the Metropolitan Washington Water Supply Emergency Agreement (1994), Gaithersburg should continue to support regional actions in the event of emergencies that affect water supply from the Potomac

River to the Washington Metropolitan Region. Several plans relate to water supply emergencies. The first plan provides a regional response mechanism for health-related emergencies in the Washington Aqueduct Division system. The second plan provides a mechanism for emergencies that affect more than one of the utilities that withdraw raw water from the Potomac River. The final plan describes the routine planning and cooperative operating procedures which have significantly reduced the risk of drought affecting the region's water supply.

- **Potomac River Environmental Flow-By**: As a heavily used water resource, the Potomac River requires careful management to ensure that there is adequate flow to serve the various utilities that rely on it for drinking water as well as sustain the health of the river's natural ecosystem. Although Gaithersburg does not directly withdraw water from the Potomac River and is not a signatory of existing low flow allocation agreements, the City should continue to support activities that ensure the river has an adequate flow-by, through the Washington region, that is sufficient to maintain its biological health under severe drought conditions. These agreements have historically assumed a minimum flow-by requirement of 100 million gallons per day (MGD) to support the biological health of the river system. However, the scientific basis for and adequacy of the 100 MGD flow-by requirement is under review.

- **Potomac River Source Water Protection:** In 2002 and 2004, WSSC and MDE completed a source water assessment (SWA) for the Potomac River to inventory potential contaminants in the surrounding watershed and analyze the susceptibility of contamination to the source water that the Potomac WFP draws from the river. Potential sources of contamination in the Potomac River watershed include urban and agricultural land uses, municipal wastewater treatments plants, and potential spills from highways and petroleum pipelines.[5] WSSC and MDE are also part of the Potomac Drinking Water Source Protection (DWSP) Partnership, which is a voluntary alliance of drinking water suppliers and government agencies working to protect drinking water sources. The Partnership is identifying source water protection strategies as recommended by regional SWAs. Gaithersburg's stormwater runoff and effluent from the Seneca Wastewater Treatment Plan ultimately drain into the Potomac River upstream of the Potomac WFP intake; therefore, it is important for the City to ensure that water quality standards for both wastewater treatment and stormwater management are fulfilled in order to protect the safety of the City's water supply and avoid the need for expensive treatment systems.

- **WSSC Programs for Sustained Water Conservation and Waste Reduction**: WSSC has a variety of programs to promote water conservation. These include public outreach and education programs, plumbing codes requiring water saving fixtures in new installations and replacements, and a conservation-oriented water/sewer rate structure that progressively increases charges as the customer's average daily consumption increases.

[5] WSSC 2007 Water Quality Report

- **Infrastructure Replacement and Expansion**: Gaithersburg and areas within the maximum expansion limits are located within WSSC's W-1 service area, which means that these areas are either served by water community systems that already exist or are under construction. However, in order to accommodate future demand, infrastructure improvements will be needed to replace outdated systems or to expand systems to meet future demand. Pumping stations, storage facilities, and transmission lines are governed largely by WSSC for the greater region. Aging infrastructure must be invested in to maintain service and prevent large water line ruptures. To address this issue, WSSC is improving monitoring of existing infrastructure and developing a multi-year infrastructure investment program. Since 2001, WSSC has been pursuing a water main replacement program to address the portions of the water main system that have exceeded their useful service life. Gaithersburg's future redevelopment and development should coordinate with WSSC's infrastructure improvement program.

Figure 2: WSSC inspection and maintenance of aging infrastructure.

- **Metropolitan Washington Regional Wise Water Use Campaign**: This regional program is coordinated by the Metropolitan Washington Council of Governments (MWCOG) with the support of local utilities, governments, and businesses. It is designed to increase awareness and support for wise water use throughout the metropolitan region, regardless of weather conditions. The program also enhances consumer understanding and awareness of watersheds, water resources, and drinking water supply. While the Washington region has adequate water supply at this time, this program is important for responsible management of this finite resource so that the future needs of this region will continue to be met.

- **Gaithersburg Adequate Public Facilities Ordinance (APFO)**: Adopted on January 2, 2007, Gaithersburg's Adequate Public Facilities Ordinance (O-1-07) contains four facets, one of which addresses water and sewer services. This ordinance codifies the responsibilities of the City of Gaithersburg during plan review and reaffirms the oversight roles of both Montgomery County and WSSC as to future development within the City and water and sewer capacity. Section 24-247(a) of the APFO states: "[d]evelopment that would create a total water demand that would exceed available supply less an adequate reserve for fire-flow shall not be approved. A minimum of 1,000 gallons per minute shall be deemed adequate fire-flow for the purpose of this subsection. Final water supply adequacy shall be confirmed by the Washington Suburban Sanitary Commission (WSSC) prior to the issuance of development approvals."

- **Gaithersburg Water Demand Management Programs**: The greatest change that can be made locally and immediately is with water demand management. Green building practices can more efficiently use water and landscaping and stormwater management practices can also reduce water demand. Households, businesses, and institutions can reduce water consumption by installing water efficient landscaping, rain barrels, high-efficiency plumbing and control technologies (e.g., toilets, faucets, showers, dishwashers, clothes washers, and cooling towers), graywater systems, and retrofits to older structures. Widespread education and outreach efforts on the benefits of water conservation are proven to reduce water use in a community. Conservation is especially important during the summer months when demand is high and supplies are low. While Gaithersburg requires green building practices in new commercial and residential buildings, the City should continue to work with WSSC, MWCOG, and Montgomery County on green building codes, stormwater management practices, conservation landscaping practices, incentives, and education programs that promote efficient water fixtures, systems, and practices for both new and existing buildings.

5. Wastewater Assessment

5.1 Existing Wastewater Services

The Washington Suburban Sanitary Commission (WSSC) is primarily responsible for providing wastewater services for the City of Gaithersburg, including the treatment, conveyance, and discharge of sewage. The Washington Suburban Sanitary District (WSSD) community sewerage system is organized by treatment plant service areas and sewer basins. A wastewater treatment service area is comprised of one or several sewer basins where the collection, conveyance, and treatment of wastewater are provided. To take advantage of gravity to the greatest extent possible, sewage collection and conveyance systems generally follow streams and waterways; as a result, the sewer basins are generally referred to by their related watershed (as delineated previously in Map 5).

Two wastewater treatment plants (WWTP) provide wastewater treatment services for Gaithersburg; the Blue Plains Wastewater Treatment Plant in Washington D.C. and the Seneca Wastewater Treatment Plant in Germantown, MD. The hierarchy of service areas and sewer basins is summarized in Table 5 and shown in Map 10. Gaithersburg's 2008 corporate limits currently span two sewer basins: Muddy Branch and Seneca. Growth in accordance with the MEL boundary could span four sewer basins: Muddy Branch, Seneca, Rock Creek, and Watts Branch. The Muddy Branch, Rock Creek, and Watts Branch sewer basins fall in the Blue Plains Service Area, while the Seneca Creek sewer basin falls within the Seneca Treatment Plant Service Area. As indicated in Map 11, the City of Gaithersburg and most areas within the MEL have sewer categories of S-1, indicating that they are served by wastewater community systems that already exist or are under construction. Two sites (one being Crown Farm) have categories of S-3, meaning new community services will be provided with the commencement of construction of approved projects. Map 12 illustrates the existing sewage infrastructure within Gaithersburg, including sewage pumping stations, sewer lines, and sewer basins.

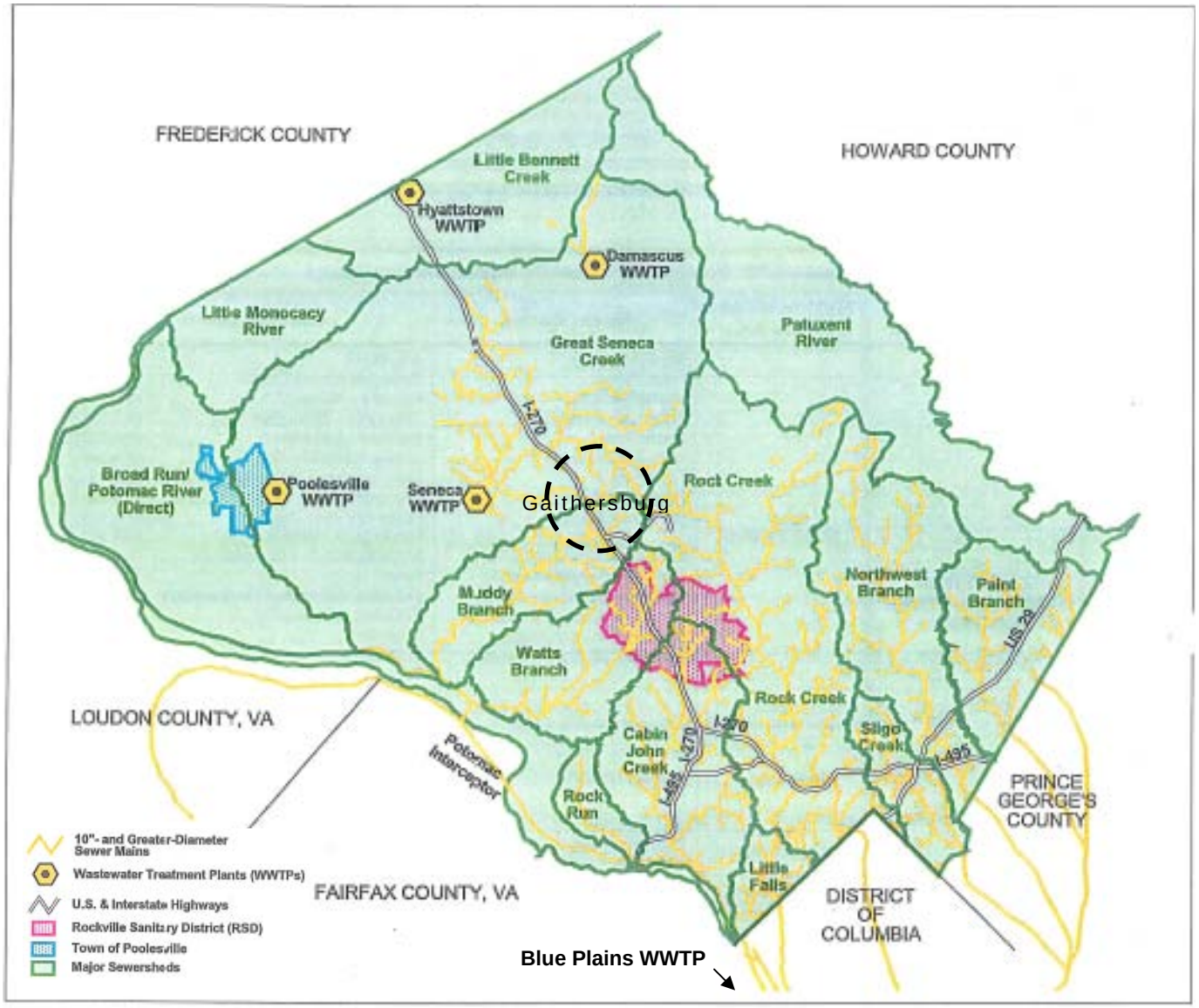
Table 5: Community Sewerage Systems Serving Gaithersburg

Community Sewerage System	Wastewater Treatment Plant Service Area	Capacity (million gallons per day [MGD])	Sewer Basins
Washington Suburban Sanitary District (WSSD)	Blue Plains[6]	370 MGD (Total) 170 MGD (WSSC allocation)	Muddy Branch Rock Creek Watts Branch
	Seneca	20 MGD (Current) 26 MGD (Future expansion)	Seneca Creek

Source: Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.

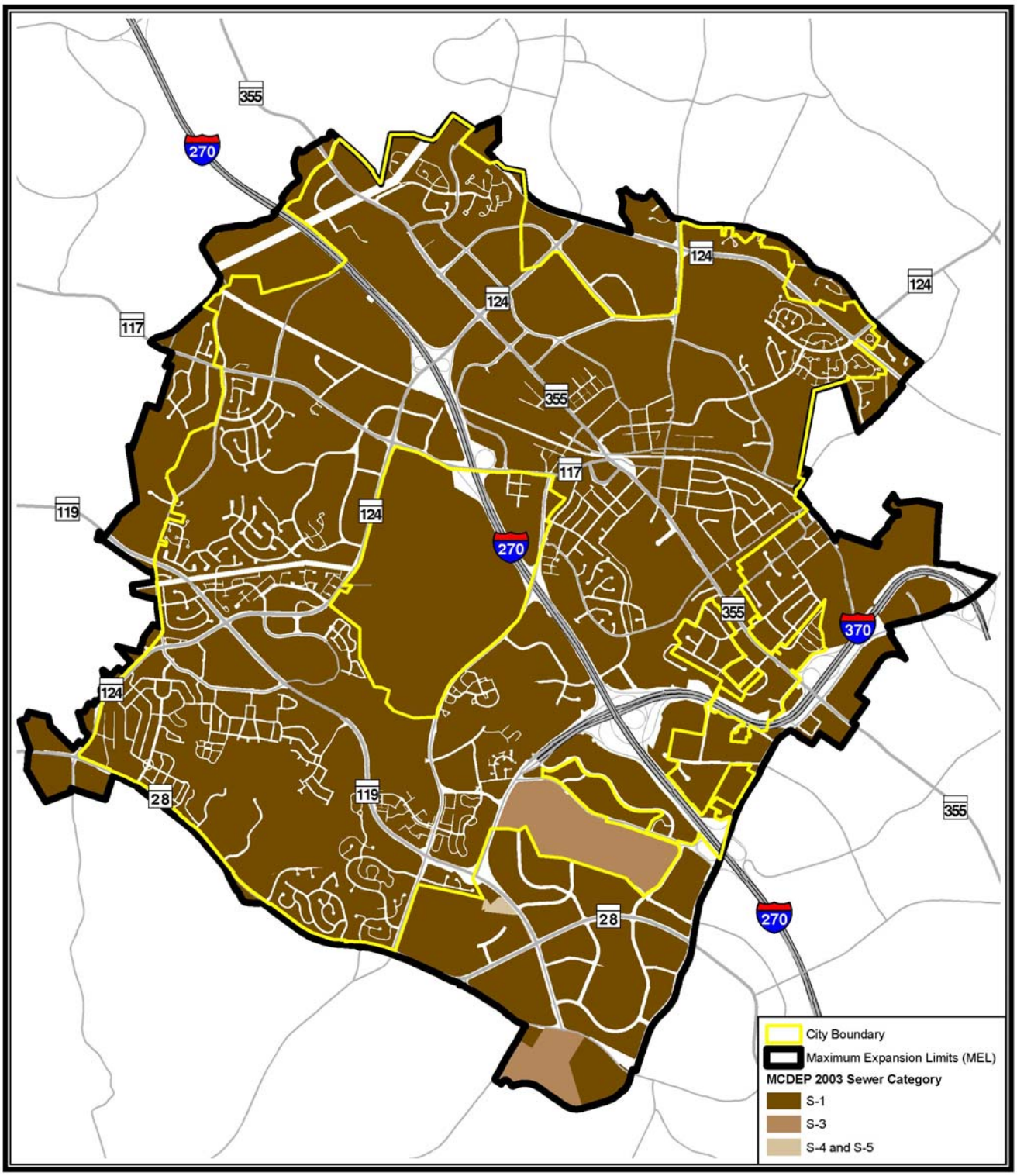
[6] The Blue Plains Wastewater Treatment Plant is operated by the D.C. Water and Sewer Authority (WASA) and allocates capacity to WSSC.

Map 10: Regional Sewage Basins and Wastewater Treatment Plants

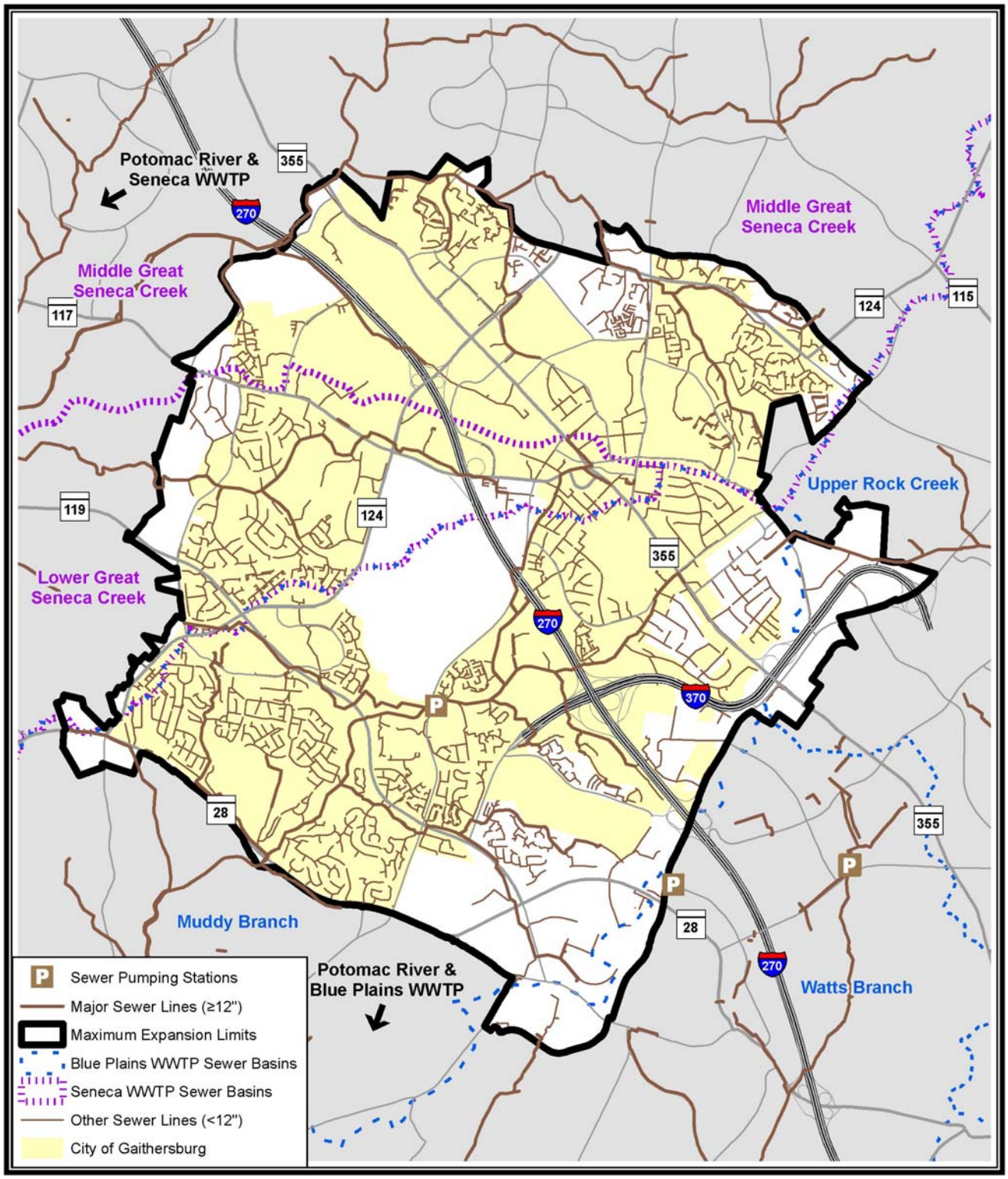


Source: Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.

Map 11: Sewer Service Area Categories, 2003-2012 CWSP



Map 12: Local Sewage Infrastructure Serving Gaithersburg



5.1.1 Blue Plains Wastewater Treatment Plant Service Area

Figure 3: Blue Plains Wastewater Treatment Plant in Washington D.C.

The Blue Plains Wastewater Treatment Plant (WWTP) is located along the Potomac River in Washington D.C. It is a regional facility owned and operated by the D.C. Water and Sewer Authority (WASA). The Blue Plains Intermunicipal Agreement (IMA) of 1985 is the basic agreement under which the Blue Plains WWTP is operated, and its signatories include the District of Columbia; Fairfax County, Virginia; Montgomery and Prince George's Counties, Maryland; and WSSC. The IMA of 1985 signatories are allocated part of the Blue Plains' average capacity. In 1997 the Blue Plains WWTP was officially rated at a capacity of 370 MGD, and WSSC is allocated approximately 170 MGD, which it is not currently exceeding.[7] The unit processes at the Blue Plains WWTP include primary treatment, secondary treatment, advanced treatment, disinfection, dechlorination, solids conditioning, and solids handling.

The principal sewer line that conveys wastewater from the Muddy Branch and Watts Branch Sewer Basins to the District of Columbia is the Potomac Interceptor (PI). As a regional sewerage facility, it is also governed by the IMA of 1985. The principal sewer line that conveys wastewater from the Rock Creek Sewer Basin is the Rock Creek Trunk Sewer (RCTS). The recent expansion of the Seneca WWTP helped to alleviate capacity constraints in the Muddy Branch sewer system, relieve capacity and flow limitations in the Potomac Interceptor, and decrease use of capacity for WSSC at the Blue Plains WWTP. Additionally, WSSC has projected expected flows through 2015 to identify trunk sewers with capacity issues. Gaithersburg growth areas located within Muddy Branch, Watts Branch, and Rock Creek sewage basins may have future trunk sewer capacity constraints; as a result, regional coordination will be needed for the areas in the MEL if they become annexed into the City.

[7] *Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.*

5.1.2 Seneca Wastewater Treatment Plant Service Area

Figure 4: Seneca Wastewater Treatment Plant in Germantown, Maryland.

The Seneca Wastewater Treatment Plant (WWTP) Service Area includes substantial portions of the Great Seneca Creek and Little Seneca Creek watersheds and serves the communities of Gaithersburg, Germantown, and Clarksburg. Seneca WWTP has just been expanded from 6 MGD to a capacity of 20 MGD, and could be expanded further to treat 26 MGD. At this time, 20 MGD provides enough capacity and wastewater is no longer being diverted to the Blue Plains WWTP. Sewerage service is presently provided by a system of trunk sewers along Great Seneca Creek and Long Draught Branch, Whetstone Run, Cabin Branch, and Gunners Branch. Growth within the Seneca Creek Basin during recent years has made it one of the most active basins in the County for providing new wastewater services. Under current development projections, the Great Seneca Trunk Sewer, Whetstone Run Sewer, and Cabin Branch Sewer may all have capacity constraints and/or require relief measures in the future.

5.2 Wastewater Projections and Analysis

The WRE wastewater assessment utilizes the Municipal Growth Element's (MGE) forecasts to estimate average daily wastewater demand in 2030 for the two growth scenarios and compares it to the current capacity and planned capacity of the WSSC wastewater system. In order to analyze wastewater treatment plant capacity, it is necessary to break the 2030 projections down into wastewater service areas, which are essentially watersheds. Wastewater demand is calculated by multiplying WSSC's wastewater flow factors for different land use types, as listed in Table 6, by the forecast number of single family dwelling unit (SFDU), multi-family dwelling unit (MFDU), and jobs from Table 1. For the purposes of this analysis, it is assumed that exactly one household occupies each single family or multifamily housing unit, so that the 2030 forecast number of households from Table 1 are equivalent to the forecast number of single family and multifamily housing units. Existing and forecast wastewater service demand for each wastewater service area is summarized in Table 7. The 2008 baseline estimate includes wastewater demand for Existing and Pipeline growth. The 2030 forecast demand includes two growth scenarios: 1) an average of 20 dwelling units/100 jobs per acre; and 2) an average of 32 dwelling units/160 jobs per acre.

Table 6: WSSC Average Daily Wastewater Generation Factors[8]

Land Use Type	Average Wastewater flow in gallons per day (gpd)
Single-Family Dwelling Unit (SFDU)	255 gpd
Multi-Family Dwelling Unit (MFDU)	178 gpd
Employees (Jobs)	40 gpd

Source: WSSC Planning Group's Draft 2006 Wastewater Flow Projections/Demographic Analysis

Table 7: Gaithersburg Existing and Forecast Wastewater Service Demand

Service Area	City Limits (million gallons/day [MGD])			City Limits and MEL (MGD)		
		2030 Forecast Demand			2030 Forecast Demand	
	2008 Demand (Existing & Pipeline)	Scenario 1 (average 20 dwelling units/100 jobs per acre)	Scenario 2 (average 32 dwelling units/160 jobs per acre)	2008 Demand (Existing & Pipeline)	Scenario 1 (average 20 dwelling units/100 jobs per acre)	Scenario 2 (average 32dwelling units/160 jobs per acre)
Blue Plains WWTP						
Single family	1.83	2.12	2.29	2.01	2.90	3.43
Multi-family	1.13	1.29	1.41	1.69	2.25	2.62
Employees	1.12	1.41	1.68	6.79	3.41	4.24
Total	**4.08**	**4.81**	**5.37**	**6.15**	**8.55**	**10.29**
Seneca WWTP						
Single family	1.37	2.23	2.75	1.62	2.60	3.20
Multi-family	1.61	1.81	2.17	2.04	2.33	2.74
Employees	1.74	2.71	3.52	1.89	3.06	3.99
Total	**4.72**	**6.75**	**8.44**	**5.55**	**7.99**	**9.93**
Combined WWTPs						
Single family	3.20	4.35	5.03	3.63	5.50	6.63
Multi-family	2.75	3.09	3.58	3.73	4.57	5.36
Employees	2.86	4.12	5.20	8.67	6.47	8.24
TOTAL	**8.81**	**11.56**	**13.81**	**11.70**	**16.54**	**20.22**

According to the baseline 2008 estimate, the City's existing and allocated wastewater demand is approximately 8.81 millions of gallons of water per day (MGD). If future growth only occurs within Gaithersburg's 2008 corporate limits, the maximum estimated 2030 wastewater demand will be 13.81 MGD. If all of the land within the MEL were to be annexed into the City, the maximum estimated 2030 wastewater demand would be 20.22 MGD, using Growth Scenario

[8] The average daily water use factors (Table 3) and wastewater generation factors (Table 4) differ slightly due to data sources. The average daily water use factors were taken from the Montgomery County Comprehensive Water and Sewerage Plan (CWSP). For sewage flows, the CWSP utilizes a model based on existing sewer flows and future growth forecasts that could not be transferred to the City's WRE analysis. Therefore, WSSC provided the *Draft 2006 Wastewater Flow Projection/Demographic Analysis* as a source for wastewater generation factors.

2. In order to analyze potential capacity constraints, forecasts are broken up by each wastewater treatment plant service area.

- **Blue Plains Wastewater Treatment Plant**: Under Growth Scenario #2, which has the greatest potential impact between baseline and future conditions for the City limits and MEL, the forecast demand would generate an additional 4.14 MGD for a total of 10.29 MGD. WSSC has over 45 MGD remaining in its allocated capacity at Blue Plains, and it is likely that the increase of 4.14 MGD could be treated at the facility. Additionally, a dynamic hydraulic model of the Potomac Interceptor (PI) completed in 2002 determined that the PI has capacity to convey flows to Blue Plains WWTP through 2030[9].

- **Seneca Wastewater Treatment Plant**: Under Growth Scenario #2, which has the greatest potential impact between baseline and future conditions for the City limits and MEL, the forecast demand would generate an additional 4.38 MGD for a total of 9.93 MGD. The plant's current capacity of 20 MGD adequately treats current regional flows of 17 MGD; however, the planned expansion to 26 MGD capacity (to be completed by 2011[10]) will be necessary to accommodate future development. In the past, when the Seneca WWTP could not treat all wastewater from the sewer service area, flows were diverted to Blue Plains; however, this flow transfer is no longer feasible.

5.3 Wastewater Discussion and Strategies

Public and community wastewater systems will continue to experience pressure from population and employment growth and State and Federal regulations. As growth pressures place demand on facilities and infrastructure, more stringent restrictions may be placed on the levels of pollutants permitted in effluent discharged into local waterways. While the growth analyses indicate that Blue Plains and Seneca wastewater treatment plants would have the capacity to serve Gaithersburg's maximum forecast demand of 20.22 MGD, regional coordination between jurisdictions is required to confirm that the wastewater treatment capacity is adequate, pollutant loads do not exceed water quality standards, and transmission infrastructure is adequate to meet *total regional growth demands*.

The responsibilities of planning and providing sewerage service in Montgomery County are multi-jurisdictional and depend on the cooperative efforts of County, bi-county, municipal, State, and regional agencies and authorities. This is especially true with regard to the use of the Blue Plains Facility, which serves the District of Columbia; Fairfax County, Virginia; Montgomery and Prince George's Counties, Maryland; and WSSC. Under State law, Montgomery County has planning authority for the availability and adequacy of sewerage service for land use in the County. Montgomery County is responsible for developing both a Water Resources Element and a Comprehensive Water Supply and Sewerage Systems Plan (CWSP) that incorporate all or part of the subsidiary plans for municipalities, sanitary districts, privately-owned facilities and other government agencies in the County. Gaithersburg coordinates with Montgomery County and the Maryland-National Capital Park and Planning Commission to ensure that the City's forecasted growth is factored in the County's regional growth plans and capacity analyses. Subsequently,

[9] Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, Approved 2003-2012 Plan.
[10] WSSC, Interoffice Memo, Quarterly Available Capacity Report October-December 2007

Montgomery County's Water Resources Element will provide a more comprehensive analysis of the *region's total projected wastewater demand* and system capacity.

It is important for Gaithersburg to collaborate with these entities to pursue the following wastewater management programs and strategies:

- **Regional Treatment and Conveyance Capacity**
  - ***Blue Plains Service Area:*** While there would be enough capacity under the given allocation for WSSC at the Blue Plains WWTP, regional coordination of growth is important because there are multiple demands on this facility and the District of Columbia sometimes exceeds its current pollutant load allocation during storm events and wet weather conditions. Regional coordination of growth is also important because there may be issues related to the conveyance of sewage. Although the main basin in Gaithersburg (Muddy Branch) has adequate conveyance capacity through 2015, it recently required relief measures. Continued increase in flows in this basin could raise issues again. Growth in the Watts Branch and Rock Creek Basins could exacerbate current capacity issues.
  - ***Seneca Service Area***: The expansion of treatment capacity at the Seneca WWTP will accommodate near-term future growth, but it will remain important to coordinate development and additional demand in the Seneca Creek watershed with planned facility upgrades.

- **Discharge and Nutrient Loading**
  - ***Blue Plains WWTP:*** The Blue Plains WWTP discharges to the Potomac River in Washington D.C. (outside and downstream of Gaithersburg's jurisdictional limits). A plant upgrade to incorporate Enhanced Nutrient Removal (ENR) technology to address discharge and nutrient loading is anticipated to be completed by 2015. After completion of this upgrade, the effluent total nitrogen goal is 3 mg/L and the total phosphorus goal is 0.18 mg/L. The plant's total nitrogen load cap is 2,006,108 pounds per year and the phosphorus load cap is 92,975 pounds per year. After the ENR upgrade, the annual nitrogen load projected for 2015 will fall just below the cap, and the projected phosphorus load will fall well below the cap in 2015[11]. Projections do not extend further into the future. If a better technology is not introduced after the upgrade, wastewater flows may need to be carefully evaluated in order to meet the nutrient caps. Opening another plant is not a practical option because of expense and feasibility and because the nutrient caps fully allocate the available nitrogen and phosphorus loads in all river basins.
  - ***Seneca WWTP***: The Seneca WWTP discharges to Great Seneca Creek within Montgomery County, MD (outside and downstream of Gaithersburg's jurisdictional limits). A plant upgrade to incorporate Enhanced Nutrient Removal (ENR) technology to address discharge and nutrient loading is anticipated to be completed by 2011, with its expansion from 20 to 26 MGD treatment capacity. The plant's total nitrogen load cap is 243,645 pounds per year and the phosphorus cap is 10,964 pounds per year. Nitrogen loading from 2005 exceeded the cap, but 2006 levels were lower than the cap, and phosphorus is well under that cap currently. In 2015,

[11] Maryland Department of the Environment (2008). Facts about Blue Plains Wastewater Treatment Plant.

both the nitrogen and phosphorus loadings are projected to reach the cap limit[12]. Again, if new technology does not emerge, then flow must be limited to the plant's capacity of 26 MGD.

- **Infrastructure Replacement and Expansion:** Most of Gaithersburg and areas within the maximum expansion limits are located within WSSC's S-1 service area, which means that these areas are either served by water community systems that already exist or are under construction. However, in order to accommodate future demand, infrastructure improvements will be needed to replace outdated systems or to expand systems to meet future demand. Repairing, expanding, and maintaining the wastewater infrastructure is the responsibility of larger planning bodies like WSSC, WASA, and Montgomery County. Currently there is still allocated capacity; however, maintaining and expanding trunk sewers may be required in the future.

- **WSSC Programs for Sustained Water Conservation and Waste Reduction**: WSSC has a variety of programs to promote water conservation and waste reduction. These include public outreach and education programs, plumbing codes requiring water saving fixtures in new installations and replacements, and a conservation-oriented water/sewer rate structure that progressively increases charges as the customer's average daily consumption increases.

- **Gaithersburg Adequate Public Facilities Ordinance (APFO)**: Adopted on January 2, 2007, Gaithersburg's Adequate Public Facilities Ordinance (O-1-07) contains four facets, one of which addresses water and sewer services. This ordinance codifies the responsibilities of the City of Gaithersburg during plan review and reaffirms the oversight roles of both Montgomery County and WSSC as to future development within the City and water and sewer capacity. Section 24-247(b) of the APFO states: "[d]evelopment that would cause the City to exceed transmission capacity available at Blue Plains Wastewater Treatment Plant, Seneca Wastewater Treatment Plant or other facilities as determined by WSSC shall not be approved. Final sewer transmission capacity shall be confirmed by WSSC prior to the issuance of development approvals."

- **Wastewater Demand Management:** The greatest change that can be made locally and immediately is with demand management. Green building practices can maximize water efficiency in a building to reduce the burden on wastewater systems. Households, businesses, and institutions can reduce wastewater generation by installing high-efficiency plumbing and control technologies (e.g., toilets, faucets, showers, dishwashers, clothes washers, and cooling towers), graywater systems, and retrofits to older structures. Widespread education and outreach efforts on the benefits of water efficiency are proven to reduce water use and wastewater generation in a community. While Gaithersburg requires green building practices in new commercial and residential buildings, the City should continue to work with WSSC, the Metropolitan Washington Council of Governments (MWCOG), and Montgomery County on green building codes, stormwater management practices, incentives, and education programs that promote efficient water fixtures, systems, and practices for both new and existing buildings.

[12] Maryland Department of the Environment (2008). Facts about Seneca Creek Wastewater Treatment Plant.

6. Stormwater and Nonpoint Source Pollution Assessment[13]

6.1 Existing Stormwater and Nonpoint Source Pollution

Nonpoint source (NPS) pollution comes from many diffuse sources when rainfall, snowmelt, or irrigation flow over land or through the ground and gather pollutants. Pollutants are then deposited into streams, rivers, lakes, and coastal waters or introduced into groundwater. The use of land for development, industry, transportation, and agriculture contributes to nonpoint source pollution and has a profound influence on the quality of Maryland's waters.

In urban areas, stormwater runoff is a significant contributor to nonpoint source pollution. Stormwater runoff is generated when precipitation flows over land or impervious surfaces such as paved streets, parking lots, and building rooftops. In natural areas stormwater is slowed by existing vegetation and allowed to percolate through the earth to recharge groundwater and maintain stream surface flows, whereas in developed areas, cleared, graded, and impervious surfaces impede this process and generate more stormwater runoff. The increase in stormwater runoff can be too much for the existing natural drainage system to handle. As a result, the natural drainage system is often "improved" to rapidly collect runoff and quickly convey it away from the site, using curb and gutter systems, enclosed storm sewers, and lined channels. Stormwater runoff is then discharged to waterways where it causes erosion and flooding and releases excess nutrients, sediment, chemicals, and trash.

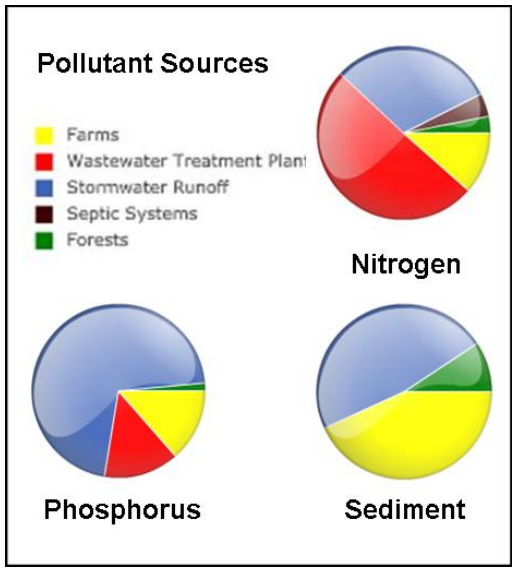


Figure 5: Potomac River Pollutant Sources

Maryland BayStat model estimation of pollutant sources in the Middle Potomac Watershed.

Consequently, land use and water quality are closely interrelated. Watershed imperviousness has been associated with a wide range of negative impacts to stream hydrology, stream morphology, biological habitat, and water quality. Impervious areas greatly impact stream health, groundwater recharge, temperature, drought hydrology conditions, water quality, and aquatic ecosystems. The Center for Watershed Protection and the Stormwater Manager's Resource Center compiled research regarding the impacts of urbanization on aquatic systems, revealing that sensitive stream elements are lost when impervious cover exceeds about 10 percent.

[13] As an urban area, Gaithersburg's WRE analysis focuses on stormwater management needs for existing and future development. As illustrated in Maps 10 and 12, there is neither an existing nor planned wastewater treatment plant (WWTP) located within Gaithersburg's corporate limits or Maximum Expansion Limits (MEL). The Seneca WWTP is located outside and downstream of the City's boundaries and there are no upstream WWTPs; therefore, wastewater pollution loads were not incorporated into Gaithersburg's analysis. Gaithersburg acknowledges that the community contributes to WWTP discharges to the Potomac River at the Blue Plains WWTP and to Great Seneca Creek at the Seneca WWTP. As indicated in Appendix C, nutrient loads from septic systems in Gaithersburg are negligible and excluded from the WRE nonpoint source analysis. However, nutrient loads for WWTPs and septic systems within Montgomery County will be incorporated into Montgomery County's Water Resources Element. As indicated in Appendix D, additional nutrient loads from other point sources are negligible and excluded from the WRE analysis.

Once imperviousness reaches 25 to 30 percent, studies show that most indicators of stream quality shift to a poor condition as the result of severe impacts from erosion, channel instability, severe habitat degradation, and decreasing biological integrity. Given that Gaithersburg is an urbanized area, watersheds within the City generally exceed the 30 percent imperviousness limit and stream quality indicators range from poor to good. As illustrated in Table 8 and Map 13, the watershed areas within the City limits have, conservatively, the following impervious cover: Muddy Branch Watershed - 32%; Middle Seneca Watershed - 38%; Lower Seneca Watershed - 40%.

According to the Chesapeake Bay Program, stormwater is responsible for 17 percent of phosphorus, 11 percent of nitrogen, and 9 percent of sediment loads to the entire Bay. In more urbanized watersheds, such as the Middle Potomac watershed where Gaithersburg is located, stormwater runoff accounts for even higher levels of pollutant loads. The Maryland BayStat model estimates that stormwater runoff accounts for nearly 30 percent of nitrogen, 70 percent of phosphorus, and 47 percent of sediment pollution in the Middle Potomac watershed. As part of the 2000 Chesapeake Bay Agreement, Maryland is committed to reducing nutrient and sediment pollution from stormwater runoff.

Maryland's original stormwater management program was implemented in the early 1980s and engineered measures were primarily used to address flood control. These structures did little to protect streams from erosion and sediment deposition and water quality continued to suffer. The State amended stormwater regulations in 2000 and adopted the 2000 Design Manual to codify more stringent stormwater management requirements for water quantity, quality, and recharge. Local stormwater management programs were required to revise their programs and implement this new program in 2001. Gaithersburg officially adopted this standard in September of 2001; therefore, projects designed between 2002 to 2009 typically reflect the 2000 design standards. Stormwater management practices have continued to evolve over the years toward environmentally sensitive "softer" techniques that remove pollutants, recharge groundwater, and protect stream channels from erosive forces. The Maryland Stormwater Management Act of 2007 mandates that environmental site design (ESD) be implemented in development and redevelopment projects to the maximum extent practicable (MEP). Local stormwater management programs are required to revise their programs and implement this new program by 2010.

The city will promote the use of ESD to maximize aesthetic value. ESD controls can be incorporated into a distributed approach on almost every section of urban and suburban environments including open space, rooftops, streetscapes, parking lots, sidewalks, and roadways. In addition to the many necessary protections from flooding, aquifer depletion, water quality, habitat disruption and pollution of the Chesapeake Bay, the city recognizes the major benefits of ESD include being a more environmentally and economically sustainable way to soften the adverse visual impacts of roadways and parking fields and maximize the pedestrian environment. The dual use of storm water management and the introduction of these additional distributed vegetated areas into the built environment will greatly improve community livability, property value and neighborhood cohesion, if the systems chosen and developed for each project maintain aesthetics as a priority. Priorities include:

- Vegetated roofs (especially where potentially visible)
- Enlarged sidewalk tree boxes (urban/TND environments)
- Building facade garden planters to collect roof runoff (urban & suburban environments)
- Bio-retention swales & curb inlets (roadways & surface parking)

Figure 6: Ponds at Bohrer Park

The ponds at Bohrer Park Summit Hall Farm not only serve as an environmental amenity, but also provide stormwater management benefits.

The City's stormwater management (SWM) system performs an essential role in mitigating the effects of development on streams and surrounding environmentally sensitive areas. Gaithersburg's public and private stormwater system consists of more than 3,600 inlets, 400 stormwater management facilities, 700 outfalls, and approximately 100 linear miles of pipe. Given that much of Gaithersburg was developed prior to the adoption of stormwater management requirements, there are many older developed areas that either lack treatment or have outdated structures (i.e., constructed prior to the adoption of the 2000 Design Manual) that provide limited water quality benefits. For areas of the City that include stormwater management controls, routine inspection and maintenance of this infrastructure is essential to ensure that both public and private systems function properly. Funding from Montgomery County's Water Quality Protection Charge helps the City inspect, maintain, and retrofit stormwater management facilities to improve and restore damaged streams and waterways.

Table 8 and Map 14 summarize Gaithersburg's watersheds and the types of stormwater management controls associated with developed drainage areas, within the City's 2008 limits and the City's MEL. For watersheds within the current City limits, general drainage area sizes and types of stormwater management controls present are characterized. Stormwater management controls are characterized according to the following:

- Undeveloped, no stormwater management required;
- No SWM best management practice present;
- SWM best management practice(s) designed to pre-2000 State standards;
- SWM best management practice(s) designed to the 2000 State standards; or
- SWM best management practice(s) designed to the 2007 State standards.[14]

It is assumed that as Growth Areas in the City and the MEL develop/redevelop, they will be required to meet the latest State stormwater management treatment requirements; therefore, pollutant loading should be reduced in these areas. New or retrofitted stormwater management best management practices may be incorporated in developed areas where: 1) redevelopment is not anticipated; 2) no SWM controls exist; or 3) there are older SWM controls that do not meet the original 2000 Maryland Stormwater Design Manual standards.

[14] At the time the Water Resources Element analysis was conducted, the 2007 State standards were not in effect.

Although the Lower Seneca Creek watershed is the City's smallest watershed, it has the greatest percentage of impervious cover and the least amount of developed area treated with stormwater management controls to protect water quality. This watershed flows into Clopper Lake, a 90 acre impoundment built for recreation and flood control. The Maryland Department of the Environment (MDE) established a Total Maximum Daily Load (TMDL) to limit phosphorus and sediment loading into Clopper Lake. Subsequently, this watershed presents a challenge as well as an opportunity for retrofit projects. As part of Gaithersburg's comprehensive watershed management program, the City is working with neighboring jurisdictions and property owners within untreated areas of the Long Draught Branch watershed to incorporate stream restoration and stormwater management projects through redevelopment, facility retrofits, and ESD improvements, where practicable. These projects are essential to help restore streams and meet water quality regulatory requirements.

Figure 7: Clopper Lake

Clopper Lake is owned by the Forest and Park Service of the Maryland Department of Natural Resources. The lake was constructed in 1975 for recreation and flood control. In order to protect these functions, MDE has established a TMDL to limit sediment and phosphorus loading.

Nearly half of the Middle Seneca watershed contains older stormwater management controls and over a third of the watershed does not have any stormwater management controls. Given that the MGE describes many areas within the Middle Seneca watershed to be potential redevelopment growth areas, opportunities to improve stormwater management may be incorporated during the redevelopment process. Additionally, the implementation of retrofits and ESD improvements may be applied in this watershed when feasible.

Gaithersburg's largest watershed, the Muddy Branch, contains many areas that were developed prior to modern stormwater regulations. Stormwater runoff has degraded streams in this watershed. The City's 2002 stream assessment identified several candidate stream restoration sites along the Muddy Branch's main stem and tributaries. In order to reduce stream erosion in the main stem, the City recently implemented an important stormwater retrofit in this watershed. The Brighton Weir stormwater management facility, located in Malcolm King Park, was retrofitted in 2004 to provide flood control for over 747 acres within the City (over 1100 acres including areas in Montgomery County). This structure significantly increases the percentage of the Muddy Branch watershed that has stormwater management controls. However, there are still many older

developed areas upstream of this structure where stormwater management could be retrofitted to provide channel protection, improve water quality, and promote groundwater recharge.

Table 8: Gaithersburg Watersheds and Stormwater Management Practices

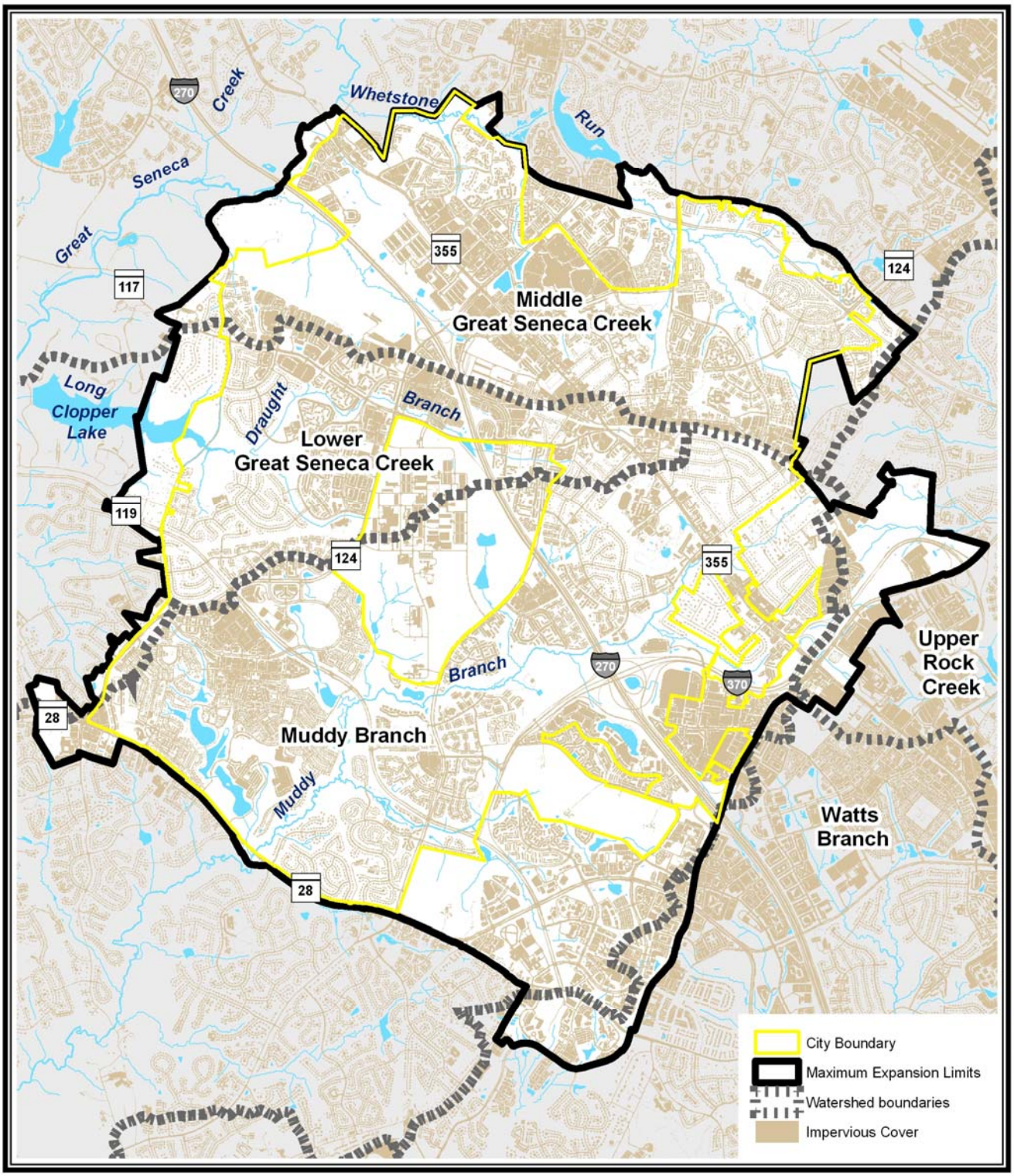
Watershed and Primary Tributaries	Gaithersburg 2008 Limits											City Limits and MEL [15]
	Watershed Area (Acres)	Impervious Cover [16]		Undeveloped (No SWM required)		No SWM, No Standard Met		Pre-2000 State SWM Standard		2000 State SWM Standard		Watershed Area (Acres)
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	
Muddy Branch	3,183	1027	32%	302	10%	1457	46%	1131	35%	293	9%	4,952
Middle Seneca Whetstone Run Great Seneca Creek	2,163	827	38%	126	6%	850	39%	1023	47%	164	8%	2,743
Lower Seneca Long Draught Branch	1,255	502	40%	86	7%	411	33%	745	59%	13	1%	1,736
Watts Branch	0	N.A.		N.A.		N.A.		N.A.		N.A.		217
Upper Rock Creek	0	N.A.		N.A.		N.A.		N.A.		N.A.		333
TOTAL	**6,601**	**2,356**	**36%**	**514**	**8%**	**2,718**	**41%**	**2,899**	44%	**470**	**7%**	**9,981**

Sources: City of Gaithersburg, Montgomery County DEP, Montgomery County DTS-GIS and DFRS, and Maryland-National Capital Park & Planning Commission

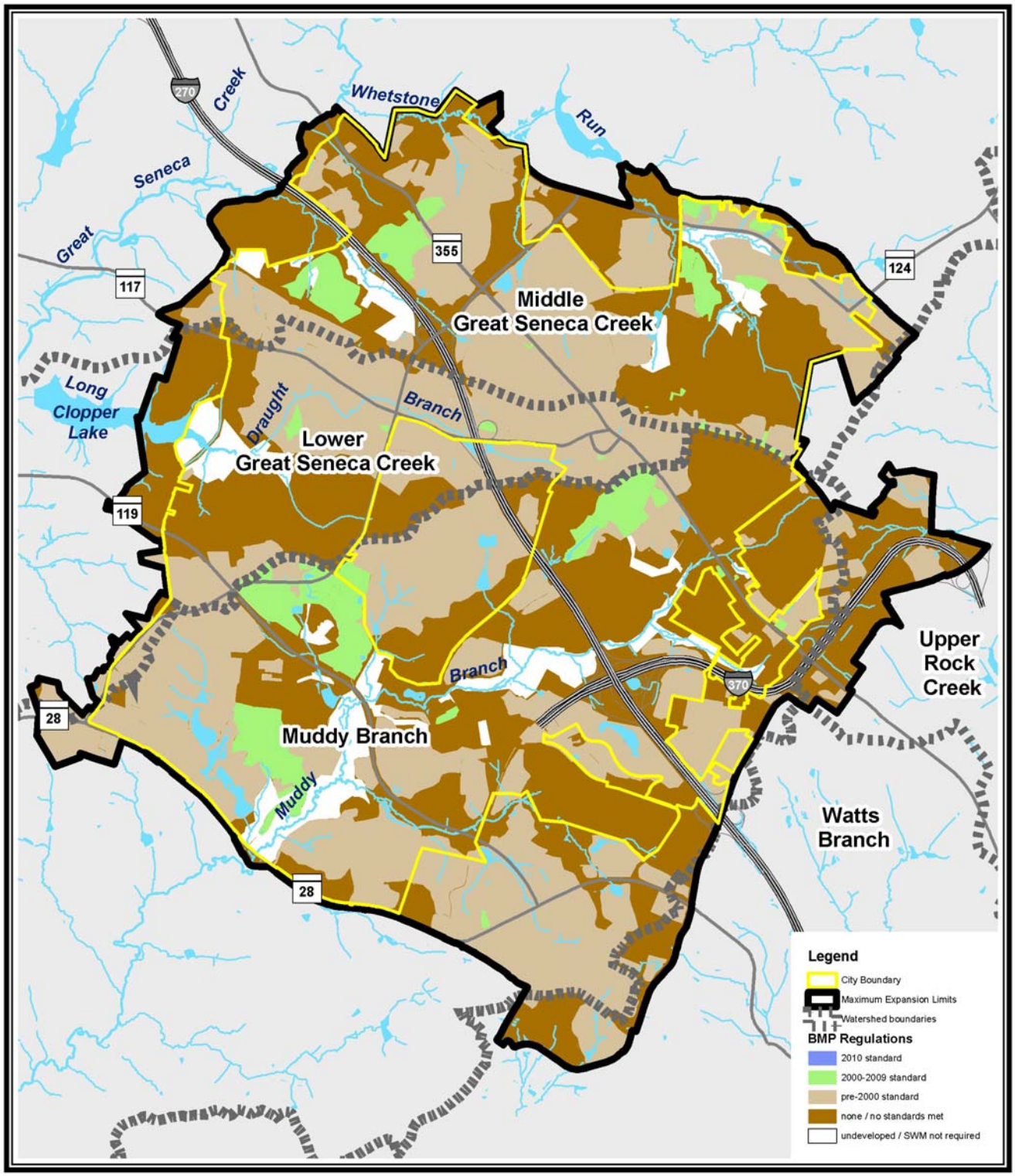
[15] Data on drainage area and SWM treatment is not available for areas in the MEL that are outside of the 2008 City limits.

[16] A conservative estimate of the impervious cover based on the most recent data available. Impervious cover used in this analysis includes buildings, garages, sheds, public roads, major private roads, athletic facilities (tennis courts, swimming pools, etc.), parking lots and associated driveways, and public paths and sidewalks but does not include private residential driveways, sidewalks, and decks.

Map 13: Impervious Cover by Watershed



Map 14: Stormwater Management Practices in Developed Drainage Areas



6.2 Stormwater and Nonpoint Source Loading Analysis

As an urban area that is entirely served by public sanitary treatment services, but does not have a WWTP within nor upstream of its boundaries, stormwater runoff is the primary source of nutrient loads in Gaithersburg. The intent of the stormwater and nonpoint source loading analysis is to provide a general assessment of how planned growth within a local jurisdiction might affect nonpoint source loads to receiving waters. This is not a simple or straightforward task: questions of scale, land use definitions, impervious cover assumptions, pollutant loading rate assumptions, planned versus forecasted growth trends, and the effectiveness of stormwater management best management practices, among others, present a host of challenges.

The Nonpoint Source Analysis (NPS) spreadsheet-based model, provided by the Maryland Department of the Environment (MDE) and the Maryland Department of Planning (MDP), was used to conduct Gaithersburg's WRE's stormwater and nonpoint source analysis. The NPS model performs a simple before-and-after analysis of the change in nutrient (nitrogen and phosphorus) loads due to proposed land use changes from 2008 to 2030 and the implementation of different best management practices (BMPs). The model is based on MDP geographic information systems (GIS) land use data that was refined to illustrate Gaithersburg's existing 2008 and estimated 2030 land uses. The net change in land use typically represents the change from agriculture, forest, or open land to developed land. Each MDP land use type is associated with specific nutrient loading rates and an impervious ratio. The model uses the net land use change and the associated changes in impervious area and nonpoint source nutrient loading rates to estimate phosphorus and nitrogen nutrient loads in pounds (lbs) per year.

The original NPS spreadsheet calculates base nitrogen and phosphorus nonpoint source loads for the year 2002 land use/land cover and septic systems by State Basin. The default spreadsheet uses three inputs: 1) land use acreages; 2) number of residential septic systems; and 3) the acreage of non-residential land to be served by septic systems. Gaithersburg's nonpoint source loading analysis excludes residential and non-residential septic nutrient loading because the City is entirely served by WSSC, septic systems are extremely rare, and all future development must utilize public wastewater treatment systems.

MDE tailored the NPS spreadsheet for Montgomery County and MDP provided 2002 land use/land cover GIS data by basin. Given Gaithersburg's location, the applicable loading factors defined as 'Potomac River above the fall line' were used. Gaithersburg further customized the model's watersheds and land use data and assumptions to better reflect local conditions:

- The Potomac watershed was divided into Gaithersburg's subwatersheds: the Muddy Branch, Lower Great Seneca, Middle Great Seneca, Watts Branch, and Upper Rock Creek.
- MDP's 2002 land use/cover GIS data was modified to better reflect Gaithersburg's zoning and development patterns[17]. Mixed-use commercial and mixed-use residential land use categories were added to the land use/cover categories.
- The nutrient loading factors and impervious ratios from the commercial land use category were applied to the new mixed-use commercial and mixed-use residential categories; as suggested by M-NCPPC to reflect the maximum scenario for imperviousness and pollutant loads that could be associated with urban mixed-use conditions.

[17] Appendix A includes the refined MDP land uses used in Gaithersburg's nonpoint source loading analysis.

- Gaithersburg's initial land cover was created by modifying MDP's 2002 land use/cover GIS data to reflect Gaithersburg's 2008 conditions.
- Gaithersburg's potential 2030 land cover was created by modifying the 2008 land use/cover GIS data to include potential land use changes associated with Pipeline and Growth Area development, as defined by the MGE, Map 4, and described in the following section.

Given that full development and build-out presents the greatest impact on local watersheds, the WRE analysis assumes that all areas identified in the MGE as Pipeline and Growth Areas will be fully developed by 2030. Both of the MGE's growth scenarios (20 units/100 jobs per acre and 32 units/160 jobs per acre) involve relative high density mixed-use development. According to MDP's land use/cover classification definitions, high-density residential includes areas with more than 8 dwelling units per acres and commercial includes areas primarily for the sale of products and services, including associated yards and parking areas. From the NPS model's perspective, there is little difference in impervious area and pollutant loading between the MGE's mixed-used growth scenarios.

Therefore, the WRE analysis differentiates nonpoint loading scenarios based on the implementation of different best management practices. The NPS model includes two default analysis tools: one that refects nutrient loadings associated with SWM best management practice implementation in 2002 (i.e., the application of the original 2000 Design Manual BMPs) and one that reflects loadings following the implementation of Tributary Strategies. The WRE analysis considers the implementation of these two scenarios to estimate the impact that growth and different development and management controls will have on local watersheds and their water quality:

- ***Scenario 1, 2000 Maryland Design Manual Stormwater Management Best Management Practices (BMPs)***: Assumes BMP implementation in accordance with the original Maryland Department of the Environment's 2000 Maryland Design Manual which established redevelopment criteria; provided design guidance for the most effective nonstructural and structural BMPs such as ponds, wetlands, and underground systems; and defined sizing criteria to meet specific pollutant removal goals, maintain groundwater recharge, reduce channel erosion, prevent overbank flooding, and pass extreme flood events.

- ***Scenario 2, Tributary Strategies***: Assumes implementation of the Middle Potomac Tributary Strategies for urban areas that include: (1) requiring all new development and redevelopment to use environmental site design (ESD) practices for stormwater management, in accordance with the Maryland Stormwater Act of 2007 requirements; (2) inspecting, maintaining, and retrofitting development from 1985-2002; (3) retrofitting 40% of untreated developed land; (4) educating residents to reduce home fertilizer use; and (5) implementing sediment and erosion control for all disturbed land.

6.2.1 Potential Future Land Use Changes

Calculations and analysis of nonpoint source pollution are based on land use. Each land use type has an associated percent impervious surface ratio and pollutant loading factors that impact the quantity and quality of stormwater. For example, forested areas will allow for

infiltration and recharging of groundwater while intense development will convey water into the stormwater system and add pollutants. The land use change analysis was conducted at a watershed level because an aggregate City analysis is not sensitive to development intensity or water quality conditions in a particular watershed. The MGE describes Pipeline and Growth Areas within each watershed, which serves as the basis of potential land use changes between 2008 and 2030, and are identified in Map 4. These areas are originally described in the MGE and are used for general analysis purposes in the WRE and should not be interpreted as entitlements, suggestions, or recommendations for future development. The 2008 baseline and the potential 2030 land uses are described below.

- ***2008 Baseline Land Use***: The 2008 baseline was determined by editing a 2002 land use/ cover GIS data from Maryland-National Capital Park and Planning Commission (M-NCPPC) and MDP to reflect existing land use in 2008. Generally, changes were only made to larger tracts of land. These changes included designating forested areas and parks, connecting roads, and relocating ponds.

- ***Potential 2030 Land Use***: To estimate potential 2030 land use, changes were made to the 2008 baseline to account for the following areas identified in the Municipal Growth Element:

  - ***Approved Pipeline development***[18] generally includes those projects that have received schematic development plan (SDP), preliminary site plan (PSP), or final site plan (FSP) approval. For areas designated as pipeline development locations, approved site plans were used to predict the 2030 land use.

  - ***Future Growth Areas*** are those areas within the City and Maximum Expansion Limits (MEL) that have the potential for growth in housing, population, and jobs by 2030 and are limited to those properties that are included in an approved Master Plan or are likely to be designated as Study Areas in the 2009 Master Plan update, are identified in the City's adopted 2008 Strategic Plan, or are properties that currently have redevelopment projects proposed. The Growth Areas are intended to serve as a guide for the potential number of acres in each watershed that may experience a change in land use by 2030 and should not be construed to indicate exactly where new growth will occur. It is expected that the Growth Areas will be mixed use in character, but the exact type of mixed use is still uncertain. As a result, the 'Mixed Use Commercial' land use was assigned to all of the Growth Areas, as recommended by the M-NCPPC guidelines. The few exceptions to this rule occurred when an adjacent regulated land use was extended into a growth area; for example the protection of stream valleys buffers.

[18] In the drinking water and wastewater assessments, pipeline development was grouped in with current demand because the demand must be met before the project moves forward and to be consistent with the MGE. In the stormwater analysis, pipeline development is included in future land use to remain consistent with current and future land use definitions being used by Montgomery County's Water Resources Element.

To better summarize changes in land use, MDP's 26 specific land use/land cover types[19] were combined into five general land use categories:

- ***Development*** includes all residential, commercial, industrial, institutional, and transportation land uses.
- ***Mixed open land*** includes recreation areas, urban areas that do not require structures, urban areas where non-conforming uses characterized by open land have become isolated, or brush and bare ground.
- ***Agricultural*** includes pasture, cropland, and open fields.
- ***Forest*** includes deciduous forests, evergreen forests, and forested wetlands.
- ***Water*** includes rivers, waterways, reservoirs, ponds, and wetlands.

Table 9 summarizes the potential land use changes by general land use category between the 2008 baseline and 2030, for both the City limits and MEL. If all potential growth occurred only within the City's 2008 limits, land use would change by approximately 388 acres; converting primarily mixed open land and agriculture land (as defined above) to developed land. The percentage of developed land would increase from 79% to 85%. If all of the land within the MEL were to be annexed into the City and develop under a mixed-use scenario; 604 acres of agriculture, forest, and mixed open land uses could be converted to developed land. The percentage of developed land would increase from 81% to 86%. Potential land use changes are mainly concentrated in the Muddy Branch watershed (315 to 439 acres), followed by the Middle Great Seneca Creek watershed (67 to 143 acres) and the Lower Great Seneca Creek (5 to 18 acres) watershed.

[19] Appendix A includes the refined MDP land uses used in Gaithersburg's nonpoint source loading analysis.

Table 9: Gaithersburg Potential Land Use Changes

Watershed / Land Use Category	2008 City Limits			2008 City Limits and MEL		
	2008 Baseline (acres)	2030 Potential (acres)	Change (acres)	2008 Baseline (acres)	2030 Potential (acres)	Change (acres)
Lower Great Seneca						
Development	1090	1095	***5***	1485	1503	***18***
Mixed open land	39	38	***-1***	42	41	***-1***
Agriculture	0	0	***0***	13	0	***-13***
Forest	118	114	***-4***	167	164	***-4***
Water	7	7	***0***	28	28	***0***
Middle Great Seneca						
Development	1752	1819	***67***	2139	2282	***143***
Mixed open land	97	99	***2***	145	154	***9***
Agriculture	24	0	***-24***	40	0	***-40***
Forest	260	214	***-46***	389	275	***-114***
Water	28	30	***1***	30	32	***1***
Muddy Branch						
Development	2365	2680	***315***	3947	4386	***439***
Mixed open land	301	139	***-162***	323	160	***-163***
Agriculture	162	0	***-162***	286	0	***-286***
Forest	297	305	***8***	320	329	***8***
Water	58	59	***1***	77	78	***1***
Upper Rock Creek						
Development	0	0	***0***	176	179	***3***
Mixed open land	0	0	***0***	9	96	***87***
Agriculture	0	0	***0***	90	0	***-90***
Forest	0	0	***0***	52	52	***0***
Water	0	0	***0***	5	5	***0***
Watts Branch						
Development	0	0	***0***	214	214	***0***
Mixed open land	0	0	***0***	0	0	***0***
Agriculture	0	0	***0***	0	0	***0***
Forest	0	0	***0***	0	0	***0***
Water	0	0	***0***	3	3	***0***
Grand Total						
Development	**5207**	**5595**	***388***	**7961**	**8564**	***604***
Mixed open land	**437**	**276**	***-161***	**519**	**451**	***-67***
Agriculture	**187**	**0**	***-187***	**429**	**0**	***-429***
Forest	**676**	**634**	***-42***	**929**	**820**	***-109***
Water	**93**	**95**	***2***	**143**	**145**	***2***

6.2.2 Nutrient Loading

For each scenario, a loading factor (pounds of pollutant per acre per year) is multiplied by existing acreage for each given land use (i.e. residential, commercial, etc.) The result, measured in pounds of pollutant per year, quantifies how planned growth and best management practices will impact local watershed health and water quality between 2008 and 2030. Tables 10 and 11 summarize the estimated 2008 and 2030 nitrogen and phosphorus pollutant loads per watershed and scenario.

Nitrogen:

- ***Scenario 1, 2000 Design Manual BMPs:*** Within the City's 2008 limits, the model predicts overall nitrogen loading will increase slightly (from 55,637 lbs/yr to 56,203 lbs/yr). Within the City and MEL, the model predicts a slight decrease in nitrogen loading (from 86,087 lbs/yr to 85,803 lbs/yr). In both cases, new development will add to nitrogen loading, but replacing agriculture crops and pasture (which have relatively high nutrient loading rates) with development (which has moderate nutrient loading rates) will decrease the relative nitrogen loading rate.

- ***Scenario 2, Tributary Strategies:*** Within the City limits, the model predicts nitrogen loading will decrease approximately 14,000 lbs/yr (from 55,637 lbs/yr to 41,661 lbs/yr). Within the City and MEL, the model predicts nitrogen loading will decrease approximately 22,500 lbs/yr (from 86,087 lbs/yr to 63,558 lbs/yr). To achieve this decrease in nutrient loading, the Tributary Strategies would have to be implemented within existing land uses and areas where land use has the potential to change by 2030.

Phosphorus:

- ***Scenario 1, 2000 Design Manual BMPs:*** Within the City limits, the model predicts phosphorus loading will decrease slightly (from 4,828 lbs/yr to 4,801 lbs/yr). Within the City and MEL, the model predicts a slight decrease in phosphorus loading (from 7,446 lbs/yr to 7,345 lbs/yr). In both cases, new development will add to phosphorus loading, but replacing agriculture crops and pasture with development decrease the relative loading rate (in lbs/acre), given this model's land use loading assumptions.

- ***Scenario 2, Tributary Strategies:*** Within the City limits, the model predicts phosphorus loading will decrease approximately 1,500 lbs/yr (from 4,828 lbs/yr to 3,351 lbs/yr). Within the City and MEL, the model predicts phosphorus loading will decrease approximately 2,300 lbs/yr (from 7,446 lbs/yr to 5,129 lbs/yr). To achieve this decrease in nutrient loading, the Tributary Strategies would have to be implemented to existing land uses and areas where land use has the potential to change by 2030.

If the Tributary Strategies are implemented throughout the City (and MEL as applicable) then the overall stormwater nonpoint source nutrient loading is anticipated to decline from 2008 levels. This reduction in nutrient loading is important for identifying suitable receiving water and land areas to meet the stormwater management disposal needs of existing and future development.

The Muddy Branch, Middle Great Seneca Creek, Rock Creek, and Watts Branch watersheds currently do not have nutrient TMDLs and therefore insufficient information is available to determine suitability for these watersheds. As the Chesapeake Bay TMDL develops, the City will partner with adjacent jurisdictions to develop watershed implementation plans to reduce nutrient loading in these watersheds.

Implementing Tributary Strategies will be particularly important in the Lower Great Seneca watershed because of the Clopper Lake Total Maximum Daily Load (TMDL) limit of 555 lbs[20] phosphorus per year. As previously illustrated in Map 5, almost the entire Lower Great Seneca watershed that is located within Gaithersburg drains to Clopper Lake. Clopper Lake also receives drainage from the National Institute of Standards and Technology (NIST) and Montgomery County. Although development and redevelopment planned in this watershed will include modern stormwater management controls that will reduce nutrient loadings, future phosphorus loadings are estimated to exceed the TMDL. According to the model's estimates, the Lower Great Seneca Creek watershed's current annual phosphorus load is approximately 946 lbs/yr within the City and 1,331 lbs/yr within the City and MEL. Implementing Tributary Strategies will reduce the phosphorus load to approximately 649 lbs/yr within the City and 911 lbs/yr within the City and MEL. These loading estimates are still above the TMDL limit and do not include nutrient loads from areas within Montgomery County and NIST that drain to Clopper Lake. Therefore, Gaithersburg, Montgomery County, and the National Institute of Standards and Technology (NIST) will need to coordinate efforts to further reduce phosphorus loads in this watershed.[21] The City of Gaithersburg recognizes that Clopper Lake, because of the presence of a phosphorus TMDL, can only be considered a suitable receiving water if future nutrient impacts are offset. This WRE includes recommendations for interjurisdictional watershed planning and pollution control efforts to help achieve that goal. In addition, this WRE recommends refining the pollution forecast in the future to allow for direct comparison to nutrient TMDLs as information becomes available.

Additionally, implementing Tributary Strategies will be very important in the Muddy Branch watershed. The Muddy Branch is where the increase in developed land use is the most concentrated and where the largest nutrient loads are generated. The headwaters of the Muddy Branch are located in Gaithersburg and are particularly sensitive to impervious area and development. Watershed studies indicate that the upper Muddy Branch exhibits unstable stream conditions with incised banks and erosion. Gaithersburg is coordinating with Montgomery County and the U.S. Army Corps of Engineers on an assessment and restoration strategies for this watershed.

[20] Maryland Department of Environment, TMDL Clopper Lake

[21] Considering that the implementation of a TMDL for Clopper Lake involves the collaboration of Federal, State, County, and City agencies, the details and scope of this watershed implementation plan are currently outside of the scope of Gaithersburg's Water Resource Element and will require additional analysis and coordination. However, Gaithersburg is committed to meeting the water quality requirements of the Clopper Lake watershed and will work with these agencies on a joint implementation plan.

Table 10: Gaithersburg Estimated Nonpoint Source Nitrogen Loading

Watershed	2008 City Limits			2008 City Limits and MEL		
	2008	2030		2008	2030	
Land Use Category	Baseline 2000 Design Manual BMPs (N lbs/yr)	Scenario 1 2000 Design Manual BMPs (N lbs/yr)	Scenario 2 Tributary Strategies (N lbs/yr)	Baseline 2000 Design Manual BMPs (N lbs/yr)	Scenario 1 2000 Design Manual BMPs (N lbs/yr)	Scenario 2 Tributary Strategies (N lbs/yr)
Lower GSC	**10,839**	**10,808**	**7,988**	**15,131**	**15,072**	**11,134**
Development	10,136	10,125	7,441	13,941	14,037	10,290
Mixed open land	403	391	280	439	426	306
Agriculture	0	0	0	135	0	0
Forest	255	247	228	362	354	328
Water	45	45	38	255	255	210
Middle GSC	**18,046**	**17,990**	**13,391**	**22,374**	**22,724**	**16,908**
Development	16,021	16,353	12,099	19,612	20,593	15,221
Mixed open land	987	1,012	726	1,272	1,370	994
Agriculture	326	0	0	494	0	0
Forest	558	457	424	831	584	541
Water	153	167	142	164	177	152
Muddy Branch	**26,753**	**27,405**	**20,283**	**43,913**	**43,415**	**32,102**
Development	22,013	24,838	18,242	36,570	40,427	29,730
Mixed open land	1,753	1,370	985	1,956	1,572	1,131
Agriculture	1,812	0	0	3,993	0	0
Forest	639	657	609	689	707	655
Water	536	539	446	706	709	586
Upper Rock Creek	**0**	**0**	**0**	**2,756**	**2,682**	**1,993**
Development	0	0	0	1,532	1,564	1,166
Mixed open land	0	0	0	95	995	713
Agriculture	0	0	0	1,006	0	0
Forest	0	0	0	94	94	87
Water	0	0	0	30	30	27
Watts Branch	**0**	**0**	**0**	**1,913**	**1,911**	**1,421**
Development	0	0	0	1,890	1,890	1,404
Mixed open land	0	0	0	0	0	0
Agriculture	0	0	0	3	3	2
Forest	0	0	0	0	0	0
Water	0	0	0	20	18	15
Grand Total	**55,637**	**56,203**	**41,661**	**86,087**	**85,803**	**63,558**
Development	48,170	51,317	37,783	73,544	78,510	57,812
Mixed open land	3,142	2,774	1,992	3,762	4,363	3,143
Agriculture	2,137	0	0	5,631	3	2
Forest	1,453	1,361	1,261	1,976	1,739	1,611
Water	735	751	626	1,174	1,188	990

Note: N lbs/yr = pounds of Nitrogen per year

Table 11: Gaithersburg Estimated Nonpoint Source Phosphorus Loading

Watershed	2008 City Limits			2008 City Limits and MEL		
	2008	2030		2008	2030	
Land Use Category	Baseline 2000 Design Manual BMPs (P lbs/yr)	Scenario 1 2000 Design Manual BMPs (P lbs/yr)	Scenario 2 Tributary Strategies (P lbs/yr)	Baseline 2000 Design Manual BMPs (P lbs/yr)	Scenario 1 2000 Design Manual BMPs (P lbs/yr)	Scenario 2 Tributary Strategies (P lbs/yr)
Lower GSC	**946**	**936**	**649**	**1,331**	**1,316**	**911**
Development	900	891	619	1,254	1,254	865
Mixed open land	41	40	26	45	43	28
Agriculture	0	0	0	14	0	0
Forest	3	3	3	4	4	4
Water	2	2	2	14	14	14
Middle GSC	**1,533**	**1,495**	**1,055**	**1,897**	**1,896**	**1,334**
Development	1,388	1,379	976	1,706	1,748	1,233
Mixed open land	100	103	67	124	134	88
Agriculture	32	0	0	50	0	0
Forest	6	5	5	10	7	6
Water	7	7	7	7	8	7
Muddy Branch	**2,349**	**2,370**	**1,647**	**3,812**	**3,749**	**2,614**
Development	1,958	2,195	1,521	3,230	3,544	2,464
Mixed open land	146	138	90	166	158	103
Agriculture	209	0	0	368	0	0
Forest	7	8	7	8	8	7
Water	30	30	30	39	39	39
Upper Rock Creek	**0**	**0**	**0**	**250**	**228**	**158**
Development	0	0	0	122	125	91
Mixed open land	0	0	0	10	101	66
Agriculture	0	0	0	116	0	0
Forest	0	0	0	1	1	1
Water	0	0	0	0	0	0
Watts Branch	**0**	**0**	**0**	**156**	**156**	**112**
Development	0	0	0	155	155	111
Mixed open land	0	0	0	0	0	0
Agriculture	0	0	0	0	0	0
Forest	0	0	0	0	0	0
Water	0	0	0	1	1	1
Grand Total	**4,828**	**4,801**	**3,351**	**7,446**	**7,345**	**5,129**
Development	4,245	4,465	3,115	6,469	6,826	4,764
Mixed open land	287	280	183	344	436	285
Agriculture	241	0	0	549	0	0
Forest	17	16	14	23	20	18
Water	39	39	39	61	62	62

Note: P lbs/yr = pounds of Phosphorus per year

6.3 Stormwater and Nonpoint Source Pollution Discussion and Strategies

Most local and regional water resources lack specific quantitative measures of assimilative capacity, such as completed Total Maximum Daily Loads (TMDL) for nutrient loads; as a result, it is not possible to determine whether or by how much the nutrient loads from future development would exceed the capacity. Given these uncertainties and the goal of protecting and restoring water quality, the City's growth, development, and redevelopment should minimize future nutrient loads and impervious surface in all watersheds. The NPS nutrient modeling demonstrates that the most effective way to minimize future nutrient loads is through the implementation of the Tributary Strategies. Additionally, Clopper Lake is a unique case with an established TMDL for phosphorus loading, so additional nutrient reduction strategies may be necessary to lower current loading levels to the established TMDL limit.

The assessment of treated and untreated developed drainage areas identifies general areas where the implementation of Tributary Strategies should be a priority; specifically the implementation of stormwater management retrofit projects and ESD for new development and re-development. The nonpoint source analysis indicates that implementing Tributary Strategies in the Lower Great Seneca watershed is important to lower the phosphorus annual loads to achieve the Clopper Lake TMDL allocations. Furthermore, the analysis shows that Muddy Branch watershed has the greatest projected change in land uses and nutrient loading and that Middle Seneca has the greatest number of untreated acres; signaling that these watersheds should also receive adequate consideration in the planning of future retrofit and restoration projects.

Nonpoint source pollution and watersheds cross jurisdictional boundaries and require regional coordination to assess the potential impacts associated with *total regional growth*. Gaithersburg coordinates with Montgomery County and the Maryland-National Capital Park and Planning Commission to ensure that the City's forecasted growth and land use changes are factored in the County's regional growth plans and nonpoint source analysis. Subsequently, Montgomery County's Water Resource Element will provide a more comprehensive analysis of the *region's total projected growth and stormwater and nonpoint source loading analysis* in order to assess potential impacts on the water quality of subwatersheds.

In addition to the summary of State and Federal water quality regulatory requirements and programs identified previously in Section 3.3, the following are specific local stormwater management strategies, policies, and programs for water quality protection and enhancement:

- **Gaithersburg's Stormwater Management Ordinance (Chapter 8 of the City Code)**: Any development that disturbs greater than five thousand (5,000) square feet of land area in the City must address stormwater runoff. The City of Gaithersburg utilizes the 2000 Maryland Stormwater Design Manual, Volumes I and II (Maryland Department of the Environment, April 2000) and the USDA Natural Resources Conservation Service Maryland Conservation Practice Standards Pond Code 378 (January 2000) as the City's official guides for stormwater principles, methods, and practices. However, the Stormwater Management Act of 2007 (Act) required significant changes to the Code of Maryland Regulations (COMAR) and the Design Manual. To comply with the 2007 Act, the City must amend Chapter 8 of the City Code to incorporate the revisions to the Maryland Stormwater Design Manual and address the other significant changes to

COMAR. The most notable provision of the 2007 Act is the implementation of environmental site design (ESD) for new development and redevelopment to the maximum extent practicable (MEP). ESD is defined as "… using small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrological runoff characteristics and minimize the impact of land development on water resources." ESD techniques are based on the premise that stormwater management should not be seen as stormwater disposal. Instead of conveying and treating stormwater in large, costly end-of-pipe facilities, ESD addresses stormwater through conserving natural features, drainage patterns, and vegetation; minimizing impervious surfaces; slowing down runoff; and increasing infiltration with the use of small, cost-effective landscape features that are frequently located onsite. ESD techniques include green roofs, pervious pavement, rain gardens, submerged gravel wetlands, rain water harvesting (cisterns and rain barrels), infiltration berms, dry wells, landscape and tree planters (e.g., linear tree pits, sidewalk planters), grass swales and bio-swales, tree-swales, grass filter strips and vegetated buffers. In order to fully implement ESD during the site plan process, amendments to revise other chapters of the City Code may be required; including but not limited to: parking requirements, parking lot design specifications, road codes and design requirements, green space requirements, paving section design standards, and landscaping requirements.

- **Tributary Strategies**: The Middle Potomac Tributary Strategy identifies the following practices for reducing pollutant loading in urban areas: (1) require all new and redevelopment to use environmental site design (ESD) practices for stormwater management; (2) inspect, maintain, and retrofit development from 1985-2002; (3) retrofit 40% of untreated developed land; (4) educate residents to reduce home fertilizer use; and (5) implement sediment and erosion control for all disturbed land. Gaithersburg's watershed management practices should strive to incorporate these strategies when feasible.

- **Sediment and Erosion Control**: Sedimentation and other impacts resulting from construction activities increase stormwater flows to streams and waterways and potentially threaten water quality. Clearing and grading activities disturbing greater than five thousand (5,000) square feet and greater than one hundred (100) cubic yards of earth are required to develop and implement an erosion and sediment control plan that is approved by the City of Gaithersburg. Furthermore, the Maryland Department of the Environment has announced plans to review and modify the State's erosion and sediment control standards. In the future, the

Figure 8: Sediment and Erosion Control

The removal of natural vegetation and topsoil during the initial phase of construction makes the exposed area particularly susceptible to erosion and sedimentation.

- **Muddy Branch and Great Seneca Watershed Partnership**: The City of Gaithersburg is partnering with the U.S. Army Corps of Engineers and Montgomery County Department of Environmental Protection to conduct watershed assessments and restoration plans for Great Seneca Creek and Muddy Branch. The watershed assessments will provide an in-depth analysis of land use, watershed conditions, impervious cover, and the adequacy of stormwater management controls in order to prioritize and design stream restoration and stormwater management retrofit projects and identify where stream and stormwater management improvements should be made during infill and redevelopment. The watershed plans will incorporate the watershed protection and enhancement strategies identified in this plan and will be used as a basis for all future local actions and programs to preserve and revitalize watersheds.

- **Stormwater Management Inspection and Maintenance Program**: Gaithersburg's stormwater facility inspection and maintenance program is responsible for inspecting and ensuring maintenance for all public and private stormwater management facilities in the City. The City has over 400 facilities comprised of wet ponds, dry ponds, sand filters, infiltration trenches, oil grit separators, and underground storage structures that are vital to protecting our streams and safety. Inspection and maintenance of this infrastructure is imperative to keep them functioning. Gaithersburg also works with common ownership communities in developing strategies and funding for stormwater management (SWM) facility repairs and upgrades.

- **Water Quality Protection Charge (WQPC)**: Inspection and maintenance of stormwater infrastructure requires a significant commitment of financial and staff resources. Therefore in 2003, the City of Gaithersburg established a memorandum of understanding with Montgomery County to have the Water Quality Protection Charge assessed on properties within the City to provide a dedicated source of funding for the City's stormwater management program. This source of funding is critical to support the City's stormwater management and NPDES Phase II permit requirements. The program currently applies to residential and associated non-residential properties. The City will continue to work with the Montgomery County Department of Environmental Protection on proposed program modifications; especially those that may address the commercial sector.

- **Stormwater Retrofits.** Stormwater retrofits can help to reduce nonpoint source pollution; particularly in more densely developed areas that lack or have inadequate stormwater management controls. Through field inspections and GIS analysis, the City is identifying locations where such retrofits could address concentrations of nonpoint source pollution, help to protect environmentally sensitive areas, or improve impaired watersheds. Retrofitting existing development is a challenging and important component of a comprehensive stormwater management plan. Stormwater management retrofit projects are incorporated into the City's stormwater management capital improvements plan.

- **Rainscapes Rewards Program**: The City of Gaithersburg has partnered with the City of Rockville and Montgomery County to create a Rainscapes Rewards program aimed at helping private property owners improve stormwater runoff conditions on their property by installing more natural drainage projects. These projects are designed to reduce the amount of stormwater entering local streams, increase groundwater recharges, and reduce chemical and nutrient pollutants entering waterways. The first phase of the City's program focuses on providing education and financial incentives for residential rain barrels. The second phase focuses on encouraging residential property owners to replace turf with conservation landscaping. Pending demand and available resources, the City may expand the program to promote rain gardens, tree canopy, pervious paving, and green roof projects.

Figure 9: Rain Barrels

Rain barrel rebates encourage residential property owners to collect and use rainwater in their yard and garden.

- **Green Building Initiatives**: Changing the way buildings are designed, constructed, and operated has a profound impact on the environment and human health. Water conservation and stormwater management controls are important elements of green building. Gaithersburg has a range of programs and building code requirements that promote "sustainable" or "green" building practices in municipal, residential, and commercial projects. Properties in Gaithersburg may also be eligible for State and County green building financial incentives.

- **Green Streets**: A street that uses vegetated facilities to manage stormwater runoff at its source is referred to as a "green street". Green streets can be applied to existing right-of-ways or new street construction and provide environmental, traffic calming, and aesthetic benefits. Green streets use an ESD approach to manage stormwater flows, improve water quality, reduce heat in urban areas, recharge groundwater, and enhance watershed health. A green street essentially handles stormwater on site through the use of vegetated facilities, such as curb extensions, planters, swales, and pervious paving. Gaithersburg completed a green street pilot retrofit project at Rabbitt Road to test this new technique and encourage this strategy in new development, redevelopment, and future City street improvement projects. In particular, this technique may be beneficial in older neighborhoods that currently lack

Figure 10: Green Streets

Green street strategies, such as the Rabbitt Road pilot project may be applied in the right-of-way of older neighborhoods to improve stormwater management.

stormwater management controls or in watersheds with water quality impairments, like Clopper Lake.

- **Stream Restoration**: Stream bank erosion, common in urban streams, contributes to the total sediment discharge in a given stream reach and threatens water quality and biological integrity of local streams. In 2002, the City conducted a comprehensive stream assessment to evaluate stream conditions and identify restoration opportunities. The study provided an ecological assessment of water quality and resource conditions within the City's more than 24 miles of streams and identified 52 restoration opportunities that could improve conditions within and along these streams. Accordingly, the City has been working with private land owners, Montgomery County, and the State to implement projects to restore these stream reaches. Furthermore, the Environment Element of the Master Plan and Section 33 of the *Environmental Standards for Development Regulation* require stream quality enhancements and stabilization during development and redevelopment where an existing stream on the development site is degraded and experiencing erosion, bank failure, or undercutting. Whenever possible, the City promotes the use of natural channel design techniques to restore channel stability and habitat by re-establishing the stream's pattern (bends and meanders), dimension (width, depth, and shape), profile (bed slope), and floodplain connection.

Figure 11: Stream Restoration

Before (top) and after (bottom) photos of a stream restoration project in the Muddy Branch. Instead of traditional bank armoring to control erosion, cross veins were used to control flow and provide a more aesthetically appealing design that mimics nature.

- **Green Infrastructure**: Green infrastructure supports healthier communities and watersheds by utilizing the absorbing and filtering ability of plants, trees, and soil to protect water quality, reduce runoff, and recharge groundwater. On a large scale, green infrastructure includes the interconnected network of open spaces and natural areas, such as greenways, parks, wetlands, floodplains, stream buffers, forests, and landscaped areas. On a smaller scale, green infrastructure includes such ESD practices as rain gardens, green roofs, infiltration planters, landscaped medians, and street trees that are located on both public and private property. Gaithersburg's *Environment Element of the Master Plan* includes strategies to maintain and enhance green infrastructure. During the development review process, the City's *Environmental Standards for Development Regulation, Forest Conservation Ordinance, Stormwater Management Ordinance, and Zoning Ordinance* include requirements for the minimization of impervious area and the protection, restoration, creation, and maintenance of such green infrastructure as stream buffers, wetlands, open space, forests, and ESD structures.

- **Storm Drain Marking Program**: Thousands of storm drain inlets are located throughout Gaithersburg. Many people are unaware that anything that goes into a storm drain goes directly into our local streams, which feed into the Potomac River, and eventually flow into the Chesapeake Bay. Gaithersburg provides free stencils or plastic decals to volunteers to mark storm drains in the community. Civic associations, homeowners associations, individuals, and students can volunteer to mark the storm drain inlets in their neighborhood with "Don't Pollute" to remind the community that nothing but rainwater should enter the storm drains.

Figure 12: Storm Drain Marking Program

Storm drain decals are part of the City's NPDES permit requirements and increase community awareness about nonpoint source pollution.

- **Education and Outreach for Pollution Prevention**: Protecting our local watersheds and the Chesapeake Bay requires everyone to lend a hand. Gaithersburg will continue to partner with other local governments and the Metropolitan Washington Council of Governments (MWCOG) on regional watershed education and stewardship programs. For example, MWCOG's *Healthy Lawns, Clean Water* campaign unites businesses, governments, and academic organizations to raise awareness of environmentally friendly lawn care. Gaithersburg has also signed the "Potomac Trash Treaty" coordinated by the Alice Ferguson Foundation. The Trash Free Potomac Watershed Initiative (TFPWI) is a program to reduce trash and increase recycling, education, and awareness of trash issues in the watershed. The City also requires an Integrated Pest Management (IPM) approach to the management of public property and HOA common areas to reduce the unnecessary application of herbicides and pesticides. The City further promotes the proper disposal of pet waste which contains excess nutrients and bacteria which can contaminate stormwater runoff.

- **'Team Up to Green Up' Program**: This City-wide program encourages volunteers to partner with the City to adopt parks and streams to clean up and improve our environment. This program includes various activities including trash and invasive plant removal and tree planting. Partners receive supplies and support from the City, and their efforts are recognized with a sign posted in their adopted area.

Figure 13: 'Team Up To Green Up' Program

The 'Team Up to Green Up' encourages volunteers to adopt parks and streams throughout the City.

7. Conclusion

The 2030 growth forecasts found in Gaithersburg's Municipal Growth Element (MGE) are consistent with the State of Maryland Smart Growth initiatives that direct State funding to identified priority funding/growth areas and with Montgomery County's and WSSC's goals to emphasize service to urbanized areas of the County. Gaithersburg's Water Resources Element (WRE) assesses drinking water supply, wastewater treatment capacity and water quality, and stormwater and nonpoint source pollution with respect to the Municipal Growth Element's forecasted growth for 2030. The WRE ensures that future comprehensive plans reflect the opportunities and limitations presented by local and regional water resources. Based on currently available data and modeling, the WRE analysis determined that with proper planning, regional coordination, and the maintenance and replacement of infrastructure:

- Adequate drinking water resources should be available to accommodate the projected growth of Gaithersburg;
- The application of upgraded technologies for wastewater treatment and expanded plant capacity should ensure that wastewater discharge is not a significant constraint for future growth;
- The application of Tributary Strategies and other best management practices should effectively manage stormwater and reduce nonpoint source pollution loading to protect water quality for watersheds that currently do not have established TMDLs; and
- The City of Gaithersburg recognizes that Clopper Lake, because of the presence of a phosphorus TMDL, can only be considered a suitable receiving water if future nutrient impacts are offset. Interjurisdictional watershed planning and pollution control efforts are needed to help achieve this goal.

Managing land use in a way that is mindful of water resources will require Gaithersburg to implement a variety of development regulations, policies, and programs. Among other things, it requires minimizing the footprint of new development; implementation of water conservation measures; staging growth based on the availability and capacity of water resources and infrastructure; protecting forested areas, natural landscapes, and natural buffers; retrofitting existing developed areas with improved stormwater management techniques; encouraging best practices in the management of public property and right-of-ways; requiring environmentally sensitive design (ESD) practices to the maximum extent practicable in all new development and redevelopment; and promoting community watershed education and stewardship.

Nevertheless, the responsibilities of planning and providing water service in Montgomery County are multi-jurisdictional. This is especially true with regard to the use of the Potomac River for source water and the Blue Plains Wastewater Treatment Plant, which are shared resources for several jurisdictions, states, and agencies. Therefore, it is important for Gaithersburg to ensure that the City's forecasted growth and land use changes are factored into regional growth plans and capacity analyses in order to ensure that the water and wastewater supply, treatment, and transmission infrastructure are all adequate to meet *total regional growth demands* and stormwater and nonpoint source pollution is assessed on the watershed level. Subsequently, Montgomery County's Water Resource Element will factor in Gaithersburg's growth and provide a more comprehensive analysis of the *region's total* projected drinking water and wastewater demands and capacity as well as regional stormwater and nonpoint source pollution loading.

8. References

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9. Appendix A: MDE Land Use/Land Cover Classifications

Generalized Land Use	Maryland Department of Planning Stormwater and Nontpoint Source Assessment Land Use/Land Cover Classification Definitions		
	Category	Code	Description
Developed Areas	Low Density Residential	11	Detached single-family/duplex units, yards and associated areas. Areas of more than 90 percent single-family/duplex dwelling units, with lot sizes of less than five acres but at least one-half acre (0.2 dwelling units/acre to 2 dwelling units/acre).
	Medium Density Residential	12	Detached single-family/duplex, attached single-unit row housing, yards, and associated areas. Areas of more than 90 percent single-family/duplex units and attached single-unit row housing, with lot sizes of less than one-half acre but at least one-eighth acre (2 dwelling units/acre to 8 dwelling units/acre).
	High Density Residential	13	Attached single-unit row housing, garden apartments, high-rise apartments/condominiums, mobile home and trailer parks. Areas of more than 90 percent high-density residential units, with more than 8 dwelling units per acre.
	Commercial	14	Retail and wholesale services. Areas used primarily for the sale of products and services, including associated yards and parking areas.
	Industrial	15	Manufacturing and industrial parks, including associated warehouses, storage yards, research laboratories, and parking areas.
	Institutional	16	Elementary and secondary schools, middle schools, junior and senior high schools, public and private colleges and universities, military installations (built-up areas only, including buildings and storage, training, and similar areas), churches, medical and health facilities, correctional facilities, and government offices and facilities that area clearly separable from the surrounding land cover.
	Extractive	17	Surface mining operations, including sand and gravel pits, quarries, coal mines, and deep coal mines. Status of activity (active vs. abandoned) is not distinguished.
	Transportation	80	Miscellaneous transportation features not elsewhere classified
	Mixed Use Residential*	n.a.	Mixed use development comprised of residential, commercial, recreational, open space, employment, and institutional uses; with a majority being residential uses.
	Mixed Use Commercial*	n.a.	Mixed use development comprised of residential, commercial, recreational, open space, employment, and institutional uses; with a majority being commercial uses.
Water	Water	50	Rivers, waterways, reservoirs, ponds, bays, estuaries, and ocean.
	Wetlands	60	Forested or non-forested wetlands, including tidal flats, tidal and non-tidal marshes, and upland swamps and wet areas.

Generalized Land Use	Maryland Department of Planning Stormwater and Nontpoint Source Assessment Land Use/Land Cover Classification Definitions		
	Category	Code	Description
Mixed Open Land	Open Urban Land	18	Urban areas whose use does not require structures or urban areas where non-conforming uses characterized by open land have become isolated. Included are golf courses, parks, recreation areas (except associated with schools or other institutions), cemeteries, and entrapped agricultural and undeveloped land within urban areas.
	Brush	44	Areas which do not produce timber other wood products but may have cutover timber stands, abandoned agriculture fields, or pasture. These areas are characterized by vegetation types such as sumac, vines, rose, brambles, and tree seedlings.
	Bare Ground	73	Areas of exposed ground caused naturally, by construction or by other cultural processes.
	Beaches	71	Extensive shoreline areas of sand and gravel accumulation, with no vegetative cover or other land use.
	Bare Rock	72	Areas of bedrock exposure, scarps, and other natural accumulations of rock without vegetative cover.
Agriculture	Cropland	21	Field crops and forage crops.
	Pasture	22	Land used for pasture, both permanent and rotated; grass.
	Orchards	23	Areas of intensively managed commercial bush and tree crops, including areas used for fruit production, vineyards, sod and seed farms, nurseries, and green houses.
	Feeding Operations	24	Cattle feed lots, holding lots for animals, hog feeding lots, poultry houses, and commercial fishing areas (including oyster beds).
	Large lot subdivision (agriculture)	191	Residential subdivisions with lot sizes of less than 20 acres but at least 5 acres, with a dominant land cover of open fields or pasture.
	Row and Garden Crops	25	Intensively managed truck and vegetable farms and associated areas.
Forest	Deciduous Forest	41	Forested areas in which the trees characteristically lose their leaves at the end of the growing season. Included are such species as oak, hickory, aspen, sycamore, birch, yellow poplar, elm, maple, and cypress.
	Evergreen Forest	42	Forested areas in which the trees are characterized by persistent foliage throughout the year. Included are such species as white pine, pond pine, hemlock, southern white cedar, and red pine.
	Mixed Forest	43	Forested areas in which neither deciduous nor evergreen species dominate, but in which there is a combination of both types.

* Added by Gaithersburg to reflect local zoning and development conditions.

10. Appendix B: Acronyms Used In This Document

Acronym	Meaning
APFO	Adequate Public Facilities Ordinance
BMP	Best Management Practices
CCT	Corridor Cities Transitway
COMAR	Code of Maryland Regulations
CWA	Clean Water Act (Federal)
CWSP	Comprehensive Water Supply and Sewerage Systems Plan (Montgomery County)
DWSP	Drinking Water Source Protection
ENR	Enhanced Nutrient Removal
EPA	Environmental Protection Agency
ESD	Environmental Site Design
FSP	Final Site Plan
GLB	Gross Land Buildable
ICC	Inter-County Connector
IMA	Intermunicipal Agreement (Blue Plains Facility)
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
MEL	Maximum Expansion Limits
MEP	Maximum Extent Practicable
MFDU	Multi-family Dwelling Unit
MGD	Million Gallons per Day
MGE	Municipal Growth Element
M-NCPPC	Maryland-National Capital Park and Planning Commission
MWCOG	Metropolitan Washington Council of Governments
NIST	National Institute of Standards and Technology
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Source Pollution
PFA	Priority Funding Area
PI	Potomac Interceptor (sewer line)
PSP	Preliminary Site Plan
RCTS	Rock Creek Trunk Sewer
SDP	Schematic Development Plan
SFDU	Single Family Dwelling Unit
SWA	Source Water Assessment
SWM	Stormwater Management

Acronym	Meaning
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
WASA	District of Columbia Water and Sewer Authority
WFP	Water Filtration Plant
WQPC	Water Quality Protection Charge (Montgomery County)
WRE	Water Resources Element
WSSC	Washington Suburban Sanitary Commission
WWTP	Wastewater Treatment Plant

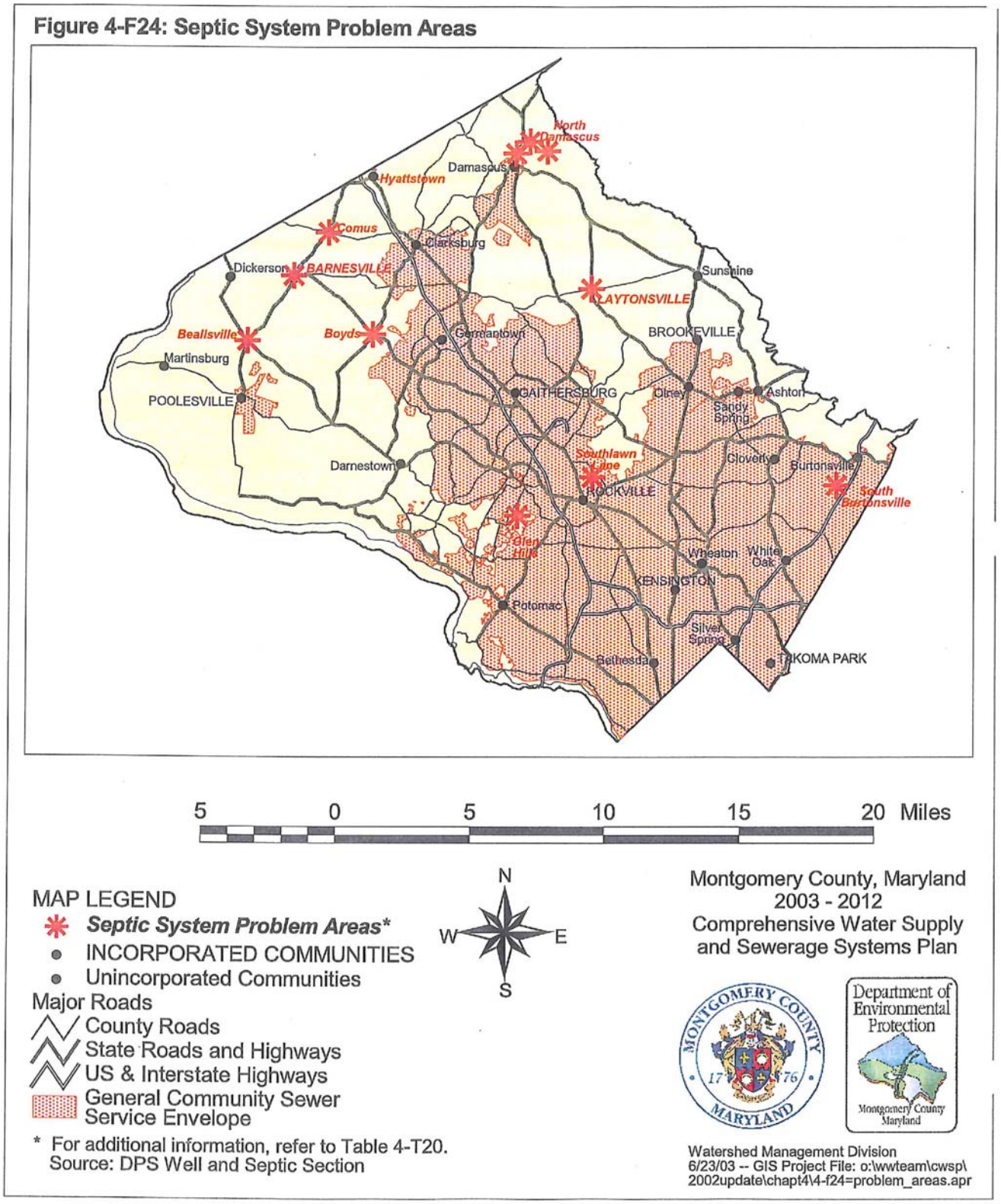
11. Appendix C: Septic Systems and Wells Located in Gaithersburg

Given that all of Gaithersburg and the Maximum Expansion Limits are within WSSC's service area and that new development, redevelopment and/or renovations will require all structures to utilize WSSC for drinking water and sanitary treatment services. For this reason, septic systems and wells were excluded from the official analysis.

11.1 Septic Systems

Montgomery County Department of Permitting Services (DPS) Wells and Septic Section administers and enforces County and State laws governing on-site, individual sewerage systems to prevent failing or improperly maintained septic systems that can contribute excessive nitrogen to ground and surface waters. Montgomery County has identified septic system problem areas in Figure 4-F24 of the *Comprehensive Water Supply and Sewerage Systems Plan*. According to this map, there are no problem areas located in or near Gaithersburg.

Figure 4-F24: Septic System Problem Areas



According to a 2006 review of permitted septic tanks by Montgomery County and Gaithersburg's Neighborhood Services Division, only two properties in the City of Gaithersburg were confirmed to have active septic tanks:

1. 123 East Deer Park: Residential
2. 895 Quince Orchard Road: Commercial

Other commercial properties were identified by Montgomery County as potentially having septic system permits; however, the following addresses/tanks could not be confirmed to exist:

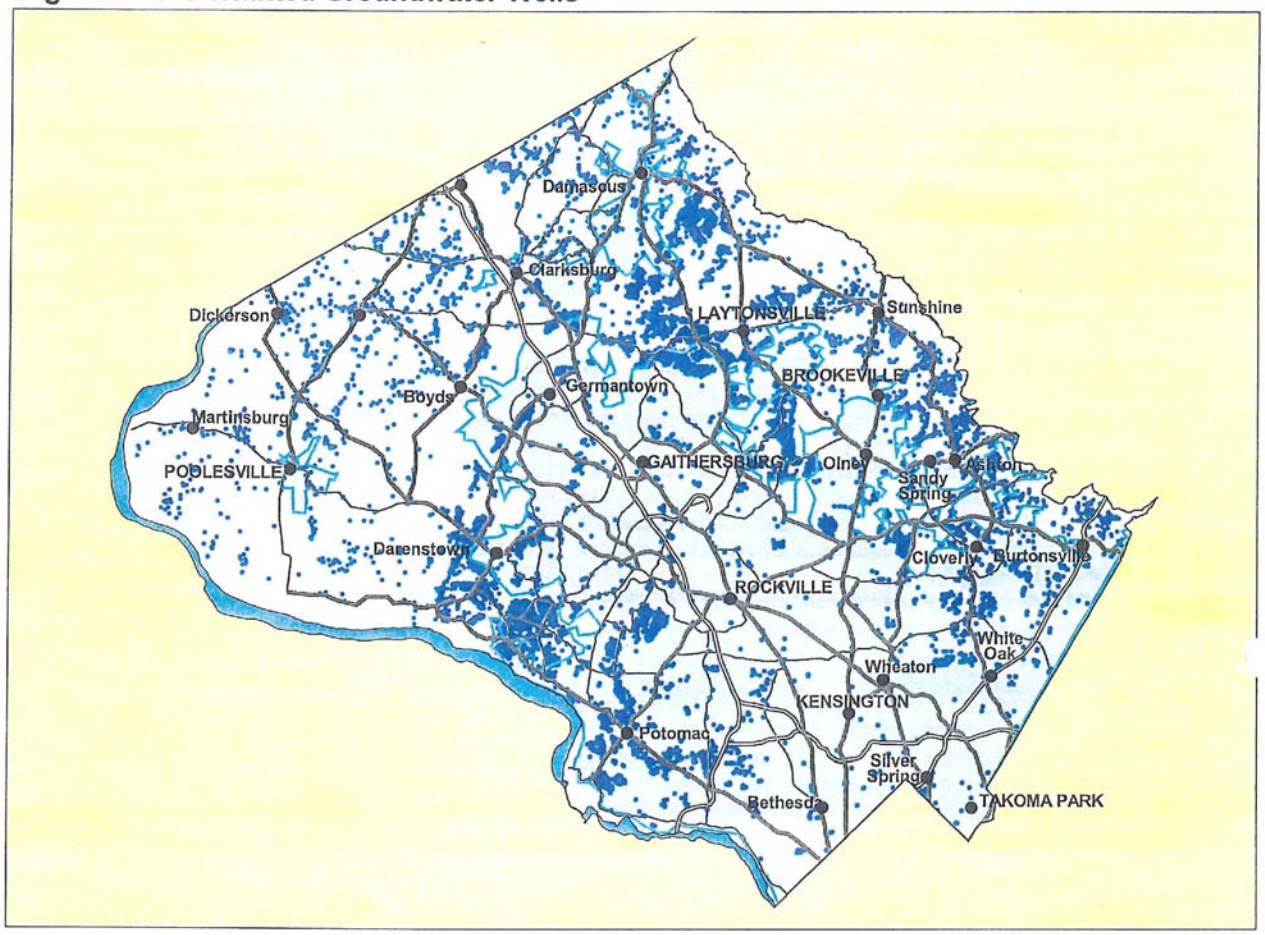
1. 249 Muddy Branch
2. 293 Muddy Branch
3. 307 Muddy Branch
4. 335 Muddy Branch
5. 375 Muddy Branch
6. 453 Muddy Branch
7. 815 Russell Ave
8. 1 East Diamond Ave
9. 800 Frederick Ave
10. 434 Diamond Ave
11. 671 East Diamond
12. 119 Frederick Ave

Preliminary model runs incorporated the 14 total confirmed/unconfirmed septic tanks and the results indicated that they contributed a negligible amount of pollution—less than 1% of nutrient loads. Given that all of Gaithersburg and the Maximum Expansion Limits are within WSSC's service area and that redevelopment and/or building renovations will require all structures to utilize WSSC for sanitary treatment services, septic systems were excluded from the official nutrient loading analysis.

11.2 Groundwater Wells

According to the Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, the following map (Figure 3-F9) identifies *permitted* groundwater wells (not necessarily active wells) in Montgomery County. The City of Gaithersburg is served by WSSC and is located entirely within a W-1 water service category, meaning that it is either served by water community systems that already exist or under construction. Furthermore, Montgomery County has identified well problem areas in Figure 3-F11 of the *Comprehensive Water Supply and Sewerage Systems Plan*. According to this map, there are no problem areas located in or near Gaithersburg.

Figure 3-F9: Permitted Groundwater Wells



5 0 5 10 15 20 25 Miles

N
W E
S

MAP LEGEND
- Permitted Groundwater Wells*
- Communities

Major Roads
- County Roads
- State Roads and Highways
- US & Interstate Highways
- General Community Water Service Envelope

* As verified by DPS well permit records.

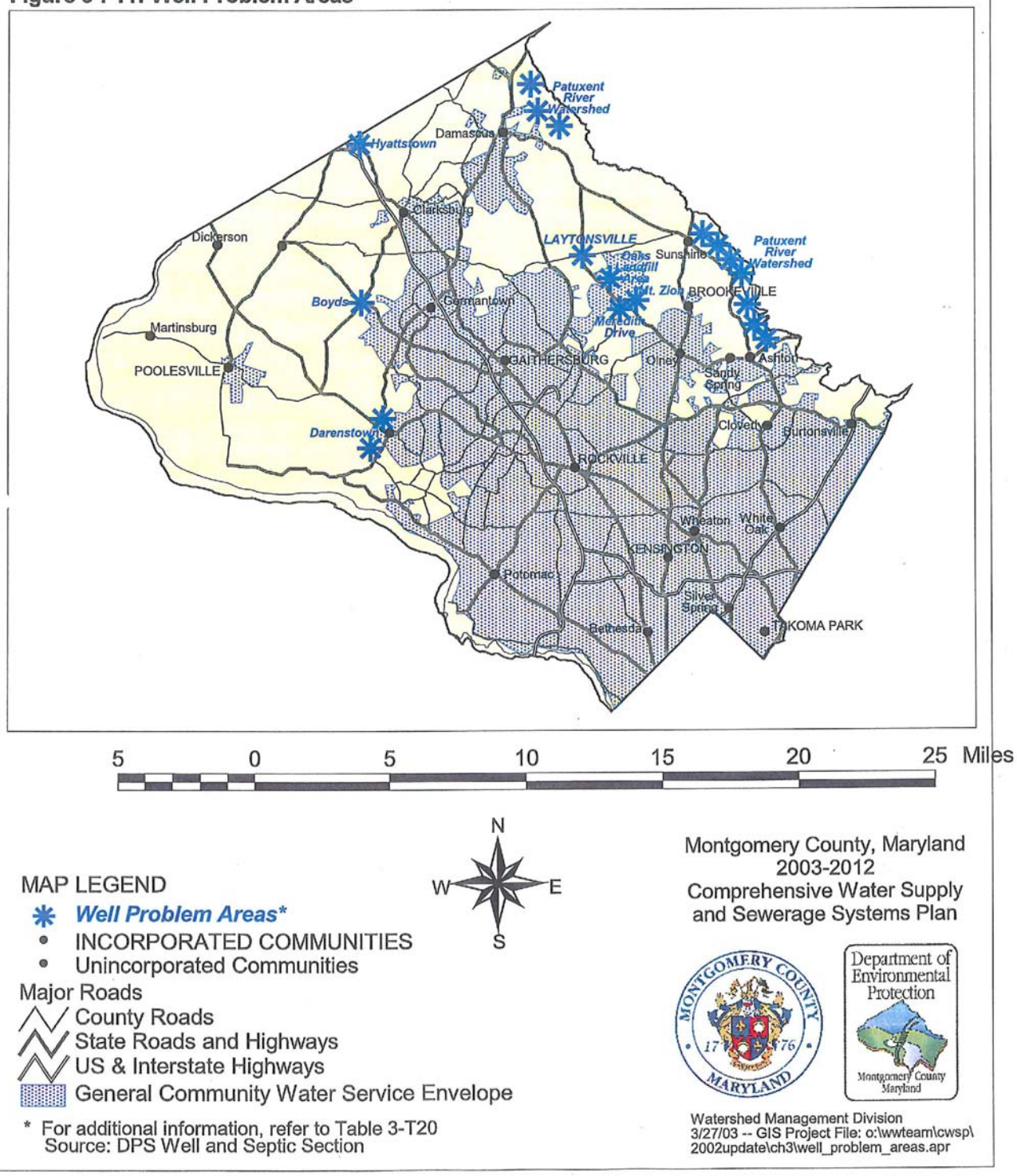
Source: Mont.Co. Groundwater Protection Strategy (DEP)

Montgomery County, Maryland
2003-2012
Comprehensive Water Supply and Sewerage Systems Plan

Department of Environmental Protection
Montgomery County Maryland

Watershed Management Division
5/26/04 -- GIS Project File: o:\wwteam\cwsp\2002update\ch3\3-f9-groundwater_wells.apr

Figure 3-F11: Well Problem Areas



12. Appendix D: NPDES Permits within Gaithersburg

The following tables are based on data extracted from the NPDES permit database (updated December 15, 2009) for facilities within the Gaithersburg, Maryland ZIP codes (20877, 20878, 20879). Please note that grey text in the tables below indicates facilities that are located outside of the City of Gaithersburg corporate limits.

The following summarizes the 15 NPDES permits within Gaithersburg (please note that none of the permits reference nutrient concentrations):

- 6 operators of apartment buildings with swimming pools (turbidity, pH, flow, and chlorine);
- 1 hotel with a swimming pool (pH and flow);
- 5 civic, social, and fraternal associations with swimming pools (dissolved oxygen, pH, dissolved copper, chlorine, temperature, flow, total copper);
- 1 refuse system for a public elementary school (methyl tert-butyl ether, benzene, toluene, xylene, ethyl benzene, petrol hydrocarbons, flow);
- 1 business service, not elsewhere classified, with a geothermal heating and cooling system (temperature and flow); and
- 1 linear natural gas distribution company (dissolved oxygen, pH, total suspended solids, chlorine, temperature, flow, and oil and grease).

The U.S. Environmental Protection Agency's The Water Discharge Permits Query Form allows the retrieval of selected data from the Permit Compliance System (PCS) database in Envirofacts regarding facilities holding National Pollutant Discharge Elimination System (NPDES) permits. This system is available online at:

http://www.epa.gov/enviro/html/pcs/pcs_query_java.html

12.1 NPDES Permits for ZIP Code 20877

NPDES ID	Facility Information	FACILITY NAME	ADDRESS	COUNTY NAME	PERMIT ISSUED DATE	PERMIT EXPIRED DATE	SIC CODE	SIC DESC
MDG344034	View Facility Information	CHESAPEAKE PETROLEUM AND SUPPLY COMPANY INCORPORATED	16821 OAKMONT AVENUE GAITHERSBURG, MD 20877	MONTGOMERY	JUN-04-1998	APR-22-2002	5171	PETROLEUM BULK STATIONS AND TERMINALS
MDG766333	View Facility Information	GAITHERHOUSE APARTMENTS	501 B S. FREDERICK AVE,APT 3 GAITHERSBURG, MD 20877	MONTGOMERY	SEP-25-2002	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766866	View Facility Information	GAITHERSBURG HILTON	620 PERRY PARKWAY GAITHERSBURG, MD 20877	MONTGOMERY	MAY-10-2004	DEC-27-2006	7011	HOTELS AND MOTELS
MDG766586	View Facility Information	LONDONDERRY APARTMENTS	17041 DOWNING STREET GAITHERSBURG, MD 20877	MONTGOMERY	DEC-31-2002	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766928	View Facility Information	STRATFORD PLACE	12 WEST DEER PARK ROAD GAITHERSBURG, MD 20877	MONTGOMERY	AUG-16-2004	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766486	View Facility Information	SUMMIT CREST	38 NORTH SUMMIT AVENUE GAITHERSBURG, MD 20877	MONTGOMERY	OCT-11-2002	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766655	View Facility Information	UPPER COUNTY OUTDOOR POOL	8211 EMORY GROVE ROAD GAITHERSBURG, MD 20877	MONTGOMERY	APR-07-2003	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MD0069183	View Facility Information	VILLA RIDGE CONDOMINIUMS	414 GIRARD STREET GAITHERSBURG, MD 20877	MONTGOMERY	JUL-01-2004	JUN-30-2009	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766799	View Facility Information	WEST DEER PARK APARTMENTS	72-A WEST DEER PARK ROAD GAITHERSBURG, MD 20877	MONTGOMERY	OCT-01-2003	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS

Note: Facilities shown in grey text are located outside of the City of Gaithersburg corporate limits.

12.2 NPDES Permits for ZIP Code 20878

NPDES ID	Facility Information	FACILITY NAME	ADDRESS	COUNTY NAME	PERMIT ISSUED DATE	PERMIT EXPIRED DATE	SIC CODE	SIC DESC
MDG766724	View Facility Information	CIDER MILL APARTMENTS	18301 LOST KNIFE CIRCLE GAITHERSBURG, MD 20878	MONTGOMERY	JUN-10-2003	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766472	View Facility Information	DIAMOND FARM HOMEOWNERS ASSOCIATION	1203 QUINCE ORCHARD ROAD GAITHERSBURG, MD 20878	MONTGOMERY	SEP-27-2002	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG914709	View Facility Information	FIELDS ROAD ELEMENTARY SCHOOL	1 SCHOOL DRIVE GAITHERSBURG, MD 20878	MONTGOMERY	JUL-30-2001	APR-22-2002	4953	REFUSE SYSTEMS
MD0068195	View Facility Information	GLOBAL EXCHANGE SERVICES	11555 DARNESTOWN ROAD GAITHERSBURG, MD 208783200	MONTGOMERY	SEP-01-2004	AUG-31-2009	7389	BUSINESS SERVICES, NOT ELSEWHERE CLASSIFIED
MDG766629	View Facility Information	LAKELANDS COMMUNITY ASSOC.	960 MAIN STREET GAITHERSBURG, MD 20878	MONTGOMERY	JUL-17-2003	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766628	View Facility Information	LAKELANDS RIDGE H.O.A.	100 HIGH GABLES DRIVE GAITHERSBURG, MD 20878	MONTGOMERY	APR-05-2004	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766527	View Facility Information	QUINCE ORCHARD SWIM & TENNIS CLUB	16601 ROUNDABOUT DRIVE GAITHERSBURG, MD 20878	MONTGOMERY	OCT-25-2002	DEC-27-2006	7991	PHYSICAL FITNESS FACILITIES
MDG766794	View Facility Information	STONE BRIDGE POOL	14801 STONEBRIDGE VIEW DRIVE GAITHERSBURG, MD 20878	MONTGOMERY	AUG-14-2003	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766859	View Facility Information	THE ORCHARDS H.O.A.	113 ORCHARD DRIVE GAITHERSBURG, MD 20878	MONTGOMERY	MAY-10-2004	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766250	View Facility Information	WASHINGTONIAN TOWER CONDOMINIUM	9701 FIELDS ROAD GAITHERSBURG, MD 20878	MONTGOMERY	JUL-18-2002	DEC-27-2006	7999	AMUSEMENT AND RECREATION SERVICES, NOT ELSEWHERE CLASSIFIED

Note: Facilities shown in grey text are located outside of the City of Gaithersburg corporate limits.

12.3 NPDES Permits for ZIP Code 20879

NPDES ID	Facility Information	FACILITY NAME	ADDRESS	COUNTY NAME	PERMIT ISSUED DATE	PERMIT EXPIRED DATE	SIC CODE	SIC DESC
MDG679458	View Facility Information	COLUMBIA GAS NAT.GAS.TRANS.PL	LINEAR FACILITY GAITHERSBURG, MD 20879	MONTGOMERY	JUN-23-2003	DEC-27-2006	4924	NATURAL GAS DISTRIBUTION
MD0064955	View Facility Information	CONCRETE GENERAL	8000 BEECHCRAFT AVENUE GAITHERSBURG, MD 20879	MONTGOMERY	JUL-01-2001	JUN-30-2006	1611	HIGHWAY AND STREET CONSTRUCTION, EXCEPT ELEVATED HIGHWAYS
MDG766930	View Facility Information	HUNT CLUB	404 CHRISTOPHER AVENUE GAITHERSBURG, MD 20879	MONTGOMERY	AUG-16-2004	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766576	View Facility Information	KENTLANDS CLUB	485 TSCHIFFELY SQUARE ROAD GAITHERSBURG, MD 20879	MONTGOMERY	JAN-14-2003	DEC-27-2006	6513	OPERATORS OF APARTMENT BUILDINGS
MDG766865	View Facility Information	MONTGOMERY PLACE	8825 CENTERWAY ROAD GAITHERSBURG, MD 20879	MONTGOMERY	MAY-10-2004	DEC-27-2006	8641	CIVIC, SOCIAL, AND FRATERNAL ASSOCIATIONS
MDG766042	View Facility Information	THOMAS CHOICE GDN CONDO	19401 BRASSIE PLACE GAITHERSBURG, MD 20879	MONTGOMERY	APR-26-2002	DEC-28-2006	6519	LESSORS OF REAL PROPERTY, NOT ELSEWHERE CLASSIFIED

Note: Facilities shown in grey text are located outside of the City of Gaithersburg corporate limits.